DAV UNIVERSITY JALANDHAR

Course Scheme & Syllabus

Master of Technology

In

Mechanical Engineering

Session 2015–2016 (Onwards)

DAV UNIVERSITY, JALANDHAR

M Tech (Mechanical Engineering)

Semester	Course Code	Course Title	L	T	P	Cr	Nature of Course
1	MGT551	Research Methodology	3	1	0	4	Core
1	MTH551A	Numerical Analysis	4	0	0	4	Core
1	MEC502	Advance Design	4	0	0	4	Core
1	MEC503	Metal Cutting	4	0	0	4	Core
1	MEC505	Production Planning and Control	4	0	0	4	Core
1	MEC513	Metal Cutting Lab	0	0	4	2	Core (Lab)
			19	**1**	**4**	**22**	
Semester	**Course Code**	**Course Title**	**L**	**T**	**P**	**Cr**	**Nature of Course**
2	MEC556	CAD/CAM	4	0	0	4	Core
2		Discipline Specific Elective -1	4	0	0	4	DSE-1
2		Discipline Specific Elective -2	4	0	0	4	DSE-2
2		Discipline Specific Elective -3	4	0	0	4	DSE-3
2		Generic Elective -1	4	0	0	4	GE-2
2	MEC566	CAD/CAM Lab	0	0	4	2	Core (Lab)
2	MEC550	Seminar	0	0	4	4	Seminar
			20	**0**	**8**	**26**	
Semester	**Course Code**	**Course Title**	**L**	**T**	**P**	**Cr**	**Nature of Course**
3		Discipline Specific Elective -4	4	0	0	4	DSE-4
3		Generic Elective -2	4	0	0	4	GE-2
3	MEC599	Dissertation Part - 1	0	0	0	8	Dissertation Part - 1
			8	**0**	**0**	**16**	
Semester	**Course Code**	**Course Title**	**L**	**T**	**P**	**Cr**	**Nature of Course**
4	MEC700	Dissertation	0	0	0	24	Dissertation Part - 2
			0	0	0	**24**	

Discipline Specific Electives

DSE-1	Course Code	Course Title	L	T	P	Cr.	Area of Specialization
	MEC606	Industrial Tribology	4	0	0	4	Design
	MEC605	Metal Casting and Forming	4	0	0	4	Manufacturing
	MEC625	Hydro Dynamic Machine	4	0	0	4	Thermal
	MEC607	Quality Control and Reliability	4	0	0	4	Industrial

DSE-2	Course Code	Course Title	L	T	P	Cr.	Area of Specialization
	MEC626	Computational Fluid Dynamics	4	0	0	4	Design
	MEC555	Mechatronics	4	0	0	4	Manufacturing
	MEC621	Renewable Energy Sources	4	0	0	4	Thermal
	MEC609	Material Management	4	0	0	4	Industrial

DSE-3	Course Code	Course Title	L	T	P	Cr.	Area of Specialization
	MEC612	Finite Element Method	4	0	0	4	Design
	MEC608	Non-Destructive Testing	4	0	0	4	Manufacturing
	MEC623	IC Engine	4	0	0	4	Thermal
	MEC610	Supply Chain Management	4	0	0	4	Industrial

DSE-4	Course Code	Course Title	L	T	P	Cr.	Area of Specialization
	MEC554	Advance Materials	4	0	0	4	Design
	MEC601	Welding Technology	4	0	0	4	Manufacturing
	MEC624	Gas Turbines and Compressors	4	0	0	4	Thermal
	MEC611	Industrial and Organizational Psychology	4	0	0	4	Industrial

L: Lectures T: Tutorial P: Practical Cr: Credits

Generic Electives

S. No	Course Code	Course Title	L	T	P	Cr.
1	ELE901	Renewable Energy Sources	4	0	0	4
2	ELE902	Energy Audit and Management	4	0	0	4
3	CHL901	Analytical Techniques	4	0	0	4
4	CHL902	Pollution Abatrment and Control Equipment's	4	0	0	4
5	MEC901	Methods Engineering and Ergonomics	4	0	0	4
6	MEC902	Power Plant Engineering	4	0	0	4
7	CSE901	Soft Computing	4	0	0	4
8	CSE902	Mobile Communications	4	0	0	4
9	ECE901	Smart Sensors	4	0	0	4
10	ECE902	Silicon Chip Technology	4	0	0	4
11	CIV901	Transportation Engineering	4	0	0	4
12	CIV902	Water Resource Engineering	4	0	0	4
13	MGT051	Business Strategy	4	0	0	4
14	MGT553	Principles of Marketing	4	0	0	4

Detailed Syllabus

DAV UNIVERSITY, JALANDHAR

Course Title: Research Methodology

Course Code: MGT551

L	T	P	Credits
3	1	-	4

Course Objective: The course is designed to introduce the students to research methodology and application of research techniques and procedures. The primary goal of this course is to develop a sound understanding of research methods.

Learning Outcomes: The students will be able to apply the various research methods by using computerized data analysis software's to solve the real life problems.

UNIT – A

Introduction to Research: Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India.

Defining the Research Problem: What is a Research Problem?, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, factors affecting RDs, Relation among RDs, Developing a Research Plan.

UNIT – B

Sampling design and Procedures: Sample or Census, The Sampling Design Process, A Classification of Sampling Techniques, Choosing Nonprobability Versus Probability Sampling, Uses of Non probability Versus Probability Sampling

Measurement and Scaling: Non-comparative Scaling Techniques, Continuous Rating Scale, Itemized Rating Scale, Non-comparative Itemized Rating Scale Decisions, Multi-item Scales, Scale Evaluation, Choosing a Scaling Technique

Methods of Data Collection: Collection of Primary Data, Observation Method, Interview Method, Collection of Data through Questionnaires, Collection of Data through Schedules, Some Other Methods of Data Collection, Collection of Secondary Data, Selection of Appropriate Method for Data Collection.

Questionnaire & form design: questionnaire & observation forms, questionnaire design process.

UNIT – C

Data preparation: editing, coding, transcribing

Data analysis: tests of significance based on t, f and z distribution and chi-square test; cross tabulation

Multiple Regression: Overview of Multiple Regression, Statistics Associated with Multiple Regression, Conducting Multiple Regression, Stepwise Regression, Multicollinearity

Discriminant Analysis: Discriminant Analysis Model, Statistics Associated with Discriminant Analysis, Conducting Discriminant Analysis

Conjoint Analysis: Basic Concepts in Conjoint Analysis, Statistics Associated with Conjoint Analysis, Conducting Conjoint Analysis, Assumptions & Limitations of Conjoint Analysis, Hybrid Conjoint Analysis

UNIT – D

Multi-Dimensional Scaling: Basic Concepts in Multidimensional Scaling (MDS), Statistics Associated with MDS, Conducting Multidimensional Scaling, Selecting an MDS Procedure, Deciding on the Number of Dimensions, Labelling the Dimensions & Interpreting the Configuration, Assessing Reliability and Validity, Assumptions & Limitations of MDS, Scaling Preference Data

Correspondence Analysis: Relationship between MDS, FA, & DA

Factor Analysis: Factor Analysis Model, Statistics Associated with Factor Analysis, Conducting Factor Analysis, Applications of Common Factor Analysis

Cluster Analysis: Statistics Associated with Cluster Analysis, Conducting Cluster Analysis, Applications of Non-hierarchical Clustering, Clustering Variables

Research Report Writing: Contents of Report, Executive Summary, Bibliography format. Presentation of Report

References:

1) Bajpai Naval, *Business Research Methods*, Pearson Publications. Print.

2) Malhotra, Naresh K. *Marketing Research: An Applied Orientation*, 5th Edition. Pearson/Prentice-Hall, 2007. Print.

3) Proctor Tony, *Essentials of Marketing Research*, Prentice Hall, 4th Edition. Print.

4) Beri, G. C. Marketing research, McGraw-Hill, 4th Edition. Print.

5) Kothari, C.R. *Research Methodology*, New Age Publishers. Print.

DAV UNIVERSITY, JALANDHAR

Course Title: Numerical Analysis

Paper Code: MTH 551A

L	T	P	Credits
4	-	-	4

Objective:

The aim of this course is to teach the applications of various numerical techniques for a variety of problems occurring in daily life. At the end of the course, the students will be able to do programming in MATLAB and understand the basic concepts in Numerical Analysis of differential equations.

UNIT-A

Approximate numbers, Significant figures, rounding off numbers, Error Absolute, Relative and percentage

Algebraic and transcendental equations: Review of some concepts, Solution of algebraic and transcendental equations: Bisection method, RegulaFalsi, Newton Raphson, Lin Barstow's, convergence.

Systems of simultaneous Equations: Crammer's rule, Gauss elimination, Gauss Jordon method, Matrix inversion method, Iterative methods: Jacobi method and Gauss-Seidel method, partition method, Eigenvalues and Eigen vectors: Cayley Hamilton theorem, Power method for finding largest Eigen value.

UNIT –B

Finite Difference Methods: Forward, Backward, Central differences, Newton's forward, backward and divided difference formulae, Gauss, Stirling, Bessel central difference formulae.

UNIT –C

Numerical Differentiation and Numerical Integration: Numerical Differentiation, Trapezoidal and Simpson's one third, Simpson's three eight rule for numerical integration, adaptive integration, Taylor's series method, Euler, modified Euler method, Runge-Kutta methods, Boole, weddle rule, Double integration.

UNIT –D

Ordinary and Partial Differential Equations: Solution of second and higher order differential equations, boundary value problems, Solution of partial differential equations: Laplace, Heat, Wave equation.

References:

1) Atkinson, K.E. *An Introduction to Numerical Analysis*. Wiley. 1989. Print.

2) Eriksson, Estep, Hansbo, and Johnson, C. *Computational Differential Equations*. Cambridge: Cambridge University Press. 1996. Print.

