GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

TEACHING AND EXAMINATION SCHEME

Programme	**Bachelor of Technology**	Branch/Spec.	**Mechanical Engineering**
Semester	**VII**		
Effective from Academic Year	**2017-18**	Effective from the batch Admitted in	**July 2014**

Subject Code	**Subject Name**	**Teaching scheme**												**Examination scheme (Marks)**					
		Credit						Hours (per week)						Theory			Practical		
		Lecture(DT)			Practical(Lab.)			Lecture(DT)			Practical(Lab.)			CE	SEE	Total	CE	SEE	Total
		L	TU	Total	P	TW	Total	L	TU	Total	P	TW	Total						
2ME701	Turbomachinery	3	0	3	1	0	1	3	0	3	2	0	2	40	60	100	25	25	50
2ME702	Design of Mechanical System	3	0	3	1	0	1	3	0	3	2	0	2	40	60	100	25	25	50
2ME703	Production Technology	3	0	3	1	0	1	3	0	3	2	0	2	40	60	100	25	25	50
2ME704	Computer Aided Design	3	0	3	1	0	1	3	0	3	2	0	2	40	60	100	25	25	50
2ME705/1	Foundry Technology	3	0	3	1	0	1	3	0	3	2	0	2	40	60	100	25	25	50
2ME705/2	Internal Combustion Engine	3	0	3	1	0	1	3	0	3	2	0	2	40	60	100	25	25	50
2ME705/3	Refrigeration Engineering	3	0	3	1	0	1	3	0	3	2	0	2	40	60	100	25	25	50
2ME705/4	Hydraulic and Pneumatic Systems	3	0	3	1	0	1	3	0	3	2	0	2	40	60	100	25	25	50
2ME706	Minor Project	0	0	0	2	0	2	0	0	0	4	0	4	0	0	0	50	50	100
2ME707	*Practical Training	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	25	25	50
Total		**15**	**0**	**15**	**9**	**0**	**9**	**15**	**0**	**15**	**14**	**0**	**14**	**200**	**300**	**500**	**200**	**200**	**400**

Note(*) = Students have to take 2 to 3 weeks industrial training at the end of Semester VI and prepare an industrial training report and evaluation of that report will be assess at starting of Semester VII.

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Programme	Bachelor of Technology		Branch/Spec.	Mechanical Engineering	
Semester	VII		Version	2.0.0.0	
Effective from Academic Year	2017-18		Effective from the batch Admitted in	July 2014	
Subject code	**2ME701**	Subject Name	**Turbomachinery**		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	25	25	50

Pre-requisites:

Learning Outcome:

After learning this course, student should be able to:

- Understand to apply physics of flow through turbomachines.
- Understand the basics losses involved in turbomachines.
- Understand the radial machines and axial machines their need and applications for propulsion of jet engines.
- Understand the knowledge of fluid flow pattern, basic working principles and need of rotating element as per its requirement in aircrafts.

Theory syllabus

Unit	Content	Hrs
1	**Principle of Thermal Turbo machinery:** Types and classification of turbo machines, Principle of operation of turbo machines, Euler's equation, Components of energy transfer, Definitions of various efficiency.	4
2	**Steam Nozzles:** Types of nozzles, Velocity and heat drop correlation, Condition for maximum discharge, Construction detail and governing system, Nozzle efficiency, Effect of friction on nozzle efficiency, Physical concept of critical pressure, General relationship between area ,velocity and pressure in nozzle flow, Super saturated flow, Effect of variation of back pressure, Static and stagnation pressure, Wind tunnels, Blower tunnels, Suction tunnels, Induction tunnels, Supersonic tunnels.	8
3	**Turbines:** Types and classification of steam turbines, Principle of operation of impulse and reaction steam turbines, Velocity diagrams, Work done, Various efficiency criteria, Parameters affecting efficiency, Most economical and efficient operation consideration, Reheat factor, Compounding, Optimum blade heights, Number of stages and heat drop, Multistage. Steam Nozzle & turbine construction Details, Governing of Machinery.	8
4	**Gas Turbines:** Introduction and classification of gas turbine, Simple open cycle gas turbine, Closed cycle gas turbine, Ideal and actual Brayton cycle, Optimum pressure ratio for maximum thermal efficiency, Cycle work ratio, Cycle air rate, Calculation of s.f.c., Means of improving the efficiency and specific output of simple cycle, Open cycle gas turbine with regeneration, reheating, intercooling for improve the efficiency, Combine cycle power system.	6

