Samrat Ashok Technological Institute (Engg. College),Vidisha (M.P.)
Mechanical Engineering Department

V-SEM B.Tech. Mechanical	Subject Code	Subject Name / Title	Maximum Marks Allotted					Contract Hrs. per weeks			Total Credits
			Theory			Practical					
			End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work	L	T	P	
	ME-1851	Heat & Mass Transfer	70	20	10	30	20	3	-	2	4

Course Outcomes: At the end of the course, the students will able to:

CO 1	Understand the basic modes of heat transfer and compute temperature distribution in steady and unsteady state heat transfer through conduction
CO 2	Heat transfer analysis of extended surfaces
CO 3	Interpret and analyze forced and free convection
CO 4	Understand the Principle of Radiation, Evaluation of heat transfer by radiation between different Geometries and basic of Mass Transfer
CO 5	Design and analysis of Heat Exchanger

Mapping of course outcomes with program outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3				2							1
CO 2	3	3	2	2	2				1			1
CO 3	3	3	2	2	1	1						1
CO 4	3	3	2	2		1	1					1
CO 5	3	2	3	2	1	1			1	1		1
ME1851	3	2.75	2.25	2	1.5	1	1		1	1		1

UNIT-1

Basic Concepts: Modes of heat transfer, Fourier's law, Newton's law, Stefan Boltzman law; thermal resistance and conductance, analogy between flow of heat and electricity, combined heat transfer process; **Conduction:** Fourier heat conduction equation, its form in rectangular, cylindrical and spherical coordinates, thermal diffusivity, linear one dimensional steady state conduction through a slab, tubes, spherical shells and composite structures, electrical analogies, critical-insulation-thickness for pipes, effect of variable thermal conductivity.

UNIT 2

Extended surfaces (fins): Heat transfer from a straight and annular fin (plate) for a uniform cross section; error in measurement of temperature in a thermometer well, fin efficiency, fin effectiveness, applications; **Unsteady heat conduction:** Transient and periodic conduction, heating and cooling of bodies with known temperatures distribution, systems with infinite thermal conductivity, response of thermocouples.

UNIT 3

Convection: Introduction, free and forced convection; principle of dimensional analysis, Buckingham 'pie' theorem, application of dimensional analysis of free and forced convection, empirical correlations for laminar and turbulent flow over flat plate and tubular geometry; calculation of convective heat transfer coefficient using data book.

UNIT 4

Heat exchangers: Types- parallel flow, counter flow; evaporator and condensers, overall heat transfers coefficient, fouling factors, long-mean temperature difference (LMTD), method of heat exchanger analysis, effectiveness of heat exchanger, NTU method;

Mass transfer: Fick's law, equi-molar diffusion, diffusion coefficient, analogy with heat transfer, diffusion of vapour in a stationary medium.

UNIT 5

Thermal radiation: Nature of radiation, emissive power, absorption, transmission, reflection and emission of radiation, Planck's distribution law, radiation from real surfaces; radiation heat exchange between black and gray surfaces, shape factor, analogical electrical network, radiation shields.

Boiling and condensation: Film wise and drop wise condensation; Nusselt theory for film wise condensation on a vertical plate and its modification for horizontal tubes; boiling heat transfer phenomenon, regimes of boiling, boiling correlations

References:

1. Sukhatme SP; Heat and mass transfer; University Press Hyderabad
2. Holman JP; Heat transfer; TMH
3. Dutta Binay K; Heat Transfer; PHI
4. Kumar DS; Heat and mass transfer; SK Kataria and Sons Delhi
5. Kreith; Heat transfer,
6. Sachdeva RC; Fundamentals of engineering heat and mass transfer,.
7. Gupta & Prakash; Engineering heat transfer,

Suggested List of Experiments:

1. Determination Thermal Conductivity (k) of Metallic Solid
2. Forced Convection Heat Transfer (h) analyses
3. Plot the Temperature Distribution (Radial) in Lagged pipe and determination Thermal Conductivity (k) of pipe insulation.
4. Analysis of Parallel flow and counter flow heat exchanger, effectiveness and heat transfer rat (Parallel and counter flow heat exchanger Apparatus)
5. Study of 'Twin Slab' guarded hot plate Apparatus
6. Determine Emissivity of test plate (Emissivity Apparatus)
7. Determination Thermal Conductivity (k) using Spherical Apparatus
8. Study of Composite Slab Apparatus
9. Analysis of Dropwise & Filmwise Condensation (Dropwise & Filmwise Apparatus)
10. Analysis of Critical Heat Flux (Heat Flux Apparatus)