3) Golub, and Ortega, J.M. *Scientific Computing and Differential Equations: An Introduction to Numerical Methods*. Academic Press. 1992. Print.

4) Conte and Boor.*Elementary Numerical Analysis*, An Algorithmic Approach**.** New Delhi: Tata McGraw Hill. 1981. Print.

5) Jain, M.K. *Numerical Analysis for Scientists and Engineers*. New Delhi: S.B.W. Publishers. 1971. Print.

L	T	P	Credits

DAV UNIVERSITY, JALANDHAR

Course Title: **Advanced Design**

4	-	-	4

Course Code: MEC502

Course Objectives:

- To impart the knowledge of various stresses and fracture mechanics.
- To provide the knowledge of design principles and design of machine components.
- To provide the information of computer aided machine design.

Unit-A

Design against Static Load (7Hrs)

Modes of failure, theories of elastic failure, selection and use of failure theories, fracture mechanism, thermal stresses, and residual stresses

Design against Fluctuating Load (7Hrs)

Stress concentration factor, reduction in stress concentration, fatigue failure, low and high cycle fatigue, cumulative damage theories

Unit-B

Contact Stresses (6Hrs)

Hertzian contact stresses (cylindrical and spherical surfaces) and their effect on design; theory of limit design; Machinery construction principles

Statistical Consideration in Design (6Hrs)

Probability distribution, design and natural tolerances, reliability, probabilistic approach to design

Unit-C

Fatigue and Creep (7Hrs)

Fracture Mechanics approach to fatigue, Causes and interpretation of failures in fatigue, Fracture Mechanics approach to creep, Causes and interpretation of failures in creep.

Design of Machine Components (7Hrs)

Design parameters of various types of gears, Design and selection of certain machine elements (Gears, axle, flywheel, clutches, nut-bolts and brakes).

Unit-D

Computer Aided Machine Design (10Hrs)

Philosophy of Computer Aided Machine Design, Interactive design software, Basic advantages of analysis Software, Design of machine components (springs, gears, temporary fasteners, permanent fasteners, belts and ropes) through interactive programming

Industrial product design **(6Hrs)**

Creative design, ergonomics and aesthetic, requirements – quality and maintainability considerations

Learning Outcomes:

- Students will be able to know about various stresses and design theories.
- Student will able to understand the design of various machine components.
- Students will able to recognize the use of computer in design of mechanical components.
- Students will able to know various considerations to be made in product design.

References:

1) Bhandari, V.B. Design of Machine Elements. New Delhi: McGraw Hill Education, 2014.

2) Jindal, U.C. Machine Design, New Delhi: Pearson, 2010.

3) Shigley J.E. Mechanical Engineering Design. New York: McGraw Hill 2008.

L	T	P	Credits

Course Title: Metal Cutting

4	-	-	4

Course Code: MEC503

Course Objectives:

- To learn about tool, oblique cutting, cutting fluids and tool failure analysis.

UNIT – A

Introduction (5Hrs)

System of Tool nomenclature, Tool Geometry, Mechanism of Chip formation and forces in orthogonal cutting, Merchant's force diagram, Factors affecting cutting temperature, Tool wear and Tool Life.

Oblique Cutting (9Hrs)

Normal chip reduction coefficient under oblique cutting, true shear angle, effective rake, influx region consideration for deformation, direction of maximum elongation, effect of cutting variables on chip reduction co- efficient, forces system in oblique cutting, effect of wear land on force system, force system in milling, effect of helix angle.

UNIT – B

Dynamometry (8Hrs)

Fundamentals of Dynamometry, Theoretical determination of forces, angle relations, heat and temperature during metal cutting; distribution, measurement, analysis, theoretical estimation of work piece temperature, hot machining

Fundamental Factors Effect Tool Forces (8Hrs)

Correlation of standard mechanized test (Abuladze –relation), nature of contact and stagnant phenomenon, rates of strains, shear strain and normal strain distributions, cutting variables on cutting forces.

UNIT- C

Cutting Tool Materials (6Hrs)

Introduction, Cutting tool materials: Plain Carbon Tool Steels, Alloy Tool Steels, HSS, Non Ferrous cast alloys (Stelities), Cemented Carbide, Ceramics and Oxides, Diamonds, CBN, UCON, Salons.

Cutting Fluids (6Hrs)

Cutting Fluids, Properties of Cutting Fluids, Types of Cutting Fluids, Requirement of good cutting fluid, Selection of a cutting fluid, Effect of fluids on cutting variables

UNIT- D

Cutting Tool Failure Analysis (14Hrs)

Tools materials analysis of plastic failure (from stability criterion), Analysis failure by brittle fracture, wear of cutting tools, criterion, flank and crater wear analysis, optimum tool life, tool life equations, (Taylor's woxen etc.) Tool life test, Machining optimization, predominant types of wear; abrasive, adhesive, diffusion wear models, wear measurements and techniques, theory of tool wear oxidative mathematical modelling for wear, test of machinability and influence of metallurgy on machinability. Economics of Metal machining.

Learning Outcome:

- Students will learn about tool, about oblique cutting, about cutting fluids and tool failure analysis.

References:

1) Brown. *Machining of Metals***.** Prentice hall. Print.

2) Shaw.*Principles of Metal cutting***.** Oxford I.B.H. Print.

3) Arshimov & Alekree. *Metal cutting theory & Cutting tool design.* MIR Publications. Print.

4) Shan, H. S. *Modern Machining Processes* .New Delhi: Tata McGraw Hill Publishing Co., 2002. Print.

5) Jain, Serope, Kalpak. *Manufacturing engineering and Technology.* Addison Wesley Publishing Co., 1995. Print.

6) Ghosh, Amitabh. *Manufacturing Processes*. New Delhi: Tata McGraw Hill Publishing Co., 2001. Print.

7) Jain, V.K. *Advanced Machining Processes*. New Delhi: Allied Publishers, 2009. Print.

DAV UNIVERSITY, JALANDHAR

Course Title: Production Planning and Controls
Paper Code: MEC505

L	T	P	Credits
4	-	-	4

UNIT-A

Concepts of Production Planning & Control (6Hrs)

Concept of Production System, Types of production systems (Job Order Production, Batch Production, and Continuous Production), Concepts of PPC, Definitions, Objectives and Functions of PPC, Organization of PPC Department, Production Planning, Production Control, Principles of sound production control system.

Sales Forecasting and Market Analysis (8Hrs)

Introduction, Types of forecasting, Objectives and importance of sales forecasting, Process of sales forecasting, Advantages and disadvantages of sales forecasting, Factors affecting forecasting, Methods of sales forecasting, Market analysis.

UNIT –B

Process Planning, Operation Planning and Capacity Planning (6Hrs)

Process planning, Pre requisites of process planning, Steps in process planning, Factors affecting process planning, Make or Buy decision, Operation Planning, Capacity Planning

Aggregate Planning: MRP and MPS (6Hrs)

Aggregate planning, Cost relevant with aggregate planning, Concept of MRP, Inputs to MRP (MPS, Bill of materials, Inventory status file), Working of MRP, MRP Outputs, Computerized system of MRP, Benefits and limitations of MRP

Selection of Materials, Methods, Machines and Manpower (2Hrs)

Selection of materials, Process selection, Machine selection, Recruitment and selection of manpower

UNIT-C

Routing, Scheduling and Dispatching (9Hrs)

Routing (Routing procedure, Route Sheet, Routing in different production system), Scheduling (Factor affecting scheduling, Master schedule, production schedule and Machine loading), Dispatching (Work order documents, Dispatching rules, Centralized and Decentralized dispatching)

Line Balancing and Progress Control (5Hrs)

Introduction, Terminology, Methods, Progress control through records and charts, Functions of progress control

UNIT –D

Factory Location, Plant Layout and Material Handling (14Hrs)

Nature of location decisions, Importance of plant location, Choice of site for location, State regulations on location, Comparison of locations, Suburban area, Economic survey of site selection, Plant layout, Situations, in which plant layout problem may arise, Factors influencing plant layout, Principles of plant layout, Techniques used in plant layout, Types, Symptom of bad plant layout, Storage space requirement, Flow pattern, Material Handling, Factors to be considered in material handling problems, Principles of material handling, Material handling devices.

References

1) Bansal, V.B. *Industrial Engineering and Production Management.* New Delhi: Kapson Publishers. 2015. Print.
2) Mahajan M. *Production Planning & Control.* New Delhi: Dhanpat Rai & Co. Print.
3) Buffa. *Production andOperations Management*. Wiley. Print.
4) Jain and Agarwal. *Production Planning & Control*. New Delhi: Khanna Publishers.Print.
5) Chunawala. *Production and Operation Management*. New Delhi: Himalaya Publication. Print.

Course Title: Metal Cutting Lab

Course Code: MEC-513

List of Experiments:

1. Practice on Lathe: 05 Jobs (Jobs should cover various lathe operations like centering, facing, turning, stepped turning, parting, threading, taper turning, chamfering and knurling)
2. Practice on Shaper: 01 Job (Slot cutting)
3. Practice on milling machine: 01 Job (Slot cutting)
4. Practice on Surface grinder: 01 Job (Creating Flat surface)
5. Practice on Drilling Machine: 01 Job (Marking and drilling operations)

Course Title: Computer Aided Design/

DAV UNIVERSITY, JALANDHAR

Computer Aided Manufacturing

Course Code: MEC-556

L	T	P	Credits
4	-	-	4

Course Objectives:

- To learn about the applications and benefits of CAD.
- To learn about geometric transformation, about various curves and surfaces modelling techniques
- To learn about automation & CAPP.

UNIT –A

Introduction (6 hrs)

Introduction to CAD, Design Process, Introduction to CAM/ CIMS, Importance and Necessity of CAD, Applications of CAD, Coordinate System (WCS, UCS, SCS)

2-D Transformations (4 hrs)

Introduction, transformation of points and line, 2-D rotation, reflection, scaling and combined transformation, homogeneous coordinates.

