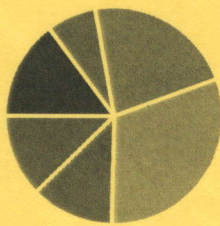


CO1	Describe and analyze different types of sources and mathematical expressions related to thermodynamics and various terms and factors involved with power plant operation.
CO2	Analyze the working and layout of steam power plants and the different systems comprising the plant and discuss about its economic and safety impacts
CO3	Combine concepts of previously learnt courses to define the working principle of diesel power plant, its layout, safety principles and compare it with plants of other types.
CO4	Describe the working principle and basic components of the nuclear power plant and the economic and safety principles involved with it.
CO5	Explain the applications of power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of electrical energy production.

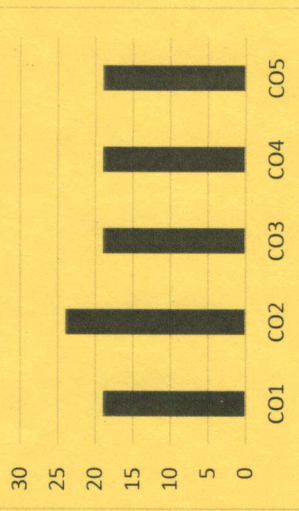
GRAPHICAL REPRESENTATION

Blooms Level Wise Marks Distribution



■ KL1 ■ KL2 ■ KL3 ■ KL4 ■ KL5 ■ KL6

Course Outcome Wise Marks Distribution



ARKA JAIN University
Jharkhand

NAAC GRADE A
ACCREDITED UNIVERSITY

[20-11-2025]
END SEM EXAMINATION
School of Engineering & IT

Program	EEE / ME	Branch	B. Tech
Subject Name	Power Plant Engineering	Session	Odd, 2025-26
Semester	VII	Year	Nov, 2025
Time: 3 Hour Max. Marks : 70	Start writing from 2nd page onwards; don't Write on the 1st Page^o Backside • Answer all Questions of Section A (Compulsory) • Answer Any Four out of Six of Section B • Answer Any Three out of Five of Section C • Steam Table may be allowed. • Possession of <u>Mobile Phone</u> or any kind of <u>Written Material, Arguments with the Invigilator or Discussion with Co-Student</u> will come under <u>Unfair Means</u> and will <u>Result in the Cancellation of the Paper(s)</u> . K1 : Remembering K3 : Applying K5 : Evaluating K2 : Understanding K4 : Analysing K6 : Creating		
Knowledge Level (KL)			

Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)

Q.N	QUESTIONS	Marks	COs	KL
1				
i	Describe super critical boilers.	2	CO1	K1
ii	Define steam rate and heat rate.	2	CO1	K2
iii	Describe the effect of inter cooling in a gas turbine plant.	2	CO2	K1
iv	Illustrate the advantages of Integrated Gasifier based combined cycle power plants.	2	CO2	K2
v	List the function of control rods with example.	2	CO3	K1
vi	Define the term "Breeding".	2	CO3	K2
vii	Classify the hydroelectric turbines with respect to high medium and low head.	2	CO4	K1
viii	State the applications of geothermal energy	2	CO4	K1
ix	What do you understand by power plant economics?	2	CO5	K1
x	Define tariff?	2	CO5	K3

Section B (Answer any FOUR out of SIX) – 20 Marks

(Each question Carry 05 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	Describe the Fuel handling system of thermal power plant.	05	CO1	K3
3	Draw and explain PV and TS diagrams of Rankine cycle.	05	CO2	K4
4	Explain nuclear fission, nuclear fusion and chain reaction.	05	CO3	K3
5	Describe in detail about the various types of Wind energy system.	05	CO4	K3
6	Illustrate the difference between closed cycle and open cycle gas turbine power plants.	05	CO2	K4
7	A central power station has annual factors as follows. Load factor = 60%, capacity factor = 40% and use factor = 45%. Power station has a maximum demand of 15000 KW. Determine the annual energy production, reserve capacity over and above peak load hours per year not in service.	05	CO5	K4

