20IF301T					Industry 4.0					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	--	--	100

COURSE OBJECTIVES

1. To interpret the core elements and basic technologies of Industry 4.0
2. To understand how the core elements and technologies of Industry 4.0 are interconnected
3. To develop a holistic approach to improve processes and products with Industry 4.0

UNIT I: INDUSTRY 4.0 – CONCEPTS & TERMINOLOGIES **08 Hrs.**

Industry 4.0, Smart business model, Technology road-map, Sensing & actuation, Communication, Internet of things (IoT), Cyber Physical Systems and Next Generation Sensors, Visualization, Cloud Computing.

UNIT II: SMART WORLD & SUSTAINABLE ENVIRONMENT **08 Hrs.**

Sensors and their integration, Renewable Energy System, Hybrid Energy System, Smart Grid, Smart Metering, Communication Protocols, 5G Technology, Smart Agriculture, Smart Infrastructure, Physiological Sensors, Human Machine Interface.

UNIT III: SMART MANUFACTURING **08 Hrs.**

Automation Systems, Additive Manufacturing, Micro-Electro-Mechanical Systems (MEMS), Smart Factories and Interconnection, Advanced Robotics – Autonomous and Swarm, Self-Propelled Vehicles, Drones–Unmanned Aerial Vehicle (UAV), 3d Printing, Spacecrafts.

UNIT IV: TRANSFORMING TECHNOLOGIES IN BIOENGINEERING **08 Hrs.**

Establishment of Smart Biotechnology Factory, Artificial Intelligence in Bioprocess Technology, 3D Bio Printing for Tissue Engineering, Simulation Tools, RSM and Box Model, Cyber Physical System based Telemedicine, Real Time Biosensors, Bio nanotechnology, biofuel.

Total Hours 32 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Understand the core elements and basic technologies for Industry 4.0
CO2 – Apply the different computational techniques and algorithms for realizing Industry 4.0
CO3 – Transform the traditional business approach by integrating the data and intelligence
CO4 – Develop the traditional industries with intelligent and automated machines
CO5 – Utilize data and intelligence for the development of Smart World
CO6 – Understand the concept, significance and means to achieve sustainable development

TEXT/REFERENCE BOOKS

1. Ustundag Alp, and EmreCevikcan, Industry 4.0: Managing the Digital Transformation, Springer,First Edition, 2018
2. Kaushik Kumar, DivyaZindani, and J. Paulo Davim, Digital Manufacturing and Assembly Systems in Industry 4.0., CRC Press, Taylor & Francis First Edition, 2019.
3. Antonella Petrillo, Raffaele Cioffi, and Fabio De Felice, Digital Transformation in Smart Manufacturing., IntechOpen Publisher, First Edition, 2018.
4. J. Ekanayake, K. Liyanage, J. Wu, A. Yokoyama and N. Jenkins, Smart Grid: Technology and Applications, John Wiley and Sons Ltd., First Edition, 2012
5. Alasdair Gilchrist, Industry 4.0: The Industrial Internet of Things, Apress, First Edition, 2016
6. Ibrahim Garbie, Sustainability in Manufacturing Enterprises: Concepts, Analyses and Assessments for Industry 4.0, Springer, First Edition, 2016

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A/Question: 4 Questions, one from each unit, each carrying 15 marks 60 Marks
Part B/Question: 4 Questions, one from each unit, each carrying 10 marks 40 Marks