

	ARKA JAIN University Jharkhand		NAAC GRADE A ACCREDITED UNIVERSITY		END SEM EXAMINATION School of Engineering & IT	
Program	M. Tech			Branch	Manufacturing Engg	
Subject Name	Automation and Production systems		Session		Even, 2024-2025	
Semester	2 nd			Year	June, 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 • Graf Paper / Drawing Sheet/ Log Book/ Ledger (Not Required) • Possession of <u>Mobile Phone</u> or any kind of <u>Written Material, Arguments with the Invigilator or Discussion with Co-Student</u> will comes 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			

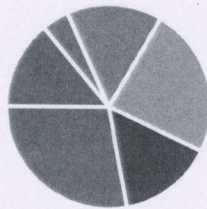
Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)			
Q. N1	QUESTIONS	Marks	COs KL
i	What do you understand by Automation in Manufacturing?	2	CO1 K2
ii	Enlist the essential components of a manufacturing system.	2	CO1 K2
iii	What is inspection?	2	CO2 K3
iv	Name the different types of conveyors.	2	CO2 K2
v	Define agile manufacturing.	2	CO1 K1
vi	Name different drive system used in Robot joints.	2	CO3 K3
vii	Write down the cost involved in Manufacturing.	2	CO2 K1
viii	What is buffer storage?	2	CO5 K2
ix	Enlist different Components FMS.	2	CO5 K1
x	What are the principles should adhere while determining the efficient sequence?	2	CO4 K2

Course Outcomes, **KL-** Knowledge Level, **PO** – Program Outcome

CO1	Identification, Classification of different Automation types in Production System and application of production concepts using mathematical models
CO2	Analyze the concepts of Automation with respect to Process Industries and Discrete Manufacturing Industries
CO3	Apply the concepts of mathematical models in material handling , Automation System and discrete control using PLCs
CO4	Apply the concepts of mathematical models in automated storage systems
CO5	Evaluate the techniques involved in FMS

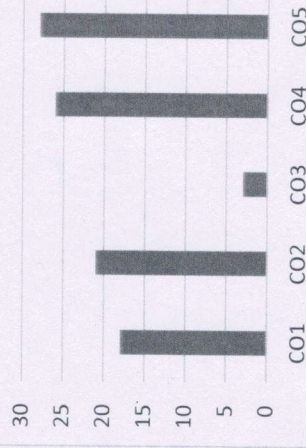
GRAPHICAL REPRESENTATION

Bloom's Level wise Marks Distribution



■ K1 ■ K2 ■ K3 ■ K4 ■ K5 ■ K6

Course Outcome Wise Marks Distribution



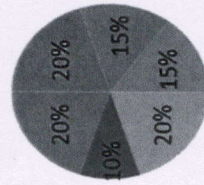
Section B (Answer any FOUR out of SIX) – 20 Marks (Each question Carry 05 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
2	What are levels of automation in manufacturing? Also Explain their key features.	05	CO2	K3
3	What are different types of Production System? Compare them with respect to variety and volume of production.	05	CO3	K3
4	List out applications, advantages, disadvantages of FMS.	05	CO3	K2
5	Explain about End Effectors – Sensors in Robotics.	05	CO4	K3
6	What are the steps involved in Process planning?	05	CO5	K2
7	Explain FMS Planning and Implementation Issues in Manufacturing.	05	CO4	K3
Section C (Answer any THREE out of FIVE) – 30 Marks- (Each question Carry 10 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
8	Explain any one of Automation Migration Strategy.	10	CO3	K4
9	Discuss the technology behind automated data collection system.	10	CO4	K4
10	Explain about Robot Anatomy and Related Attributes. .	10	CO5	K5
11	Explain the FMS Layout and its application and benefits.	10	CO5	K5
12	Compare rigid automation and flexible automation in manufacturing. Discuss their respective advantages, limitations, and applications.	10	CO3	K5