5	**Jet Propulsion:** Principle of jet propulsion, Classification of jet propulsion engines, Working and cycle of Turbo jet engine, After burner, Thrust, Thrust power, Propulsive efficiency, Thermal efficiency, Merits and demerits of jet propulsion, Turboprop engine, Ramjet engine, Turbofan engine and rocket engines.	6
6	**Axial Flow Compressors :** Introduction, Construction and operation, Velocity diagram and work done factor, Pressure ratio and static pressure rise, Degree of reaction, Choice of reaction, Blade loading and flow coefficient, Aerofoil blading, Drag and lift coefficients, Stalling, Radial equilibrium theory, Free vortex, forced vortex, Characteristics of curves of centrifugal and axial flow compressors.	6
7	**Reciprocating compressors:** Construction and working, Multistage conditions for minimum work, Intercooling, Heat rejected in compressors and intercoolers, Efficiency and control of air compressors, Reciprocating air motors, Testing of compressors	7

Practical content
The term work to be prepared by the candidates shall consists of technical report of about ten experiments performed by the candidates out of which at least two experiments will be based on each of the following topics listed under the headings of a. Nozzles b. Turbines c. Jet Propulsion

Text Books	
1	R. Yadav, “Steam & Gas Turbine”, Central Publishing House, Kolkata. 7th Edition.
2	S.M. Yahya, “Fundamentals of Compressible Flow with Aircraft and Rocket propulsion”, New International Publishers, Delhi, 2003.
3	Ganeshan, “Gas turbine & Jet Propulsion” Tata McGraw Hill, New Delhi, 2003.

Reference Books	
1	Domkundwar, Khajuria, “Thermodynamics & Heat Engines”, Dhanpat Rai & Sons, Delhi. 2012.
2	R K Rajput, “Thermal Engineering”, Laxmi Publication, Delhi. 3rdEdition, 2015.
3	Raj Mohan Gupta, “Steam Turbine”, Oxford IBH, Delhi. 2006.
4	S.M. Yahya, “Turbines Compressors and Fans”, Tata McGraw Hill, New Delhi. 3rdEdition.
5	Kearton, “Steam Turbine Design & Practice” CBS Publishers, New Delhi. 3rdEdition.
6	Gopalkrishnan and Prithvi Raj, “A Practice of Turbo Machines”, Scitech Publications (India) Pvt. Ltd., Chennai. 3rdEdition.

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Semester	VII		Version	2.0.0.0	
Effective from Academic Year	2017-18		Effective from the batch Admitted in		July 2014
Subject code	**2ME702**	Subject Name	**Design Of Mechanical System**		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	25	25	50

Pre-requisites:

- Students should have the basic knowledge of Machine Design fundamentals.
- Students should have the basic knowledge of Mechanical Systems.

Learning Outcome:

After learning this course, student should be able to:

- Design various types of gears as per applications and industrial requirements.
- Select the appropriate Bearing, Bearing mounting, Bearing seal for the specific application for static as well as dynamic conditions based on manufacturer's catalogue with uniform loading or variable loading conditions.
- Design of different I.C. engine components, Material handling equipment, Hoisting Machinery and its components as per industry requirement.
- Apply the Johnson method for optimum design of machine elements like Rods, Shaft, Spring and Torsion bars.

