RV College of Engineering®
Mysore Road, RV Vidyaniketan Post
Bengaluru - 560059, Karnataka, India
NBA Accredited 6th - BE(4th)
hod.me@rvce.edu.in
www.rvce.edu.in
Tel: 080-68188143 / 8144

Department of Mechanical Engineering

CIE - I

Date	May 2024	Maximum Marks	50
Course Code	ME124BTS	Duration	90 Minutes
Sem	II Semester	USN:	
Course Name: ELEMENTS OF INDUSTRY 4.0			

#	Questions	M	BT	CO
1.	Define Industry 4.0 and explain the various design principles it incorporates. How do these principles differentiate Industry 4.0 from previous industrial revolutions?	10	2	1
2.	Discuss the goals of Industry 4.0 and the reasons why industries are adopting it. Provide specific examples to support your answer.	10	2	1
3.	**Evaluate** the opportunities and challenges of implementing Industry 4.0 in modern industries. How can companies address the challenges to capitalize on the opportunities?	10	5	1
4.	**Analyze** how horizontal and vertical integration in Industry 4.0 leads to end-to-end engineering of the overall value chain. Include the role of digital integration platforms in your analysis.	10	4	2
5.	Describe how Industry 4.0 is impacting the skills required in modern industries. What strategies can be implemented to prepare the workforce for these changes?	10	2	1

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

Marks Distribution	Particulars		CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5	L6
	Test	Max Marks	40	10	--	--	--	30	--	10	10	--

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Department of Mechanical Engineering

CIE – II

Date	June 2024	Maximum Marks	50
Course Code	ME124BTS	Duration	90 Min
Course Name	Elements of Industry 4.0	**USN:**	

#	Questions	M	BT	CO
1.	Describe how augmented reality (AR) and virtual reality (VR) can be used in industrial applications such as maintenance, assembly, collaborative operations, and training. Provide examples for each application to illustrate your answer.	10	2	3
2.	Describe the advantages of additive manufacturing technologies and their impact on the environment. How are these technologies utilized in industries such as automotive, aerospace, electronics, and medical?	10	2	4
3.	Explain the concepts of a digital twin and a virtual factory in the context of smart manufacturing. How do these concepts contribute to Total Productive Maintenance (TPM) and the implementation of Industry 4.0 in MSMEs?	10	2	3
4.	consider a mid-sized manufacturing company looking to implement cloud computing to enhance its operations. Evaluate the potential benefits and challenges associated with cloud computing in the context of Industry 4.0. Discuss how cloud computing can facilitate the IT/OT convergence and address cyber security concems.	10	6	3
5.	Imagine you are part of a team visiting a smart manufacturing facility that has adopted Industry 4.0 and Industry 5.0 principles. Create a report outlining the key technologies observed, their applications, and the benefits achieved by the facility. Include an analysis of how these technologies contribute to the overall productivity and sustainability of the manufacturing processes.	10	5	3

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Department of Mechanical Engineering

Improvement CIE

Date	July 2024	Maximum Marks	50
Course Code	ME124BTS	Duration	120 Min
Course Name	**Elements of Industry 4.0**	**USN:**	

PART A **Max. Marks: 10**

#	Questions	M	BT	CO
1.	An intelligent conveyor system uses _____, AI, and IoT to optimize the movement of goods within a facility.	1	2	4
2.	In predictive maintenance, AI algorithms analyze data from _____ to predict equipment failures before they occur.	1	2	4
3.	Dynamic Routing in intelligent conveyor systems adjusts paths based on _____.	1	2	4
4.	Predictive Maintenance uses AI algorithms to predict equipment _____	1	2	4
5.	In the medical industry, additive manufacturing is used to produce custom _____, providing patient-specific solutions	1	2	3
6.	Additive manufacturing involves creating objects by adding material _____ by _____ based on digital models.	1	2	3
7.	Selective Laser Sintering (SLS) uses a laser to sinter material in ____ form.	1	2	3
8.	Google lens is used in _____	1	2	3
9.	Advantages of additive manufacturing include_____	2	2	3