	ARKA JAIN University Jharkhand		NAAC GRADE A ACCREDITED UNIVERSITY		END SEM EXAMINATION School of Engineering & IT
	Program	M.Tech	Branch	Manufacturing Engineering	
	Subject Name	Advance Foundry Technology	Session	Even, 2024-2025	
	Semester	2 nd	Year	June, 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 • Graf Paper / Drawing Sheet/ Log Book/ Ledger (please Mention if any) • Possession of Mobile Phone or any kind of Written Material, Arguments with the Invigilator or Discussion with Co-Student will comes under Unfair Means and will Result in the Cancellation of the Paper(s).					
Knowledge Level (KL)		K1 : Remembering		K5 : Evaluating	
		K2 : Understanding		K3 : Applying	
				K4 : Analysing	
				K6 : Creating	

GRAPHICAL REPRESENTATION

Bloom's Level wise marks Distribution

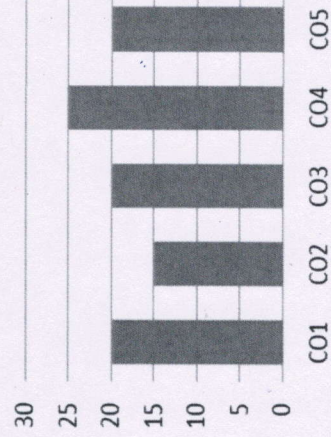
Bloom's Level Wise Marks Distribution



■ Level 1 ■ Level 2 ■ Level 3

Course Outcome Wise Marks Distribution

Course Outcome Wise Marks Distribution



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

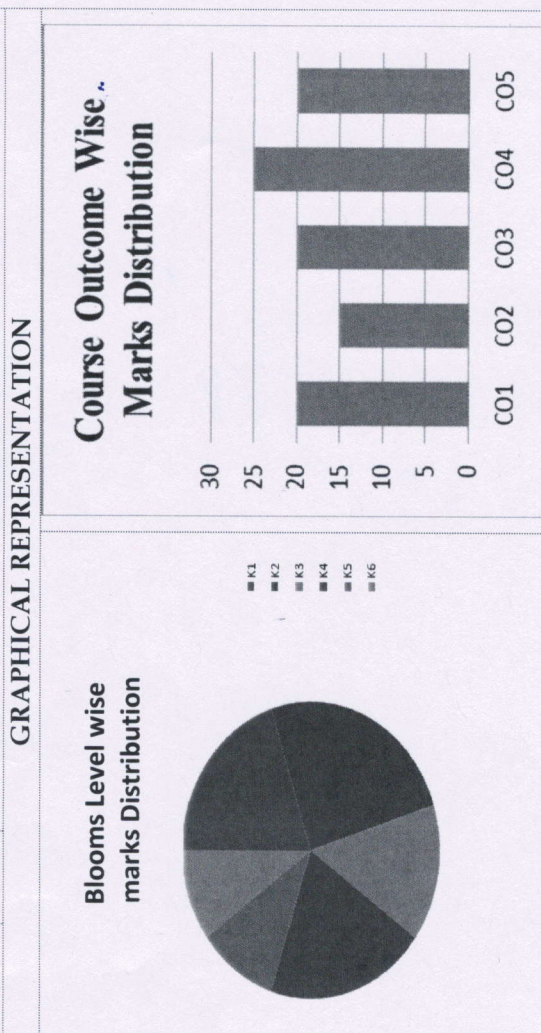
Q.N	QUESTIONS	Marks	COs	KL
1				
i	Enlist role of Foundry work in casting.	2	CO1	K1
ii	Discuss the advantages and disadvantages of sand casting?	2	CO1	K1
iii	How solidification time important in casting? Discuss in brief.	2	CO2	K4
iv	What are the key components of a foundry and their functions?	2	CO3	K2
v	Define these casting terms : i) Solid Shrinkage ii) Core	2	CO2	K4
vi	Enlist main components of a gating system.	2	CO5	K5
vii	How does the choice of ferrous metal impact the casting process?	2	CO2	K2
viii	Why casting process does is preferred as primary manufacturing?	2	CO3	K3
ix	What is sand casting and how does it work?	2	CO4	K4