UNIT –B

3-D Transformations (4 hrs)

3-D scaling, shearing, rotation, reflection and translation, concatenations, concepts of hidden-line removal, shading and rendering

Wireframe Modelling (9 hrs)

Geometric Construction Models, Curve representation methods, Parametric representation of cubic splines, Bezier and B-spline curves, blending functions, trimming and segmentation of curve

UNIT –C

Surfaces Modelling (8 hrs)

Surface entities, Plane surface, ruled surface, polygon and quadric surface, surface of revolution, Bi-Cubic, Bezier Surface and B-Spline surfaces.

Solids Modelling (8 hrs)

Solid models and representation scheme, boundary representation, constructive solid geometry, sweep representation

UNIT –D

Automation and Numerical Control **(8 hrs)**

Introduction, fixed, programmable and flexible automation, types of NC systems, MCU and other components, NC partprogrammingManual, Computer assisted part programming, APT Languages, Adaptive control.

Manufacturing Planning Systems and Process Control **(9 hrs)**

CAPP - Computer Integrated production planning systems, MRP, Capacity planning, Shop Floor control factory, Data collection systems, Computer process interface, types of computer process control, process monitoring, supervisory computer control

Learning Outcomes:

- Students will be able to describe the principles of 2D and 3D Transformations and the concepts of Geometric modelling, and solid modelling
- Students will able to describe the automation in manufacturing.

References:

1) Alavala, C. R. *CAD/CAM Concepts and Applications***.** New Delhi:PHI Learning. Print.

2) Groover M.P. and Zimmer, W..*CAD/ CAM***.** New Delhi: Prantice Hall. Print.

3) Zeid I.*CAD/ CAM Theory and Practice***.** New Delhi:Tata McGraw Hill.Print.

4) ChirsMc and BrowneJimmie.*CAD/CAM Principles, Practice & Manufacturing Management*. Wesley. Print.

5) Groover Mikell P., *Automation production systems and computer – integrated manufacturing.*Prentice Hall of India. Ltd., 1998.

6) Rao, P.N.Tewari, N.K. and Kundra,T.K. *Computer Aided Manufacturing*, New Delhi:Tata McGraw Hill, 2001.

7) Koren Yoram, *Computer integrated manufacturing systems.*New Delhi:McGraw Hill, 1983

8) Ranky Paul G. *Computer integrated manufacturing.*New Delhi:Prentice Hall, 1990

L	T	P	Cr

DAV UNIVERSITY, JALANDHAR

Course Title: Computer Aided Design/ Computer Aided Manufacturing Lab

-	-	4	2

Course Code: MEC-566

The students will be required to carry out the following exercises using educational software (I-DEAS, Pro-Engineer, Solid Work etc.)

1. Setting up of drawing environment by setting drawing limits, drawing units, naming the drawing, naming layers, setting line types for different layers using various type of lines in engineering drawing, saving the file with drawing extension.
2. Layout drawing of a building using different layer and line colors indicating all Building details. Name the details using text commands, Make a title Block.
3. To Draw Orthographic projection Drawings (Front, Top and side) of boiler safety valve giving name the various components of the valve.
4. Make an Isometric dimensioned drawing of a connecting Rod using isometric grid and snap.
5. Draw quarter sectional isometric view of a cotter joint.
6. Draw different types of bolts and nuts with internal and external threading in Acme threading standards. Save the bolts and nuts as blocks suitable for insertion.
7. Draw 3D models by extruding simple 2D objects, dimension and name the objects.
8. Draw a spiral by extruding a circle.

Discipline Specific Electives

DAV UNIVERSITY, JALANDHAR

Course Title: Tribology

Course Code: MEC432

L	T	P	Cr
4	-	-	4

Course Objectives:

- Design of surfaces in contact is a critical problem for mechanical engineering. Tribology is an interdisciplinary course which deals with fundamentals of surface contact, friction, wear and lubrication.
- Topics in Tribology include description and modeling of engineering surfaces, popular surface contact theories, major modes of friction, wear, lubrication and adhesion.

Unit-A

Introduction: **(8Hrs)**

friction, wear and lubrication, types of engineering contacts: conforming and non-conforming, Types of motion: rubbing, sliding, oscillating, rolling, surface of interaction, elastic and plastic deformations, properties of materials, surface energy and flash temperature theory.

Friction: **(6Hrs)**

Laws of sliding friction, concept of adhesion, Tabor's model of elastic thermo friction, rolling friction, measurement of friction

Unit-B

Wear: **(8Hrs)**

Laws of wear types of wear such as adhesive, declamation, abrasive, corrosive, fretting, erosive and oxidative, Measurement of wear and friction in atmosphere and different environments, Prevention and control of wear and friction in machines, wear of cutting tools and dies, study of abrasion in grading, lapping/ honing

Lubrication: **(8Hrs)**

Mechanism of lubrication, Boundary, squeeze film hydrodynamic and elasto hydrodynamic and hydrostatic lubrication, plasto hydrodynamic lubrication, solution of Reynolds's equation in two and three dimensional flow, pressure distribution load carrying capacity friction forces in oil film and coefficient of friction in journal bearing, Solid, Liquid and Gas lubricants types and their applications

Unit-C

Bearing Design: **(8Hrs)**

Design of bearing clearance in journal bearing, minimum film thickness, sommar field number, oil grooves and flow of oil in axial and circumferential grooves cavitation's and turbulence in oil bearings, Heat generation and cooling or bearing hydrostatic and dynamic and their applications in machine tools, Design of air bearings and other gas bearings.

Rolling Friction: **(6Hrs)**

Reynold slip, Heathe cote concept selection of roller bearings and their methods of lubrication design aspects and modes of bearing failures and elasto hydrodynamic lubrication

Unit-D

Tests and Instrumentation in Tribology: **(10Hrs)**

Sliding friction and wear abrasion test, rolling contact and fatigue test, solid particle and erosion test, Corrosion test Special instruments for lubricant analysis such as optical and infrared spectroscopy and infra-red spectroscopy, atomic absorption and emission spectroscopy, mass spectroscopy, NMR spectroscopy, X ray diffraction and chromatographic techniques, Use of transducers and instruments in Tribology- film thickness measurement using modern techniques – Development of test rigs for Tribology research.

Learning Outcomes:

- Have a clear overall picture about the basics of tribology and related sciences, theoretical background about processes in tribological system, mechanisms and forms of interaction of friction surfaces;
- Understand smooth contact and rough surface contact;
- Be familiar with adhesion theories and the effect of adhesion on friction and wear;

References:

1) Gwidon, W. Stachowiah and Gwidon, W. *Engineering Tribology,* 2013. Print.

2) Bhusan, Bharat. *Principles and Application of Tribology*, 1999. Print.

3) Khonsari, and Booser *Applied Tribology: Bearing Design and Lubrication,* 2008. Print.

4) Srivastva, Sushil kumar. *Tribology in Industries.* 2001.Print.

5) Majumdar, B.C. *Introduction to Tribology of Bearing,* 1999. Print.

DAV UNIVERSITY, JALANDHAR

L	T	P	Cr
4	-	-	4

Course Title: Metal Casting and Forming

Course Code: MEC- 605

UNIT – A

Introduction (5Hrs)

General, Classification of manufacturing processes, various kinds of Production System, Computers in manufacturing, Selection of manufacturing process.

Casting and Moulding Methods (9Hrs)

Introduction, advantages, limitations and applications of casting process, Classification of casting process, Steps involved in casting, Pattern types, Allowances for pattern, pattern, materials, colour coding and storing of patterns. Molding methods and Processes, Moulding materials, Molding sands and its ingredients, Properties of moulding sand, Cores, Sand casting defects, Design of castings.

UNIT – B

Sand Castings Processes and their Inspection (7Hrs)

Pressures die casting, Permanent mould casting, Centrifugal casting, Precision investment casting and its types, Cleaning and finishing of casting, Inspection and testing of casting, Defects in castings.

Foundry Melting Furnaces (8Hrs)

Selection of furnace-crucibles oil fired furnaces, electric furnaces cupola, calculation of cupola charges, hot blast, cupola-Degasifications, inoculation-pouring equipment, Inspection of castings. Need-Areas for mechanization-Typical layout-sand reclamation techniques-material handling, pollution control in Foundry, Computers in casting process.

UNIT – C

Forming (14Hrs)

Metallurgical aspects of metal forming slip, twining mechanics of plastic deformation effects of temperature, strain rate-microstructure and friction in metal forming, yield criteria and their significance-classification of metal forming processes, Principle classification equipment, tooling processes, parameters and calculation of forces during forging and rolling processes, Ring compression tests, Post forming heat treatment, Defects (cause and remedy) applications. Classification of extrusion processes, tool, equipment and principle of these processes, influence of friction, Extrusion force calculation, Defects and analysis: Rod/wire drawing-tool, equipment and

principle of processes defects, Tube drawing and sinking processes-Mannesmann processes of seamless pipe manufacturing.

UNIT - D

Classification of forming process (13Hrs)

Classification conventional and HERF processes Presses types and selection of presses, formability of sheet metals, Principle, process parameters, equipment and application of the following processes. Deep drawing, spinning, stretch forming, plate bending, press brake forming, Explosive forming, electro hydraulic forming, magnetic pulse forming. Super plastic forming, electro forming-fine blanking, P/M forging-Isothermal forging-high speed, hot forging high velocity extrusion

References:

1) Raghuwanshi B.S. *A Course in Workshop Technology.* Vol. 1. New Delhi: Dhanpat Rai. 10th Edition 2009. Print.

2) Taylor & Wulff, J. *Foundry Engineering.* Wiley Eastern Limited, 1993. Print.