Theory syllabus

Unit	Content	Hrs
1	**Design of gears**: Spur Gear, Helical gear, Bevel gear & Worm gear, Consideration of form factor, Velocity factor, Service factor, and stress concentration factor for gear tooth profile, Reliability factor. Consideration under dynamic action and wear load, Selection of material of gear, Consideration of surface finish & surface hardness, Gear lubrication, Load rating of m/c cut spur & helical gears. Heat treatment of gear.	10
2	**Design of bearings:** Introduction, Classification, Sliding contact bearing, Hydrodynamic bearings, Design criteria of hydrodynamic bearings, Design procedure, Step and collar bearings, Foot step bearing, Roller bearings, Bearing capacity, Static load rating, dynamic capacity of bearing, Bearing life, Design of ball and roller bearings, Design for variable loading, Methods of mountings, Bearing seals, Lubrication of bearing.	10
3	**Design of I.C. engine components**: Piston, Connecting rod, Crankshaft, Flywheel.	7
4	**Design of hoisting machinery**: Choice of material handling equipment, Components of hoisting equipment, Flexible-hoisting appliances, Design of fiber ropes, Pulley system, Steel wire ropes, Fatigue life of ropes, Stresses in hoisting rope, Rope sheaves, Rope drums, Design of hook.	10

5	**Introduction to optimum design using Johnson method :** Application to machine elements like rods, Shaft, Spring, Torsion bars	8

Practical content

The term work shall be based on experimental and analytical work on topics mentioned bellows:

1. Exercise on material section of various machine elements.
2. Preparation of design report consisting of one of the following problems along with drawing (parts and assembly)
   - i. Material handling equipment –hoist, cranes etc….
   - ii. Centrifugal pump
   - iii. I.C engine –petrol or diesel, two strokes or four strokes.
   - iv. Speed gear boxes-machine tool of automotive.
   - v. Machine tools such as drilling m/c, milling m/c, lathe
3. Term work preparation of design report for minor problems, and may be solved by computer program.

Text Books

1	Bhandari, “Machine design” Tata McGraw Hill, New Delhi. 3rd Edition.
2	Dr. N.K.Mehta, “Machine tool design and numerical control”, Tata McGraw-Hill, New Delhi. 2002.

Reference Books

1	Haidari, Nirali Prakashan, “Machine design”, New Delhi. 1st Edition.
2	R.B. Patil, “Machine design”, Techmax Publications, Pune. 4th Revised Edition.
3	R.C. Patel, “Machine design”, C. Jamnadas & Company, Mumbai. 2006.
4	Sharma and Agrawal, “Machine design”, S.K. Kataria Publication, Delhi,12th Edition.
5	Joseph Shiglay, “Mechanical Engineering Design”, Magraw Hill, New Delhi,7th edition.
6	“Design Data Book”, PSG Publications, Coimbatore.
7	“Design data handbook of CMT” 2nd Edition.

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Semester	VII		Version	2.0.0.0	
Effective from Academic Year	2017-18		Effective from the batch Admitted in		July 2014
Subject code	**2ME703**	Subject Name	**Production Technology**		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	25	25	50

Pre-requisites:

- Students should have the basic knowledge of Manufacturing Processes.

Learning Outcome:

After learning this course, student should be able to:

- Understand the basics of material removal in various modern manufacturing processes.
- Understand the effect of process parameters during machining of various advanced materials.
- Perform various thread and gear manufacturing methods.
- Analysis of various unconventional manufacturing processes for the given job assignment.
- Design Jig and fixture for required machining operations.
- Design for dies required for various sheet metal operations.

Theory syllabus

Unit	Content	Hrs
1	**Cutting Tool**: Types of single point and multi-point tools, Tool bit, Tipped tools, Form tools, Tool geometry and tool signature, Its systems, Tool materials, Positive and negative rake cutting, Recent developments in cutting tool materials, Selection of cutting tool from manufactures catalogue.	4
2	**Theory of Metal Cutting and Economics of Machining Process**: Orthogonal and oblique cutting, theory of chip formation, Types of chips, Thickness ratio and shear plane angle, Forces and power in machining, Concept of machinability, Tool wear and tool life, Economics of machining, Cutting fluids, Types, Properties and scope of use. Thermal Analysis.	10
3	**Analysis of Machine Tool:** Study of general features relating to frames, Slides, Transmission of motion & power.	5
4	**Gear and Thread Manufacturing**: Different types thread manufacturing methods, Different gear generating and forming methods with their special features, Gear finishing processes.	6
5	**Unconventional Machining Techniques:** Study of unconventional machining techniques EDM, USM, AJM, ECM EBM, LBM, Wire Cut EDM, Plasma, and WJM Processes.	10
6	**Jigs and Fixtures:** Definition, Its importance in mass production, Design principles, Types of locating & clamping devices, Jig bushes, Types of drilling jigs, Types of fixtures	4

