SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA, M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)

Mechanical Engineering Department

Semester/Year		V/III	Program		B.Tech.
Subject Category	**DE-I**	Subject Code:	**MEE-354(A)**	Subject Name:	**Internal Combustion Engine**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:(Only for open electives)

Course Objective:

This course is designed to provide a basic, fundamental understanding of internal combustion engines. This course covers many topics, including introducing IC engines and the various combustion processes in spark-ignition (SI) and compression-ignition (CI) engines. It also covers normal combustion, abnormal combustion, and using the heat balance sheet to judge the performance of an IC engine.

Course Outcomes:

After completion of the course, students would be able to -

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2	2	2	3			1		2
CO2	3	1	2	1		1	2					1
CO3	2	3	3	2	2	3	1					
CO4	1	2	2	2	1	2	1					2
CO5	2	2	2	1	2	1	1		2			2

Contents:			
UNITs	Descriptions	Hrs.	CO's
I	**Internal Combustion Engine:** S.I. and C.I. engines of two and four-stroke cycles, real cycle analysis ofS.I. and C.I. engines, determination of engine dimensions, speed, fuel consumption, output, meaneffective pressure, efficiency, factors affecting volumetric efficiency, heat balance, performancecharacteristics of S.I. and C.I. engines, cylinder arrangement, firing ordcylinder engines, valve timing.	8	1
II	**Combustion in S.I. engines:**Flame development and propagation, ignition lag, effect of air density,temperature, engine speed, turbulence and ignition timings, physical and chemicaldetonation, 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 ofvarious type combustion chambers, valve timing and firing order.	8	2
III	**Combustion in C.I. Engines:** Times base indicator diagrams and their study, various stages ofcombustion, delay period, diesel knock, octane number, knock inhibitors, salient features of varioustypes of combustion chambers,fuel, ignition, cooling, exhaust and lubrication systems; Simpleproblems on fuel injection, various types of engines, their classification and salient features. Rotary I.C. engines, their principles of working.	8	3
IV	**I.C. Engine System:** Fuels, ignition systems, cooling, exhaust/scavenging and lubrication system.Fuel metering in S.I. engine: Fuel injection in S.I. engine (M.P.F.I.& T.D.I.), Theory of carburetion, simpleproblems on carburetion. Fuel metering in CI engines: Fuel injection in CI engines and simpleproblems, various types of engines, their classification and salient features. **Fuels:** Conventional fuels and alternate fuels, engine exhaust emission, carbon monoxide, un-burnthydrocarbon, oxides of nitrogen, smoke, density, measurement and control, hydrogen as an alternatefuel.	8	4
V	**Supercharging:** Effect of attitude on mixture strength and output of S.I. engines, low and high-pressure supercharging, exhaust, gas turbo-charging, supercharging of two-stroke engines.	8	5
Guest Lectures (if any)			

Total Hours	40	

Suggestive list of experiments:

1. Load test in Ruston engine.
2. Measurement of Indicative power and brake power and calculation of mechanical efficiency by conducting Morse test.
3. Load test in Variable compression ratio engine (VCR Engine).
4. Performance and analysis of four-stroke single-cylinder diesel engine test rig with electric dynamometer.
5. Performance and analysis of four-stroke four-cylinder petrol engine test rig with hydraulic dynamometer.
6. Study of carburestter.
7. Study of fuel pump and fuel injector.
8. Study of the lubrication system.
9. Study of the cooling system.
10. Study of the battery ignition system.

Text Books-

1. Internal Combustion Engines by V. Ganeshan
2. Internal Combustion Engines by R.K. Rajput

Reference Books-

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

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 30 sessional marks and 60 semester End-term Marks. The practical marks are 40, out of which 30 marks will be awarded for viva voce and 10 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid-semester, 20 marks to be awarded for day-to-day performance and Quizzes/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by the Board of Studies on	Date:
Approval by the Academic Council on	Date:
Compiled and designed by	Name 1. Dr.Gopal Kumar Deshmukh
Checked and approved by	Name 1. **Dr. Sanjay Katarey**

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
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Mechanical Engineering Department

Semester/Year		V/III	Program		B.Tech.
Subject Category	**DE-II**	Subject Code:	MEE-**354(B)**	Subject Name:	Turbo machinery

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:(Only for open electives)

Course Objective:

This course provides a simple understanding of the basic components of steam turbines and hydraulic turbines. The course contains Energy transfer in turbo machines, Steam turbines, water turbine, Centrifugal Pumps, Rotary Fans, Blowers and Compressors and Power Transmitting turbo machines.