Samrat Ashok Technological Institute (Engg. College),Vidisha (M.P.)
Mechanical Engineering Department

V-SEM B.Tech. Mechanical	Subject Code	Subject Name / Title	Maximum Marks Allotted					Contract Hrs. per weeks			Total Credits
			Theory			Practical					
			End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work	L	T	P	
	ME-1852	Internal Combustion Engines	70	20	10	30	20	3	-	2	4

Course Outcomes: At the end of the course, the students will able to:

CO 1	Evaluate performance of I.C. Engines
CO 2	Understand the Combustion phenomena and design for S.I. and C.I. Engines
CO 3	Understand working of various I.C. engine systems such as Fuel, Systems, Lubrication systems
CO 4	Understand different engine exhaust emissions and their controlling methods
CO 5	Evaluate methods for improving the I.C. Engine performance

Mapping of course outcomes with program outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	2	2	2	3			1		2
CO 2	3	1	2	1		1	2					1
CO 3	2	3	3	2	2	3	1					
CO 4	1	2	2	2	1	2	1					2
CO 5	2	2	2	1	2	1	1		2			2
ME1852	2.2	2.2	2.4	1.6	1.4	1.8	1.6		2	1		1.75

UNIT – I

Internal Combustion Engine: S.I. and C.I. engines of two and four stroke cycles, real cycle analysis of SI and CI engines, determination of engine dimensions, speed, fuel consumption, output, mean effective pressure, efficiency, factors effecting volumetric efficiency, heat balance, performance characteristics of SI and CI engines, cylinder arrangement, firing order, power balance for multi-cylinder engines, valve timing.

UNIT – II

Combustion in SI engines: Flame development and propagation, ignition lag, effect of air density, temperature, engine speed, turbulence and ignition timings, physical and chemical aspects of detonation, effect of engine and fuel variables on knocking tendency, knock rating of volatile fuels, octane number, H.U.C.R., action of dopes, pre-ignition, its causes and remedy, salient features of various type combustion chambers, valve timing and firing order.

UNIT – III

Combustion in C.I. Engines: Times base indicator diagrams and their study, various stages of combustion, delay period, diesel knock, octane number, knock inhibitors, salient features of various types of combustion chambers, fuel, ignition, cooling, exhaust and lubrication systems; Simple problems on fuel injection, various types of engines, their classification and salient features. Rotary I. C. engines, their principles of working.

UNIT – IV

I.C. Engine System: Fuels, ignition systems, cooling, exhaust/scavenging and lubrication system. Fuel metering in SI engine: Fuel injection in SI engine (MPFI & TDI), Theory of carburetion, simple problems on carburetion. Fuel metering in CI engines: Fuel injection in CI engine and simple problems, various types of engines, their classification and salient features.

Fuels: Conventional fuels and alternate fuels, engine exhaust emission, carbon monoxide, un-burnt hydro carbon, oxides of nitrogen, smoke, density, measurement and control, hydrogen as alternate fuel.

UNIT – V

Supercharging: Effect of attitude on mixture strength and output of S.I. engines, low and high pressure super charging, exhaust, gas turbo-charging, supercharging of two stroke engines.

References Books:

1. A course in IC engines by M.L. Mathur & R.P. Sharma
2. Internal Combusion Engines by V. Ganeshan
3. Internal Combusion Engines Theory & Practice by G.F. Taylor
4. Introduction to IC Engines by Richard Stone
5. Internal Combustion Engines by Domkundwar, Dhanpat Rai Publications

Samrat Ashok Technological Institute (Engg. College),Vidisha (M.P.)
Mechanical Engineering Department

V-SEM B.Tech. Mechanical	Subject Code	Subject Name / Title	Maximum Marks Allotted					Contract Hrs. per weeks			Total Credits
			Theory			Practical					
			End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work	L	T	P	
	ME-1853	Manufacturing Process - II	70	20	10	30	20	3	-	2	4

Course Outcomes: At the end of the course, the students will able to:

CO 1	Understand working of lathe, Shaper, Drilling, Milling, Broaching, Grinding, Mechatronics and CNC Machines
CO 2	Comprehend speed and feed mechanism of machine tools
CO 3	Perform operations on machine tools
CO 4	Indentify Sensors, Transducers to monitor and control the bahivour of a process

Mapping of course outcomes with program outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3											2
CO 2	2	1				1	2		2		2	2
CO 3						2	3					3
CO 4	2											
ME1853	2.33	1				1.5	2.5		2		2	2.33

UNIT – I

Lathe: Classification of machine tools and their basic components; lathe- specification, components & accessories, various operations on lathes, capstan & turret lathes, tool layout, methods of thread production, machining time, single point cutting tools, tool signature and nomenclature

UNIT – II

Grinding: Types of grinding machines, surface, cylindrical, centreless grinding, grinding wheels, specifications, loading, glazing, trueing, dressing of grinding wheels.

