

B.E E&C EIGHTH SEMESTER SYLLABUS

Wireless Cellular and LTE 4G Broadband

B.E., VIII Semester, Electronics & Communication Engineering/ Telecommunication Engineering

[As per Choice Based Credit System (CBCS) scheme]

Subject Code	15EC81	IA Marks	20
Number of Lecture	04	Exam Marks	80
Total Number	50 (10 Hours / Module)	Exam Hours	03
CREDITS – 04			
Course Objectives: This course will enable students to: <ul style="list-style-type: none"> • Understand the basics of LTE standardization phases and specifications. • Explain the system architecture of LTE and E-UTRAN, the layer of LTE, based on the use of OFDMA and SC-FDMA principles. • Analyze the role of LTE radio interface protocols to set up, reconfigure and release the Radio Bearer, for transferring the EPS bearer. • Analyze the main factors affecting LTE performance including mobile speed and transmission bandwidth. 			
Module – 1			RBT Level
Key Enablers for LTE features: OFDM, Single carrier FDMA, Single carrier FDE, Channel Dependent Multiuser Resource Scheduling, Multi antenna Techniques, IP based Flat network Architecture, LTE Network Architecture. (Sec 1.4- 1.5 of Text).			L1, L2
Wireless Fundamentals: Cellular concept, Broadband wireless channel (BWC), Fading in BWC, Modeling BWC – Empirical and Statistical models, Mitigation of Narrow band and Broadband Fading (Sec 2.2 – 2.7 of Text).			
Module – 2			
Multicarrier Modulation: OFDM basics, OFDM in LTE, Timing and Frequency Synchronization, PAR, SC-FDE (Sec 3.2 – 3.6 of Text).			L1, L2
OFDMA and SC-FDMA: OFDM with FDMA, TDMA, CDMA, OFDMA, SC-FDMA, OFDMA and SC-FDMA in LTE (Sec 4.1 – 4.3, 4.5 of Text).			
Multiple Antenna Transmission and Reception: Spatial Diversity overview, Receive Diversity, Transmit Diversity, Interference cancellation and signal enhancement, Spatial Multiplexing, Choice between Diversity, Interference suppression and Spatial Multiplexing (Sec 5.1 – 5.6 of Text).			
Module – 3			
Overview and Channel Structure of LTE: Introduction to LTE, Channel Structure of LTE, Downlink OFDMA Radio Resource, Uplink			L1, L2

SC-FDMA Radio Resource(Sec 6.1 – 6.4 of Text).	
Downlink Transport Channel Processing: Overview, Downlink shared channels, Downlink Control Channels, Broadcast channels, Multicast channels, Downlink physical channels, H-ARQ on Downlink(Sec 7.1 – 7.7 of Text).	
Module – 4	
Uplink Channel Transport Processing: Overview, Uplink shared channels, Uplink Control Information, Uplink Reference signals, Random Access Channels, H-ARQ on uplink (Sec 8.1 – 8.6 of Text).	L1, L2
Physical Layer Procedures: Hybrid – ARQ procedures, Channel Quality Indicator CQI feedback, Precoder for closed loop MIMO Operations, Uplink channel sounding, Buffer status Reporting in uplink, Scheduling and Resource Allocation, Cell Search, Random Access Procedures, Power Control in uplink(Sec 9.1- 9.6, 9.8, 9.9, 9.10 Text).	
Module – 5	
Radio Resource Management and Mobility Management: PDCP overview, MAC/RLC overview, RRC overview, Mobility Management, Inter-cell Interference Coordination(Sec 10.1 – 10.5 of Text).	L1, L2
Course Outcomes: At the end of the course, students will be able to: <ul style="list-style-type: none"> Understand the system architecture and the functional standard specified in LTE 4G. Analyze the role of LTE radio interface protocols and EPS Data convergence protocols to set up, reconfigure and release data and voice from users. Demonstrate the UTRAN and EPS handling processes from set up to release including mobility management for a variety of data call scenarios. Test and Evaluate the Performance of resource management and packet data processing and transport algorithms. 	
Question Paper pattern: <ul style="list-style-type: none"> The Question paper will have ten questions. Each full Question consisting of 16 marks There will be 2 full Questions (with a maximum of Three sub questions) from each module. Each full question will have sub questions covering all the topics under a module. The Students will have to answer 5 full Questions, selecting one full Question from each module. 	
Text Book:	
Arunabha Ghosh, Jan Zhang, Jefferey Andrews, Riaz Mohammed, 'Fundamentals of LTE', Prentice Hall, Communications Engg. and Emerging Technologies.	