	placement strategies to ensure proper feeding of molten metal and minimize defects.			
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x	What quality control measures are important in ferrous metal casting?	2	CO4	K4
Section B (Answer any FOUR out of SIX) – 20 Marks (Each question Carry 05 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
2	How can the pouring temperature of molten metal affect the quality of a casting?	05	CO1	K2
3	What factor should be considered for design of an effective gating system in casting? Explain with suitable diagram.	05	CO1	K3
4	How Progressive and directional Solidification important. Explain in detail.	05	CO2	K4
5	Explain the steps involved in sand casting with suitable diagram.	05	CO5	K4
6	What is green sand mold? What are the advantages of using green sand in sand casting?	05	CO3	K4
7	Briefly explain the term "pattern allowance" in pattern making for casting.	05	CO4	K5
Section C (Answer any THREE out of FIVE) – 30 Marks (Each question Carry 10 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
8	Discuss the steps involved in the sand casting process, from pattern preparation to the removal of the casting. Include the role of each step in ensuring quality and accuracy of the final product.	10	CO4	K5
9	Explain the purpose and components of a gating system in casting. Describe the design considerations for an effective gating system and how they impact casting quality.	10	CO1	K2
10	Discuss the types of patterns that are commonly used in sand casting.	10	CO3	K3
11	What are different types of Cast Irons? Explain any three of them along with composition, properties and applications.	10	CO4	K5
12	Describe the principles of riser design in sand casting. Discuss the different types of risers and their	10	CO5	K1

JGI ARKAJAIN University Jharkhand END TERM EXAMINATION School of Engineering & IT		Branch Manufacturing Engineering		Program M.TECH	
Subject Name Mechatronics and MEMS		Semester 2 nd		Year 2024-25/ Even	
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 - Graph Paper / Drawing Sheet/ Log Book/ Ledger (please Mention if any) - Possession of Mobile Phones or any kind of Written Material, Arguments with the Invigilator or Discussing with Co-Student will comes under Unfair Means and will Result in the Cancellation of the Papers.			
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 Q1-x) – 20 Marks					
Q. N 1	QUESTIONS	Marks	COs	KL	PO
i	Explain the function of a capacitive sensor in a robot end effectors?	2	CO 1	K1	PO 2
ii	What is meant by system in mechatronics?	2	CO 1	K1	PO 2
iii	How do you define pneumatic system?	2	CO 2	K4	PO 3
iv	What is the purpose of using filter in hydraulic system ?	2	CO 3	K2	PO 3
v	Mention the examples of automatic system?	2	CO 2	K4	PO 4
vi	State the purpose of control system	2	CO 3	K5	PO 4
vii	Name few elements of engine management system?	2	CO 2	K2	PO 3
viii	Define encoding and decoding processes.	2	CO 3	K3	PO 4
ix	Why do we need to take care while using derivative control?	2	CO 4	K4	PO 3

CO- Course Outcomes,	KL- Knowledge Level,	PO – Program Outcome
CO1	Define Mechatronics systems and recognize its various elements.	
CO2	Compile the key signal conditioning circuits.	
CO3	Demonstrate the concepts of system models and controllers.	
CO4	Understand the concepts of programming logic controllers.	
CO5	Understand the concepts of MEMS.	



	(i) Two switches are normally open and both have to be closed for a motor to operate. (ii) Either of two, normally open, switches have to be closed for a coil to be energized and operate	4		4
12	Design a mechatronics system for an automatic windshield wiper in Car Systems?	10	CO 4	K1 PO 5

