

GUJARAT TECHNOLOGICAL UNIVERSITY

ELECTRONICS & COMMUNICATION (EMBEDDED SYSTEM) (54)

EMBEDDED WIRELESS TECHNOLOGIES

SUBJECT CODE: 2735404

M.E. SEM-III

Type of course: Embedded Wireless Communication

Prerequisite: Fundamental knowledge of Wireless Communication and Digital Communication.

Rationale: This Subject Provide the students an exposure to understand wireless communication technology and learn how to implement it on embedded platform. It also helps the students to develop their own project or carried our dissertation work on embedded wireless application. This subject provides the opportunity to the student to understand real environment problem in wireless communication and motivate them to bring out with the solution by practically implementing application.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	ESE (V)		PA (I)			
					ESE	OEP	PA	RP		
3	2#	2	5	70	30	20	10	10	10	150

Course Content:

Sr. No.	Course Content	Total Hrs	% Weightage
1	Basics of Wireless Communication Technologies - Radio architectures: TRF, single conversion and dual conversion, IQ Modulation - AM, FM, SSB, TDMA, FDMA , CDMA, OFDM, BPSK , QPSK; PLL – phase locked loops, Wireless Standards – IS-136, IS-95, 802.11(a-g), GSM, 3G, WiMax, 4G, LTE, Ultra Wide Band, Cognitive Radio, Software Defined Radio, RFID, MIMO.	12	25
2	Embedded Systems – Hardware, Software, Internet Access; Socket Programming – Internet Architecture, UDP, TCP, client/server; Internet Application Protocols – HTTP, FTP, SNMP, Audio/Video Applications	08	20
3	Embedded systems hardware and software interfaces; Protocol Debugging & Testing Tools – PING, Sniffers, Load Generators; Development tools – SDK, simulators, debuggers; TCP/IP – architecture, socket programming and debugging	08	20
4	Wireless Technologies and Implementation - Wireless LAN : 802.11 & WiMAX, RFID & Bluetooth, GSM & GPRS, Bluetooth – architecture, protocols, implementation, and programming API; WiFi – architecture, protocols, implementation, and API; ZigBee – architecture, protocols, Real time Implementation of GSM & GPRS, TCP/IP, Bluetooth, ZigBee and WiFi modules with Microcontroller, RFID Implementation with Microcontroller.	08	20
5	Practical application of Embedded system in Wireless field.	06	15

	Health Monitoring and data Transmission by embedded unit, Event detection and Transmission in Traffic surveillances, Industrial Automation and agriculture.		
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Reference Books:

1. Embedded Systems and Wireless Technology: Theory and Practical Applications, Raul A. Santos, CRC Press
2. Embedded Systems and Wireless Technology: Theory and practical applications by Dr. Raúl Aquino santos, MSc. Arthur Edwards Block (University of Colima, Mexico)
3. Fundamentals of Mobile and Pervasive Computing by Frank Adelstein, Sandeep K.S. Gupta, Golden G. Richard III, and Loren Schwiebert, Publisher: McGraw-Hill Education, 2005, ISBN-10:0071412379, ISBN-13: 978-0071412377.
4. Context-Aware Pervasive Systems: Architectures for a New Breed of Applications by Seng Loke, Publisher: AUERBACH, 1st edition (December 7, 2006), ISBN-10: 0849372550, ISBN-13: 978-0849372551
5. Cooperating Embedded Systems and Wireless Sensor Networks by Michel Banatre (Editor), Pedro Jose Marron (Editor), AnibalOllero (Editor), Adam Wolisz (Editor)

Course Outcome:

1. Students will get practical exposure about wireless communication and its application in real word by using Embedded Platform.
2. Students would be acquainted with the New advancement in wireless communication field like RFID, MIMO, Zeegee and find their relevant application in their work.
3. Students can acquainted about industrial application and understand the industrial problem.
4. This subject helps the students to come up with new innovative ideas which led them towards long/short term research activity.

List of Experiments:

EXP. NAME OF THE EXPERIMENT
NO.

1. To Study Various Multiple Access methods like FDMA, TDMA and CDMA on kit/software tools.
2. To Simulate MIMO using simulation tolls (MATLAB)
3. To study OFDM and simulate it by using Simulation Tool(MATLAB)
4. To Study Various Network Commands.
5. To develop an application in embedded for object tracking using GPS
6. To Study various AT Commands using Kit.
7. To develop a small application using for data transmission using Zig-Bee.
8. To Develop application to operate remote device by sending SMS from remote place.
9. To develop an application on embedded platform to sense data locally and send it at remotely.
10. To develop a health monitoring application on embedded platform.

Design based Problems (DP)/Open Ended Problem:

1. Develop an application for Traffic Surveillances on embedded platform.
2. Develop an application for Automation in agriculture on embedded platform.
3. Develop an Industrial automation application.
4. Develop an health monitoring application using Embedded system
5. Develop an Automatic Toll collecting Application using RFID.

Major Equipments:

- i. Personal Computer.
- ii. Oscilloscope
- iii. Wireless Communication Kits.
- iv. Embedded Kits

C. List of Software:

Linux Platform

Learning website:

www.nptel.ac.in

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.