Reference Books:

1. LTE for UMTS Evolution to LTE-Advanced' Harri Holma and Antti Toskala, Second Edition - 2011, John Wiley & Sons, Ltd. Print ISBN: 9780470660003.
2. 'EVOLVED PACKET SYSTEM (EPS) ; THE LTE AND SAE EVOLUTION OF 3G UMTS' by Pierre Lescuyer and Thierry Lucidarme, 2008, John Wiley & Sons, Ltd. Print ISBN:978-0-470-05976-0.
3. 'LTE – The UMTS Long Term Evolution ; From Theory to Practice' by Stefania Sesia, Issam Toufik, and Matthew Baker, 2009 John Wiley & Sons Ltd, ISBN 978-0-470-69716-0.

FIBER OPTICS and NETWORKS
B.E., VIII Semester, Electronics & Communication Engineering
 [As per Choice Based Credit System (CBCS)]

Subject Code	15EC82	IA Marks	20
Number of Lecture Hours/Week	4	Exam Marks	80
Total Number of Lecture Hours	50(10 Hours / Module)	Exam Hours	03
CREDITS – 04			
Course Objectives: This course will enable students to: <ul style="list-style-type: none"> • Learn the basic principle of optical fiber communication with different modes of light propagation. • Understand the transmission characteristics and losses in optical fiber. • Study of optical components and its applications in optical communication networks. • Learn the network standards in optical fiber and understand the network architectures along with its functionalities. 			
Module -1			RBT Level
Optical fiber Communications: Historical development, The general system, Advantages of optical fiber communication, Optical fiber waveguides: Ray theory transmission, Modes in planar guide, Phase and group velocity, Cylindrical fiber: Modes, Step index fibers, Graded index fibers, Single mode fibers, Cutoff wavelength, Mode field diameter, effective refractive index. Fiber Materials, Photonic crystal fibers. (Text 2)			L1, L2
Module -2			
Transmission characteristics of optical fiber: Attenuation, Material absorption losses, Linear scattering losses, Nonlinear scattering losses, Fiber bend loss, Dispersion, Chromatic dispersion, Intermodal dispersion: Multimode step index fiber.			L1, L2
Optical Fiber Connectors: Fiber alignment and joint loss, Fiber splices, Fiber connectors, Fiber couplers. (Text 2)			
Module -3			
Optical sources: Energy Bands, Direct and Indirect Bandgaps, Light Emitting diodes: LED Structures, Light Source Materials, Quantum Efficiency and LED Power, Modulation. Laser Diodes: Modes and Threshold conditions, Rate equation, External Quantum Efficiency, Resonant frequencies, Laser Diode structures and Radiation Patterns: Single mode lasers.			L1, L2
Photodetectors: Physical principles of Photodiodes, Photodetector noise, Detector response time.			
Optical Receiver: Optical Receiver Operation: Error sources,			

Front End Amplifiers, Receiver sensitivity, Quantum Limit. (Text 1)	
Module -4	
WDM Concepts and Components: Overview of WDM: Operational Principles of WDM, WDM standards, Mach-Zehnder Interferometer Multiplexers, Isolators and Circulators, Fiber grating filters, Dielectric Thin-Film Filters, Diffraction Gratings, Active Optical Components, Tunable light sources, Optical amplifiers: Basic application and Types, Semiconductor optical amplifiers, Erbium Doped Fiber Amplifiers, Raman Amplifiers, Wideband Optical Amplifiers. (Text 1)	L1, L2
Module -5	
Optical Networks: Optical network evolution and concepts: Optical networking terminology, Optical network node and switching elements, Wavelength division multiplexed networks, Public telecommunication network overview. Optical network transmission modes, layers and protocols: Synchronous networks, Asynchronous transfer mode, OSI reference model, Optical transport network, Internet protocol, Wavelength routing networks: Routing and wavelength assignment, Optical switching networks: Optical circuit switched networks, packet switched networks, Multiprotocol Label Switching, Optical burst switching networks, Optical network deployment: Long-haul networks, Metropolitan area networks, Access networks, Local area networks. (Text 2)	L1, L2
Course Outcomes: At the end of the course, students will be able to: <ol style="list-style-type: none"> 1. Classification and working of optical fiber with different modes of signal propagation. 2. Describe the transmission characteristics and losses in optical fiber communication. 3. Describe the construction and working principle of optical connectors, multiplexers and amplifiers. 4. Describe the constructional features and the characteristics of optical sources and detectors. 5. Illustrate the networking aspects of optical fiber and describe various standards associated with it. 	
Question Paper pattern: <ul style="list-style-type: none"> • The Question paper will have ten questions. • Each full Question consisting of 16 marks • There will be 2 full Questions (with a maximum of Three sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The Students will have to answer 5 full Questions, selecting one full Question from each module. 	
Text Books: <ol style="list-style-type: none"> 1. Gerd Keiser , Optical Fiber Communication, 5th Edition, McGraw Hill 	

