

IVB.Tech I Semester (E.C.E)

23A04703c	<u>5G COMMUNICATIONS</u>	L	T	P	C
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Course Objectives:

1. To introduce the fundamental concepts of 5G spectrum, radio access technologies, and system requirements.
2. To understand the architecture and physical layer aspects of 5G networks, including MIMO and beamforming.
3. To explore advanced 5G radio-access technologies and their role in multi-user communication.
4. To study network slicing, SDN, NFV, and their applications in vehicular communications.
5. To analyze mobility management, interference control, and dynamic network reconfiguration in 5G.

Course Outcomes:

After completing the course, the student will be able to,

1. Understand the 5G radio spectrum and channel models, including spectrum sharing and propagation challenges.
2. Analyze the 5G network architecture, including the core network, RAN, and physical layer procedures.
3. Evaluate different 5G radio-access technologies, including new waveforms and non-orthogonal multiple access schemes.
4. Apply network slicing concepts and vehicular communication techniques for efficient 5G network deployment.
5. Develop strategies for mobility and handoff management to optimize network performance and minimize interference.

UNIT I

5G Radio Spectrum: 5G spectrum landscape and requirements, Spectrum access modes and sharing scenarios, 5G spectrum technologies.

5G Channel Model: The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling.

5G Use Cases and System Concept: Use cases and requirements, 5G system concept.

UNIT II

Radio Interface Architecture: 5G architecture options, core network architecture, RAN architecture. 5G PHYSICAL LAYER: Physical channels and signals, 5G frame structure, physical layer procedures (MIMO, Power control, link adaptation, beam forming).

UNIT III

5G Radio-Access Technologies: Access design principles for multi-user communications, multi-carrier with filtering: a new waveform, non-orthogonal schemes for efficient multiple access

UNIT IV

Introduction to 5G Network Slicing: Network Slicing, E2E Slicing, SDN and NFV Slicing

Vehicular Communications: From V2V to AV2X, key standards, VC architectures, V2X Use cases

UNIT V

Mobility and Handoff Management in 5G: Network deployment types, Interference management in 5G, Mobility management in 5G, Dynamic network reconfiguration in 5G.

Textbooks:

1. Afif Osseiran, Jose F Monserrat, Patrick Marsch, “5G Mobile and Wireless Communications Technology”, Cambridge University Press, 2016
2. Saad Z. Asif, “5G Mobile Communications Concepts and Technologies”, CRC Press, Taylor & Francis Group, First Edition, 2018
3. Harri Holma, Antti Toskala, Takehiro Nakamura, “5G Technology 3GPP NEW RADIO”, John Wiley & Sons First Edition, 2020

References:

1. Gordon L. Stuber, “Principles of Mobile Communication”, KLUWER ACADEMIC PUBLISHERS, 2nd Edition, 2002
2. Joseph C. Liberti, Theodore S. Rappaport, “Smart Antennas for Wireless Communications”, Prentice Hall PTR, 1999
3. Ying Zhang, “Network Function Virtualization Concepts and Applicability in 5G Networks”, John Wiley & Sons, 2018.