Course Code	18ECE220T	Course Name	Advanced Mobile Communication Systems	Course Category	E	Professional Elective	L	T	P	C
							3	0	0	3

Pre-requisite Courses	18ECC301T	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Electronics and Communication Engineering	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Gain knowledge about the latest Standards from 3G to 5G systems.
CLR-2 :	Introduce the concepts of OFDM systems and standards.
CLR-3 :	Study the basics of MIMO system and the impact of different channel models on it.
CLR-4 :	Understand the techniques of cognitive radio spectrum sensing and sharing
CLR-5 :	Study the techniques of Millimeter wave communication
CLR-6 :	Apply the knowledge gained to various Advanced Mobile Communication Systems

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning 1 (Level of Thinking (Bloom))	Learning 2 (Expected Proficiency (%))	Learning 3 (Expected Attainment (%))
CLO-1 :	Apply the architecture and functionalities of 3G and 4G systems	2,3	85	80
CLO-2 :	Understand the concepts of OFDM and it issues	2,3	80	85
CLO-3 :	Understand the MIMO communication systems	2,3	85	80
CLO-4 :	Understand the principle of Cognitive Radio Techniques	2,3	80	75
CLO-5 :	Acquire the concept of millimeter wave communication	2,3	85	80
CLO-6 :	Able to analyze the Advance Mobile communication systems			

	Program Learning Outcomes (PLO)														
	1 Engineering Knowledge	2 Problem Analysis	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment & Sustainability	8 Ethics	9 Individual & Team Work	10 Communication	11 Project Mgt. & Finance	12 Life Long Learning	13 PSO-1: Professional Achievement	14 PSO – 2: Project Management Techniques	15 PSO – 3: Analyze & Research
CLO-1 :	H	-	M	M	-	-	-	-	-	-	-	-	H	-	M
CLO-2 :	M	-	H	M	-	-	-	-	-	-	-	-	M	-	H
CLO-3 :	H	-	M	H	-	-	-	-	-	-	-	-	M	-	H
CLO-4 :	M	-	-	M	-	-	-	-	-	-	-	-	M	-	H
CLO-5 :	M	-	M	H	-	-	-	-	-	-	-	-	M	-	H
CLO-6 :													M		H

Duration (hour)		Advanced cellular mobile communication systems	Multicarrier modulation technique-OFDM	MIMO systems	Cognitive Spectrum management	Millimeter wave communication
		9	9	9	9	9
S-1	SLO-1	Overview of the legacy 3GPP cellular systems	Introduction to OFDM	Introduction to MIMO	Cognitive transceiver Introduction	Millimeter Wave Characteristics
	SLO-2	Overview of the legacy 3GPP cellular systems	Multicarrier Modulation Introduction	Introduction to MIMO Channel Capacity	Cognitive transceiver architecture	Introduction to Channel Performance at Mm wave communication
S-2	SLO-1	WiMAX systems: Introduction	Multicarrier Modulation	MIMO Channel Estimation	Interweaving	Channel Performance at Mm wave communication
	SLO-2	WiMAX systems: Architecture	Cyclic Prefix	MIMO Channel Estimation	Principle of interweaving	Modulation for Millimeter Wave communication
S-3	SLO-1	WiMAX systems: Architecture	Channel model	MIMO Spatial Multiplexing	Principle of interweaving	Modulation for Millimeter Wave communication
	SLO-2	WiMAX systems : Frame structure	SNR	MIMO Spatial Multiplexing	Introduction to Spectrums	Millimeter wave transmitter
S-4	SLO-1	WiMAX systems : Frame structure	SNR Performance	V- BLAST 2	Types of Spectrum	Millimeter wave Receiver
	SLO-2	WiMAX systems : Applications	SNR Problems	V- BLAST 2	Spectrum sensing	Millimeter wave Antenna
S 5-6	SLO-1	LTE systems: Introduction	OFDM Introduction	MIMO Diversity	Advantages of Spectrum sensing	Introduction Mm wave Communications
	SLO-2					
S-7	SLO-1	LTE systems: Architecture	OFDM Issues	MIMO Diversity	Disadvantages of Spectrum sensing	Emerging applications of Mm wave Communications
	SLO-2	LTE systems: Architecture	OFDM Issues	Alamouti	Disadvantages of Spectrum sensing	Emerging applications of Mm wave Communications
S-8	SLO-1	LTE systems: Frame structure	PAPR	Alamouti	Spectrum Management	Millimeter Wave Standards.
	SLO-2	LTE systems: Frame structure	Frequency and timing	OSTBC	Spectrum Management	Introduction to Millimeter Wave Standards.
S-9	SLO-1	LTE systems: applications	Frequency offset issues.	MIMO :OFDM system Introduction	Spectrum Management	Development of Millimeter Wave Standards.
	SLO-2	LTE systems: applications	Timing offset issues.	MIMO :OFDM system	Spectrum Management	Development of Millimeter Wave Standards.

Learning Resources

1. Andrea Molisch, "Wireless Communication", Cambridge University Press, 2nd edition, 2013.
2. Theodre Rappaport, "Wireless Communication: Principle and Practice", Prentice Hall, 2nd edition, 2014.
3. Kao-Cheng Huang, Zhaocheng Wang, "Millimeter Wave Communication System", Wiley-IEEE Press, 2nd edition, 2011.
4. EzioBigleri, "MIMO Wireless Communications", Cambridge University Press, 1st edition, 2007.
5. Arslan, Hüseyin, ed. *Cognitive radio, software defined radio, and adaptive wireless systems*. Springer Science & Business Media, 2007.(263-284)
6. Thomas W.Rondeau, Charles W. Bostain, "Artificial Intelligence in Wireless communication", ARTECH HOUSE .2009 {pp1-51]
7. Andrew Goldsmith, Wireless Communications, Cambridge University Press, 2005.
8. Mischa Dohler, Jose F. Monserrat Afif Osseiran " 5G Mobile and Wireless Communication Technology", Cambridge University Press 2016.

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage) CLA – 1 (10%) Theory	CLA – 1 (10%) Practice	CLA – 2 (15%) Theory	CLA – 2 (15%) Practice	CLA – 3 (15%) Theory	CLA – 3 (15%) Practice	CLA – 4 (10%)# Theory	CLA – 4 (10%)# Practice	Final Examination (50% weightage) Theory	Final Examination (50% weightage) Practice
Level 1	Remember / Understand	40 %	-	30 %	-	30 %	-	30 %	-	30%	-
Level 2	Apply / Analyze	40 %	-	40 %	-	40 %	-	40 %	-	40%	-
Level 3	Evaluate / Create	20 %	-	30 %	-	30 %	-	30 %	-	30%	-
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
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Commencement of Classes- ODD Semester 13.07.2021

Commencement of Classes- ODD Semester 13.07.2021

Assignment – I 28.07.2021

Commencement of Internal Assessment - I 11.08.2021

Assignment – II 03.09.2021

Commencement of Internal Assessment - II 27.09.2021

Commencement of Internal Assessment – III 08.11.2021

Last Working Day 24.11.2021

Commencement of University Theory Examinations (Tentative) 29.11.2021