Course Outcomes:

After completion of the course, students would be able to -

1. Understand the principles and application of Turbo Machines
2. Analysis of turbo Machines
3. Understand various types of turbo turbines and its applications
4. Understand Rotary fans, Blowers, Compressors
5. Understand principles and applications of Power transmitting turbo machines

	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	3	3	3	3						3
CO2	3	3		2	3	2						3
CO3	2	2	3			2						
CO4	3		2									3
CO5	2		3									2

Contents:			
UNITs	Descriptions	Hrs.	CO's
I	**Energy transfer in turbo machines:** application of first and second laws of thermodynamics to turbo machines, moment of momentum equation and Euler turbine equation, principles of impulse and reaction machines, degree of reaction, energy equation for relative velocities, one dimensional analysis only.	6	1
II	**Steam turbines:** impulse staging, velocity and pressure compounding, utilization factor, analysis for optimum U.F Curtis stage, and Rateau stage, include qualitative analysis, effect of blade and nozzle losses on vane efficiency, stage efficiency, analysis for optimum efficiency, mass flow and blade height. **Reactions staging:** Parson's stages, degree of reaction, nozzle efficiency, velocity coefficient, stator efficiency, carry over efficiency, stage efficiency, vane efficiency, conditions for optimum efficiency, speed ratio, axial thrust, reheat factor in turbines, problem of radial equilibrium, free and forced vortex types of flow, flow with constant reaction, governing and performance characteristics of steam turbines.	9	2
III	**Water turbines:** Classification, Pelton, Francis and Kaplan turbines, vector diagrams and work-done, draft tubes, governing of water turbines. **Centrifugal Pumps:** classification, advantage over reciprocating type, definition of mano-metric head, gross head, static head, vector diagram and work done. **Performance and characteristics:** Application of dimensional analysis and similarity to water turbines and centrifugal pumps, unit and specific quantities, selection of machines, Hydraulic, volumetric, mechanical and overall efficiencies, Main and operating characteristics of the machines, cavitations.	9	3
IV	**Rotary Fans, Blowers and Compressors:** Classification based on pressure rise, centrifugal and axial flow machines. Centrifugal Blowers Vane shape, velocity triangle, degree of reactions, slip coefficient, size and speed of machine, vane shape and stresses,	8	4

	efficiency, characteristics, fan laws and characteristics. Centrifugal Compressor – Vector diagrams, work done, temp and pressure ratio, slip factor, work input factor, pressure coefficient, Dimensions of inlet eye, impeller and diffuser. Axial flow Compressors- Vector diagrams, work done factor, temp and pressure ratio, degree of reaction, Dimensional Analysis, Characteristics, surging, Polytrophic and isentropic efficiencies.		
V	**Power Transmitting turbo machines:** Application and general theory, their torque ratio, speed ratio, slip and efficiency, velocity diagrams, fluid coupling and Torque converter, characteristics, Positive displacement machines and turbo machines, their distinction. Positive displacement pumps with fixed and variable displacements, Hydrostatic systems hydraulic intensifier, accumulator, press and crane.	8	5
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

1. Study of Steam Power Plant Model (Steam Engine with Boiler) working
2. Study of Impulse Turbine.
3. Study of Pure Reaction Turbine.
4. Performance of Pelton wheel turbine.
5. Performance of Francis turbine.
6. Performance of Kaplan turbine.
7. Study of Draft tubes.
8. Determination of Blower efficiency using Backward and Forward blades.
9. Study of Torque Converter.
10. Study of Hydraulic lift and Press.

Text Books-

1. Kadambi V Manohar Prasad; An introduction to EC Vol. III-Turbo machinery; Wiley Eastern Delhi.
2. Turbo Machines by A ValanArasu

Reference Books-

1. Venkanna BK; Turbomachinery; PHI
2. Shepherd DG; Turbo machinery
3. Csanady; Turbo machines
4. Bansal R. K; Fluid Mechanics & Fluid Machines;

5. Rogers Cohen &SarvanMulto Gas Turbine Theory
6. Kearton W. J; Steam Turbine: Theory & Practice

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. The practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Name 1. Dr.Kamlesh Kumar Sharma
Checked and approved by	Name 1. **Dr. Sanjay Katarey**

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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Mechanical Engineering Department

Semester/Year		V/III	Program		B.Tech.
Subject Category	**DE-III**	Subject Code:	**MEE-354(C)**	Subject Name:	**Gas Dynamics**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:(Only for open electives)

Course Objective:

This course provides the fundamentals of compressible fluid flow, emphasising a wide variety of steady, one-dimensional flow problems and a general understanding of the principles of multi-dimensional flow.

Course Outcomes:

After completion of the course, students would be able to -

1. Solve flow equations for quasi-one-dimensional flow through variable area ducts.
2. Analyze the flow through constant area ducts with friction and heat transfer.
3. Analyze flows with normal and oblique shocks.
4. Solve flow problems with supersonic velocities using shock-expansion theory.
5. Design experimental setup.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2				2	2					1
CO2	3	3	3	1	2	2	2					1
CO3	3	3	3	3	3	3	3					1
CO4	3	3	2	3	3	3	1					1
CO5	3	3	3	2	3	3	3	2	3	3	3	1