7	**Press Tool Design:** Design of Blanking, Piercing, Drawing and Bending dies.	6
Practical content		
The term work shall be based on experimental and analytical work on topics mentioned above.		
Text Books		
1	P.C. Sharma, “Production Technology”, S. Chand and Company Ltd., New Delhi, 10th Revised edition, 2010.	
2	R.K. Jain and S.C. Gupta, “Production Technology”, Khanna Publishers, New Delhi, 2002.	
Reference Books		
1	Serope Kalpakjian and Steven R. Schmid, “Manufacturing Engineering and Technology”, Addison Wesley Longman (Singapore) Pte Ltd, Delhi, 2009.	
2	HMT, “Production Technology”, Tata McGraw Hill publishing co. ltd., 1st edition, 2008.	
3	Pandey & Singh, “Production Engineering Science”, Standard Publishers, Delhi This Edition First Published, 2003.	
4	Geoffrey Boothroyd, “Fundamentals of Metal Machining and Machining tool” ,Tata McGraw-Hill, New Delhi, 2nd Edition.	
5	Cyril Donaldson, V. C. Goold “Tool design” Tata McGraw-Hill Education, 3rd Edition.	
6	American Society of Tool and Manufacturing Engineers “Fundamental of Tool design” Prentice-Hall, 2011.	

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Programme	Bachelor of Technology		Branch/Spec.	Mechanical Engineering	
Semester	VII		Version	2.0.0.0	
Effective from Academic Year	2017-18		Effective from the batch Admitted in		July 2014
Subject code	**2ME704**	Subject Name	**Computer Aided Design**		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	25	25	50

Pre-requisites:

- Fundamental knowledge of Mechanical Engineering Subjects.
- Knowledge of programing languages like C, C++ and MATLAB

Learning Outcome:

After learning this course, student should be able to:

- Select input and output devices for computer systems for mechanical engineering requirements.
- Understand the mathematics of basic geometrical shapes and concept for geometry manipulation.
- Prepare program of basic shapes, curves, surfaces and solids.
- Operate analysis software for analysis of mechanical components.
- Use of various Numerical methods like FDM, FBM and FEM for analysis of basic components.

Theory syllabus

Unit	Content	Hrs
1	**Fundamentals of CAD**: Introduction, Reasons for implementing a CAD system, Computer aided process application, Benefits, CAD software's, Elements of programming, CAD programming.	4
2	**Computer Aided Graphics**: Image on screen, Scan conversion, Graphic mode, Graphic function, Pixel, Drawings, Line, Curves (Circle, ellipse etc…), and Filling of objects.	6
3	**Geometrical Transformation two and three Dimensions**: Two-dimensional transformation Matrix presentation, Presentation of transformation in uniform and composite transformation, Mirror image, Shearing, Homogeneous matrix Three-dimensional transformation Three dimensional representation of matrix, Translation, Scaling, Rotation, Mirror, Shearing, Composite matrix.	6
4	**Geometrical Modelling:** Types and mathematical representation of curves, Wire frame models - entities presentation in parametric form, Lines, Circles, Ellipse, Parabola, Parametric representation of synthetic curves i.e Cubic curves, B- spline, Bezier spline, Sweep curve, Surface and solid model, Fundamentals of solid modelling, B- rep, Constructive solid geometry, Analytical modelling, STL & Octri Models.	8
5	**Finite Element Analysis:** Methods of analysis - FEM, FDM, FBM, Application of FEA, Boundary conditions, Pre-processing, Solution, Pro processing, Introduction to different FEA professional software	6
6	**Elements and Mesh Generation**:	5

