

**Nirma University**  
**Institute of Technology, School of Technology**  
**MTech Computer Science and Engineering / MTech Computer Science and**  
**Engineering (Information and Network Security)**  
Semester - II

L	T	P	C
3	0	2	4

<b>Course Code</b>	3CS12D102
<b>Course Name</b>	Wireless Networks

**Course Learning Outcomes (CLOs):**

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

1. recognize design issues involved in different wireless networks
2. employ available technologies to satisfy various application requirements
3. analyze proposed technological solutions

**Syllabus:**

**Teaching  
Hours**

**Unit I**

**Introduction:** Growth of mobile communications, Mobile Communications Fundamentals and its Evolution, Mobile data, Wi-Fi, Bluetooth, Overview of 1G and 2G

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**Unit II**

**Third-Generation (3G) Overview:** Universal Mobile Telecommunications Service (UMTS), UMTS Services, The UMTS Air Interface, Overview of 3GPP Releases Network Architectures, Overview of CDMA2000, TD-CDMA, TD-SCDMA

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**Unit III**

**Universal Mobile Telecommunications Service (UMTS):** UMTS Basics, The WCDMA Air Interface, The UTRAN Architecture, Establishment of a UMTS Voice Call, UMTS Packet Data, High Speed Packet Data, Handover, HSPA Connection Establishment

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**Unit IV**

**CDMA2000:** Radio and Network Components, Network Structure, Packet-Data Transport Process Flow, Radio Network, EVDO

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**Unit V**

**TD-SDMA and TD-CDMA:** Generic TD-SDMA Architecture, Core Network, Radio Network, Interference Mitigation Techniques, RAN Traffic Planning, Handover, Generic TD-CDMA Architecture, Core Network, Radio Network, Interference Mitigation Techniques, RAN Traffic Planning, Handover

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**Unit VI**

**Long-Term Evolution (LTE):** LTE Ecosystem, Standards, Radio Spectrum, LTE Architecture, User Equipment, Enhanced Node B, Core Network, Radio

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Channel Components, TD-LTE, Multiple Input Multiple Output (MIMO), LTE Scheduler, Carrier Aggregation, Cell Search, Cell Re-selection, Attach and Default Bearer Activation, Handover, Self-Organizing Networks (SONs), Relay Cells, Heterogeneous Network (HetNET), Remote Radio Heads (RRH), VoLTE, LTE Advanced

## **Unit VII**

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**Fifth-Generation (5G):** 5G Goals, Performance Requirements, Next Generation Mobile Networks (NGMN) and 3GPP Use case families, Building blocks of 5G: New Radio (NR) Interface - Millimeter Wave Spectrum, Massive MIMO, Flexible OFDM Numerologies, Multi-RAT Connectivity, Advance Channel Coding, Network Features - Cloud RAN, 5G Core, Service Based Architecture, RAN Architecture Optimization, Multi-access Edge Computing (MEC), Network Slicing, Virtualization and Automation Technologies

## **Unit VIII**

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**Introduction to Sixth-Generation (6G):** Outlook of 6G, Computational Holographic Radio and Enabling Technologies for 6G, Air-interfaces for ultra-low power communications, Semantic Plane Filtering and Control, AI-assisted PHY technologies for 6G, Mobility-Enhanced Edge Intelligence (MEET) for 6G

## **Unit IX**

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**Wi-Fi:** 802.11 Standards, WiFi Protocols, Frequency Allocation, Modulation and Coding Schemes, Network Architecture, Security, 802.11 Services, Hot Spots, Virtual Private Networks (VPN), Mobile VPN, VPN Types, Wi-Fi Integration with 3G/4G

### **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:**

Laboratory work will be based on above syllabus with minimum 5 experiments to be incorporated.

### **Suggested Readings<sup>^</sup>:**

1. Clint Smith and Daniel Collins, Wireless Networks, McGraw Hill
2. Nishith Tripathi and Jeffrey Reed, 5G Cellular Communications: Journey and Destination, A Multimedia, (eBook) Rohde & Schwarz
3. Kaveh Pahlavan and Prashant Krishnamurthy, Principals of Wireless Networks: A Unified Approach, Prentice Hall
4. William Stallings, Wireless Communications and Networks, Pearson
5. <http://www.6gsummit.com/program/the-1st-6g-wireless-summit/>

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

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<sup>^</sup>this is not an exhaustive list