Contents:			
UNITs	Descriptions	Hrs.	CO's
I	**Introduction:** Review of basic fluid dynamics, thermodynamic principles, and conservation equations for inviscid flows.	8	1
II	**Dimensional Flow:** One-dimensional wave motion, normal shock waves, Oblique shockwaves, Prandtl-Meyer expansions and applications, Generalized one.	8	2
III	**Nozzle Flow:** Isentropic Flow with area change, flow with friction (Fannoaddition (Rayleigh flow), Method of characteristics (application to one isentropic flow).	8	3
IV	**Supersonic Flow:** Velocity Potential Equation, Numerical Techniques for Steady SupersonicFlow, Time Marching Technique for Supersonic Blunt Bodies and Nozzles.	8	4
V	**Experimental setups:** Shock Tubes, Compressible flow facilities, Measurement Techniques,Experiment Design.	8	5
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

Text Books-

3. Balachandran P; Gas Dynamics for Engineers; PHI Learning
4. R. Yadav, Steam and Gas Turbines

Reference Books-

3. Mahesh M Rathore, Thermal Engineering, TMH
4. Anderson, J.D Jr., Modern Compressible Flows, Tata McGraw Hill, 2012.
5. Yahya, S.M., Fundamentals of Compressible Flow, New Age International Pub.,2013.
6. Zucrow, M., Gas Dynamics, Wiley India, 2013

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 30 sessional marks and 60 semester End-term Marks.

Recommendation by the Board of Studies on	Date:
Approval by the Academic Council on	Date:
Compiled and designed by	Name 1. Dr. Gopal Kumar Deshmukh

Annexure 5

Checked and approved by	Name 1. **Dr. Sanjay Katarey**

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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Mechanical Engineering Department

Semester/Year		VI/III	Program		B.Tech.
Subject Category	**DE-I**	Subject Code:	**MEE-363(A)**	Subject Name:	**Mechatronics and Automation**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites☹Only for open electives)

Course Objective:

Study of Mechatronics and Automation is driven by several fundamental objectives, reflecting the multidisciplinary nature of these fields and their impact on various industries. Studying echatronics and automation equips individuals with the knowledge and skills needed to design intelligent, integrated systems, automate processes for efficiency and cost-effectiveness, and contribute to advancements in technology and innovation.
The combination of these fields is particularly powerful in addressing the challenges of modern engineering and manufacturing

Course Outcomes:

After completion of the course, students would be able to –

1. Understand the Control System.
2. Analyze the Sensors and Transducers
3. Analyzethe Hydraulic and Pneumatics system and Circuits
4. Understand the Robotics ,Actuators and programmable Logic Controllers.
5. Analyze the Automation and industry 4.0.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO 1	3	2		3	3							
CO2	3			3								
CO3	3		3									

CO4	3				3							
CO5	3		3	2	3							

Contents:			
UNITs	Descriptions	Hrs.	CO's
I	**Mechatronics** Systems: elements of echatronics systems, measurements systems , control systems, transfer functions, procedure for determining the transfer functions of a control systems, representation of a control system by block diagrams, modeling a control system, transient and steady state response, time response of a first order control systems, time response of second order control systems	8	1
II	**Sensors and Transducers**, characteristics parameters used in transducers, displacement sensor, position sensors, proximity sensor, motion sensors, light sensors, liquid flow sensor , digital transducers, Incremental optical encoders, absolute optical encoders.	8	2
III	**Hydraulic and Pneumatic** Actuating systems, Hydraulic systems, Pneumatic systems, control valves, components of electro pneumatic systems, Pneumatic and Hydraulic circuits.	8	3
IV	**Robotics and Programmable Logic Controllers :Degree of freedom of robotic system,robotjoints,robotcoordinates,robot characteristics, robot languages , classification of robots,application of robots, robot vision.** **Mechanical and electrical actuating systems**, D.C. motors, A.C. motors, stepper motors, servomotor, programmable logic controllers, PLC programming, applications of PLC.	12	4
V	**Automation:** introduction, Principles and Strategies of Automation, safety Monitoring, maintenance and repair Diagnostics, error Detection and Recovery, levels of automations, Merits and Demerits of automation. Automated Guided Vehicles (AGV's) , Automated Storage and Retrieval System (ASRS), **Automatic identification methods and Industry 4.0**: Overview of Automatic Identification Methods, Bar Code Technology, Radio Frequency Identification, Other AIDC Technologies. Industry 4.0 strategy.	14	5
Guest Lectures (if any)		**Yes-2**	
Total Hours		50	

Annexure 5

Suggestive list of experiments:

1.Obtain the speed torque characteristics of AC Servo Motors.

2.Obtain the speed torque characteristics of DC Servo Motors.

3.Calibration of LVDT KIT

4.Determination of force using strain gauge Kit.

5.Determination of Angle using Capacitive Pickup.

6.Determination of Pressure using Strain Gauge.

7.Measurement of Temperature using Thermocouples.

8.Study of ASRS.

9.Study of Hydraulic and Pneumatic Actuator systems.

10.Study of PLC.