	Basic types of elements 1-D, 2-D, 3-D, Element selection criteria, Co-ordinate systems and shape functions, 1D thermal Analysis.	
7	**One Dimensional problem**: Finite element modelling, Node numbering, Element stiffness matrix, Assembling global stiffness matrix K, Properties of K, Treatment of boundary conditions, Gaussian elimination approach and penalty approach, Stress calculations, Temperature effects, Shape functions.	6
8	**2-D Trusses:** 2-D problem Plain stress, Local and global co-ordinates, Element stiffness matrix, Global stiffness matrix, Solution for nodal displacement and elemental stresses.	4
Practical content		
The term work shall be based on experimental and analytical work on topics mentioned above		
Text Books		
1	Dr. Chandrupatla and Dr. Belegundu, "Introduction to Finite elements in Engineering Applications.", Pearson education, New Delhi. 3rd Edition	
2	Ibrahim Zeid, "CAD/CAM Theory and Practice", Tata McGraw-Hill, New Delhi. 2nd edition	
Reference Books		
1	Dr. S. S. Khandare, "Computer Aided Design", Charotar publishing house, Anand, Gujarat. 9th Edition	
2	P. Radhakrishnan S. Subrarnanyan, V. Raja, "CAD/CAM/CIM", New Age International (P) Ltd., Delhi.2008	
3	F. Rogers and J. Alan Adams, "Mathematical Elements for Computer Graphics", Tata McGraw-Hill, New Delhi. 2nd edition	

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Programme	Bachelor of Technology	Branch/Spec.	Mechanical Engineering
Semester	VII	Version	2.0.0.0
Effective from Academic Year	2017-18	Effective from the batch Admitted in	July 2014
Subject code	**2ME705/1**	Subject Name	**Foundry Technology**

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	25	25	50

Pre-requisites:

Learning Outcome:

After learning this course, student should be able to:

- Understand the basic of various casting processes and concept of solidification.
- Design the gating and riser system of casting.
- Learn the melting practices of ferrous and non-ferrous metals.
- Evaluate metallurgical aspect of casting processes and non destructive testing.
- Understand basics of simulation methods for casting.

Theory syllabus

Unit	Content	Hrs
1	**Conventional metal casting methods:** Green sand moulding, CO_2 moulding, Shell moulding, Die casting, Centrifugal casting, Investment casting, Plant equipment's & Mechanization.	6
2	**Solidification phenomena:** Liquid solid transformation, nucleation, Crystal growth, solidification of castings, Rapid solidification, Amorphous solidification, Directional solidification, Micro and macro segregation	6
3	**Cast irons:** Grey iron, White iron, Ductile iron & malleable iron.	4
4	**Non-ferrous foundry practice:** Property of liquid metal and their significance in mould practice, Dissolution of gases in metals, Metal mould reaction, Fluidity, Hot tears, grain refinement, Steel moulding and cast iron moulding.	6
5	**Defects in casting:** Defects arising with various casting processes, Their identification and preventing methods, Cast structure - property relationship	6
6	**Principle of casting designs as applied to the ferrous castings**: Risers, primary functions of riser, Riser shape, Riser design, Positions of risers and location of riser. Gating system, types of gates, Design of gating system.	5
7	**Advance Casting Processes:** Full mould casting, Quick casting, Continuous casting, Vacuum casting.	4

8	**NDT methods:** Introduction, visual inspection, Liquid dye penetrant test, Radiography inspection method, Magnetic particle inspection, Ultrasonic inspection method.	4
9	**Simulation of casting Process:** Introduction, advantages and applications of simulation, Numerical Simulation of Casting Solidification, Methods design and modelling.	4
Practical content		
The term work shall be based on experimental and analytical work on topics mentioned above Field work.		
Text Books		
1	Richard Heine, Carl Loper and Philip Rosenthal, "Principle of metal casting", Tata McGraw Hill, New Delhi. 2nd Edition.	
2	P.C.Mukharji, "Principle of metal casting", Oxford & Ibh Publishing Co Pvt Ltd, New Delhi, 3rd Edition.	
Reference Books		
1	J.G.Bralla, "Handbook of Product Design for Manufacture", McGraw Hill M.F. 2nd Edition.	
2	B. Ravi, "Metal Casting Computer Aided Design and Analysis" Prentice Hall of India, New Delhi, 2005.	
3	Richard W. Heine, Carl R. Loper, "Principles of Metal Casting" Tata McGraw-Hill, New Delhi, 2004.	
4	John R. Brown, "Foseco Ferrous Foundry man's Handbook", Butterworth-Heinemann, New York, 10th Edition.	