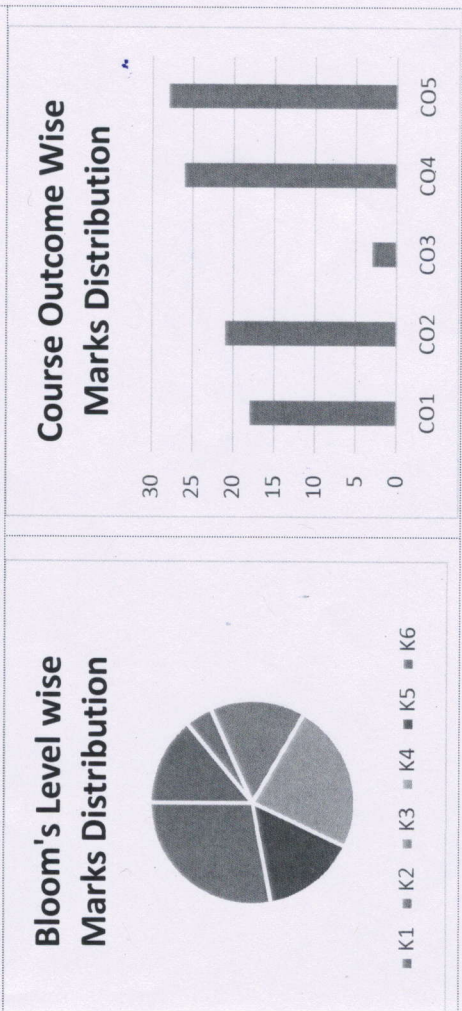
x	List various types of PLC programming devices.	1	CO 4	K4	PO 3
SECTION B (ANSWER ANY FOUR OUT OF SIX) – 20 MARKS (EACH QUESTION 5 MARKS)					
Q. No.	QUESTIONS	Marks	CO S	KL	PO
2	What is ALU? State its function.	5	CO 1	K2	PO 3
3	Explain how a PLC can be used to handle an analog input.	5	CO 1	K3	PO 2
4	Distinguish between traditional design approach and Mechatronics approach.	5	CO 2	K4	PO 3
5	What are the basic elements of a closed loop control system?	5	CO 2	K4	PO 4
6	Discuss the possible design solutions for a pick and place robot?	5	CO 3	K4	PO 3
7	Compare and contrast the control system for the domestic central heating system involving a bimetallic thermostat and that involving a microprocessor?	5	CO 4	K5	PO 4

SECTION C (ANSWER ANY THREE OUT OF FIVE) – 30 MARKS
(EACH QUESTION 10 MARKS)

Q. No.	QUESTIONS	Marks	CO S	KL	PO
8	Explain with a neat sketch microprocessor-based controllers.	10	CO 2	K5	PO 3
9	A hydraulic cylinder is to be used to move a work piece in a manufacturing operation through a distance of 50mm in 10sec. A force of 10KN is required to move the workpiece. Determine the required working pressure and hydraulic liquid flow if a cylinder with a piston diameter of 100mm is available.	10	CO 1	K2	PO 4
10	Derive a mathematical differential equation for governing a system of electric motor.	10	CO 3	K3	PO 3
11	Draw the ladder diagram to represent	10	CO	K5	PO

 ARKA JAIN University Jharkhand NAAC GRADE A ACCREDITED UNIVERSITY		END TERM EXAMINATION School of Engineering & IT		
Program	M. Tech	Branch	Manufacturing	
Subject Name	Flexible Manufacturing Systems	Session	Even, 2024-2025	
Semester	II	Year	June, 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 • Graph Paper / Drawing Sheet/ Log Book/ Ledger (please Mention if any) • Possession of Mobile Phones or any kind of Written Material, Arguments with the Invigilator or Discussing with Co-Student will comes under Unfair Means and will Result in the Cancellation of the Papers.				
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Section A (Each question Carry 02 Marks from Q1-i to Q1-xx) – 20 Marks				
Q. N1	QUESTIONS	Marks	PO	
i	Define a Flexible Manufacturing System (FMS).	2	CO1 K1 PO2	
ii	Name two functions of the FMS host computer.	2	CO2 K3 PO2	
iii	What is meant by system integration in FMS development?	2	CO2 K4 PO3	
iv	What is the role of area controllers in FMS?	2	CO3 K2 PO3	
v	Define Distributed Numerical Control (DNC).	2	CO5 K3 PO2	
vi	What is a Kanban card?	2	CO4 K3 PO2	
vii	List any two modes of DNC communication.	2	CO2 K1 PO3	
viii	What is the primary objective of scheduling in FMS?	2	CO3 K3 PO3	
ix	Mention one advantage of using a carousel storage system.	2	CO5 K4 PO4	
x	What is WIP (Work-In-Progress) storage?	2	CO4 K2 PO1	
Section B (Answer any FOUR out of SIX) – 20 Marks (Each question 5 Marks)				