Text Books-

1. Mechtronics, K P Ramchandran , Wiley India Pvt. Ltd.
2. Robotics : Introduction to Robotics by Saeed B Niku, Pearson Education Asia

Reference Books-

1. Mechatronics, W. Boltan, Pearson Education.

2. Mechatronics, N P Mahalik,Tata McGraw-Hill Publishing Limited

3. Modern Control Systems, Katsuhiko Ogata, Prentice Hall

4.Hydraulics and Pneumatics: A Technician's and Engineer's Guide" by Andrew Parr

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. The practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Annexure 5

Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Name 1.Dr.Ravindra Mohan Saxena
Checked and approved by	Name 1**Dr. Pankaj Agarwal**

Annexure 5

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
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Mechanical Engineering Department

Semester/Year		VI/III	Program		B.Tech.
Subject Category	**DE-II**	Subject Code:	**ME-363 (B)**	Subject Name:	**Computer Integrated Manufacturing**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites☹Only for open electives)

Course Objective:

This course provides a simple understanding of the basic components of Computer Inegrated Manufacturing The course contains CIM, automation,control Strategies for automation, CAM, NC/DNC/CNC systems,Robot Technology, AS/RS, AGV systems, Group technology,FMS and Expert system.

Course Outcomes:

After completion of the course, students would be able to –

1. A knowledge of automated process in a modern manufacturing environment.
2. An understanding of using automation, control strategies towards numerical control, robotics,automated storage and retrieval system, CIM, expert systems in manufacturing.
3. An understanding of anufacturin manufacturing/ production strategies such as group technology ,agilemanufaturing, FMS
4. Design and analysis of part program of cnc ,PLC, AS/RS, FMS, Robot programming

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2			2	1	2	1	3		3	3
CO2	3	2	1	1	3		2		3		3	2
CO3	3	2	1	1	3	1	3		3		3	1
CO4	2	3	3	3				1	3			1

Annexure 5

Contents:			
UNITs	Descriptions	Hrs.	CO's
I	Introduction- Introduction, Modern manufacturing,Integration and rationalization, Elements of CIM system, CIM hardware and software, Implementating CIM, Advantages and limitations	6	1
II	Automation and Production Systems- History of automation, Building block of automation technology, Types of automation systems, Automation production economics, Viability appraisal for automated production Control Strategies for Automation System- Control process, Electrical and Mechanical Analogies, Laplace Transform, Transfer Function, Linear and Non-linear systems, Adaptive Control, Logical Sequence Control, PLCs and Networking for Automation	10	2
III	Computer Aided Manufacturing- Introduction, CAM hierarchy, Elements of CAM systems, CNC machine types, Classification, File Formats, Controllers, Hierarchical controls, Tooling on CNC, Fixtures on CNC, Rationale for CAD/CAM, NC, DNC, CNC and Adaptive control, Methods of Part-programming, CAM softwares	8	3
IV	.Robot, Automated Material Handling and Storage system- Robot anatomy, Robot Congiguration, Robot control systems, Accuracy, Repeatability, End effectors, Robot programming, Robot languages, Robot applications, Automated material handling and storage system, Design of system, Automated guided vehicle systems, Automated retrieval systems.	8	4
V	Group Technology(GT),Computerized Manufacturing Planning System- Introduction, Part families, Part anufacturing and coding, Production flow analysis, Machine cell design, Celluar manufacturing systems, Agile anufacturing, Flexible manufacturing systems(FMS), Types of flexibility and uncertainty. Expert Systems- Introduction to expert systems, Need and classification,Artifial Intelligence	8	5
Guest Lectures (if any)			
Total Hours		40	

Annexure 5

Suggestive list of experiments:

1. Study of equipment available in CIM lab.
2. Study of Process Planning and Part Programming.
3. Study of Preparatory Functions (G- Codes)
4. Study of Miscellaneous Functions (M- Codes)
5. Preparation of a part program for given parts on CNC Lathe machine.
6. Preparation of a part program for given part on CNC Milling machine.
7. Study and part program preparation of AS/RS.
8. Study and Location setting of AGV.
9. Study and Location setting of Robotic Arm.
10. Study of working of the FMS by using CNC Lathe, CNC Milling, Transfer Conveyor, Robotic Arm,AS/RS, and AGV.

Text Books:

1. Production System & CIM by Groover: PHI
2. Automation Production Systems and Cmputer Integrated Manufacturing by Mikell P Groover: PHI
3. Principle of Automation and Advanced Manufacturing Systems By Dr K C Jain and Sanjay Jain
4. Robotics- Control, Sensing, Vision and Intelligence by K S Fu, RC Gonzalez and C S E Lee: Tata McGraw Hills
5. CAD/CAM: Principles and Applications by P N Rao: Tata McGraw Hills
6. CIM: Principle of Computer Integrated Manufacuring by J B Waldner: John Wiley & Sons

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. The practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Name 1.Prof Sanjay Jain and Prof Neeraj Sen
	Name 1.**Dr Sanjay Katarey**

Annexure 5

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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Mechanical Engineering Department

Semester/Year		VI/III	Program		B.Tech.
Subject Category	**DE-III**	Subject Code:	**MEC-363(C)**	Subject Name:	**MODERN MANUFACTURING TECHNOLOGY(AI,IOT,DIGITAL MANUFACTURING)**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:(Only for open electives)

Course Objective:

The students are expected to understand special machining process, micromachining process etc, also students to know the fundamental of manufacturing and Industry 4.0,gain the knowledge of machine learning and data analytics. Students also understand the basics of AI in area of Manufacturing science.