3) Lindberg R.A. *Processes and Materials of Manufacture***.** New Delhi: Prentice Hall of India (P) Ltd. 1996. Print.

4) Jain Kalpak. *Manufacturing engineering and Technology***.** Edition III. Addison Wesley Publishing Co. 1995. Print.

5) William and Robert M. Caddel. *Metal forming***.** Prentice Hall Publishing Co.1990. Print.

DAV UNIVERSITY, JALANDHAR

Course Title: Hydro Dynamic Machine

Course Code: MEC625

L	T	P	Cr
4	-	-	4

Course Objectives:

- To expose students to various strategic issues related to hydro dynamic machines such as turbines, pumps etc.
- The objective is to analyse the operating principles of hydrodynamic components and equipment, their function and design principles, control, solving problems of design, static and dynamic properties. Lessons learned are a good prerequisite for independent work in the particular field of hydrodynamic machines.

UNIT - A

Introduction (12 Hrs)

Basic fluid mechanics of turbo machinery; Eulers equation for energy conversion through rotor one-dimensional theory and its limitations; two – dimensional theory of flow through axial and radial – flow machines.

UNIT - B

Hydrodynamic Machines-Turbines (8 Hrs)

Classification of turbines and various forms of turbine runners, Impulse turbines; general theory of impulse machines; performance characteristics; design of runner; bucket shape and size; design of nozzles; regulation mechanisms; penstock design. Reaction turbines; general theory of reaction machines; performance characteristics;

Types; Francis and Kaplan turbines;

Design Process (8 Hrs)

Runner design; blade design; design of the spiral casing; guide vanes and draft tube design; theory of cavitation flows in hydrodynamic runners

UNIT - C

Hydrodynamic pumps (8 Hrs)

Classification of pumps and various forms of pump impellers; general theory of centrifugal pumps; performance characteristics;

Design Process (8 Hrs)

Design of casings and diffusers; cavitation effects in impellers

UNIT - D

Hydrodynamic Transmissions (10 Hrs)

General features; primary and secondary units of the systems; fluid couplings and torque converters; general theory; performance characteristics; basic design considerations.

Learning outcomes:

- The subject Hydraulic machines and devices allow students to get the complex view on hydraulic machines according to the type of model of its optimal usage.
- Have basic knowledge of work, power, and efficiency of energetic systems.
- Select and evaluate performances of hydropower plants.
- Select and evaluate performances of energy accumulation systems.
- Set up valuable business plants and determine cost of energy for various plants.
- In the domain of fluid power machines and equipment, the student gets skills about the construction and about possibilities of usage of these machines in energetic and another device.

References:

1) George Friedrich Wislicenus*Fluid Mechanics of Turbo machinery*, Vol. I. Dover Publications, 2008.Print.

2) Shepherd Macmillan.*Principles of Turbo machinery,* Elsevier, 2005.Print.

3) Stepanoff John Wiley. *Centrifugal & Axial Flow pumps,* Springer, 2008. Print.

4) Weston Butterworth's Components.*Theory & Design of Automatic Transmission, 2015.*Print.

DAV UNIVERSITY, JALANDHAR

L	T	P	Cr
4	-	-	4

Course Title: Quality Control and Reliability

Course Code: MEC-607

Course Objectives:

- To impart the knowledge about the concepts of quality and quality control.
- To make students understand about the concepts of acceptance sampling and TQM.
- To give awareness about the reliability and its management.

UNIT – A

Introduction (6Hrs)

Concept of quality, Need, Factor influencing quality, Types of quality, Quality control, Cost of quality control, Quality assurance, Benefits, Modern concept, Inspection and quality control, Quality characteristics, Quality circles with case study.

Statistical Concepts and Control Charts (8Hrs)

Review of fundamental statistical concept, Frequency distribution, Central tendency, measures of dispersion, Probability distributions, statistical quality control, Theory of control charts, Control charts for variables and attributes ($\bar{x}$, R, P, np and C chart), their advantages and disadvantages, Applications

UNIT– B

Acceptance Sampling (12Hrs)

Introduction, Advantages and Disadvantages, Operating Characteristics curve, Producer's and consumer's risk, Quality indices for acceptance sampling plans, Types of sampling Plans-single double sequential sampling plan, Sampling plan for variables, continuous sampling plans, Skip lot sampling plans, Chain sampling plan.

UNIT– C

Total Quality Management (10Hrs)

Introduction, Concept of Total quality, Quality function deployment tools for continuous quality improvement with case study, ISO 9000:2000 family of standards, Six sigma: DMAIC and its comparison with ISO system

UNIT – D

Reliability (14Hrs)

Introduction, Factors effecting Reliability, Failure and its types, Failure curve, reliability and its management, MTBF, MTTF, Relationship b/w reliability failure rate and MTBF, and its characteristics, reliability predictions and analysis, System reliability analysis, Reliability test and life testing plans, Types of test, Maintainability and Availability.

Learning Outcome:

- Students get clear about the concepts of quality and quality control.
- Students learn to do acceptance sampling and construct control charts.
- Students learn to test and ensure reliability of the machines.

References:

1) Mitra, Amitava**.** *Fundamental of Quality Control and Improvement*. Wiley. 2016. Print.

2) Harrism and Wadsworth, M. *Modern Methods for Quality Control and Improvement.*Wiley. 2002.Print.

3) Grant, E. and Leavenworth R. *Statistical quality control*, New Delhi: Tata McGraw Hill. 2008. Print.

4) Ebeling. *An introduction to reliability and maintainability engineering.* New Delhi: Tata McGraw Hill. 2004. Print.

5) Sharma, D.D. *Total Quality Control.* New Delhi: Tata McGraw Hill. 2011. Print.

6) Raju, N.V.S. *Industrial Engineering and Management*. Cengage Learning. 2013. Print.

DAV UNIVERSITY, JALANDHAR

L	T	P	Cr
4	-	-	4

Course Title: Computational Fluid Dynamics

Course Code: MEC626

Course Objectives:

- It is intended to provide the basic tools needed for numerically solving fluid flow and heat transfer processes using computer.
- Ability to apply knowledge of basic science and engineering fundamentals
- Ability to communicate effectively, not only with engineers but also with the community at large

  In-depth technical competence in at least one engineering discipline
- Ability to undertake problem identification, formulation and solution
- Ability to utilise a systems approach to design and operational performance

UNIT - A

Introduction (6 Hrs)

Computational Fluid Dynamics as a Research and Design Tool, Applications of Computational Fluid Dynamics

Governing Equations of Fluid Dynamics (8 Hrs)

Introduction, Control Volume, Substantial Derivative, Divergence of Velocity, Continuity Equation, Momentum Equation and Energy Equation

UNIT - B

Mathematical Behaviour of Partial Differential Equations (8 Hrs)

Introduction, Classification of Quasi-Linear Partial Differential Equations, Eigen Value Method, Hyperbolic Equations, Parabolic Equations, Elliptic Equations

Finite element methods (8 Hrs)

Rayleigh- Ritz, Galerkin and Least square methods; interpolation functions; one and two dimensional elements; applications.

UNIT - C

Basics Aspects of Discretization (8 Hrs)

Introduction, Introduction of Finite Differences, Difference Equations, Explicit and Implicit Approaches, Errors and Stability Analysis, Grid Generation

Incompressible Fluid Flow (8 Hrs)

Introduction, Implicit Crank-Nicholson Technique, Pressure Correction Method, Computation of Boundary Layer Flow

UNIT - D

Heat Transfer **(10 Hrs)**

Finite Difference Applications in Heat conduction and Convention – Heat conduction, steady heat conduction, in a rectangular geometry, transient heat conduction, Finite difference application in convective heat transfer.

Learning outcomes:

- Understand and be able to numerically solve the governing equations for fluid flow
- Understand and apply finite difference, finite volume and finite element methods to fluid flow problems
- Understand how grids are generated
- Understand how to assess stability and conduct a grid-convergence assessment
- Understand and apply turbulence models to engineering fluid flow problems
- Understand and apply compressible flow solvers
- Understand the issues surrounding two-phase flow modelling
- Be able to numerically solve a heat transfer problem
- Be able to use ANSYS CFX to an acceptable standard for a graduate engineer.

REFERENCES:

1) Anderson, J.D. *Computational fluid dynamics - Basics with applications*. New Delhi: Tata McGraw Hill, 2015. Print.

2) Anderson, Tannehill, and Pletcher, R.H.*Computational Fluid Mechanics and Heat Transfer*. Taylor and Francis, 2015. Print.

3) Patankar, S.V. *Numerical heat transfer and fluid flow*. Butter-worth Publishers, 2015. Print.

4) Sengupta, T.K.*Fundamentals of Computational Fluid Dynamics*. New Delhi: University Press, 2004. Print.

DAV UNIVERSITY, JALANDHAR

L	T	P	Cr
4	-	-	4

Course Title: Mechatronics

Paper Code: MEC555

Course Objectives:

- Have a strong foundation in science and focus in mechanical, electronics, control, software, and computer engineering, and a solid command of the newest technologies.
- Be able to design, analyze, and test "intelligent" products and processes that incorporate appropriate computing tools, sensors, and actuators.
- Be able to demonstrate professional interaction and communicate effectively with team members.
- Be able to work efficiently in multidisciplinary teams.
- Be prepared for a variety of engineering careers, graduate studies, and continuing education.
- Practice professional and ethical responsibility, and, be aware of the impact of their designs on human-kind and the environment

UNIT -A

Introduction (6 Hrs)

Definitions, trends, control systems, microprocessor / micro controller based controllers, PC based controllers, applications: SPM, robot, CNC machine, FMS, CIM.

Sensor Technology (8 Hrs)

Sensor and transducers, terminology, displacement, position, proximity - encoders, velocity – tachogenerators, force - strain gauges, pressure, temperature-thermocouples, RTDs, thermistors, light sensors - photoelectric sensors, IR sensors, sensor selection.

