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| | Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 NAAC Accredited with A+ Grade (An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur) | |
| Department of Business Administration Curriculum and Syllabus: BBAXX17 | | |

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| B. Tech. Open Elective BBAXX17: Industry 4.0 (Open Elective) | | | |
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| Teaching Scheme | | Examination Scheme | |
| Lectures | 4 Hrs/week | CT-1 | 15 Marks |
| Tutorial | - | CT-2 | 15 Marks |
| Total Credit | 4 | TA | 10 Marks |
| | | ESE | 60 Marks |
| | | Total | 100 Marks |
| | | Duration of ESE: 03 Hrs. | |

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| Course Contents | |
| Unit I | Sensing & Actuation: Transducer, Sensor and its Characteristics, Sensor Classification, Actuator and its Classification, Actuator Characteristics. Industry 4.0: Historical Context its Classification, Drivers - Megatrends, Tipping Points. |
| Unit II | Sustainability Assessment of Manufacturing Industry: Introduction to Sustainable Industry, Sustainability in Industry 4.0, Introduction to Globalization Issues, Introduction to Emerging Issues, Sustainability Assessment of Emerging Issues. Lean Production System: Introduction of Lean Production System, Classification of wastes, Value streams in Lean, Lean production in Industry 4.0, Implementation of Lean implies. |
| Unit III | Smart and Connected Business Perspective: Introduction and its classification of Smart and Connected Business, need of smart business model, Value creation in smart business model, Layers and technologies for creating values. Smart Factories: Introduction and Components of smart factory, Characteristics of smart factories, Supporting technologies for smart factories, Automation pyramid of a smart factory. |
| Unit IV | Cyber-Physical Systems and Next-Generation Sensors: Differences with Embedded Systems, Features and application of Cyber-Physical Systems, CPS Architecture for Industry 4.0, Need and application of next-Generation Sensors, Design Challenges of Next Generation Sensors. Collaboration Platform and Product Lifecycle Management: Collaboration Productivity in Industry 4.0, Product Lifecycle Management, PLM for Industry 4.0, Scope of PLM. |
| Unit V | Augmented Reality and Virtual Reality: Augmented Reality and Virtual Reality in IIoT, Introduction and Chronological order of Augmented Reality, Applications of Augmented Reality, Types of Augmented Reality, Introduction and Chronological order of Virtual Reality, Applications of Virtual Reality, Types of Virtual Reality. Introduction of Artificial Intelligence and Big Data: Techniques and scope of AI, Role of AI in Industry 4.0, Classification of big data, Characteristics of Big Data. |

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| Text Books | |
| 1 | Ravi Kant, Hema Gurung, "Industry 4.0: Concepts, Processes and Systems". |
| 2 | Bartodziej, Christoph Jan, "The Concept Industry 4.0". |
| 3 | Klaus Schwab, "The Fourth Industrial Revolution". |
| Reference Books | |

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| 1 | Alp Ustundag and Emre Cevikcan," Industry 4.0: Managing the Digital Transformation". |
| 2 | Mahdi Sharifzadeh, "Industry 4.0 Vision for the Supply of Energy and Materials: Enabling Technologies and Emerging Applications". |
| 3 | Aydin Azizi, Reza Vatankhah Barenji, "Industry 4.0: Technologies, Applications, and Challenges (Emerging Trends in Mechatronics)". |
| Useful Links | |
| 1 | https://nptel.ac.in/courses/106105195 |

| Course Code BBAXX17 | Course Outcomes | CL | Class Sessions |
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| CO1 | Understand the Sensor, Actuation and basics of Industry 4.0. | 1 | 9 |
| CO2 | Understand the Sustainability Assessment and Lean Production method in manufacturing industry. | 2 | 9 |
| CO3 | Understand the importance of Smart and Connected Business, and Smart Factories for Industry 4.0. | 2 | 9 |
| CO4 | Analyze the Cyber-Physical Systems and Next-Generation Sensors, and Product Lifecycle Management for Industry 4.0. | 4 | 9 |
| CO5 | Analyze the Augmented Reality, Virtual Reality, Artificial Intelligence and Big Data for Industry 4.0. | 4 | 9 |



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Dean Academics

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