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Semester	VII		Version	2.0.0.0	
Effective from Academic Year	2017-18		Effective from the batch Admitted in		July 2014
Subject code	**2ME705/2**	Subject Name	**Internal Combustion Engine**		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	25	25	50

Pre-requisites:

Learning Outcome:

After learning this course, student should be able to:

- Do in-depth cycle analysis for different types of engines.
- Analyse fuel supply systems, ignition and governing systems of IC Engines.
- Understand combustion process of SI and CI Engines.
- Measure operating characteristics of IC Engines.
- Compare the experimental results with theoretical trends.

Theory syllabus

Unit	Content	Hrs
1	**Fuel Supply System In Engines:** S.I Engines: Types of Mechanical Fuel Injection system, M.P.F.I. Lucas petrol injection system, Electronic Fuel Injection. Alternate Flues for IC Engine, Fuel Injection System in C.I. Engines: Heat release pattern, Requirement, Quantity of Fuel & Size of Nozzle Orifice, Spray Formation, and Dispersion factors affecting spray Characteristics.	8
2	**Ignition System:** Ignition Requirements, Battery & Coil Ignition System, Magneto Ignition System, Electronic Ignition System, Advantages over Conventional System, Ignition Timings Spark Plug, Spark Advance Mechanism, Spark Plug Heat Range ,Factor Affecting Energy Requirement of the Ignition System.	8
3	**Combustion in Engines:** **S.I. Engines:-** Ignition Limits, Stages of Combustion in S.I. Engine, Effect of Engine Variable on Ignition Lag and Flame Propagation, Abnormal Combustion, Detonation or Knocking Effect of Detonation, Effect of Engine Variables on knock or detonation, Theory of Detonation in S.I. Engines & Chemistry of Detonation, Control of Detonation Surface Ignition, Design Principle of Combustion Chamber, and Types of Combustion Chamber. **C.I. Engines:-** Stages of Combustion in C.I. Engines, Air Fuel Ratio, Delay Period or Ignition Lag, Variable effecting Delay Period, Diesel Knocks, Methods of Controlling Diesel Knock, C.I. Engine Combustion Chambers, Cold Starting of C.I. Engine and Cold Starting Aids.	10
4	**Governing of I.C. Engines:** Requirement of Governing, Methods of Governing, Hit & Miss Governing (Gas and Diesel Engines), Quality Governing, Quantity Governing.	6

5	**Supercharging:** Objects of Supercharging, Supercharging of S.I. and C.I. Engines, Effects on Performance of Engine, Turbocharging, Methods of Turbocharging, Limitations of Turbocharging	6
6	**Rating, Testing , Performance of Automotive Engines:** Fuel Measurement, Measurement of Air Consumption, Measurement of Speed, Heat Balance Sheet or Energy Balance, Engine Performance Curves (Performance curves for S.I. and C.I. Engines), Testing of Engines as per ISI Codes.	7
Practical content		
The term work shall be based on experimental and analytical work on topics mentioned above Field work.		
Text Books		
1	V. Ganeshan, "I.C. Engines", Tata Mc Graw Hill , New Delhi, 2003.	
2	Mathur & Sharma, "I.C. Engines", Dhanpatrai and sons, Delhi, 1994.	
Reference Books		
1	James .D. Halderman (Theory & Servicing), "Automotive Engine", Chase.D.Mitchell Jr (Pearson), New Delhi, 4th Edition	
2	B.L. Singhal, "I.C. Engines & Automobile Energy", Tech-Max Publications Pune, 7th Edition	
3	Domkundwar, "I.C. Engines", Dhanpatrai and sons, Delhi. 2008	
4	Dr. R.K. Singhal, "I.C. Engines", Katson Books, Delhi, 6th Edition.	