UNIT -B

Signal Conditioning (8 Hrs)

Introduction, the operational amplifier, protection, filtering, Wheatstone bridge, digital signals, multiplexers, data acquisition, digital signal processing, pulse-modulation.

Precision Mechanical Actuation (8 Hrs)

Pneumatic actuation systems, electro-pneumatic actuation systems, hydraulic actuation systems, electro-hydraulic actuation systems, mechanical systems, types of motion, kinematics, inverse kinematics, timing belts, ball screw and nut, linearmotion guides, linear bearings, harmonic transmission, bearings, motor / drive selection.

UNIT -C

Electromechanical Drives **(8 Hrs)**

Relays and solenoids, stepper motors, DC brushed and brushless motors, DC servo motors, AC / DC motors for non-servo motion drives, braking methods, pulse width modulated, Bipolar driver, Mosfet drives, SCR drives, variable frequency drives.

Digital Electronics **(8 Hrs)**

Digital logic, number systems, logic gates, Boolean algebra, Karnaugh maps, sequential logic.

UNIT -D

Control System **(10 Hrs)**

System transfer function, Laplace transformation and its applications, continuous and discrete processes, proportional control, integral control, differential control, PID control, digital controllers, control system performance, controller tuning, adaptive control, frequency response, PLC, PMC, introduction to fuzzy logic and neural networks.

Learning outcomes:

- Design and conduct experiments to evaluate the performance of a mechatronics system or component with respect to specifications, as well as to analyse and interpret data.
- Design mechatronics component, system or process to meet desired needs.
- Define and solve engineering problems.
- Use the techniques, skills, and modern mechatronics engineering tools necessary for engineering practice.
- Function effectively as members of multidisciplinary teams.
- Communicate technical matters effectively in oral, written, and graphical form.

References:

1) Kamm. *Understanding Electro-Mechanical Engineering - An Introduction to Mechatronics*. New Delhi: Prentice-Hall of India.2014. Print.

2) Koren, *Computer Control of Manufacturing system*. New Delhi: Tata McGraw Hill.2015 Print.

3) Groover.*Production Systems and CIM.* New Delhi: PHI. 2015. Print.

4) Maleki.*Flexible Manufacturing systems*. New Delhi: Prentice Hall.2014. Print.

5) Kuo, B.C. *Feedback Control Systems*. New Delhi: PHI.2014. Print.

DAV UNIVERSITY, JALANDHAR

Course Title: Renewable Energy Sources

Course Code: MEC621

L	T	P	Cr
4	-	-	4

Course Objectives:

- To impart the knowledge information about the various non-conventional energy resources.
- To understand the issue of fuel availability and world energy scenario.
- To provide the information about the use of various renewable energy sources to produce electricity to support sustainability.

UNIT - A

Introduction (6Hrs)

Energy Scenario – Survey of Energy Resources – Classification – Need for Non-Conventional Energy Resources.

Solar Energy (2Hrs)

The Sun-Earth Relationship–Solar radiation – Attention –Radiation measuring Instruments.

Solar Energy Applications (12Hrs)

Solar water Heating, Space heating – Active and Passive heating – Energy storage – selective surface – solar stills and ponds – solar refrigeration – photovoltaic generation.

UNIT - B

Wind Energy (6Hrs)

Wind – characteristics – wind energy conversion systems – types – Betz model – Interference Factor – Power Coefficient – Torque Coefficient and thrust coefficient – Lift machines and drag machines – matching – electricity generation..

Geothermal Energy (6Hrs)

Structure of Earth – Geothermal Regions – Hot springs – Hot Rocks – Hot Aquifers – Analytical Methods to estimate Thermal Potential – Harnessing Techniques – Electricity Generation Systems.

UNIT - C

Energy from Oceans (3Hrs)

Tidal Energy; Tides – Diurnal and Semi – Diurnal Nature – Power from Tides

Wave Energy (6Hrs)

Waves – Theoretical Energy Available – Calculation of period and phase, velocity of waves wave power systems – submerged devices.

Ocean Thermal Energy **(3Hrs)**

Principles – Heat Exchangers – Pumping requirements – Practical Considerations.

UNIT - D

Bio – Energy **(6Hrs)**

Biomass Energy Sources – Plant Productivity, Biomass Wastes – Aerobic and Anaerobic bio-conversion processes – Raw Materials and properties of Bio-gas- Bio-gas plant Technology and Status – The Energetic and Economics of Biomass systems – Biomass gasification

Direct Energy Conversion Systems **(6Hrs)**

Fuel Cells and Solar Cells–Thermionic and Thermoelectric Generation – MHD Generator- Open and Closed Systems

Learning Outcomes:

- Students will be able to know about world energy scenario.
- Student will be able to know about the various renewable energy resources.
- Students will be able to relate the concept of sustainability through renewable energy use.
- Students will be able to develop the understanding of integration of renewable energy source with existing infrastructure.

References:

1) John & Weir, T. *Renewable Energy Resources*. Taylor and Francis. 2006

2) Tiwari and Ghosal, M.K., *Renewable Energy Resources. Basic Principles and Applications.* New Delhi: Narosa Publishing house, New Delhi, 2005

3) Rai, G.D. *Non-Conventional Energy Sources.* 4th Edition. New Delhi: Khanna Publishers. 2000.

4) Desai, Ashok. *Non-Conventional Energy*. New Age International Limited, New Delhi, 2003.

DAV UNIVERSITY, JALANDHAR

L	T	P	Cr
4	-	-	4

Course Title: **Material Management**

Course Code: MEC609

Course Objectives:

- Students will learn about the concepts of purchasing and material management.
- Students will also study about work in all functional areas of business.

UNIT – A

Role of Material Management in Business **(4Hrs)**

Types of materials organizations (Purchasing, Procurement, Materials management, Physical Distribution Management, Logistic Management)

Fundamental of Purchasing and Procurement **(4Hrs)**

Importance of supplier, Factors in supplier selection, Sources of supplier information, Long-term, strategic materials planning, Evaluating potential suppliers, Post-selection problems.

Pricing Principle **(4Hrs)**

General economic considerations, Methods of pricing

UNIT – B

Inventory Management **(8Hrs)**

Function and definition of inventories, ABC Concept, Dependent and Independent Demand, Type of Inventory Control System (Cyclic Ordering System, Order Point System, Material Requirement Planning System), Determination of Order Quantity, EOQ Concept, Applications and Limitations of EOQ, Determination of order point and safety stock,

Capital Equipment **(6Hrs)**

Differences in procurement of capital equipment, Procedure of purchase of capital equipment, Purchasing's role in capital equipment procurement, Techniques of economic analysis

UNIT – C

Traffic **(6Hrs)**

Carrier selection and routing (Shipping terms, Modes of transportation, Types of carriers, Regulation and Deregulation, Class rates and Commodity rates), Loss and damage of fright, Transportation cost reduction

Receiving and Stores **(6Hrs)**

Responsibilities of receiving and stores, Receiving procedures and paperwork, Identification of materials, Stores systems, Storing of materials, Methods and equipment's, Automated warehousing, layout

UNIT– D

Policies and Procedures **(6Hrs)**

Centralization of purchasing, Policies affecting vendors, Ethics in purchasing

General Procurement Procedures **(6Hrs)**

Definition, Description and Transmission of need, Supplier selection and order preparation, Order follow up, Receipt and inspection, invoice audit and order completion

Purchasing Records **(6Hrs)**

Open orders, closed orders, purchase log, Commodity records, Supplier records, and Contract and tool records

Handling "rush" orders

Handling "small" orders

Learning Outcomes:

- Students will be able to know about the importance of material management and concepts of purchase and procurement.
- Students will able to recognize the different inventory models and ordering techniques along with economic analysis.
- Students will also be familiarized with different purchasing and procurement policies and procedures.

References:

1) Donald W. Dobler. *Purchasing and materials management.* TMH. Fourth Edition. Print.

2) Nair. *Purchasing and materials management.* New Delhi: Vikas Publishers. Print.

3) Raju, N.V.S. *Industrial Engineering and Management*. New Delhi: Cengage Learning. Print.

4) Chunawala. *Production and Operation Management.* New Delhi: Himalaya Publication. Eighth Edition, 2013. Print.

DAV UNIVERSITY, JALANDHAR

Course Title: **Finite Element Method**

L	T	P	Cr
4	-	-	4

Course Code: MEC612

Course Objectives:

- Students will learn about the basic concepts of FEM.
- To provide the knowledge of one, two, three dimensional and axisymmetric Problems
- To provide the information of static, scalar field and dynamic problems.

Unit-A

Introduction (6Hrs)

Historical Background, Stresses and equilibrium, Boundary Conditions, Strain-Displacement Relations, Stress-Strain Relations, Temperature Effects, matrix algebra and Gaussian elimination.

Fundamental Concepts (6Hrs)

Classification of Differential Equations, Rayleigh-Ritz Method, Galerkin's Method, Point Collocation Method, Least Square Method, Weighted Residual Method, Variational Formulation

Unit-B

One and TwoDimensional Problems (8Hrs)

Introduction, coordinates and shape functions, Potential energy approach, Galerkin Approach, Assembly of the global stiffness matrix and load vector, FEM equations and treatment of boundary conditions, Quadratic shape functions, Finite Element Modeling, Constant Strain Triangle (CST), Temperature effect, Problem modelling and Boundary conditions

Two Dimensional Isoperimetric element (5Hrs)

The Four Node Quadrilateral, Numerical Integration, Higher Order Elements; Nine Node Quadrilateral, Eight Node Quadrilaterals, Six Node Triangle

Unit-C

Axisymmetric solids subjected to axisymmetric loadings (5 Hrs)

Axisymmetric formulation, FEM using triangular element, problem using boundary conditions

Truss, Beams and Frames (6 Hrs)

Plain and three Dimensional Trusses, Beams on elastic support, Plain and three Dimensionalframes, Beams and frames in various different conditions.