Section C (Answer any THREE out of FIVE) – 30 Marks

(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
8	Steam power plant operates on a simple ideal Rankine cycle between the pressure limits of 3 MPa and 50 kPa. The temperature of the steam at the turbine inlet is 300°C, and the mass flow rate of steam through the cycle is 35 kg/s. Show the cycle on a T-s diagram with respect to saturation lines, and determines (a) The thermal efficiency of the cycle and (b) The net power output of the power plant.	10	CO1	K5
9	In an open cycle regenerative gas turbine plant, the air enters the compressor at 1 bar and 32°C and leaves at 6.9 bar. The temperature at the end of combustion chamber is 816°C. The isentropic efficiencies of compressor and turbine are respectively 0.84 and 0.85. Regenerator effectiveness is 60%. Determine: (a) Thermal efficiency, (b) Air rate, (c) Work ratio.	10	CO2	K4

10 Draw the diagram of PWR and BWR and explain the advantages and disadvantages. What are the conditions which prefer PWR and BWR.

10

CO3

K4

11 Describe the working of low head Hydro Plant with a neat diagram.

10

CO4

K5

12 Explain the pollution control technologies including waste disposal options for coal power plant.

10

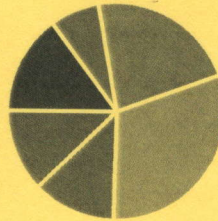
CO5

K6

CO1	Describe and analyze different types of sources and mathematical expressions related to thermodynamics and various terms and factors involved with power plant operation.
CO2	Analyze the working and layout of steam power plants and the different systems comprising the plant and discuss about its economic and safety impacts
CO3	Combine concepts of previously learnt courses to define the working principle of diesel power plant, its layout, safety principles and compare it with plants of other types.
CO4	Describe the working principle and basic components of the nuclear power plant and the economic and safety principles involved with it.
CO5	Explain the applications of power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of electrical energy production.

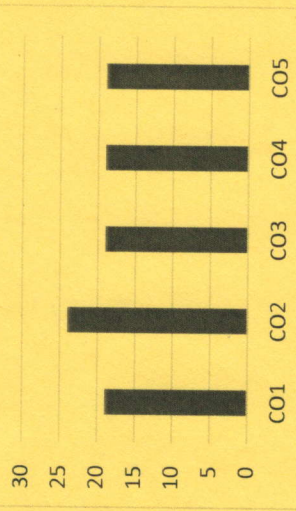
GRAPHICAL REPRESENTATION

Blooms Level Wise Marks Distribution



■ KL1 ■ KL2 ■ KL3 ■ KL4 ■ KL5 ■ KL6

Course Outcome Wise Marks Distribution



ARKA JAIN University
Jharkhand



[20-11-2025]

END SEM EXAMINATION
School of Engineering & IT

Program	EEE / ME	Branch	B. Tech
Subject Name	Power Plant Engineering	Session	Odd, 2025-26
Semester	VII	Year	Nov, 2025
Time: 3 Hour Max. Marks : 70	<ul style="list-style-type: none"> Start writing from 2nd page onwards; don't Write on the 1st Page Backside Answer all Questions of Section A (Compulsory) Answer Any Four out of Six of Section B Answer Any Three out of Five of Section C Steam Table may be allowed. Assessment of Mobile Phone or any kind of Written Material, Arguments with the Invigilator or Discussion with Co-Student will come under Unfair Means and will Result in the Cancellation of the Paper(s). 		
Knowledge Level (KL)	K1 : Remembering	K3 : Applying	K5 : Evaluating
	K2 : Understanding	K4 : Analysing	K6 : Creating

Section A (Each question Carry 02 Marks from Q1-i to x - 20 Marks)

Q. N	QUESTIONS	Marks	COs	KL
i	Describe super critical boilers.	2	CO1	K1
ii	Define steam rate and heat rate.	2	CO1	K2
iii	Describe the effect of inter cooling in a gas turbine plant.	2	CO2	K1
iv	Illustrate the advantages of Integrated Gasifier based combined cycle power plants.	2	CO2	K2
v	List the function of control rods with example.	2	CO3	K1
vi	Define the term "Breeding".	2	CO3	K2
vii	Classify the hydroelectric turbines with respect to high medium and low head.	2	CO4	K1
viii	State the applications of geothermal energy	2	CO4	K1
ix	What do you understand by power plant economics?	2	CO5	K1
x	Define tariff?	2	CO5	K3

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 05 Marks)