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Programme	Bachelor of Technology		Branch/Spec.	Mechanical Engineering	
Semester	VII		Version	2.0.0.0	
Effective from Academic Year	2017-18		Effective from the batch Admitted in	July 2014	
Subject code	**2ME705/3**	Subject Name	**Refrigeration Engineering**		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	25	25	50

Pre-requisites:

Basic Thermodynamics

Learning Outcome:

After learning this course, student should be able to:

- Understand the vapour compression and vapour absorption system operation.
- Analyse the conventional, non-conventional and low temperature refrigeration cycles and methods of improving performance.
- Know about the different working substance used in refrigeration system
- Select different components , controls and accessories for refrigeration system

Theory syllabus

Unit	Content	Hrs
1	**Introduction**: Vapour Compression System, P-h chart, Compound compression with flash and inter cooler, their analysis, Multiple evaporator and condenser system, Vapour Absorption system, Air Refrigeration analysis on T-S plane.	4
2	**Non-Conventional Refrigeration Systems :** Steam Jet Refrigeration Basic concept, system components, and construction and working, application, advantages and disadvantages Theoretical analysis on T– S plane, Thermo Electronic, Vortex Tube Refrigeration Construction and working, application, advantages and disadvantages, simple analysis.	8
3	**Refrigerants :** Primary and secondary refrigerant, classifications, designation of refrigerant, desirable properties of ideal refrigerants, need of new refrigerants.	6
4	**Low Temperature Refrigeration:** Cascade refrigeration system, Solid carbon dioxide or Dry Ice, Liquefaction of gases, Linde and Clande system for liquefaction of air, Application of Low temperature.	6
5	**Application of Refrigeration:** Application in Domestic, and industry purposes, such as domestic refrigerator, Ice plants, Cooling load estimation water cooler, bottle cooler, walk in cooler, their construction and working, application of refrigeration in transport, principles of freeze drying.	5
6	**Refrigerant Compressors:** Types of reciprocating compressor, Construction and working of single stage reciprocating compressor, Multistage compression, Construction and working of Centrifugal compressors ,	6

	comparison of performance of reciprocating compressor and centrifugal compressors, Rotary compressors, Screw compressors.	
7	**Refrigeration Components ,Controls and Accessories :** Types of condensers, Air cooled condensers, water cooled condenser, Evaporative condensers, cooling tower and spray ponds, classification of evaporators, Heat transfer in evaporators, Hand expansion valve, Automatic expansion valve, Thermostatic expansion valve Capillary tube, low side float , High side float and Solenoid valves.	6
8	**Methods of de frosting :** Natural defrosting Automatic defrosting, water defrosting, Electric defrosting, Hot gas defrosting, defrosting of multiple evaporator system Students be given idea about relevant BIS/ASHRAE/ARI standards in appropriate place and topics.	4
Practical content		
The term work shall be based on experimental and analytical work on topics mentioned above Field work.		
Text Books		
1	P.S.Desai, “Modern Refrigeration and Air conditioning”, Khanna Pub., Delhi, 2004.	
2	Domkundwar, “Refrigeration & Air Conditioning”, Dhanpatrai& Co., Delhi, 4th Edition.	
Reference Books		
1	Roy J. Dossat, “Principles of Refrigeration”, Prentice Hall, UK, 5th Edition.	
2	C.P.Arora, “Refrigeration and Air conditioning”, Tata McGraw Hill, New Delhi, 3rd Edition.	
3	Bellany, “Refrigeration & Air Conditioning” Khanna Pub., Delhi, 2nd Edition.	

GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology	Branch/Spec.	Mechanical Engineering
Semester	VII	Version	2.0.0.0
Effective from Academic Year	2017-18	Effective from the batch Admitted in	July-2014
Subject code	**2ME705/4**	Subject Name	**Hydraulic and Pneumatic Systems**

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	25	25	50

Pre-requisites:

Student should have:

- Basic knowledge of fluid mechanics and thermodynamics.
- Concept of automation.

Learning Outcome:

After successful completion of the course, student will be able to :

- Design and maintenance of industrial hydraulic circuits.
- Design and maintenance of industrial pneumatic circuits.
- Use simulation software of hydraulics and pneumatics.
- Use hydraulics and pneumatics as drives of industrial automation.