Course Outcomes:

After completion of the course, students would be able to -

1. To produce useful research output in machining of various material.
2. Application of knowledge to manage shop floor problem.
3. Emerging technologies to address IoT challenges.
4. Apply the smart factory concept in manufacturing industry.
5. Understand and apply the AI tool in manufacturing.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2		1			2	1					1
CO2	2			2			2		2			1
CO3	1	2	1	2		1						
CO4	2		2		2			2				3
CO5	2		1		1	2		1				3

Contents:

Annexure 5

UNITs	Descriptions	Hrs.	CO's
I	**MICRO MACHING AND NANO FABRICATION** Theory of micromachining-Chip formation-size effect in micromachining-microturning, micromilling, microdrilling- Micromachining tool design-Micro EDM-Microwire EDM-Nano fabrication:LIGA, Ionbeametching,Molecularmanufacturingtechniques–Atomicmachining-Nanomachiningtechniques– Top/Bottom up Nano fabrication techniques - Sub micron lithographic technique, conventional film growth technique, Chemical etching, Quantum dot fabrication techniques – MOCVD – Epitaxy techniques.	5	1
II	**RAPID PROTO TYPING AND SURFACE MODIFICATION TECHNIQUES** Introduction – Classification – Principle advantages limitations and applications- Stereo lithography – Selective laser sintering –FDM, SGC, LOM, 3D Printing-Surface modification Techniques: Sputtering- CVD-PVD-Diamond like carbon coating-Plasma Spraying Technique.-Diffusion coatings-Pulsed layer deposition.	5	2
III	**INTERNET OF THINGS FOR MANUFACTURING** Technology of the IoT and applications,.IoT data management requirements, Architecture of IoT, Issues in implementing IoT, Technological challenges, Design challenges in IoT -Standardization, Security and privacy, Infrastructure, Analytics, Design principles for connected devices -Embedded devices, physical design, online components, embedded coding system. Informed Manufacturing plant – Elements, IoT implementation in Transportation and logistics, Energy and utilities, Automotive Connected supply chain, Plant floor control automation, remote monitoring, Management of critical assets, Applications HCI and IoT world -Multilingual interactions Robotics and Autonomous Vehicles Sensing and data processing-Simultaneous mapping and localization-Levels of autonomy, Smart factories, Future research challenges	12	3
IV	**SMART MANUFACTURING** Industry 4.0:Basic principals and technologies of smartfactory, Digitalization and Networked economy, Globalization and Emerging Issues, Artificial Intelligence nad Augmented reality in manufacturing ,human Robot collabratiion,standards of industry 4.0 and cloud application,cloud Manufacturing and the connected factory,dataanalytics,Introduction and Importance and charecterstics of Big data,Size of big data,Types of analytics ,model complexity,Over and	9	4

	Under fitting,Data management with Python Application in factory AND assembly line,food industry etc.		
V	**An Introduction to Implementing AI in Manufacturing** **Introduction, Potential of AI, challenges** , Evolution of Artificial Intelligence ,Opportunities for Artificial Intelligence in Manufacturing ,Hierarchical Approach to Manufacturing Systems, Artificial Intelligence for Manufacturing System Optimization Modeling and Performance Analysis, Artificial Intelligence for Manufacturing Applications of Human–Robot Collaboration ,Artificial Intelligence For Process Monitoring, Diagnostics, Prognostics, Practical Implementation of Artificial Intelligence in Manufacturing, Challenges and Opportunities for Future	9	5
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

Text Books-

1. SeropeKalpakjian., "Manufacturing Engineering and Technology" Pearson Education,2001
2. 2.Adrian McEwan and Hakim Cassimally, "Designing the internet of things", Wiley, 2013

Reference Books-

1. Bandyopadhyay. A.K., Nano Materials, New age international publishers, New Delhi, 2008, ISBN:8122422578.
2. Bharat Bhushan, Handbook of nanotechnology, springer, Germany, 2010.
3. Jain V.K., 'Introduction to Micro machining' Narosa Publishing House, 2011
4. Code Halos: How the Digital Lives of People, Things, and Organizations are Changing the Rules of Business, by Malcolm Frank, Paul Roehrig and Ben Pring, published by John Wiley & Sons.
5. Internet of Things: A Hands-On Approach by Vijay Madisetti, ArshdeepBahga, VPT; 1st edition 2014

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. The practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester

– End examination as per the norms of AICTE.	
Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Name 1.Neeraj Sen
Checked and approved by	Name 1.**Dr Sanjay Katarey**

Annexure 5

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
Mechanical Engineering Department