10	Draw the diagram of PWR and BWR and explain the advantages and disadvantages. What are the conditions which prefer PWR and BWR.	10	CO3	K4
11	Describe the working of low head Hydro Plant with a neat diagram.	10	CO4	K5
12	Explain the pollution control technologies including waste disposal options for coal power plant.	10	CO5	K6

Q. No.	QUESTIONS	Marks	COs	KL
2	Describe the Fuel handling system of thermal power plant.	05	CO1	K3
3	Draw and explain PV and TS diagrams of Rankine cycle.	05	CO2	K4
4	Explain nuclear fission, nuclear fusion and chain reaction.	05	CO3	K3
5	Describe in detail about the various types of Wind energy system.	05	CO4	K3
6	Illustrate the difference between closed cycle and open cycle gas turbine power plants.	05	CO2	K4
7	A central power station has annual factors as follows. Load factor = 60%, capacity factor = 40% and use factor = 45%. Power station has a maximum demand of 15000 KW. Determine the annual energy production, reserve capacity over and above peak load hours per year not in service.	05	CO5	K4

Section C (Answer any THREE out of FIVE) – 30 Marks
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
8	Steam power plant operates on a simple ideal Rankine cycle between the pressure limits of 3 MPa and 50 kPa. The temperature of the steam at the turbine inlet is 300°C, and the mass flow rate of steam through the cycle is 35 kg/s. Show the cycle on a T-s diagram with respect to saturation lines, and determines (a) The thermal efficiency of the cycle and (b) The net power output of the power plant.	10	CO1	K5
9	In an open cycle regenerative gas turbine plant, the air enters the compressor at 1 bar and 32°C and leaves at 6.9 bar. The temperature at the end of combustion chamber is 816°C. The isentropic efficiencies of compressor and turbine are respectively 0.84 and 0.85. Regenerator effectiveness is 60%. Determine: (a) Thermal efficiency, (b) Air rate, (c) Work ratio.	10	CO2	K4



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[22-11-2025]

END SEM EXAMINATION
School of Engineering & IT

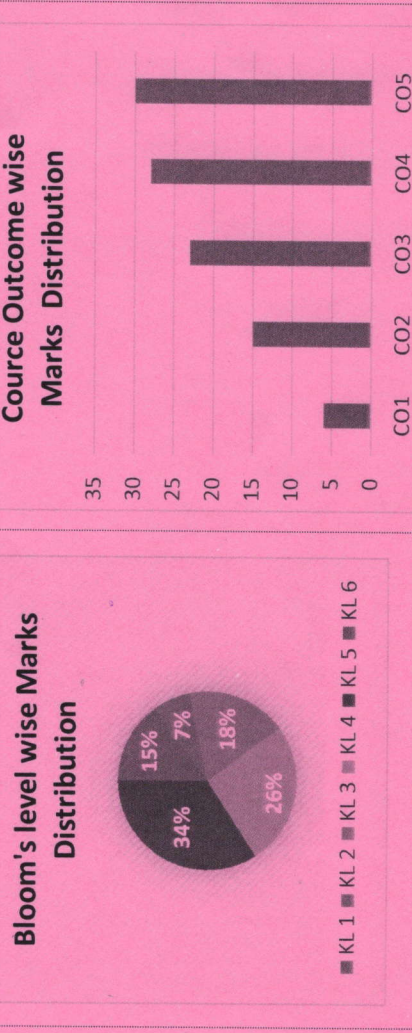
Program	Mechanical Engineering	Branch	B.Tech
Subject Name	Automation in Manufacturing	Session	Odd, 2025-26
Semester	VII	Year	Nov, 2025
Time: 3 Hour Max. Marks : 70	<ul style="list-style-type: none"> Start writing from 2nd page onwards; don't write on the 1st Page^e Backside Answer all Questions of Section A (Compulsory) Answer Any Four out of Six of Section B Answer Any Three out of Five of Section C Design Data Book will be allowed. Possession of <u>Mobile Phone</u> or any kind of <u>Written Material, Arguments with the Invigilator or Discussion with Co-Student</u> will come under <u>Unfair Means</u> and will <u>Result</u> in the <u>Cancellation of the Paper(s)</u>. 		
Knowledge Level (KL)	K1 : Remembering	K3 : Applying	K5 : Evaluating
	K2 : Understanding	K4 : Analysing	K6 : Creating

