Kadi Sarva Vishwavidyalaya

Faculty of Engineering & Technology

Fourth Year Bachelor of Engineering (Computer/IT)

(To be Proposed For: Academic Year 2020-21)

Subject Code: CT803A-N	**Subject Title: Adhoc and Sensor Networks**
Pre-requisite	

Teaching Scheme (Credits and Hours)

Teaching scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**Mid Sem Exam**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
04	00	02	06	05	03	70	30	20	30	150

Course Objective:

- Learn Ad hoc network and Sensor Network fundamentals
- Understand the different routing protocols
- Have an in-depth knowledge on sensor network architecture and design issues
- Understand the transport layer and security issues possible in Ad hoc and Sensor networks
- Have an exposure to mote programming platforms and tools

Outline of the Course:

Sr. No	**Title of the Unit**	**Minimum Hours**
1	AD HOC NETWORKS – INTRODUCTION AND ROUTING PROTOCOLS	16
2	SENSOR NETWORKS – INTRODUCTION & ARCHITECTURES	14
3	WSN NETWORKING CONCEPTS AND PROTOCOLS	12
4	SENSOR NETWORK SECURITY	11
5	SENSOR NETWORK PLATFORMS AND TOOLS	11

Total hours (Theory): 64
Total hours (Lab): 32
Total hours: 96

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Detailed Syllabus

Sr. No	Topic	Lect. Hr.	Weightage (%)
1	**AD HOC NETWORKS – INTRODUCTION AND ROUTING PROTOCOLS:** • Elements of Ad hoc Wireless Networks, Issues in Ad hoc wireless networks, Example commercial applications of Ad hoc networking, Ad hoc wireless Internet, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table Driven Routing Protocols – Destination Sequenced Distance Vector (DSDV), On–Demand Routing protocols –Ad hoc On–Demand Distance Vector Routing (AODV).	16	24
2	**SENSOR NETWORKS – INTRODUCTION & ARCHITECTURES:** • Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks, WSN application examples, Single-Node Architecture – Hardware Components, Energy Consumption of Sensor Nodes, Network Architecture – Sensor Network Scenarios, Transceiver Design Considerations, Optimization Goals and Figures of Merit.	14	22
3	**WSN NETWORKING CONCEPTS AND PROTOCOLS:** • MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts – S-MAC, The Mediation Device Protocol, Contention based protocols – PAMAS, Schedule based protocols – LEACH, IEEE 802.15.4 MAC protocol, Routing Protocols, Energy Efficient Routing, Challenges and Issues in Transport layer protocol.	12	22
4	**SENSOR NETWORK SECURITY:** • Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Layer wise attacks in wireless sensor networks, possible solutions for jamming, tampering, black hole attack, flooding attack. Key Distribution and Management, Secure Routing – SPINS, reliability requirements in sensor networks.	11	16
5	**SENSOR NETWORK PLATFORMS AND TOOLS:** • Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms – TinyOS, nesC, CONTIKIOS, Node-level Simulators – NS2 and its extension to sensor networks, COOJA, TOSSIM, Programming beyond individual nodes – State centric programming.	11	16
	Total	64	100

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Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lecture and laboratory which carries 10 marks in overall evaluation.
- One internal exam will be conducted as a part of internal theory evaluation.
- Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.

Learning Outcome:

On successful completion of this course, the student should be able to:

- Know the basics of Ad hoc networks and Wireless Sensor Networks
- Apply this knowledge to identify the suitable routing algorithm based on the network and user requirement
- Apply the knowledge to identify appropriate physical and MAC layer protocols
- Understand the transport layer and security issues possible in Ad hoc and sensor networks.
- Be familiar with the OS used in Wireless Sensor Networks and build basic modules

e-Resources:

- https://nptel.ac.in/courses/106105160/

Reference Books:

- C. Siva Ram Murthy and B. S. Manoj, “Ad Hoc Wireless Networks Architectures and Protocols”, Prentice Hall, PTR, 2004.
- Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks-Technology, Protocols, and Applications”, John Wiley, 2007.
- Carlos De Morais Cordeiro, Dharma Prakash Agrawal “Ad Hoc & Sensor Networks: Theory and Applications”, World Scientific Publishing Company, 2006.
- Holger Karl, Andreas Willig “Protocols and Architecture for Wireless Sensor Networks” John Wiley and Sons, Ltd.

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List of experiments:

Sr. No	Name of Experiment
1.	Introduction of Wireless sensor network applications and its simulation.
2.	Network Simulator installation of wireless sensor network.
3.	Write TCL script for transmission between mobile nodes.
4.	Write TCL script for sensor nodes with different parameters.
5.	Generate tcl script for udp and CBR traffic in WSN nodes.
6.	Generate tcl script for TCP and CBR traffic in WSN nodes.
7.	Implementation of routing protocol in NS2 for AODV protocol.
8.	Implementation of routing protocol in NS2 for DSR protocol.
9.	Implementation of routing protocol in NS2 for TORA protocol.
10.	Study other wireless sensor network simulators (Mannasim. Contiki.)