<p>Education(India) Private Limited, 2015. ISBN:1-25-900687-5.</p> <p>2. John M Senior, Optical Fiber Communications, Principles and Practice, 3rd Edition, Pearson Education, 2010, ISBN:978-81-317-3266-3</p>
<p>Reference Book:</p> <p>Joseph C Palais, Fiber Optic Communication , Pearson Education, 2005, ISBN:0130085103</p>

NETWORK AND CYBER SECURITY
B.E., VIII Semester, Electronics & Communication Engineering
 [As per Choice Based credit System (CBCS) Scheme]

Subject Code	15EC835	IA Marks	20
Number of Lecture Hours/Week	03	Exam marks	80
Total Number of Lecture Hours	40 (8 Hours per Module)	Exam Hours	03
CREDITS – 03			
Course Objectives: This course will enable students to: <ul style="list-style-type: none"> • Know about security concerns in Email and Internet Protocol. • Understand cyber security concepts. • List the problems that can arise in cyber security. • Discuss the various cyber security frame work. 			
Module-1			RBT Level
Transport Level Security: Web Security Considerations, Secure Sockets Layer, Transport Layer Security, HTTPS, Secure Shell (SSH) (Text 1: Chapter 15)			L1, L2
Module-2			
E-mail Security: Pretty Good Privacy, S/MIME, Domain keys identified mail (Text 1: Chapter 17)			L1, L2
Module-3			
IP Security: IP Security Overview, IP Security Policy, Encapsulation Security Payload (ESP), Combining security Associations Internet Key Exchange. Cryptographic Suites(Text 1: Chapter 18)			L1, L2
Module-4			
Cyber network security concepts: Security Architecture, antipattern: signature based malware detection versus polymorphic threads, document driven certification and accreditation, policy driven security certifications. Refactored solution: reputational, behavioural and entropy based malware detection. The problems: cyber antipatterns concept, forces in cyber antipatterns, cyber anti pattern templates, cyber security antipattern catalog (Text-2: Chapter1 & 2)			L1, L2, L3
Module-5			
Cyber network security concepts contd. : Enterprise security using Zachman framework Zachman framework for enterprise architecture, primitive models versus composite models, architectural problem solving patterns, enterprise workshop, matrix mining, mini patterns for problem solving meetings. Case study: cyber security hands on – managing administrations			L1, L2, L3

and root accounts, installing hardware, reimaging OS, installing system protection/ antimalware, configuring firewalls (Text-2: Chapter 3 & 4).	
Course Outcomes: After studying this course, students will be able to: <ul style="list-style-type: none"> • Explain network security protocols • Understand the basic concepts of cyber security • Discuss the cyber security problems • Explain Enterprise Security Framework • Apply concept of cyber security framework in computer system administration 	
Question paper pattern: <ul style="list-style-type: none"> • The question paper will have 10 full questions carrying equal marks. • Each full question consists of 16 marks with a maximum of Three sub questions. • There will be 2 full questions from each module covering all the topics of the module • The students will have to answer 5 full questions, selecting one full question from each module. 	
Text Books: <ol style="list-style-type: none"> 1. William Stallings, “Cryptography and Network Security Principles and Practice”, Pearson Education Inc., 6th Edition, 2014, ISBN: 978-93-325-1877-3. 2. Thomas J. Mowbray, “Cyber Security – Managing Systems, Conducting Testing, and Investigating Intrusions”, Wiley. 	
Reference Books: <ol style="list-style-type: none"> 1. Cryptography and Network Security, Behrouz A. Forouzan, TMH, 2007. 2. Cryptography and Network Security, Atul Kahate, TMH, 2003. 	