Section A (Each question Carry 02 Marks from Q1-i to x - 20 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
i	What do you understand by Automation in Manufacturing?	2	CO1	K1
ii	What do you mean by Product Development?	2	CO1	K2
iii	Make a list of Part feeding devices in automatic assembly system.	2	CO2	K2
iv	Define automation in manufacturing.	2	CO2	K1
v	List the function of sensors and actuators.	2	CO3	K1
vi	List any two advantages of automation in industry.	2	CO1	K2
vii	Discuss the importance of manufacturability in product design phase.	2	CO4	K3
viii	Name two examples of automated material handling systems.	2	CO3	K3
ix	Write difference between fixed and programmable automation.	2	CO3	K3
x	Differentiate between manned workstations and automated cells in terms of productivity and operational efficiency.	2	CO5	K1

Course Outcomes	CO1	Understand the concept and types of automation
	CO2	Assessment of degree and level of automation
	CO3	Justification of automation.
	CO4	To get the knowledge of various elements of manufacturing automation – CAD/CAM, sensors, pneumatics, hydraulics and CNC
	CO5	Understanding transfer lines and advanced industrial automation.

GRAPHICAL REPRESENTATION

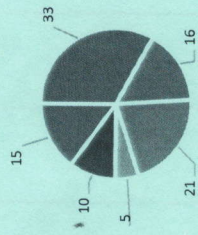


Section B (Answer any FOUR out of SIX) – 20 Marks (Each question Carry 05 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
2	What are levels of automation in manufacturing? Also Explain their key features.	05	CO2	K2
3	Explain the role of Computer Graphics Software and Database in CAD systems.	05	CO2	K3
4	Define automation. List the different types of automation used in manufacturing.	05	CO1	K2
5	What are basics functions that must be carried out to convert raw material into finished Products. Explain in detail.	05	CO5	K3
6	Define Low Cost Automation (LCA). List any four advantages of implementing LCA in small and medium industries.	05	CO4	K3
7	Define the terms product design and process route modeling in the context of modeling and simulation	05	CO3	K4
Section C (Answer any THREE out of FIVE) – 30 Marks (Each question Carry 10 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
8	Discuss the reasons why automation is essential in modern manufacturing industries. Highlight its impact on productivity, quality control, and operational efficiency. Provide examples of industries where automation has significantly transformed manufacturing processes.	10	CO3	K4
9	How can design for manufacturability (DFM) and design for assembly (DFA) principles be integrated into the product design process?	10	CO4	K4
10	Evaluate the selection criteria for using pneumatics vs hydraulics in LCA systems. Support your answer with suitable industrial examples.	10	CO4	K5
11	Describe the use of computer control in machining centers. How does it contribute to flexibility in manufacturing?	10	CO2	K5
12	Illustrate the working of a Single Station Automated Cell using a simple diagram and process flow.	10	CO5	K4

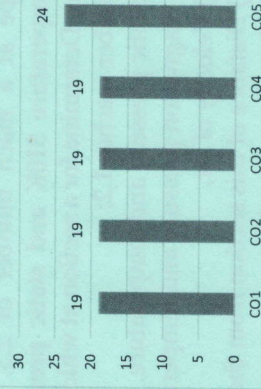
[CO1]	Understand the basic difference between incompressible and compressible flow.
[CO2]	Understand the phenomenon of shock waves and its effect on flow.
[CO3]	Apply gas dynamics principles in the Jet and Space Propulsion.
[CO4]	Understand the phenomenon of shock waves and its effect on flow.
[CO5]	Apply gas dynamics principles in the Jet and Space Propulsion.

GRAFICAL REPRESENTATION

Bloom's Level wise Marks Distribution



Course Outcome Wise Marks Distribution



• K1 • K2 • K3 • K4 • K5 • K6

		[18-11-2025] END SEM EXAMINATION School of Engineering & IT	
Branch	Mechanical Engineering	Program	B. Tech
Subject Name	Gas Dynamics & Jet Propulsion	Session	Odd, 2025-26
Semester	VII	Year	Nov 2025
Time: 3 Hour Max. Marks : 70	• Start writing from 2nd page onwards; don't Write on the 1st Page Backside • Answer all Questions of Section A (Compulsory) • Answer Any Four out of Six of Section B • Answer Any Three out of Five of Section C • Gas Table is allowed • Possession of Mobile Phones or any kind of Written Material, Arguments with the Invigilator or Discussing with Co-Student will come under Unfair Means and will Result in the Cancellation of the Papers.		
Knowledge Level (KL)	K1 : Remembering K2 : Understanding	K3 : Applying K4 : Analysing	K5 : Evaluating K6 : Creating