Theory syllabus

Unit	Content	Hrs
1	**Basics of Hydraulic and Pneumatic systems:** Fluid properties, basic components required for hydraulics system, different types of oil filters,Advantages, disadvantages & application Application of pneumatics, Gas laws, basic components required for pneumatic systems, Advantages, disadvantages & application	4
2	**Actuators and valves of Hydraulics system:** Types of cylinder, cylinder force, velocity & power, Construction of cylinder, Cushioning of cylinder, Introduction to hydraulic motor, Gear motor, vane motor & piston motor, Construction & classification of direction control valves, Valve operating method, Centre condition of spool valves, Pressure relief valve ,Pressure reducing valve, Unloading valve, Sequence valve, Counterbalance valve, Throttle valve, Throttle with check valve, Check valve, Pressure gauge, Pressure intensifier, Pressure switch, Temperature switch, Accumulators ,Flow meter	10
3	**Basic circuits of Hydraulics system and industrial applications:** Control of single acting and double acting cylinder, Meter in and meter out circuits, Regenerative circuit, Counter valve application, Automatic cylinder reciprocating, Fail safe circuit, Pump unloading circuits	8
4	**Actuators and valves of Pneumatic system:** Introduction to FRL unit, Air filter, pressure regulator & lubricator , Types of cylinders Single acting cylinder, Double acting cylinder, Classification according to construction, Cushion assembly, Types of mount, Piston speed & force, types of air motors, Types of valves, Direction control valves, Valve position, Basic construction of valves, Overlapping ,Controlling methods & control techniques, Flow control valve ,Non return flow control valve, Check valve ,Quick	8

	exhaust valve, Time delay valve ,Shuttle valve ,Twin pressure valve ,Solenoid valve	
5	**Basic circuits of Pneumatic system and industrial applications:** Symbols, Control of single acting & double acting cylinder by various methods, Impulse operation, Speed control of a cylinder, Sequencing of motions, Automatic cylinder reciprocating, Time delay circuits, Logic operation circuits, Electro-pneumatics Relays ,Electro-pneumatics circuits ,Circuits by cascade systems	8
6	**Simulation of hydraulic and Pneumatic Circuits:** Introduction to software of hydraulic and Pneumatic system, Designing of different circuit in software, internal simulation in software , simulation with actual component using software like automation in industry	7

Practical content	
The Practical/term work shall be based on the topics mentioned above and will be defended by the candidates.	
Text Books	
1	Anthony Esposito, “Fluid Power with Applications”, Pearson Education 2005
2	Majumdar S.R., “Oil Hydraulics Systems - Principles and Maintenance”, Tata McGraw-Hill, 2001
3	Majumdar S.R., “Pneumatic systems – Principles and maintenance”, Tata McGraw Hill, 1995
Reference Books	
1	Srinivasan.R, “Hydraulic and Pneumatic controls”, Vijay Nicole, 2006
2	Shanmugasundaram.K, “Hydraulic and Pneumatic controls”, Chand & Co, 2006
3	Anthony Lal, “Oil hydraulics in the service of industry”, Allied publishers, 1982
4	Harry L. Stevart D.B, “Practical guide to fluid power”, Taraoeala sons and Port Ltd. Broadey, 1976
5	Michael J, Prinches and Ashby J. G, “Power Hydraulics”, Prentice Hall, 1989
6	Dudelyt, A. Pease and John T. Pippenger, “Basic Fluid Power”, Prentice Hall, 1987

GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology	Branch/Spec.	Mechanical Engineering
Semester	VII	Version	2.0.0.0
Effective from Academic Year	2017-18	Effective from the batch Admitted in	July 2014
Subject code	**2ME706**	Subject Name	**Minor Project**

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	0	0	2	0	2	Theory	00	00	00
Hours	0	0	4	0	4	Practical	50	50	100

Pre-requisites:

Learning Outcome:

After learning this course, student should be able to:

- Demonstrate knowledge of contemporary issues in their chosen field of Project.
- Demonstrate an ability to present and defend their Project work to a panel of experts.
- Demonstrate a depth of knowledge of Mechanical Engineering.

Theory syllabus

Unit	Content	Hrs
1	The Student will have to prepare a thorough project report/ literature review based on practical work or experimental work or Analysis, Simulation, Design & Development of a product, using CAD – CAM software and will have to give a presentation based on it.	20
2	The project may be carried out either in Institute or Industries or Research organization. Concerned guide & Head of the Department should approve project. The examiners will evaluate project at the end of the term.	40

Practical content

The students will have to submit the project report with thorough literature review and presentation of the subject matter.