

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	Minor in Industrial Automation (Inter-disciplinary) Offered by B.Tech. in Electronics and Instrumentation Engineering
Semester :	VI
Course Code:	3EI604IE24
Course Title:	Edge Computing Application in Automation (Except CSE)
Course Type:	Department Elective- I under Minor (Interdisciplinary)
Year of introduction:	2024-2025

L	T	Practical component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to -

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| 1. understand concept of edge computing | (BL2) |
| 2. analyze the problem using edge domain | (BL3) |
| 3. develop the ML model using data analytic techniques | (BL4) |
| 4. apply the edge computing technique. | (BL4) |

Contents

	Teaching hours (Total 45)
Unit-I Introduction Introduction to computing paradigm, cluster computing, cloud computing, utility computing, fog computing and edge computing	04
Unit-II Edge computing and its essentials Edge computing architecture, state of the art edge computing interfaces and devices, Edge computing simulators, network architectures.	10
Unit-III Edge analytics Types of Data , Data Analytics , Goals of Data Analytics , Domains Benefiting from Big Data Analytics , Real-Time Applications of Data Analytics , Phases of Data Analytics, Machine Learning-Model Building , Performance Evaluation , Types of Data Analytics ,Descriptive Analytics , Edge Data Analytics , Potential of Edge Analytics Architecture of Edge Analytics , Machine Learning for Edge Devices Edge Analytics: Case Study.	10
Unit-IV Edge data security Data Security, Data confidentiality, Authentication, privacy preserving schemes , Edge based attacks and prevention.	08
Unit-V Edge computing case studies Autonomous vehicles, smart cities, Industrial automation , gaming , content delivery, Health Sector etc	08
Unit-VI Future trends and emerging technologies Edge computing and 5G , Blockchain in edge computing ,Quantum computing implications for edge ,Ethical considerations in edge computing	05



Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

This shall consist of at least 10 practicals based on the above syllabus.

Suggested Readings/ References:

1. Anitha Kumari, Edge computing fundamentals, CRC Press
2. Haitham Hamza and Satyajit Sinha, Edge Computing: A Comprehensive Guide, CRC Press
3. Ronan Keryell and Jonas Maebe, Edge Computing: Towards a Comprehensive Ecosystem, Springer
4. Sunil Cheruvu and Prasant Mohapatra, Practical Industrial IoT Security and Edge Computing Applications, Apress

Suggested List of Experiments:

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| 1. | Setting up a Raspberry Pi cluster as an edge computing node | (02 Hrs) |
| 2. | Building a sensor network and deploying it at the edge | (02 Hrs) |
| 3. | Implementing edge analytics for real-time processing of data stream | (02 Hrs) |
| 4. | Optimizing resource utilization in edge computing using containerization and clustering | (02 Hrs) |
| 5. | Implementing machine learning models at the edge for AI-based inference | (02 Hrs) |
| 6. | Setting up a secure communication channel between edge devices and the cloud | (02 Hrs) |
| 7. | Integrating blockchain for secure and decentralized edge computing | (02 Hrs) |
| 8. | Implementing edge computing for healthcare applications such as patient monitoring and diagnosis | (02 Hrs) |
| 9. | Testing edge computing systems for performance, latency, and energy efficiency | (04 Hrs) |
| 10. | Deploying edge computing for industrial automation and predictive maintenance | (04 Hrs) |

L = Lecture, T = Tutorial, P = Practical, C = Credit