Section A (Each question Carry 02 Marks from Q1-i to Q1-x) – 20 Marks					
Q.N	QUESTIONS	Marks	COs	KL	PO
i	Define zone of action and zone of silence?	2	CO1	K1	PO2
ii	Explain Mach cone and Mach angle?	2	CO1	K2	PO1
iii	What are the consumptions made for fanno flow?	2	CO2	K1	PO2
iv	What is Rayleigh line and Fanno line?	2	CO2	K2	PO3
v	What are the properties change across a normal shock?	2	CO3	K3	PO1
vi	Define compression and rarefaction shock? Is the latter possible?	2	CO3	K1	PO2
vii	What is Thrust Specific Fuel Consumption (TSFC)?	2	CO4	K3	PO2
viii	Define Specific impulse.	2	CO4	K1	PO3
ix	What is weight flow coefficient?	2	CO5	K2	PO2
x	Define propulsion efficiency.	2	CO5	K3	PO1

Section B (Answer any FOUR out of SIX) - 20 Marks
(Each question Carry 5 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
2	A conical diffuser has entry and exit diameters of 15 cm and 30 cm respectively. The pressure, temperature and velocity of air at entry are 0.69 bar, 340 K and 180 m/s respectively. Determine i) Exit pressure ii) The exit velocity and iii) The force exerted on the diffuser walls assume isentropic flow, $\gamma = 1.4$, $C_p = 1.00$ J/Kg K	5	CO1	K4	PO2
3	Air enters a constant area duct at $M1 = 3$, $P1 = 1$ atm and $T1 = 300$ K. inside the duct the heat added per unit mass is $q = 3 \times 10^5$ J/Kg. Calculate the flow properties $M2$, $P2$, $T2$, $\rho2$, $To2$ and $PO2$ at the exit.	5	CO2	K3	PO3
4	The velocity of a normal shock wave moving into stagnant air ($P = 1.0$ bar, $T = 17^\circ\text{C}$) is 500m/s. if the area of cross section of the duct is constant, determine pressure, temperature, velocity of air, stagnation temperature and Mach number imparted upstream of the wave front.	5	CO3	K6	PO1
5	Differentiate turbojet and turboprop propulsion engines with suitable diagrams.	5	CO4	K1	PO3
6	Explain briefly about the propellant feed system of a liquid propellant rocket engine with suitable schematic sketches.	5	CO5	K1	PO1
7	A rocket engine has the following data. Combustion chamber pressure is 38 bar, combustion chamber temperature is 3500K, oxidizer flow rate is 41.67 Kg/s, mixture ratio is 5, and the properties of exhaust gases are $C_p/C_v = 1.3$ and $R = 0.287$ kJ/KgK. The expansion takes place to the ambient pressure of 0.0582 bar. Calculate the nozzle throat area, thrust, thrust coefficient, exit velocity of the exhaust and maximum possible exhaust velocity.	5	CO5	K1	PO3

Section C (Answer any THREE out of FIVE) - 30 Marks
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
8	Air at $P_o = 10$ bar, $T_o = 400$ K is supplied to a 50 mm diameter pipe. The friction factor for the pipe surface is 0.002. If the Mach number changes from 3.0 at the entry to 1.0 at the exit determine i) The length of the pipe and ii) The mass flow rate.	10	CO1	K5	PO1
9	A long pipe of 0.0254 m diameter has a mean coefficient of friction of 0.003. Air enters the pipe at a mach number of 2.5, stagnation temperature 310K and static pressure 0.507 bar. Determine for a section at which the mach number reaches 1.2: i) Static pressure and temperature, ii) Stagnation pressure and temperature, iii) Velocity of air, iv) Distance of this section from the inlet and v) Mass flow rate of air.	10	CO2	K6	PO3
10	Derive the equation for static pressure ratio across the shock waves.	10	CO3	K2	PO2
11	Describe the working of supersonic ramjet engine with a neat sketch. List out its advantages and disadvantages.	10	CO4	K3	PO2
12	Describe the important properties of liquid and solid propellants desired for rocket propulsion.	10	CO5	K1	PO1