Semester/Year		VI/III	Program		B.Tech.
Subject Category	**DE –I**	Subject Code:	**MEE 364(A)**	Subject Name:	**Dynamics of Machine**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10				100	3	1		4

Prerequisites:(Only for open electives)

Course Objective:

Course Outcomes:

After completion of the course, students would be able to -

1. Understand turning moment diagrams of different engines and fluctuation of speed
2. Understand balancing concepts of Balancing and analyze inertia forces in IC engines
3. Learn functions of various Governors and analysis various forces associated in Governors
4. Learn concepts of frictional torque and analyze functioning of Clutches, Bearing
5. Understand concepts of vibrations

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	2								
CO2	3	3	2	2								
CO3	3	3	2	2								
CO4	3	3	2	2								
CO5	3	3	2	2								

Contents:

UNITs	Descriptions	Hrs.	CO's

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	8	1
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..	8	2
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	8	3
IV	**Brakes & Clutches**: Materials for friction surface, uniform pressure and uniform wear theories, Design of friction clutches: Disk, plate clutches, cone & centrifugal clutches. Design of brakes: Rope, band & block brake, Internal expanding brakes, Disk brakes	8	4
V	**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 **Forced Vibration**: Response of one degree freedom systems to periodic forcing, Harmonic disturbances, Disturbance caused by unbalance, Support motion, transmissibility, Vibration isolation vibration measurement	8	5
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:
Text Books- 1. Rattan SS; Theory of machines; TMH 2. Ambekar, AG; Mechanism and Machine Theory; PHI 3. Sharma and Purohit; Design of Machine elements; PHI 4. Ghosh and Mallik; Theory of Mechanisms and Machines; Affiliated East-West Press, Delhi 5. Grover; Mechanical Vibrations 6. Theory of Vibrations by Thomson Shingley J.E; Machine Design; TMH
Reference Books- 1. Bevan; Theory of Machines 2. Norton RL; kinematics and dynamics of machinery; TMH 3. Balaney; Theory of Machines
Modes of Evaluation and Rubric
There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. The practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Name 1.Dr. Chandra Pal Singh
Checked and approved by	Name 1.**Prof. Sandeep Jain**

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
Mechanical Engineering Department

Semester/Year		VI/III	Program		B.Tech.
Subject Category	**DE-II**	Subject Code:	**MEE364(B)**	Subject Name:	**Industrial Engineering and Management**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10				100	3	1		4

Prerequisites:(Only for open electives)

Course Objective:

Course Outcomes:

After completion of the course, students would be able to -

1. Able to perform Method Study and Time Study in a real time application using Modern Tools
2. Able to analyze Ergonomics and human factor demands of Industrial Environment
3. Able to prepare Planning related to Manufacturing
4. Able to suggest Jigs and fixtures as per job requirement
5. Able to analyze production process performance

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3			3	2				2	3	1	
CO2	3	2	2	2		3	1	1	1		2	
CO3	3	1	2						2	2	1	
CO4	3											
CO5	3	2		3	1				2	2	3	2

Contents:

Annexure 5

UNITs	Descriptions	Hrs.	CO's
I	Productivity: Concept of production, types of production, concept of productivity, production Vs productivity, factors influencing productivity, Moslow's theory of hierarchy of needs, productivity Vs standard of living.	8	1
II	Method Study: Introduction to work study, definition of method study, basic steps of method study, process chart, recording techniques, diagrams and templates, Therblig, micro-motion study, SIMO chart, memo-motion study, principles of motion economy.	8	2
III	Time Study: Procedure of work measurement, apparatus required for time study, Rating, measuring the job, elements, allowances, standard time , synthetic data , analytical estimating, PMTS, work factor, MTM, activity sampling , applications, numerical problems.	8	3
IV	Human Factors Engineering: Introduction to ergonomics and human factors Engineering, physiological basis of human performance, Biomechanics, Psychology of work and work load perception, Physical work environment, Basis of ergonomic problem identification, Safety	8	4
V	Production Planning and control: Types of production function of production planning and control, organization of production planning and control, pre-planning operation, planning of productive capacity plant, requirements of special tooling like jigs and fixtures. Routing, loading, scheduling, dispatching and follow-up, production control in intermittent manufacture and continuous manufacturing, bar chart, operation chart, flow chart, Gantt chart, sequencing, numerical problems	8	5
Guest Lectures (if any)			
Total Hours		40	

Annexure 5

Suggestive list of experiments:

Text Books-

1. Benjamin .W. Neibel, Motion and Time Study, Richard D. Irwin Inc., Seventh Edition, 1982.
2. Barnes, R.M. Motion and Time study, John Wiley, 1980.
3. Stephen Konz, Work Design, Publishing Horizon Inc., Second Edition, 1979.
4. Industrial Engineering and Production Management by Jain, Verma&Kartikeya, Dreamtech Publication 2013.
5. Jain and Agrawal, Production Planning & Control and Industrial Management, Khanna publishers

Reference Books-

1. Buffa, sarin, Modern Production/Operations Management, 8/e, John Wiley & Sons
2. Bridger R.S., Introduction to Ergonomics, McGraw Hill, 1995
3. ILO, Work Study, ILO Publication.