Three Dimensional Problem (5 Hrs)

Stress Calculations, Mesh Preparation, higher order elements, frontal method.

Unit-D

Scalar Field Problems **(5Hrs)**

Introduction, Steady-state heat transfer, Potential Flow, Fluid Flow in Ducts

Dynamic Considerations **(5 Hrs)**

Element Mass Matrices, Evaluation of Eigen Values and Eigen Vectors.

Computer Implementation **(5 Hrs)**

Introduction; Computer Program Organization for Calculation of System Matrices

Learning Outcomes:

- A close insight of discretization of the domain in finite element method.
- Understand the basic finite element formulation techniques.
- Be able to derive equations in finite element methods for one and two dimensionalproblems.
- Be able to formulate and solve basic problems in axisymmetric, heat transfer and solid mechanics.
- Be able to write computer program based on finite element methods.
- Be able to use any commercial software, to solve basic engineering problems in heat transfer and solid mechanics.

References:

1) Chandrupatla, T.R and Belegundu A.D, T.S. *Introduction to Finite Elements in Engineering*, New Delhi: Pearson Education: 2015. Print.

2) Alavala, C. R. *Finite Element Methods*, New Delhi: PHI Learning Pvt. Ltd. 2015.Print.

3) Moaveni, S. *Finite Element Analysis*, New Delhi: PHI Learning Pvt. Ltd. 2015.Print.

4) Seshu, P. *Textbook of Finite Element Analysis*, New Delhi: PHI Learning Pvt. Ltd. 2015.Print.

5) Reddy, J. N. *An Introduction to the Finite Element Method*, New Delhi: McGraw Hill Education.2015 Print.

DAV UNIVERSITY, JALANDHAR

L	T	P	Cr
4	-	-	4

Course Title: Non Destructive Testing

Course Code: MEC608

Course Objectives

- Non-destructive testing (NDT) relates to the examination of materials for flaws without harming the object being tested. As an industrial test method, NDT provides a cost effective means of testing while protecting the object's usability for its designed purpose.

UNIT – A

Introduction to NDT (10Hrs)

Non-destructive testing, Scope of non-destructive testing, Advantage of non-destructive testing, destructive methods of testing, Comparison between non-destructive and destructive testing, Common NDT methods, Flaws and defects, Applications, Attractive use of NDT in detecting surface cracks and bond strength due to failure fatigue.

UNIT – B

Visual Inspection (8Hrs)

Introduction, Basic terms associated with Visual inspection, Equipment used for Visual inspection, Machine vision, Ringing test/ Hammer test, Chalk test, Attractive use of visual inspection in welding defects, Practical visual inspection tips in welding, Advantages and limitations of visual inspection.

Penetrant Testing (8Hrs)

Introduction, Principle of permanent test, Tests and standards, Test stations, Accessories, Advantages and disadvantages of permanent test, Examples of applications of DPT, Types of penetrants, Characteristics of good penetrants, Developers and its types, Quality and process control, Health and Safety and Precautions in liquid penetrant inspection, Standards applicable to liquid penetrant testing, Leak test, Zyglo fluorescent penetrant test

UNIT – C

Magnetic Particle Testing (8Hrs)

Introduction, Principles of magnetic particle testing, Scope of magnetic particle testing, Basic terms associated with magnetic materials, Classification of magnetic materials, Domains and hysteresis, Magnetic field orientation, Methods of magnetization, DC and AC magnetization – Skin

Effect, Equipment's, Lights, Magnetic field indicator, Testing techniques, Advantages, Disadvantages and Applications of magnetic particle testing.

Radiographic Examination (8Hrs)

History of radiography, Types of radiations, Basic properties, X-ray radiography principle and radiation sources, Scattered radiations, X-ray film and accessories, Film interpretation and viewing radiographs, Geometric principles in radiography, Digital radiography, Advantages, Disadvantages and Applications of radiography, Types of radiographic techniques, Precautions against radiation hazards and health

UNIT – D

Ultrasonic Methods: (7Hrs)

Introduction, Basic terms associated with ultrasonic testing, Principles of ultrasonic testing, Equipment of ultrasonic testing, Ultrasonic probes, Radiated field of ultrasonic transducers, Advantages, Disadvantages and Applications of ultrasonic testing, Ultrasonic inspection techniques, CRO, Data presentation.

Eddy Current Testing (7Hrs)

Introduction, Working principles of eddy current testing, Factors affecting eddy current, Eddy current flow characteristics, eddy current instruments and probes, Advantages, Disadvantages and Applications of eddy current testing.

Learning Outcome:

- Students will be able to know about various NDT Techiques and their applicatrions**.**

References:

1) Lari & Kumar.*Basics of Non Destructive Testing. New* Delhi: S K Kataria & Sons.2013. Print.

2) Davies, Troxell, and Hauck G.F.W. *The testing of Engineering materials*, New York: McGraw Hill. Print.

3) Armstrong, W.H. *Mechanical Inspection*, New York: McGraw Hill. Print.

4) Bhargava. A. K. *Mechanical Behavior and Testing of Materials*. New Delhi: PHI. Print.

DAV UNIVERSITY, JALANDHAR

L	T	P	Cr
4	-	-	4

Course Title: I.C. Engine

Course Code: MEC623

Course Objectives:

- To make understanding of thermal analysis of internal combustion engines with their components.
- To impart the knowledge of gas exchange processes and combustion processes
- To make students familiar with the impact of I.C. engines on environment so that they can think significant innovations in I.C. engines.
- To make students familiar with alternate fuels and their performances.

UNIT – A

Thermodynamic Analysis of IC Engines Cycle (6hrs)

Properties of working fluid, thermodynamic charts, unburned mixture charts, burned mixture, fuel air cycle analysis, real cycles, availability analysis of engine processes

Gas Exchange Processes (8hrs)

Inlet and exhaust processes in the four stroke cycle, volumetric efficiency, quasi-static and dynamic effects, flow through valves. Scavenging in the two-stroke cycle engines, scavenging parameters and models, actual scavenging processes, flow through ports. Supercharging and turbocharging, basic relationships, compressors, turbines characteristics, matching of compressor, turbines and engine characteristics

UNIT - B

Combustion in I.C. Engines (8hrs)

S.I. engines; Ignition limits; stages of combustion in S.I. Engines; Ignition lag; velocity of flame propagation; detonation; effects of engine variables on detonation; theories of detonation; octane rating of fuels; pre-ignition; S.I. engine combustion chambers, Stages of combustion in C.I. Engines; delay period; variables affecting delay period; knock in C.I. engines, Cetane rating; C.I. engine combustion chambers.

Combustion in SI Engines (6hrs)

Essential features of the process, thermodynamic analysis of SI engine combustion, combustion process characterization, and cyclic variations in combustion

UNIT - C

Air pollution from I.C. Engine and Its remedies (6hrs)

Pollutants from S.I. and C.I. Engines, Methods of emission control; alternative fuels for I.C. Engines; the current scenario on the pollution front.

Pollutant formation and Control **(8hrs)**

Nature and extent of problem, Nitrogen oxides. Kinetics of NO formation, NO_x formation in spark-ignition engines, NO_x formation in CI engines. Carbon monoxide, unburned hydrocarbon emissions. Particulate emissions exhaust gas treatment, catalytic

UNIT - D

Alternate-Fuels **(6hrs)**

Alcohols, Vegetable oils and bio-diesel, Bio-gas, Natural Gas, Liquefied Petroleum Gas, Hydrogen, Properties, Suitability, Engine Modifications, Performance, Combustion and Emission Characteristics of SI and CI Engines using these alternate fuels.

Recent-Trends **(6hrs)**

Homogeneous Charge Compression Ignition Engine, Lean Burn Engine, Stratified Charge Engine, Surface Ignition Engine, Four Valve and Overhead cam Engines, Electronic Engine Management, Common Rail Direct Injection Diesel Engine, Gasoline Direct Injection Engine, Data Acquisition System –pressure pick up, charge amplifier PC for Combustion and Heat release analysis in Engines.

Learning Outcomes:

- Students will be able to know various air-standard cycles and fuel cycles.
- Student will be able to understand the functioning of different mechanical components installed in an I.C engine and recent innovations in the engines.
- Students will get to know about engine emissions and their control devices.
- Students will have knowledge of Gas turbine power units and their application part.

References

1) Ganesan, V. *Internal combustion engines.* New Delhi: Tata McGraw-Hill. Print.

2) Willard, W. Pulkrabek. *Engineering fundamental of the I.C. Engine.* New Delhi: PHI. Print.

3) Obert, E.F. *Internal Combustion Engines & Air pollution.* New York: Hopper & Row Publication. Print.

4) Heywood, B. John. *Internal Combustion Engines Fundamentals. New York:* McGraw Hill. Print.

5) Gupta, N. H. *Fundamentals of Internal Combustion Engines.* New Delhi: PHI. Print.

6) Cohen, H. and Rogers, G.F.C. *Gas turbine theory.* England: Longman house publication. Print.

DAV UNIVERSITY, JALANDHAR

Course Title: **Supply Chain Management**

L	T	P	Cr
4	-	-	4

Course Code: MEC-610

Course Objectives:

- To attain professional coherence in strategic thinking and acting.
- To master the concepts and methods of Supply chain management

Unit-A

Supply Chain Management: What and Why? (6Hrs)

Background of supply chain management, Concept of SCM, Generic types of supply chains, Various dimensions and implications, Major drivers of supply chain, SCM as profession.