Course Outcomes,		KL- Knowledge Level,	PO – Program Outcome
Course Outcomes	CO1	Understand the concept of FMS and automation in conventional manufacturing system.	
	CO2	Synchronize the material handling machineries with retrieval systems.	
	CO3	Able to apply concepts of JIT, KANBAN and GT in a FMS system.	
	CO4	Able to perform different types of scheduling and loading techniques in production system.	
	CO5	They will be finally able to economically and technically justify the application of FMS and tool management.	
GRAPHICAL REPRESENTATION			



Q. No.	QUESTIONS	Marks	COs	KL	PO
2	Discuss the importance of performance measures in evaluating FMS efficiency.	5	CO1	K4	PO2
3	Differentiate between the functions of an FMS host computer and area controller.	5	CO2	K2	PO2
4	List any two types of flexibility in FMS.	5	CO2	K3	PO3
5	Explain how simulation is used in FMS development and planning.	5	CO3	K3	PO3
6	Describe the working of a Kanban system and explain its types.	5	CO5	K1	PO3
7	Analyze the reasons for adopting Group Technology in modern manufacturing.	5	CO4	K2	PO4

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

Q. No.	QUESTIONS	Marks	COs	KL	PO
8	Explain different types of FMS configurations with suitable examples.	10	CO2	K4	PO3
9	Critically evaluate the challenges and success factors in FMS project implementation.	10	CO3	K6	PO2
10	Evaluate the effectiveness of JIT implementation in reducing waste and improving productivity.	10	CO5	K3	PO2
11	Discuss a case study of a successful FMS implementation. What were the relational, technological, and economic factors contributing to its success?	10	CO4	K3	PO3
12	Discuss various tool management strategies used in FMS with suitable examples	10	CO2	K1	PO3

ix	What is the key economic drawback of liquid-hydrogen storage for automobiles compared with 700-bar gas?	2	CO5	KL2
x	State the range of stack lifetimes (in hours) specified by transit agencies for fuel-cell buses.	2	CO5	KL2
Section B (Answer any FOUR out of SIX) – 20 Marks (Each question Carry 05 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
2	Evaluate the feasibility of transitioning to a hydrogen-based economy in terms of economics, infrastructure requirements, and safety concerns. Provide justified recommendations for overcoming the key challenges.	5	CO1	KL2
3	Describe the construction and working of hydrogen-oxygen (H ₂ - O ₂) fuel cell with neat diagram.	5	CO1	KL2
4	List the technologies for hydrogen storage. Explain one.	5	CO2	KL4
5	How does hydrogen fuel cell technology work? What markets are hydrogen fuel cells viable in today?	5	CO4	KL1
6	Explain why automotive fuel-cell stacks are commonly operated at 60–80 °C rather than room temperature.	5	CO3	KL4
7	Explain why relative humidity affects proton conductivity in Nafion and relate this to I–V curve shape.	5	CO5	KL3
Section C (Answer any THREE out of FIVE) – 30 Marks (Each question Carry 10 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
8	Describe carbon-nanotube spill over mechanisms for hydrogen adsorption.	10	CO2	KL4
9	Examine how Ni-based versus Rh-based catalysts influence selectivity in partial-oxidation reforming.	10	CO3	KL4

10	Compare and contrast the technical, economic, and environmental performance of three large-scale power-generation pathways by 2040: (a) NG-fired combined-cycle, (b) coal with carbon capture	10	CO4	KL2
11	Decompose the sensitivity of FCEV WTW emissions to electrolyzer efficiency, H ₂ compression energy, and stack lifespan.	10	CO5	KL5
12	What is hydrogen and how is it used in transport and other sectors of the economy?	10	CO5	KL4

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