Drilling: Introduction, types of drilling machines, machine size, operations, Tool and working holding devices, machining time, classification drill tools nomenclature, reaming.

UNIT – III

Milling: Vertical, horizontal and universal type machines, size and specifications, universal dividing head, indexing, milling operations, gear cutting, milling cutters.

Broaching: broaching principle, broaches and broaching machines, applications.

UNIT – IV

Shapers: Classification and specifications, principle parts, quick return mechanisms, shaper operations, machining time.

Gear Cutting: Die casting, methods of forming gears, generating process, Gear shaping, gear shaving, gear grinding, gear testing.

UNIT – V

Surface finishing operations: Lapping, honing, superfinishing, polishing, buffing, burnishing.
Numerical control of machine tools: NC machine tool system, principle axes of control, tool positioning systems, motion control systems, classification of NC system, type of numerical controls, part programming.

References Books:

1. Rao PN; Manufacturing Technology vol I and II; TMH
2. Hazra Chadhary; Workshop Tech.II; Media Promoter and Pub
3. Lindberg RA; Processes and Materials of Manufacturing; PHI.
4. Raghuvanshi;BS; Work shop technology Vol-I, II; Dhanpat Rai Delhi
5. KC Jain & Sanjay Jain; Principles of Automation and Advanced manufacturing systems: Khanna Publisher, New Delhi
6. HMT; Production Processes; TMH

Samrat Ashok Technological Institute (Engg. College),Vidisha (M.P.)
Mechanical Engineering Department

V-SEM B.Tech. Mechanical	Subject Code	Subject Name / Title	Maximum Marks Allotted					Contract Hrs. per weeks			Total Credits
			Theory			Practical					
			End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work	L	T	P	
	ME-1854	Theory of Machines-II	70	20	10	-	-	3	1	-	4

Course Outcomes: At the end of the course, the students will able to:

CO 1	Understand turning moment diagrams of different engines and fluctuation of speed
CO 2	Learn functions of various Governors and analysis various forces associated in Governors
CO 3	Understand balancing concepts of Balancing and analyze inertia forces in IC engines
CO 4	Learn concepts of frictional torque and analyze functioning of Clutches, Bearing
CO 5	Understand Mechanism of belt drive and analysis of forces and torque associated with belt drive, Breaks and dynamometer

Mapping of course outcomes with program outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	3								
CO 2	3	3	2	2								
CO 3	3	3	2	3								
CO 4	3	3	2	2								
CO 5	3	3	2	2								
ME1854	3	3	2.2	2.4								

UNIT – I

Turning Moment and Flywheel: Turning Moment Diagram for a Four Stroke Cycle I.C. Engine and Multi Cylinder Engine, Fluctuation of Energy and Production of Energy and Co-Efficient of Fluctuation of Energy, Co-Efficient of Fluctuation of Speed, Energy Stored in a Flywheel,

UNIT – II

Balancing of Inertia Forces and Moments in Machines: Balancing of rotating masses, two plane balancing, determination of balancing masses (graphical and analytical methods), balancing of rotors, balancing of internal combustion engines (single cylinder engines, in-line engines, V-twin engines, radial engines, Lanchester technique of engine balancing, Alignment of shaft.

UNIT – III

Governors: Functions Various Terms Used, Types of Governor- Watt, Porter, Proell & Hartnell, Inertia Governor, Sensitiveness and Stability of Governor; Isochronous Governor, Hunting, Effort and Power of a Porter Governor, Controlling Force Diagrams For Porter and Spring Controlled Governor, Coefficient of Insensitiveness..

UNIT – IV

Single Degree Free Vibration: Basic features of vibratory systems, Degrees of freedom ,single degree of freedom, Free vibration, Equations of motion, Natural frequency, Types of Damping, Damped vibration, Torsional vibration of shaft, Critical speeds of shafts, Torsional vibration, Two and three rotor torsional systems.

UNIT – V

Forced Vibration: Response of one degree freedom systems to periodic forcing, Harmonic disturbances, Disturbance caused by unbalance, Support motion, transmissibility, Vibration isolation vibration measurement.