Strategic Decisions in Supply Chain Management (8Hrs)

Introduction, Business Strategy (Model for strategy formation, Order winners and qualifiers, Supply Chain strategies, Value in supply chain: quality, delivery, flexibility and cost), Core competencies in supply chains, Strategic supply chain decisions, Customer Relationship Management Strategy, Supplier Relationship Management Strategy

UNIT – B

Source Management in Supply Chain (4Hrs)

Introduction, Elements of strategic sourcing, A Collaborative perspective, Development of partnership

Inventory Management in Supply Chain (6Hrs)

Introduction, Types of inventory, Supply/Demand uncertainties, Inventory costs, Selective inventory control, Vendor managed inventory systems, Inventory Performance measures

Transportation Management in Supply Chain (8Hrs)

Introduction, Strategy, Transportation selection, Trade Off, Modes of transportation and distribution, Third party logistic (3PL), Overview of an Indian infrastructure for transportation

UNIT – C

Information Technology in Supply Chain (6Hrs)

Introduction, Typical IT solutions: Electronic Data Interchange, Internet/Extranet, Data mining/Data warehousing, E-Commerce, E- Procurement, Bar Coding technology, Other technologies

Information System in Supply Chain **(6Hrs)**

Introduction, Computer based information system, Computer Models, Perceptions about ERP, ERP and SCM

UNIT – D

Reverse Supply Chain **(6Hrs)**

Introduction, Reverse Supply Chain vs Forward Supply Chain, Types of reverse flows, Issues in management of reverse supply chain, Reverse supply chain for food items, Reverse logistics and environmental impact

Cases in Supply Chain **(6Hrs)**

Newspaper supply chain, Book Publishing, Supply chain in Disaster Management

Learning Outcomes:

- Students will be able to know about the importance and strategic decisions involved in supply chain management.
- Students will be able to evaluate various types of inventory control and management in a supply chain.
- Students will also be made familiar with the concept of reverse supp

References:

1) Mohanty. *Supply Chain Management.* New Delhi: Biztantra. Print.

2) Sahay. *Supply Chain Modelling and Solutions.* New Delhi: Macmillan. 2009. Print.

3) Raghuram. *Logistics andSupply Chain Management.* New Delhi: Macmillan. Print.

DAV UNIVERSITY, JALANDHAR

Course Title: Advance Material

L	T	P	Cr
4	-	-	4

Course Code: MEC554

Course Objectives

- To introduce the students with the advance material like composites, Nano materials and plastics and to make them familiar with recent innovation in design of these materials

UNIT - A

Nano materials (12Hrs)

Carbon nanotubes, structure and properties, chemistry of carbon nanotubes, graphite whiskers, cones and polyhedral crystals, nano crystalline diamond, carbide derived carbon nanotubes in multifunctional polymer nano composites, nano structured materials for field emission devices, nano textured carbons for electrochemical energy storage.

UNIT - B

Composites (12Hrs)

Introduction, reinforcements, matrix materials, processing, interface, micromechanics, monotonic behaviour, cyclic fatigue, creep, wear, applications, shape memory alloys (SMAs), metallic foam, recemat metal foam etc.

UNIT - C

Plastics (14Hrs)

Introduction to plastics, polymeric materials (molecular viewpoint),microstructures in polymers, mechanical properties (macro view point) chemical and physical properties (macro view point), designing with plastics, thermoplastic materials (commodity plastics), thermoplastic materials(engineering plastics), thermo set materials, elastomeric (rubber) materials, extrusion, injection moulding, blow moulding, thermoforming, rotational moulding, casting, foaming, compression moulding, transfer moulding, and related processes, radiation, finishing, adhesion and assembly operations and management, Environmental aspects of plastics.

UNIT - D

Development of Advanced Composite Materials (10Hrs)

Micromechanical behaviour of a lamina, Mechanics of materials and elasticity approach to stiffness, Comparison of approaches, Mechanics of materials approach to strength. Fatigue behaviour in composites, Effect of holes in laminates, Fracture mechanics with reference to

composites, transverse shear effects, Post curing shapes of un symmetric laminates, Environmental effects.

Design of Composite Materials (8Hrs)

Introduction to design of composite structures, structural design, material selection, configuration selection, laminate joints, Design requirements and design failures criteria, optimization concepts, design analysis philosophy for composite structures.

Learning Outcome:

- Students will be able to know the characterstics of various advance material like composites, Nano materials and plastics.

References

1) Sehgal, Lindberg R.A. *Materials, their Nature, Properties and Fabrication*. New Delhi: S Chand. Print.

2) Polmear, I. J. *Light alloys: Metallurgy of Light Metals*. Arnold. 3rd Edition. 1995. Print.

3) Robert, M. *Mechanics of Composite Materials*. Print.

DAV UNIVERSITY, JALANDHAR

Course Title: **Welding Technology**

L	T	P	Cr
4	-	-	4

Course Code: MEC601

Course Objectives:

- This course is designed to provide students with an overviewof a wide variety of manufacturing processes for fabricated of engineering materials.
- The students will learn principles, operations and capabilities of various metal joining processes.
- To get the knowledge of metal transfer and melting rate.

Unit-A

Introduction (10Hrs)

Basic classification of welding processes, weld ability, weld thermal cycle, metallurgy of fusion welds, solidification mechanism and microstructural products in weld metal, epitaxial, cellular and dendritic solidification, metallurgical changes in weld metal, phase transformation during cooling of weld metal in carbon and low alloy steel, prediction of microstructures and properties of weld metal. Heat affected zone, re-crystallization and grain growth of HAZ, gas metal reaction, effects of alloying elements on welding of ferrous metals.

Unit-B

Welding Arc (6Hrs)

Arc efficiency, temperature distribution in the arc; arc forces, arc blow, electrical characteristics of an arc, mechanism of arc initiation and maintenance, role of electrode polarity on arc behaviour and arc stability, analysis of the arc.

Coated Electrodes (6Hrs)

Electrode coatings, classification of coatings of electrodes for SMAW, SAW fluxes, role of flux ingredients and shielding gases, classification of solid and flux code wires

Unit- C

Fusion Welding (10Hrs)

Manual metal arc welding MMAW, GTAW, GMAW, FCAW and CO welding processes, plasma arc, submerged arc welding, electro gas and electro slag welding, analysis of the process.

Welding Power Sources (6Hrs)

Arc welding power sources basic charters tics of power sources for various arc welding processes, duty cycles, AC, DC welding power source, DC rectifiers, thyristor controlled rectifiers, transistorized units, inverter systems. Arc length regulation in mechanized welding processes

Unit-D

Metal Transfer and Melting Rate (6Hrs)

Mechanism and types of metal transfer, forces affecting metal transfer, modes of metal transfer, metal transfer in various welding processes, effective of polarity on metal transfer and melting rate.

Solid State Welding (6Hrs)

Theory and mechanism of solid state welding, Techniques and scope of friction welding, diffusion welding, cold pressure welding and ultrasonic welding

Welding Techniques using Radiation Energy (6Hrs)

Technique, scope and application of the electron beam and laser welding processes

Learning Outcomes:

- They will have a close insight about of metallurgy of fusion welds, solidification mechanism and microstructural of weldment.
- The students will learn about the metal transfer and melting rate.
- They will earn the ability to understand the importance ofthe manufacturing processes and to select a suitable metal joining processes tofabricate an engineering product.

References:

1) Parmar, R.S. *Welding Engineering & Technology*. New Delhi: Khanna Publishers.1997. Print.

2) Nandkarni, S.V. *Modern Arc Welding Technology*. New Delhi: Oxford & IBH publishing Co.1996.Print.

3) Cary, Howard,*Modern Welding Technology.* Prentice Hall, 1998.Print.

4) Richard, L. *Welding & Welding Technology.* Tata McGraw Hill. 2001. Print.

5) Bohnart, E.R.*Welding:Principles & Practices.* Tata McGraw Hill.2014. Print.

DAV UNIVERSITY, JALANDHAR

Course Title: Gas Turbine and Compressor

Course Code: MEC624

L	T	P	Cr
4	-	-	4

Course Objectives:

- To impart the knowledge of Gas turbine and design principles.
- To provide the knowledge of different compressors.
- To provide the information of turbines and gas turbine power plant.

UNIT - A

Introduction and Gas Turbine Cycle (6Hrs)

Development, classification and field of application of gas turbines, Ideal and actual cycles; multi-stage compression; reheating, regeneration, combined and cogeneration

UNIT - B

Energy Transfer and Fluid Flow Characteristics (6 Hrs)

Energy transfer between fluid and rotor; axi-symmetric flow in compressors and gas turbines

Centrifugal Compressors (8 Hrs)

Principles of operation; compressor losses; adiabatic efficiency; slip factor; pressure coefficient; power unit; design consideration for impeller and diffuser systems; performance characteristics.

Axial Flow Compressors (8 Hrs)

Elementary theory; vortex theory; degree of reaction; simple design; elementary air-foil theory; isolated airfoil and cascade theory; three dimensional flow; stages; stage efficiency and overall efficiency; performance characteristics.

UNIT - C

Turbines (13 Hrs)

Axial flow and radial flow turbines; impulse and reaction turbines; fundamental relations and velocity triangles; elementary vortex theory; limiting factors in turbine design; application of airfoil theory to the study of flow through turbine blades; aerodynamic and thermodynamic design considerations; blade materials; blade attachments and blade cooling.

UNIT - D

Gas Turbine Power Plants (12 Hrs)

Fuel and fuel feed systems; combustion systems-design considerations and flame stabilization; regenerator types and design; gas turbine power; plant performance and matching; applications.

Learning Outcomes:

- Students will be able to know about the differentiate b/w axial and centrifugal compressor
- Student will able to distinguish b/w impulse and reaction turbines
- Students will able to understand the various parameter on which Gas turbine Power plant works

References

1) V.Babu. *Fundamental of Gas Dynamics.*Noida: Ane Books, 2009 Print

2) V.Ganesan *Gas Turbine*. New Delhi: Tata McGraw Hill, 2013 Print.

