



DEPARTMENT OF ELECTRONICS AND COMMUNICATION  
ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	M.Tech		
Course Title	NEXT GENERATION WLAN		
Course Code	EC634	No. of Credits	3
Course Code of Pre-requisite subject(s)	EC613 HIGH SPEED COMMUNICATION NETWORKS		
Session	JAN2021	Section (if, applicable)	
Name of Faculty	Dr. B. Malarkodi	Department	ECE
Official Email	malark@nitt.edu	Telephone No.	04312503308
Name of Course Coordinator(s) (if, applicable)			
Official E-mail		Telephone No.	
Course Type (please tick appropriately)	Elective		
<b>Syllabus (approved in BoS)</b>			
<p>WLAN Introduction and Basics - 802.11 protocol stack basics, RF spectrum of operations, unlicensed band usage, Types of networks and their usage, Role of Wi-Fi alliance. Exercises: Survey of WLAN products in consumer appliances like laptops, phones, tablets, and other devices, their type; Visit WFA webpage to get a list of WLAN certified products and the various certification programs listed.</p>			
<p>WLAN Physical Layer - Indoor multipath channel conditions and models, Delay spread and ISI impacts on high data rate transmission, Evolution of the WLAN PHY. Layer, OFDM design and parameters for WLAN, MIMO usage in WLAN, Exercises: Matlab Simulation of channel models and studying their characteristics, 802.11 waveform generation using Matlab and checking spectrum and evm effects due to frequency offset</p>			
<p>WLAN MAC Layer - CSMA/CA principles used for WLAN MAC, Details of MAC protocol, Medium reservation and hidden nodes, MAC Frame Aggregation and QoS in WLAN, Roaming. Exercises: Calculate duration of a frame transmission based on size, rate, and the MAC protocol IFS'. Calculate NAV values in RTS/CTS frames MAC throughput calculation with and without aggregation.</p>			



WLAN Network Operations - Network Entry Process in WLAN, Security Evolution, Power save concepts, Throughput and performance of WLAN. **Exercises:** Traces with experimental setup explained can be given to students with opensource tool like wireshark. All the network operations can be converted to suitable exercises in the hands on analysis section.

WLAN Protocol Analysis - Sniffing WLAN Frames and analysis using open source tools, Inferring capabilities of APs and clients, Analysing network entry steps and debugging connection problems, Analysing Data transmission and debugging performance issues, Analysis of Roaming performance.

**Text Books**

1. Eldad Perahia and Robert Stacey, *Next Generation wireless LANS 802.11n and 802.11ac*, 2nd edition, Cambridge University Press, 2013
2. Mathew Gast, *802.11 Wireless Networks: The Definitive Guide, 2nd Edition*, OReily, 2009

**Reference Books**

1. Mathew Gast, *802.11n: A Survival Guide: Wi-Fi Above 100 Mbps*, OReilly, 2012
2. Mathew Gast, *802.11ac: A Survival Guide: Wi-Fi at Gigabit and Beyond*, OReilly, 2012

**COURSE OBJECTIVES**

To expose students to wireless local area network standards, technologies, and operations with real-life traces to correlate with the concepts

**COURSE OVERVIEW**

The aim of the course is to introduce WLAN standards and to analyse the network operations and protocols

**MAPPING OF COs with POs**

Course Outcomes	Programme Outcomes (PO) (Enter Numbers only)
CO1: To understand basics of WLAN systems including standardizing bodies, unlicensed spectrum ranges, network types	1
CO2: Appreciate physical layer challenges and solutions in 802.11 standards and be able to simulate channel conditions	4
CO3: : Be able to explain MAC layer steps in WLAN along with the motivation and impacts on throughput and coexistence	5
CO4: Trace the steps followed in a typical WLAN network with a clear understanding of security, power save, and network entry procedures	9,10,11



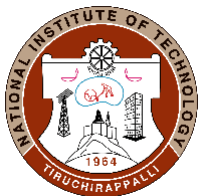
CO5: Analyze real-life protocol traces under various conditions and correlate with the concepts learnt in the earlier sections.