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. The practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Name 1.Dr. Chandra Pal Singh
Checked and approved by	Name 1.**Prof. Sanjay Jain**

Annexure 5

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
Mechanical Engineering Department

Semester/Year		VI/III	Program		B.Tech.
Subject Category	**DE-III**	Subject Code:	**MEE364(C)**	Subject Name:	**Production Planning and Control**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10				100	3	1		4

Prerequisites:(Only for open electives)

Course Objective:

Course Outcomes:

After completion of the course, students would be able to -

1. Explain production systems and their characteristics.
2. Evaluate MRP and JIT systems against traditional inventory control systems.
3. Evaluate basics of variability and its role in the performance of a production system.
4. Analyze aggregate planning strategies.
5. Apply forecasting and scheduling techniques to production systems
6. Apply theory of constraints for effective management of production systems

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3			3	2				2	3	1	
CO2	3	2	2	2		3	1	1	1		2	
CO3	3	1	2						2	2	1	
CO4	3											
CO5	3	2		3	1				2	2	3	2
CO6	3	2		3	1				2	2	3	2

Contents:			
UNITs	Descriptions	Hrs.	CO's
I	Introduction to Production Systems: Production Systems: Classification & Characterization, Overview of Production Planning and Control issues, Review of EOQ & inventory control systems	8	1
II	Material Requirement Planning: Dependent Demand & Material Requirement Planning, Structure of MRP system, MRP Calculations, Planning Issues, Implementation Issues.	8	2
III	Just in Time Production Systems: Just-in-Time System: Evolution, Characteristics of JIT Systems, Continuous Improvement, Kanban System, Strategic Implications of JIT System. Push and pull production systems.	8	3
IV	Aggregate Planning: Aggregate Planning: Purpose & Methods, Reactive and Aggressive Alternatives, Planning Strategies, LP Formulation, Master Production Scheduling.Flow Shop, Job Shop Dispatching	8	4
V	Forecasting Methods: Demand Forecasting: Principles and Methods, Judgment methods, Causal methods, Time-series methods Theory of Constraints: Concept of bottleneck, Local and global optima, Five steps of TOC approach, Performance measures.	8	5
Guest Lectures (if any)			
Total Hours		40	
Suggestive list of experiments:			

Text Books-

1. Krajewski L.J. and Ritzmen L.P., "Operations Management: Strategy and Analysis", 9th Edition, Pearson Education, 2010.

2. Chase R.B. Jacobs F.R. and Aquilano N.J., "Operations Management for Competitive Advantage", 11th Edition, Tata McGraw Hill Book Company, New Delhi, 2010.

Reference Books-

1. Hopp W. J. and Spearman M. L. “Factory Physics: Foundations of Manufacturing Management”, McGraw Hill International Edition, 3rd Edition, 2008.
2. Mukhopadhyay S.K., “Production Planning and Control”, 2nd Edition, PHI, Eastern Economy Edition, 2013.

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. The practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Name 1.Dr. Chandra Pal Singh
Checked and approved by	Name 1.**Prof. Sanjay Jain**

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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Mechanical Engineering Department

Semester/Year		VI/III	Program		B.Tech.
Subject Category	**DE-IV**	Subject Code:	**MEE364 (D)**	Subject Name:	**Reliability Engineering and TPM**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10				100	3	1		4

Prerequisites:(Only for open electives)

Course Objective:

Course Outcomes:

After completion of the course, students would be able to -

1. learn basic Concepts of Reliability and reliability distribution
2. analyze various reliability models
3. apply reliability testing methods
4. learn reliability centred maintenance
5. analyze failure modes and effects

	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO1	3	1	1	1			1	1			1	1
CO2	1	2	3	3			1	1			2	
CO3	1	2	2	3			1	1			1	1
CO4	1	2	2	3			1	1			1	1
CO5	1	2	2	3			1	1			1	1

Annexure 5

Contents:			
UNITs	Descriptions	Hrs.	CO's
I	Basic Concepts of Reliability: Probability distributions used in maintenance engineering- Binomial, Poisson, Exponential, Normal, Log-normal, Gamma and Weibull distribution; failure rate, hazard rate, failure modes, MTTR, MTBF, MTTF	8	1
II	System Reliability Models: System reliability–n-component series systems, m-component parallel systems and combined system; standby systems; K-out-of-m systems; redundancy techniques in system design; event space, decomposition (Key Stone), cut and tie sets, Markov analysis, reliability and quality, unreliability, maintainability, availability	8	2
III	Reliability Testing: Introduction, testing requirements, testing methods: Marginal Testing, Non- destructive testing, reliability tester, acceleration models, SWOT analysis	8	3
IV	Total Productive Maintenance: Evolution of TPM, TPM objectives, concept, pillars of TPM, Terro technology, Six Big Losses autonomous Maintenance. Reliability centered maintenance: concept, methodology, benefits	8	4
V	Failure Modes and Effects Analysis (FMEA) Failure Modes and Effects Analysis (FMEA) Failure Modes, Effects and Criticality Analysis (FMECA):Overview, elements of FMECA applications and benefits, risk, evaluation, risk priority numbers, criticality analysis, process FMEA, qualitative and quantitative approach to FMECA; design FMEA and steps for carrying out design FMEA	8	5
Guest Lectures (if any)			
Total Hours		40	
Suggestive list of experiments:			