3) Cox. *Gas Turbine Principles and Practice*. Newnes, 2014 Print.

4) Zucrow. *Jet Propulsion and Gas Turbine*. John Wiley.2013 Print.

DAV UNIVERSITY, JALANDHAR

Course Title: Industrial and Organizational Psychology

Course Code: MEC-611

L	T	P	Cr
4	-	-	4

Course Objectives:

- To understand Industrial and Organizational Psychology.
- To learn evaluating methods of employees performance.
- To learn the employees training methods and motivational approach.

UNIT– A

Introduction (6Hrs)

Introduction of I/O psychology, Activities and settings of I/O psychology, I/O psychology as a profession, I/O psychology as a science, History of the field of I/O psychology, Recourses required to become an I/O psychologist, Ethics in I/O field, Humanitarian work psychology.

Job Analysis (8Hrs)

Job analysis: Job orientation approach, Person orientated approach, Purposes of Job Analysis, Collection of Job Analysis information and sources of information, Approaches to collecting job analysis information, Methods of job analysis, Reliability and validity of Job Analysis information, Job evaluation.

UNIT – B

Performance Appraisal (8Hrs)

Need to appraise employees, Performance Criteria, Methods of assessing job performance (Both objective and subjective measures), Impact of technology on performance appraisal, Legal issues in performance appraisal.

Assessment Methods for Selection and Placement (6Hrs)

Job related characteristics, Psychological tests, Characteristics of tests, Ability tests, Knowledge and Skill tests, Biographical information, Interviews, Work samples, Assessment Centre's, Electronic assessment.

UNIT – C

Selecting Employees (6Hrs)

The planning of human resource needs, Recruiting applicants, Selecting employees, Validity generalization, Getting applicants to accept and keep jobs offered, Unity of scientific selection International differences in selection practices.

Training (8Hrs)

Needs assessment, Objectives, Training Design, Work environment, Training methods, Electronic Training, Mentoring, Executive coaching, Delivery of a training program, Evaluation of training program.

UNIT – D

Theories of Employee Motivation (7Hrs)

Motivation: Motivation Theories, Need of theories, Reinforcement theories, Expectancy theory, Self-efficacy theory, Justice theory, Goal setting theory, Control theory, Action theory.

Job Attitude and Emotions (7Hrs)

Nature of job satisfaction, Feeling of people about their Jobs, Assessment of job satisfaction, Antecedents of job satisfaction, Potential effects of job satisfaction, Organizational committee, Emotions at work.

Learning Outcomes:

- Students learn about Industrial and Organizational Psychology.
- Students get able to evaluateemployee's performance using various methods.
- Students learn techniques of employees training and motivation.

References:

1) Spector. *Industrial and Organizational Psychology.* Wiley. 2015. Print.

2) Frank and Jeffrey. *Work in 21st Century, Introduction* to *Industrial and Organizational Psychology.* Wiley. 2009. Print.

Genric Electives

DAV UNIVERSITY, JALANDHAR

Course Title: Method Engineering and Ergonomics

Paper Code: MEC901

L	T	P	Cr
4	-	-	4

Course Objective:

- To conduct time and motion study to improve the methods/system.
- To impart the knowledge on ergonomics to enhance productivity of the organization.

UNIT - A

Work Study **(3Hrs)**

Introduction, Component of work study, Definition, Need of work study, Applications and advantages of work study, Work study procedure

Method Study **(7Hrs)**

Definition, Objective and Procedure of method study, Recording Techniques:Process Chart, Outline/Operation process chart, Flow process chart. Two handed process chart, Multiple activity chart, Travel chart, Flow diagram, String diagram, Cyclegarph and Cronocycle graph.

Motion and Film Analysis **(4Hrs)**

Micro motion study, Therblig, SIMO Chart, Memo motion study, Models(2D and 3D)

UNIT– B

Work Measurement **(14Hrs)**

Definition, Objective and benefit of work measurement, Basic procedure of work measurement Work Measurement Techniques

Work sampling, need, confidence levels, sample size determinations, random observation, and conducting study with the simple problems.

Stop Watch Time Study: Time Study, Definition, time study equipment, selection of job, steps in time study. Breaking jobs into elements, recording information. Rating & standard Rating, standard performance, scale of rating, factors affecting rate of working, allowances and standard time determination.

Predetermined Motion Time Study (PMTS)

Method Time Measurement (MTM)

UNIT- C

Ergonomics **(5Hrs)**

Introduction, Areas of study under Ergonomics, System approach to Ergonomics model, Man-Machine System. Components of Man Machine System and Their functions – Work capabilities of Industrial Worker, Design of work space, chair table.

Controls **(4Hrs)**

Hand controls and foot controls, location of controls and work place envelope. Recommendation about hand and foot push buttons, rotary selector switches, hand wheels, crank levers etc. Instruments and displays.

Work Load **(5Hrs)**

Static and dynamic muscular work, Human motor activity, metabolism, physical work load, measurement of physical work load, mental work load, measurement of mental work load, repetitive and inspection work, work duration and rest pauses, principles of motion economy

UNIT-D

Climate **(4Hrs)**

Heat Humidity: Body heat balance, effective temperature scales, and zones of discomfort, effect of heat on body and work performance

Vibration **(5Hrs)**

Terminology, Response of body to low frequency (LF) vibration, vibrations and discomfort, effect on health of worker, high frequency vibration, effect of H.F. vibrations, methods of reducing vibrations, analysis.

Noise **(5Hrs)**

Terminology, physiological effects of noise, annoyance of noise, speed interference, hearing loss, temporary and permanent thresh hold shift, effect of noise on performance, reduction of noise, personal noise protection.

Learning Outcomes:

- Students will be able to know about various work study techniques.
- Student will able to know about how to increase the value of the product.
- Students will able to know about the various inventory control techniques.
- Students will able to know importance of ergonomics in industrial engineering.

Reference Books

1) Bansal. *Industrial Engineering and Production Management.* New Delhi: Kapson Publishers. 2015. Print.

2) Dalela and Ali, Mansoor. *Industrial Engineering and Management Systems.* New Delhi: Standard Publishing Distributors. Print.

3) Wickens. *An introduction to Human Factors Engineering*. New Delhi:PHI. Print.

4) Ralph Barnes, *Motion and Time study*. John Wiley. 8thEdition. 1985. Print.

5) Sanders and McCormick E. J., *Human Factors in Engineering Design*. Tata McGraw Hill. 6th Edition. Print.

6) Wledon. *Engineered work Measurement*. ELBS. 1991. Print.

7) Shah, H.S. *Work study and Ergonomics*. New Delhi: Dhanpat Rai & Sons. 1992. Print.

8) Bridger. *Introduction of Ergonomics*. Tata McGraw Hill. 1995. Print.

9) Lyle, Yerges, F. *Sound, Noise and Vibration Control*. Van Nostrand.1978. Print.

DAV UNIVERSITY, JALANDHAR

Course Title: Power Plant Engineering

Course Code: MEC628

L	T	P	Cr
4	-	-	4

Course Objectives:

- Students will understand various types of power Plant.
- Students will apprehend the Steam power plant.
- Students will recognise the Nuclear power plant.
- Students will understand the Non-conventional power generation.

UNIT - A

Introduction (6Hrs)

Energy resources and their availability, types of power plants, selection of the plants, review of basic thermodynamic cycles used in power plants.

Hydro Electric Power Plants (8Hrs)

Rainfall and run-off measurements and plotting of various curves for estimating stream flow and size of reservoir, power plants design, construction and operation of different components of hydro-electric power plants, site selection, comparison with other types of power plants.

UNIT - B

Steam Power Plants (7Hrs)

Flow sheet and working of modern-thermal power plants, super critical pressure steam stations, site selection, coal storage, preparation, coal handling systems, feeding and burning of pulverized fuel, ash handling systems, dust collection-mechanical dust collector and electrostatic precipitator.

Combined Cycles (8Hrs)

Constant pressure gas turbine power plants, Arrangements of combined plants (steam & gas turbine power plants), re-powering systems with gas production from coal, using PFBC systems, with organic fluids, parameters affecting thermodynamic efficiency of combined cycles

UNIT - C

Nuclear Power Plants (10Hrs)

Principles of nuclear energy, basic nuclear reactions, nuclear reactors-PWR, BWR, CANDU, Sodium graphite, fast breeder, homogeneous; gas cooled. Advantages and limitations, nuclear power station, waste disposal.

Power Plant Economics (8Hrs)

Load curve, different terms and definitions, cost of electrical energy, tariffs methods of electrical energy, performance & operating characteristics of power plants- incremental rate theory, input-output curves, efficiency, heat rate, economic load sharing, Problems.

UNIT - D

Non-Conventional Power Generation (4Hrs)

Solar radiation estimation, solar energy collectors, low, medium & high temperature power plants, OTEC, wind power plants, tidal power plants, geothermal power plants.

Direct Energy Conversion Systems (4Hrs)

Fuel cell, MHD power generation-principle, open & closed cycle's systems, thermoelectric power generation, thermionic power generation.

Learning Outcomes:

- Students will be able to know about the various requirement of the Hydro and Thermal power plants.
- Student will able to learn the power plant economics
- Students will able to understand the various parameter on which convection depends.
- Students will be capable to understand the Direct Energy Conversion Systems.

References:

1) Bernhardt, G.A. skrotzki and William, A. *Vopat, Power station Engineering and Economy.* New Delhi: Tata McGraw Hill, 2013 Print.

2) Nag, P.K. *Power Plant Engineering*. New Delhi: Tata McGraw Hill, 2011 Print.

3) A.K. Raja. *Power Plant Engineering*, New Delhi: New Age International, 2006 Print.

4) El-Wakil, M.M. *Power Plant Engineering*, McGraw Hill, 2009. Print.