

GUJARAT TECHNOLOGICAL UNIVERSITY

WIRELESS SENSOR NETWORKS

SUBJECT CODE: 3710511

M.E. 1st SEMESTER

Type of course: Programme Elective-I

Prerequisite: Wireless Communication, Data Communication and Networking

Rationale: Now a day, wireless sensor networks are used in many applications like habitat monitoring or in areas where human interventions is hazardous. Wireless sensor network is an emerging area which utilizes network of sensor nodes which are tiny in size and battery operated. They required to be used very power efficiently so that network lifetime is optimized and provide reliable communication to the base station. By learning this subject the students will appreciate the recent trends of wireless sensor networks, their design constraints and challenges.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE(E)	PA (M)	PA (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Unit 1: Introduction and overview of sensor network architecture and its applications, sensor network comparison with Ad Hoc Networks, Sensor node architecture with hardware and software details.	07	20
2	Unit 2: Hardware: Examples like mica2, micaZ, telosB, cricket, Imote2, tmote, btnode, and Sun SPOT, Software (Operating Systems): tinyOS, MANTIS, Contiki, and RetOS.	08	20
3	Unit 3: Programming tools: C, nesC. Performance comparison of wireless sensor networks simulation and experimental platforms like open source (ns-2) and commercial (QualNet, Opnet)	07	10
4	Unit 4: Overview of sensor network protocols (details of atleast 2 important protocol per layer): Physical, MAC and routing/ Network layer protocols, node discovery protocols, multi-hop and cluster based protocols, Fundamentals of 802.15.4, Bluetooth, BLE (Bluetooth low energy), UWB.	08	20
5	Unit 5: Data dissemination and processing; differences compared with other database management systems, data storage; query processing.	07	15
6	Unit 6: Specialized features: Energy preservation and efficiency; security challenges; fault- tolerance, Issues related to Localization, connectivity and topology, Sensor deployment mechanisms; coverage issues; sensor Web; sensor Grid, Open issues for future research, and Enabling technologies in wireless sensor network.	06	15

References:

- H. Karl and A. Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons, India, 2012.
- C. S. Raghavendra, K. M. Sivalingam, and T. Znati, Editors, “Wireless Sensor Networks”, Springer Verlag, 1st Indian reprint, 2010.
- F. Zhao and L. Guibas, “Wireless Sensor Networks: An Information Processing Approach”, Morgan Kaufmann, 1st Indian reprint, 2013.
- YingshuLi, MyT. Thai, Weili Wu, “Wireless sensor Network and Applications”, Springer series on signals and communication technology, 2008.

Course Outcomes:

At the end of this course, students will be able to

- Design wireless sensor network system for different applications under consideration.
- Understand the hardware details of different types of sensors and select right type of sensor for various applications.
- Understand radio standards and communication protocols to be used for wireless sensor network based systems and application.
- Use operating systems and programming languages for wireless sensor nodes, performance of wireless sensor networks systems and platforms.
- Handle special issues related to sensors like energy conservation and security challenges\
- Study / Implementation of
 1. Wireless test bed for lab usage monitoring
 2. A wireless sensor network for monitoring class room occupancy
 3. Wireless Sensor network for habitat monitoring
 4. Protocol Architectures for Cognitive Networks
 - Study of Mica2/MicaZ and associated interface board

List of Open Source Software/learning website:

sensors.cs.umass.edu/