نام درس: شبکه های نسل نوین (NGN)

کد درس: ۹۴۳۵۵۱۱

تعداد واحد: ۳ (نظری)

نوع درس: تخصصی

مقطع درس: دکتری تخصصی (Ph.D.)

پیش‌نیاز: سیستم های مخابرات بی سیم

هم‌نیاز: ---

مراجع:

1. W. Jiang, F. Luo, “6G Key Technologies: A Comprehensive Guide,” Wiley IEEE Press, 2023.
2. Ö. T. Demir, E. Björnson, and L. Sanguinetti, “Foundations of User-Centric Cell-Free Massive MIMO,” Now Foundations and Trends, 2021.

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اهداف درس:

مطالعه و تحقیق در مورد سیستم های نسل جدید مخابراتی، اهداف و ملزومات آن

طرح درس:

	مباحث
هفته اول	**Standards History of Cellular Systems Toward 6G** 0G: Pre-Cellular Systems 1G: The Birth of Cellular Network 2G: From Analog to Digital 3G: From Voice to Data-Centric 4G: Mobile Internet 5G: From Human to Machine
هفته دوم	**Pre-6G Technology and System Evolution** 1G Key Technologies such as Frequency Reuse, Cell Splitting, Sectorization, Handover, Frequency-Division Multiple Access 2G Key Technologies such as Time-Division Multiple Access, Frequency Hopping, Speech Compression, Channel Coding, Digital Modulation
هفته سوم	3G Key Technologies such as Code-Division Multiple Access, Rake Receiver, Turbo Codes 4G Key Technologies such as Orthogonal Frequency-Division Multiplexing, Carrier Aggregation, Relaying, Device-to-Device Communications
هفته چهارم	5G Key Technologies such as Massive MIMO, Millimeter Wave, Non-Orthogonal Multiple Access Introducing 6G Key Technologies such as Millimeter Wave and Terahertz Communications, Optical Wireless Communications, Cellular and Cell-Free Massive MIMO, Intelligent Reflecting Surfaces, Next-Generation Multiple Access, Open Radio Access Network

Radio Frequency Propagation Radio Frequency Waves Free-Space Propagation Cellular Propagation Mechanisms: Reflection, Diffraction, Scattering, … Prediction of Received Signal Strength Distance-Based Path Loss Large-Scale Fading Small-Scale Fading	**هفته پنجم**
Cell-Free Networks Historical Background Three Benefits over Cellular Networks	**هفته ششم**
Definition of Cell-Free Massive MIMO User-Centric Dynamic Cooperation Clustering System Models for Uplink and Downlink Network Scalability	**هفته هفتم**
Channel Modeling Channel Hardening and Favorable Propagation	**هفته هشتم**
Estimation Theory for Gaussian Variables Capacity Bounds and Spectral Efficiency	**هفته نهم**
Maximization of Rayleigh Quotients Optimization Algorithms for Utility Maximization	**هفته دهم**
Channel Estimation Uplink Pilot Transmission MMSE Channel Estimation	**هفته یازدهم**
Impact of Architecture, Contamination, & Spatial Correlation Pilot Assignment and Dynamic Cooperation Cluster Formation	**هفته دوازدهم**
Uplink Operation Centralized Uplink Operation Distributed Uplink Operation Running Example Numerical Performance Evaluation	**هفته سیزدهم**
Downlink Operation Centralized Downlink Operation Distributed Downlink Operation Numerical Performance Evaluation	**هفته چهاردم**
Spatial Resource Allocation Transmit Power Optimization	**هفته پانزدهم**
Scalable Distributed Power Optimization Comparison of Power Optimization Schemes	**هفته شانزدهم**

ارزیابی:

پروژه: ۷ نمره

آزمون پایان‌ترم: ۱۳ نمره