Text Books-

1. Ebeling CE; An Introduction To Reliability & Maintainability Engg; TMH
2. Srinath L.S; Reliability Engineering; East West Press.
3. Naikan; Reliability engg and life testing; PHI
4. Kapur KC and Lamberson LR; Reliability in Engineering Design; Wiley India
5. Telang AD and Telang A; Comprehensive Maintanance Management; PHI
6. Mishra R.C; Reliability and Maintenance Engineering; New age International publisher.
7. Dhillon; EnggMaitainability- How to design for Reliability and easy maintenance; PHI
8. Davidson John; The Reliability of mechanical system; Institution of Mech. Engineers, London

Reference Books-

1. Patrick D.T and O.'Connor; Practical Reliability Engineerin; John Wiley and Sons
2. Modarre M; Reliability and Risk Analysis, Marcel Dekker Inc CRC Press
3. Balaguruswamy; Reliability Engg; TMH

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. The practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Name 1.Dr. Chandra Pal Singh
Checked and approved by	Name 1.**Prof. Sanjay Jain**

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)

Mechanical Engineering Department

Semester/Year		VI/III	Program		B.Tech.
Subject Category	**OC**	Subject Code:	**OC-**	Subject Name:	**Introduction to Economy and Finance**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10				100	3	0		3

Prerequisites:(Only for open electives)

Course Objective:

This course provides a simple understanding of the basic components of steam power plant. The course contains steam generators, the analysis of vapour power cycle, Gas dynamics and flow through steam nozzles, Reciprocating air compressors, Steam turbines for power generation and condensers.

Course Outcomes:

After completion of the course, students would be able to -

1. Explain underlying concept of economy, finance and managerial economics.
2. Identify different finance markets and products, asset class, their value and associated risk therein.
3. Interpret different financial statements, ratios and assess financial health on the basis of financial statements.
4. Describe game theory rivalry competition and their applications in life
5. Evaluate/calculate value of different financial instruments at any given point of time (present/future value)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						1		1			2	2
CO2						1		1			3	1
CO3								1			3	1
CO4						1					3	1
CO5				2								2

Annexure 5

Contents:			
UNITs	Descriptions	Hrs.	CO's
I	Economics: Economics and Economy, types, Microeconomics and Macroeconomics, Sectors, purpose and challenges Market Economies, salient features of Indian economy Managerial economy- The Demand Curve, Factors that Affect Demand, The Supply Curve, Factors that affect Supply , law of demand and supply, elasticity.	8	1
II	Financial Market; Introduction, overview of financial system, institutional financing theory of interest rate, term structure of interest rate and yield curve. Important financial instruments and products, finance system functioning, key issue in financial function. Risk in financial market. Inflation-cause pros and cons,	8	2
III	Short term and Long term financial market: Money market and capital market, Important financial instruments like Call money, T-Bills, commercial papers, Bonds- government and corporate, Equity, private equity etc. Risk in financial market, introduction to Foreign exchange market, importance, participants functioning. Basic fundamentals of Derivative market-future, option and under laying.	8	3
IV	Financial Statements: Fundamental accounting terms and systems, financial statements- balance sheet income statement expense and profit cash flow statement, analysing statements and assessing financial health, Important ratios in financial statements, difference between a financial institutions and product company.	8	4
V	Rivalry Competition and Game theory: Competition, Oligopoly and monopoly. Buyers and sellers surplus, deadweight, Bertrand, Cournot and Stackelberg models. Game theory-prisoners dilemma, Nash equilibrium etc. Application of Game theory. Introduction to behavioral economics: biases and heuristic, emotions and decision making	8	5
Guest Lectures (if any)			
Total Hours		40	
Suggestive list of experiments:			
nil			
Text Books-			
Reference Boo Managerial Economics by Piyali Gosh Gitika & Purva Roy Choudhary McGraw Hills Financial Accounting by S N Maheshwari & Sunil K Maheshwary			

Managerial Economics by William F Samuelson –Wiley publication Indian Economy by Ramesh Singh –McGraw Hills Indian Financial System by Bharti Pathak-Pearson Financial Institutes and Market: Structure, Growth & Innovation by Bhole- McGraw Hills Taxmann's Balance Sheet Decoded by G C Pipara- Taxmann Publications Principles of Economics with course mate by N Gregory Mankiw-Cengage ks-
Modes of Evaluation and Rubric
There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. The practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Name 1. Dr Sanjay Katarey
Checked and approved by	Name 1