PART B **Max. Marks: 50**

#	Questions	M	BT	CO
1.	Evaluate the benefits and environmental impact of additive manufacturing technologies. Discuss how these technologies are applied in the automotive, aerospace, electronics, and medical industries, providing specific examples for each.	10	2	5
2.	Discuss the role of AR and VR in training within industrial environments. Compare their effectiveness in providing realistic and safe training experiences, using examples from various industries.	10	2	2
3.	Critically compare user-oriented and product-oriented features of intelligent objects. Provide detailed explanations and examples of each, and discuss their contributions to enhance user experience and product functionality	10	2	2
4.	Discuss the role of intelligent commissioning systems in modern production environments. Explain how AI-driven commissioning improves setup efficiency and accuracy and evaluate the impact on overall production timelines and costs.	10	6	5
5.	Analyze the technological paradigms in production logistics, focusing on intelligent conveyor systems. Discuss the integration of AI in these systems and evaluate its effects on material flow optimization, downtime reduction, and overall efficiency improvements.	10	5	4

ME114BTS / 22EM117 / 22EM217

USN | 1 | R | V | 2 | 3 | M | E | 1 | 2 | 5 |

RV COLLEGE OF ENGINEERING®

(An Autonomous Institution affiliated to VTU)

I / II Semester B. E. Regular / Supplementary Examinations Feb-2024

Common to all programs

ELEMENTS OF INDUSTRY 4.0 (ELECTIVE)

Time: 03 Hours *Maximum Marks: 100*

Instructions to candidates:

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. Question number 2 is compulsory. Choose any one full question from 3 or 4, 5 or 6, 7 or 8 and 9 or 10.

PART-A

1	1.1	What are the core design principles of Industry 4.0?	02
	1.2	Explain the concept of the Industrial Internet of things (IIoT) and how it contributes to the realization of Industry 4.0 goals.	02
	1.3	What are some of the challenges that organizations may face when adopting Industry 4.0 technologies?	02
	1.4	Explain the concept of Horizontal and vertical integration in the context of Industry 4.0.	02
	1.5	What are the potential industrial applications of Augmented Reality (*AR*) and virtual Reality (*VR*)?	02
	1.6	Explain one advantage and one environmental impact of additive manufacturing (3*D* printing) technologies.	02
	1.7	Explain the concept of a "Digital twin" in manufacturing.	02
	1.8	What is Total Productive Maintenance (*TPM*)? And why is it important in the context of Industry 4.0?	02
	1.9	What are the key fundamentals of Artificial Intelligence (*AI*)?	02
	1.10	Describe the concept of "Intelligent Objects" in the context of *AI*?	02

PART-B

2	a	Explain the concept of Industry 4.0 and its significance in the context of the various industrial revolutions.	08
	b	Describe the role of the Industrial Internet of Things (IIoT) in paving the road to industry 4.0.	08
3	a	Examine the significance of skilled workers in the Industry 4.0 era. What are the strategies and initiatives that can address the shortage of skilled labor in industries embracing advanced technologies?	08
	b	Discuss the opportunities and challenges posed by the lack of resources in the context of Industry 4.0 adoption.	08
		OR	
4	a	Discuss the significance of machine sensors in manufacturing processes within the framework of vertical integration.	08

	b	Examine the concept of Machine-to-Machine (*M2M*) communication and its role in vertical integration.	08
5	a	Explain the concept of Augmented Reality (*AR*) and Virtual Reality (*VR*) in the context of smart workers in Industry 4.0.	08
	b	Discuss the role of *AR* and *VR* in workforce training within the Industry 4.0 framework.	08
		OR	
6	a	Explore the applications of additive manufacturing in automotive industry.	08
	b	Examine the environmental impact of additive manufacturing. How does this technology contribute to sustainability in manufacturing processes?	08
7	a	Discuss the role of both cloud and edge computing in Industry 4.0. How do these technologies complement each other?	08
	b	Explain the fundamentals of cloud computing, including service models and deployment models.	08
		OR	
8	a	How does the integration of Information Technology (*IT*) and Operational Technology (*OT*) benefit manufacturing processes?	08
	b	Discuss the significance of cyber security in the Industry 4.0 landscape.	08
9	a	Describe one specific case study where *AI* has been successfully applied in manufacturing.	08
	b	Discuss the concept and advantages of an Intelligent Conveyor System in production logistics.	08
		OR	
10	a	Discuss the advantages of utilizing Intelligent Load Carriers in production logistics.	08
	b	Define Intelligent Objects in the context of user-oriented functions and product-oriented functions.	08