



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Information Technology

Course / Subject Code : ME01000721

Subject Name: Wireless Technology and Pervasive Computing

WEF Academic Year:	2024-25
Semester:	1 <sup>st</sup> Semester
Category of the Course:	PEC

<b>Prerequisite:</b>	Basic knowledge of computer networks and communication systems.
<b>Rationale:</b>	Wireless Technology and Pervasive Computing are essential for understanding and developing the ubiquitous connectivity and smart environments that define modern life. This subject equips students with critical knowledge of wireless communication principles and pervasive computing applications, emphasizing practical skills through hands-on labs and projects. Mastery of these areas prepares students for advanced research and professional roles in the rapidly evolving fields of wireless networks and pervasive computing systems.

## Course Scheme:

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Practical		
				ESE (E)	PA(M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

## Course Content:

Sr. No.	Course Content	No. of Hours	% of Weightage
1	<b>An Overview of Wireless Systems</b> Introduction, First- and Second-Generation Cellular Systems, Cellular Communications from 1G to 3G, Wireless 4G Mobile Network Architecture, Future Wireless Networks. Basics of Cellular concept, Cellular architecture, GSM Architecture, Hand-off methods*	6	15
2	<b>The Cellular Concept System Design Fundamentals</b> Introduction. Frequency Reuse. Channel Assignment Strategies. Handoff Strategies. Interference and System Capacity. Improving Coverage & Capacity in Cellular Systems	8	20



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3	<b>Wireless LAN:</b> introduction, fundamentals of WLANs, IEEE 802.11 standard, Bluetooth, wireless internet, mobile IP , TCP in wireless domain , optimizing web over wireless	8	20
4	<b>Multiple Access Techniques *</b> Introduction, Narrowband Channelized Systems , Wideband Systems, Comparisons of FDMA, TDMA, and DS-CDMA , Random Access Methods	7	15
5	<b>Routing Protocols in Wireless Networks</b> Introduction to routing in wireless networks, issues in designing a routing protocol for ad hoc, wireless networks classifications of routing protocols, table-driven routing protocols , on-demand routing protocols, hybrid routing protocols, hierarchical routing protocols	10	25
6	<b>Introduction to Pervasive Computing</b> Definition and vision of pervasive computing, History and evolution of pervasive computing, Characteristics of pervasive computing environments.	3	5
<b>Total</b>		<b>42</b>	<b>100</b>

\* (Scope: Basic introduction, no calculations.)

### Reference Book:

1. Wireless communications and networking Vijay K. Garg
2. Ad Hoc Wireless Networks: Architectures and Protocols by C. Siva Ram Murthy and B.S. Manoj
3. Wireless Communications: Principles and Practice, 2nd Edition By Theodore S. Rappaport

### Reference paper:

1. Ikkela, Kalle, Marko Myllynen, Juha Heinanen, and Olli Martikainen. "4G Mobile Network Architecture." In *Emerging Personal Wireless Communications*, edited by Olli Martikainen, Jari Porras, and Jenni Hyvärinen, 67:183–95. IFIP International Federation for Information Processing. Boston: Kluwer Academic Publishers, 2002. [https://doi.org/10.1007/0-306-47001-2\\_12](https://doi.org/10.1007/0-306-47001-2_12).

### Course Outcomes:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT
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		Level*
01	Understand the evolution and architecture of wireless systems from 1G to 4G and future networks. Learn the fundamentals of cellular system design, including frequency reuse, handoff strategies, and capacity improvement.	RM
02	Explore the basics of Wireless LANs, IEEE 802.11 standards, Bluetooth, mobile IP, and TCP in wireless domains.	UN
03	Compare and analyze multiple access techniques such as FDMA, TDMA, and DS-CDMA.	UN
04	Investigate routing protocols in wireless networks, focusing on table-driven, on-demand, hybrid, and hierarchical protocols.	UN/AP/AN
05	Gain insight into pervasive computing, including its definition, vision, history, and characteristics.	RM

\*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

### Suggested Course Practical List:

#### Practical 1: Introduction to NS2

- **Objective:** Install and set up NS2. Familiarize with basic commands and scripting.
- **Tasks:**
  - Install NS2 on your system.
  - Create and run a basic simulation script.
  - Analyze the simulation output using trace files.

#### Practical 2: GSM Network Simulation

- **Objective:** Simulate GSM network architecture and study hand-off methods.
- **Tasks:**
  - Set up a GSM network in NS2.
  - Implement different hand-off strategies.
  - Analyze the impact of hand-offs on network performance.

#### Practical 3: Wireless LAN (IEEE 802.11) Simulation

- **Objective:** Simulate a WLAN using the IEEE 802.11 standard and evaluate its performance.
- **Tasks:**



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- Set up a WLAN scenario in NS2.
- Implement different IEEE 802.11 standards (a/b/g/n).
- Evaluate performance metrics such as throughput, delay, and packet delivery ratio.

### Practical 4: Routing Protocols in Ad Hoc Networks

- **Objective:** Implement and compare different routing protocols in wireless ad hoc networks.
- **Tasks:**
  - Simulate table-driven routing protocols (e.g., DSDV).
  - Simulate on-demand routing protocols (e.g., AODV, DSR).
  - Compare their performance based on metrics such as route discovery time, packet delivery ratio, and control overhead.

### List of Laboratory/Learning Resources Required:

1. NS2

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