Course Code	Course Title	L	T	P	C
1152EC151	NEXT GENERATION MOBILE NETWORKS	3	0	0	3

a) Course Category

Program Elective

b) Preamble

This course gives a comprehensive overview of the current state of the 5G landscape, covering everything from the most likely use cases, to a wide range of technology options and potential 5G system architectures, to spectrum issues.

c) Prerequisite

Nil

d) Related Courses

Internet of Things, Software Defined Networking

e) Course Outcomes

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on Revised Bloom's Taxonomy)
CO1	Describe and explain the evolution of 5G, system concepts and spectrum challenges	K2
CO2	Illustrate and explain the 5G functional and physical architecture and its requirements Explain the architecture, Beamforming and hardware technologies for mmW communications	K2
CO3	Describe and explain the requirements and fundamental techniques for MTC and D2D Communication	K2
CO4	Compare and explain various radio access technologies for 5G networks	K2
CO5	Illustrate and explain the fundamentals, resource allocation and transceiver algorithms for Massive MIMO	K2

f) Correlation of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2														
CO3														
CO4														
CO5														

g) Course Content

UNIT I DRIVERS FOR 5G 9

Historical Trend for Wireless Communication - Mobile Communications Generations: 1G to 4G – Evolution of LTE Technology to Beyond 4G – Pillars of 5G – Standardization Activities -Use cases and Requirements – System Concept – Spectrum and Regulations: Spectrum for 4G – Spectrum Challenges in 5G – Spectrum Landscape and Requirements – Spectrum Access Modes and Sharing Scenarios

UNIT II 5G ARCHITECTURE AND MILLIMETER WAVE COMMUNICATION 9

5G Architecture: Software Defined Networking – Network Function Virtualization – Basics about RAN Architecture –High-Level Requirements for 5G Architecture – Functional Architecture and 5G Flexibility – Physical Architecture and 5G Deployment
Millimeter Wave Communication: Channel Propagation – Hardware Technologies for mmW Systems – Deployment Scenarios – Architecture and Mobility – Beamforming – Physical layer Techniques

UNIT III MACHINE TYPE AND D2D COMMUNICATION 9

MTC: Use cases and Categorization – MTC Requirements – Fundamental Techniques for MTC – Massive MTC – Ultra-reliable Low-latency MTC
D2D: from 4G to 5G – Radio Resource Management for Mobile Broadband D2D – Multi-hop D2D Communications for Proximity and Emergency Services – Multi-operator D2D Communication

UNIT IV 5G RADIO ACCESS TECHNOLOGIES 9

Access Design Principles for Multi-user Communications – Multi-carrier with Filtering – Non-orthogonal Schemes for Efficient Multiple Access – Radio Access for Dense Deployments – Radio Access for V2X Communication – Radio Access for Massive Machine-type Communication.

UNIT V MASSIVE MULTIPLE-INPUT MULTIPLE –OUTPUT SYSTEMS 9

MIMO in LTE – Single-user MIMO – Multi-user MIMO – Capacity of Massive MIMO – Pilot Design of Massive MIMO – Resource Allocation and Transceiver Algorithms for Massive MIMO – Fundamentals of Baseband and RF Implementation in Massive MIMO – Channel Models

Total 45 Hrs

h) Learning Resources

Reference Books

1. Asif Oseiran, Jose F.Monserrat and Patrick Marsch, “5G Mobile and Wireless Communications Technology”, Cambridge University Press, 2016.

2. Jonathan Rodriquez, “Fundamentals of 5G Mobile Networks”, Wiley, 2015

3. Patrick Marsch, Omer Bulakci, Olav Queseth and Mauro Boldi, “5G System Design – Architectural and Functional Considerations and Long Term Research”, Wiley, 2018