

Course Code	Course Name	Teaching Scheme (Hrs/Week)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical/Oral	Tutorial	Total
BEITC8042	Wireless Sensor Networks	04	02	---	04	01	---	05

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. of 2 Tests					
BEITC8042	Wireless Sensor Networks	20	20	20	80	25	---	25	150

### Course Objectives:

1. To understand the concepts of sensor networks and study the architecture of WSN.
2. To understand applications of WSN.
3. To discuss the challenges in designing MAC and routing protocols for wireless sensor networks.
4. To study different operating systems and look at performance issues.
5. To understand WSN Standards and future trends in WSN.
5. To study Challenges of Security in Wireless Sensor Networks and Protocols and Mechanisms for Security.

### Course Outcomes:

1. Students shall be able to understand and study the functionalities, applications and architecture of WSN.
2. Students shall be able to describe the challenges in designing various protocols for wireless sensor networks.

3. Students shall be able to understand the current technology trends for the implementation and deployment of wireless sensor networks.
4. Students shall gain an understanding of WSN Standards and future trends in WSN.
5. Students shall be able to understand security aspects like Privacy issues, attacks and countermeasures.

**DETAILED SYLLABUS:**

<b>Sr. No.</b>	<b>Module</b>	<b>Detailed Content</b>	<b>Hours</b>
1.	Overview and Introduction of Wireless Sensor Network	Background of Sensor Network Technology; Types of Application; Challenges for WSNs: Characteristics requirements, Required mechanism; Basic Sensor Network Architectural Elements; Sensor Network scenarios: Types of sources and sinks, single-hop versus multi hop networks, Multiple sinks and sources, three types of mobility; Some examples of sensor nodes: Mica Mote family, EYES nodes, BT nodes.	<b>6</b>
2.	Applications of Wireless Sensor Network	Category 1(C1WSNs), Category 2(C2WSNs), Range of Applications, Examples of Category 1 WSN (C1WSNs) Applications, and Examples of Category 2 WSN(C2WSNs) Applications.	<b>4</b>
3.	MAC Protocols	Fundamentals of (wireless) MAC protocols, Requirements and design considerations for MAC Protocols in WSN, Low duty cycle protocols and wakeup concepts, STEM,S-MAC, Mediation device protocol, Wakeup radio concepts, Contention- based protocols, CSMA protocols, PAMAS, Schedule-based protocols, LEACH, SMACS, Traffic-adaptive medium access protocol(TRAMA),IEEE 802.15.4 MAC protocol, Slotted CSMA-CA protocol	<b>9</b>

4.	Network and Transport layer Protocol.	Network layer : Data Dissemination and Gathering, Routing Challenges and Design Issues, Routing Strategies: Flooding and it's variants, Power-Efficient Gathering in Sensor Information Systems, Geographical routing, Transport layer : Transport protocol Design issues, Examples of Existing Transport Control Protocols: CODA, ESRT, RMST, PSFQ, GARUDA, ATP; Performance of Transport Control Protocols :Congestion, packet loss recovery.	<b>7</b>
5.	Operating Systems , Performance and Traffic Management Issues	Operating System Design Issues, Examples of Operating Systems: TinyOS, Mate, MagnetOS, MANTIS,OSPM,EYES OS, SenOS, EMERALDS, PicOS , WSN Design Issues, Performance Modeling of WSNs	<b>7</b>
6.	WSN standards and Future trends in wireless sensor networks	Wireless sensor network standards-IEEE 802.15.4 Low rate WPAN standard, The ZIGBEE alliance etc. Future trends in wireless sensor networks: Wireless Multimedia Sensor Networks, Sensor Network Applications in Challenging Environments.	<b>6</b>
7	Security	Fundamentals of Network Security ,Challenges of Security in Wireless Sensor Networks, Security Attacks in Sensor Networks, Protocols and Mechanisms for Security, IEEE 802.15.4 and ZigBee Security	<b>9</b>

### Text Books:

1. HOLGER KARL,ANDREAS WILLIG., *“Protocols, and Architectures: For Wireless Sensor Networks”*, Wiley Student Edition
2. Kazem Sohraby, Daniel Minoli, Taieb Znati., *“Wireless Sensor Networks: Technology, Protocols, and Applications”*, Wiley Student Edition.
3. Walteneus Dargie and Christian Poellabauer., *“Fundamentals of Wireless Sensor Networks-Theory & Practice”*, John Wiley publication, 2010.
4. J. Zheng and A. Jamalipour, *“Wireless Sensor Networks : A Networking Perspective “* John Wiley publication,2009

**References:**

1. Edgar H. Callaway Jr., "*Wireless Sensor Networks - Architectures and Protocols*", AUERBACH Publications, CRC Press, 2004.
2. Feng Zhao, Leonidas Guibas, "*Wireless Sensor Networks: An Information Processing Approach*", Morgan Kaufmann Series in Networking 2004.

**Term work:** Term work shall consist of at least 06 experiments from the suggested list & 04 assignments based on the syllabus.

Distribution of marks for term work shall be as follows.

1. Attendance (Theory & Practical) :05 marks
2. Laboratory Work (Experiment & Journal):15 marks
3. Assignment : 05 marks.

The final certification and acceptance of Term work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

**Suggested Practical List :**

1. Installation of OMNET ++.
2. Installation & configuration of TinyOS.
3. Implementation of any two routing algorithms using JAVA
4. Implementation of any two programs on Tiny OS.
5. Study of any of the WSN operating systems.

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus where in sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weight age of marks should be proportional to number of hours assigned to each module.