References:

1 Ambekar, AG; Mechanism and Machine Theory; PHI
2 Rattan SS; Theory of machines; TMH
3 Sharma and Purohit; Design of Machine elements; PHI
4 Bevan; Theory of Machines;
5 Ghosh and Mallik; Theory of Mechanisms and Machines; Affiliated East-West Press, Delhi
6 Norton RL; kinematics and dynamics of machinery; TMH
7 Grover; Mechanical Vibrations
8 Balaney; Theory of Machines by
9 Theory of Vibrations by Thomson

Samrat Ashok Technological Institute (Engg. College),Vidisha (M.P.)
Mechanical Engineering Department

V-SEM B.Tech. Mechanical	Subject Code	Subject Name / Title	Maximum Marks Allotted					Contract Hrs. per weeks			Total Credits
			Theory			Practical					
			End Sem	Mid Sem MST	Quiz Assignment	End Sem	Lab Work	L	T	P	
	ME-1855 (OE-I)	Operations Research	70	20	10	-	-	3	-	-	3

Course Outcomes: At the end of the course, the students will able to:

CO 1	Understand the concept of Operations Research and its modeling approach
CO 2	Formulate and solve the allocation LPP by different methods
CO 3	Formulate and solve the managerial situations as transformation, assignment, game theory and queuing theory
CO 4	Formulate and solve the Project management problem by network techniques
CO 5	Solve the inventory problem

Mapping of course outcomes with program outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3											
CO 2	3	2	2		2		2					
CO 3	3	2	1		2		2					
CO 4	3	2	1		2		2					
CO 5	3	1	1		2		2					
ME1765	3	1.75	1.25		2		2					

UNIT-I

Introduction: Definition and scope of operations research (OR), OR model, solving the OR model, art of modeling, phases of OR study.

Linear Programming: Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.

UNIT-II

Transportation Problems: Types of transportation problems, mathematical models, transportation algorithms, methods for IBFS, Stepping Stone and MODI method.

Assignment: Assignment Problem formulation, unbalanced assignment problem, Hungarian method, processing of job through machines.

UNIT-III

Network Techniques: Role of network Techniques in project Management, Basic Tools and Techniques of Project management, PERT-background and development, networking, estimating activity time, Determination of Earliest Expected and Latest allowable times, Determination of Critical Path, Applications of PERT, Critical Path Method (CPM), Numbering the events, Crashing, Resource allocation and smoothening.

UNIT-IV

Theory of Games : Rectangular games, Minimax theorem, graphical solution of 2 x *n* or *m* x 2 games, game with mixed strategies, reduction to linear programming model.

Queing theory: Elements of Queuing model, generalized Poisson queuing model, single server models and double server model.

UNIT-V

Inventory Control: Models of inventory, operation of inventory system, quantity discount.
Replacement: Replacement models: Equipments that deteriorate with time, equipments that fail with time.

Text / Reference Books:

1. Wayne L. Winston, "Operations Research" Thomson Learning, 2003.
2. Hamdy A. Taha, "Operations Research - An Introduction" Pearson Education, 2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4.Hira and Gupta "Introduction to Operations Research", S. Chand and Co. 2002
5.Hira and Gupta "Problems in Operations Research", S. Chand and Co, 2002.
6. Wagner, "Operations Research", Prentice Hall Of India, 2000.

Samrat Ashok Technological Institute (Engg. College),Vidisha (M.P.)
Mechanical Engineering Department

V-SEM B.Tech. Mechanical	Subject Code	Subject Name / Title	Maximum Marks Allotted					Contract Hrs. per weeks			Total Credits
			Theory			Practical					
			End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work	L	T	P	
	ME-1856	Heat & Mass Transfer Lab.	-	-	-	30	20	-	-	2	1

List of Experiments

1. Determination Thermal Conductivity (k) of Metallic Solid
2. Forced Convection Heat Transfer (h) analyses
3. Plot the Temperature Distribution (Radial) in Lagged pipe and determination Thermal Conductivity (k) of pipe insulation.
4. Analysis of Parallel flow and counter flow heat exchanger, effectiveness and heat transfer rat (Parallel and counter flow heat exchanger Apparatus)
5. Study of 'Twin Slab' guarded hot plate Apparatus
6. Determine Emissivity of test plate (Emissivity Apparatus)
7. Determination Thermal Conductivity (k) using Spherical Apparatus
8. Study of Composite Slab Apparatus
9. Analysis of Dropwise & Filmwise Condensation (Dropwise & Filmwise Apparatus)
10. Analysis of Critical Heat Flux (Heat Flux Apparatus)