9,10,11

COURSE TEACHING AND LEARNING ACTIVITIES			
			( Add more rows)
S.No.	Week/Contact Hours	Topic	Mode of Delivery (ms team-online mode)
1	1 <sup>st</sup>	WLAN Introduction and Basics - 802.11 protocol stack basics	PPT
2	2 <sup>nd</sup>	RF spectrum of operations, unlicensed band usage, Types of networks and their usage	PPT
3	3 <sup>rd</sup>	Role of Wi-Fi alliance. Survey of WLAN products in consumer appliances, list of WLAN certified products and the various certification programs	PPT
4	4,5	WLAN Physical Layer - Indoor multipath channel conditions and models, Delay spread and ISI impacts on high data rate transmission,	PPT
5	6	, Evolution of the WLAN PHY. Layer, OFDM design and parameters for WLAN, MIMO usage in WLAN,	PPT



6	7,8	Matlab Simulation of channel models and studying their characteristics, 802.11 waveform generation using Matlab and checking spectrum and evm effects due to frequency offset	PPT
7	9	WLAN MAC Layer - CSMA/CA principles used for WLAN MAC, Details of MAC protocol, Medium reservation and hidden nodes	PPT
8	10,11	MAC Frame Aggregation and QoS in WLAN, Roaming. <b>Exercises:</b> Calculation of 'duration of a frame transmission based on size, rate, and the MAC protocol IFS'. Calculation of NAV values in RTS/CTS frames, MAC throughput calculation with and without aggregation	PPT
9	12,13	WLAN Network Operations - Network Entry Process in WLAN, Security Evolution, Power save concepts, Throughput and performance of WLAN calculation using open source tool wireshark.	PPT
10	14,15,16	WLAN Protocol Analysis - Sniffing WLAN Frames and analysis using open source tools, Inferring capabilities of APs and clients, Analysing network entry steps and debugging connection problems, Analysing Data transmission and debugging performance issues, Analysis of Roaming performance	PPT



<b>COURSE ASSESSMENT METHODS</b> (shall range from 4 to 6)				
S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	<b>ASSESSMENT I</b> Descriptive Type Examination (2 Units )		90 minutes	30
2	<b>ASSESSMENT II</b> Descriptive Type Examination (2 Units )		90 minutes	30
CPA	Compensation Assessment*		90 minutes	
3	SEMINAR/ASSIGNMENT			10
4	Final Assessment *		120 minutes	30
<b>*mandatory; refer to guidelines on page 4</b>				
<b>COURSE EXIT SURVEY</b> (mention the ways in which the feedback about the course shall be assessed)				
1. Direct feedback from the students by having face-to-face meeting individually and as the class as a whole. 2. Feedback from the students during the class committee meetings				
<b>COURSE POLICY</b> (including compensation assessment to be specified)				
<b><u>COMPENSATION ASSESSMENT</u></b>				
<ul style="list-style-type: none"> <li>➤ Attending all the assessments is MANDATORY for every student.</li> <li>➤ If any student is not able to attend either one or both of the continuous assessments I &amp; II due to genuine reason, student is permitted to attend the compensation assessment (CPA) with only 30 % weightage for both the cases.</li> <li>➤ At any case, CPA will not be considered as an improvement test.</li> </ul>				
<b><u>ATTENDANCE POLICY</u></b> (A uniform attendance policy as specified below shall be followed)				
<ul style="list-style-type: none"> <li>➤ At least 75% attendance in each course is mandatory.</li> <li>➤ A maximum of 10% shall be allowed under On Duty (OD) category.</li> <li>➤ Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.</li> </ul>				
<b><u>ACADEMIC DISHONESTY &amp; PLAGIARISM</u></b>				
<ul style="list-style-type: none"> <li>➤ Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.</li> <li>➤ Zero mark to be awarded for the offenders. For copying from another student, both</li> </ul>				



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students get the same penalty of zero mark.

- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programmes.

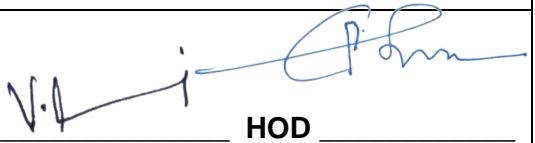
### ADDITIONAL INFORMATION, IF ANY

Students may fix appointments for detailed discussion by sending email to [malark@nitt.edu](mailto:malark@nitt.edu) two days prior to the desired appointments date with the topic to discuss. The students must come prepared for the discussion with background preparation  
Minor doubts will be clarified after the contact hours without any prior appointment.

### FOR APPROVAL

  
Course Faculty B.Malarkodi

CC- Chairperson

  
HOD



**Guidelines**

- a) The number of assessments for any theory course shall range from 4 to 6.
- b) Every theory course shall have a final assessment on the entire syllabus with at least 30% weightage.
- c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.
- d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or (Class average/2) whichever is greater.		(Peak/3) or (Class Average/2) whichever is lower		40%

- e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.
- f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.
- g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.