AC- 04/12/2024
Item No. – 6.31 (1a)

As Per NEP 2020

University of Mumbai

Syllabus for Basket of OE	
Board of Studies in Information Technology	
UG First Year Programme	
Semester	III/IV/V
Title of Paper	Industry 4.0
Credits	2
From the Academic Year	2024-25

Sr. No.	Heading	Particulars
1	**Description the course :**	Industry 4.0 course introduces students to the profound impact of the Fourth Industrial Revolution on society and various sectors. This course offers interdisciplinary insights into the evolution of industries through advanced technologies such as AI, IoT, Robotics, Security, and Blockchain, making it highly relevant across disciplines. Students can explore the societal and ethical implications, delve into the technological aspects, and understand the future of business, data-driven decision-making, and automation. The course also provides a connection to other subjects like Digital Marketing, Economics, Computer Science, and Industrial Management. Given the increasing demand for Industry 4.0 skills in the job market, students will gain an edge in careers across sectors, including tech, manufacturing, consulting, and more, making it an essential addition to their academic portfolio.
2	**Vertical :**	Open Elective
3	**Type :**	Theory
4	**Credit**:	2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a semester)
5	**Hours Allotted :**	30 Hours
6	**Marks Allotted**:	50 Marks
7	**Course Objectives**: 1. Understand the key aspects of historical industrial revolutions. 2. Understand the evolution and fundamentals of Industry 4.0. 3. Understand the fundamentals of data-oriented technologies. 4. Understand the technologies for automation of industries. 5. Understand the security challenges and related emerging technologies in Industry 4.0. 6. Understand the future of Industry 4.0.	

8	**Course Outcomes**: 1. Explain the impact and transformations of the historical industrial revolutions on society. 2. Explain the foundational principles and concepts of Industry 4.0. 3. Explain the role of data-oriented key technologies in Industry 4.0. 4. Explain the impact of automation and immersive technologies in Industry 4.0. 5. Explain the significance of security and emerging technologies in Industry 4.0. 6. Explain the prospective opportunities with Industry 4.0.
9	**Modules**:
	Module 1: Industrial Revolutions **Hours: 03**
	Foundation of industrial revolutions. Adaptation and transformation of society with industrial revolutions: First industrial revolution and its impact on manufacturing and transportation; Second industrial revolution, rise of factories, mass production, and its influence on urbanization, labor, and economy; Third industrial revolution, digitization, and its impact on communication, globalization, and knowledge economy. **Self-learning:** Innovations spurred by historical industrial revolutions.
	Module 2: Evolution of Industry 4.0 **Hours: 05**
	Drivers of Fourth Industrial Revolution. Principles of Industry 4.0. Digital technologies fueling Industry 4.0. Tech stack of Industry 4.0. Impact on society, sustainability aspects and challenges of Industry 4.0. **Self-learning:** Regulatory and Ethical Considerations in adoption of Industry 4.0, Cyber-Physical Systems.
	Module 3: Data Oriented Key Technologies in Industry 4.0 **Hours: 06**
	Types of Data; Types of Data Analytics used by Companies; Need of Data Warehouse; ETL process. Introduction to Big Data, its types and characteristics. Introduction to Data Visualization. Introduction to Artificial Intelligence and its applications in Industry 4.0. Importance and applications of IoT. Introduction to IoT Data Analytics. **Self-learning:** IoT Sensors, Data Visualization Tools
	Module 4: **Automation and Immersive Technologies in Industry 4.0** **Hours:06**

	Introduction to Industrial Automation, Types of Industrial Automation. Introduction to Robotics, Role of Robotics in Industrial Automation. High Speed, Low Latency 5G Connectivity. Overview of AR/VR based systems: Presence and interaction in virtual environments. Evolution of Digital Twins. **Self-learning:** Additive Manufacturing in Industrial Automation (3D Printing)	
	Module 5: **Security and Emerging Technologies in Industry 4.0 Hours:06**	
	CIA Triad, Cyber Threats and Risks: Malware (Viruses, Worms, Trojans) and Phishing. Need of decentralization and introduction to Blockchain, Applications of Blockchain in Industry 4.0. Metaverse as Future technology. Security Challenges in Industry 4.0. Basics of Cloud Computing and its role for Industry 4.0, Cloud Service Providers (AWS, Azure, GCP). **Self-learning:** Case Studies of cyber security in the Finance sector, Cloud-based ERP and MES solutions.	
	Module 6: Future of Industry 4.0 Hours:04	
	Jobs in Industry 4.0. Emerging technologies and trends. Social and ethical considerations in Industry 4.0. Anticipating the future landscape of Industry 4.0 **Self-learning:** Impact of Industry 4.0 for Smart Cities.	
10	**Text Books:** 1. D. Pascual, P. Daponte, U. Kumar, Handbook of Industry 4.0 and Smart Systems, CRC Press, 2019. 2. K. Schwab, Fourth Industrial Revolution, Portfolio Penguin, 2017.	
11	**Reference Books:** 1. P. Kaliraj, T. Devi, “Industry 4.0 Technologies for Education: Transformative Technologies and Applications”, CRC Press, 2023. 2. R. Kant, H. Gurung, Industry 4.0: Concepts, Processes and Systems, CRC Press, 2023. 3. M. Vohra, Digital Twin Technology: Fundamentals and Applications, Wiley, 2023.	
12	**Internal Continuous Assessment: 40%**	**Semester End: 60%**
13	**Continuous Evaluation through:** IAT-1 : 15 marks IAT-2: 15 marks	**Semester End Examination (30 marks) - Duration 1 hours.**

	Average of IAT-1 & IAT-2 = 15 marks. Projects, Presentation and assignments, (5 marks)etc.	
14	**Format of Question Paper: End-semester examination** ● Question Paper will comprise three questions each with 10 marks. All modules must be covered. All three questions need to be answered.	

Sd/- **Dr. Vaishali D. Khairnar** **BoS Chairman Information Technology**	**Sd/-** **Dr. Deven Shan** **Offg. Associate Dean** **Faculty of Science & Technology,** **University of Mumbai.**	**Sd/-** **Dr. Shivram Garge** **Offg. Dean** **Faculty of Science & Technology,** **University of Mumbai.**