COURSE HANDOUT

B.Tech (CSE) – VIth Semester

Course Title : Mobile Computing Dated: 22 – 11 – 2017

Course Code : CSE 3415 Academic Year: 2017-18

Course Structure : 3 – 1 – 0 – 4

Course Coordinator : Dr. B. D. DEEBAK

Instructor(s) : Mr. Srinivasan Nagaraj

Dr. B. D. DEEBAK

Course Description:

This course will give you an understanding of mobile computer systems particularly in the context of wireless network systems such as 2G/3G/4G mobile telephony, data networks, and other wireless networks and infrastructure. The course emphasizes how to interface hardware to mobile computing devices, and programming those devices. Contents of the course include:

- Mobile environments and communications systems.
- Hardware devices and interacting with these devices.
- Mobile operating systems available.
- Programming applications on a mobile system.
- Data and knowledge management.

Scope and Objective:

The course content enables students to:

- Identify, interpret and analyze stakeholder needs.
- Identify constraints, uncertainties and risk of the system (social, cultural, legislative, environmental, business etc.)
- Identify and apply relevant problem solving methodologies
- Design components, systems and/ or processes to meet required specification
- Synthesize alternative/innovative solutions, concepts and procedures
- Apply decision-making methodologies to evaluate solutions for efficiency, effectiveness and sustainability
- Demonstrate research skills

- Apply abstraction, mathematics and/or discipline fundamentals to analysis, design and operation
- Communicate effectively in ways appropriate to the discipline, audience and purpose
- Work as an effective member or leader of diverse teams within a multi-level, multi-disciplinary and multi-cultural setting

Course outcomes

At the end of the course, the students can:

CO1. Demonstrate knowledge of different voice and data communication standards

CO2. Analyze the need for optimizations in Mobile IP

CO3. Distinguish between proactive and reactive routing in an Ad hoc network

CO4. Develop simple app using Android

CO5: Apply techniques and technologies to design and communicate a simple mobile application for smaller devices

Text Books:

1. Mobile Computing, Raj Kamal, Oxford press, Second Edition, 2014

2. Mobile Communications, Jochen Schiller, Pearson Education, Second Edition, 2000

Reference books:

1. Mobile Computing, Asoke K Talukder, Hasan Ahmed and Roopa Yavagal, McGraw Hill, 2005

2. Fundamentals of Mobile Computing, Prasant Kumar Pattnaik and Rajib Mall, PHI Learning, 2012

3. http://www.isi.edu/nsnam/ns/doc/ns_doc.pdf (NS2 manual)

4. https://www.nsnam.org/docs/manual/ns-3-manual.pdf

5. http://ns3simulation.com/ns3-manet-simulation/

6. http://wsnlab.org/using-sumos-trace-files-with-ns3-in-ubuntu-12-04/

7. https://developer.android.com/guide/platform/index.html

8. https://hacks.mozilla.org/2014/10/creating-a-mobile-app-from-a-simple-html-site/

SYLLABUS:

Unit I: **(13+3 Hrs.)**

Mobile Communications-Overview: Wireless transmission, voice and data communication standards – 1G/2G/3G/4G, WPAN, WLAN, applications, limitations, mobile computing architecture, Overview on mobile devices and systems

Wireless Medium Access Control: Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals, MACA), modulation, Spread spectrum, SDMA, FDMA, TDMA, CDMA

GSM: services, system architecture, radio interface, localization, call handling, handover, security, GPRS, EDGE

Unit II: **(11+2 Hrs.)**

Mobile Network Layer: Mobile IP, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations, Dynamic Host Configuration Protocol

Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP

Unit III: **(13+3 Hrs.)**

Mobile Ad hoc Network (MANET): Introduction, Properties, applications, limitations, routing issues, routing algorithms - proactive (DSDV & OLSR) and reactive (DSR & AODV)

Wireless Sensor Network (WSN): Introduction, architecture, applications, security in ad hoc networks

Wireless LAN: IEEE 802.11, System architecture, Protocol layers

Unit IV: **(12+3 Hrs.)**

Network Simulator: Overview on different network simulators (NS2, NS3, Qualnet, Omnet++, Netsim etc.), configuration of MANET and WSN on NS2/NS3

Mobile OS: Overview on different mobile Oss (Android OS, IOS, Windows 8, Blackberry OS etc.), Android OS architecture, app development examples

Wireless Application Protocol (WAP): Introduction, architecture

Course Plan:

No. Lect.	Learning objectives	Topic(s) To-Be Covered	Chapter in the Textbook/ Reference
	UNIT-I: Introduction to Mobile Computing		
1.	To provide an introduction to Mobile Communication and Mobile Computing	Mobile Communication: Guided and Unguided Transmission	T-1,C-1
2.	To show a mobile communication network used for long distance communication	Modulation Method and Standard for Voice-Oriented Data Communication Standards	T-1,C-1
3.	To list the feature of 2G, 3G and 4G technologies to learn the long distance wireless mobile network communication standards	1G/2G/3G/4G, WPAN, WLAN	T-1,C-1
4.	To learn the ubiquitous computing and its related entailment by means of advanced electronic and wireless technologies	Application, Limitation	T-1,C-1

5.	To outline the architectural requirements for programming in a Mobile devices	Mobile Computing Architecture	T-1,C-1
6.	To summarize the classification of Mobile devices with respect to its broad categories	Overview of Mobile Devices and System networks	T-1,C-1
7.	**Tutorial-1**		
8.	To show how a MAC scheme using CDM has to assign certain codes to allow the separation of different users in code space	Motivation for a specialized MAC	T-2,C-3
9.	To introduce the basic function of a sine wave which already indicates the three basic modulation schemes	Modulation, Spread Spectrum	T-2,C-2
10.	To learn how to allocate a separated space to users in wireless networks	SDMA, FDMA	T-2,C-3
11.		TDMA, CDMA	T-2,C-3
12.	**Tutorial-2**		
13.	To present prominent examples for second generation (2G) mobile phone networks, cordless telephones, trunked radio systems, and third generation (3G) mobile phone networks.	GSM services, system architecture	T-2,C-4
14.		Radio Interface, Localization, Call Handling	T-2,C-4
15.		Handover, Security, GPRS, EDGE	T-2,C-4
16.	**Tutorial-3**		
	UNIT-II: Mobile Network and Transport Layer		
17.	To describe the Mobile IP Network layer which facilitates Internet-based Communication between mobile nodes	Mobile IP, IP Packet Delivery	T-1,C-5
18.	To learn how to discover home and foreign agent while moving from one network to another	Agent Advertisement	T-1,C-5
19.		Discovery	T-1,C-5
20.	**Tutorial-4**		
21.	To study how to discover an agent for	Registration	T-1,C-5

22.	services and find Care-of-Address (CoA)	Tunneling And Encapsulation	T-1,C-5
23.	To learn how to provide a route optimization in order to improve the network lifetime	Route Optimizations	T-1,C-5
24.	**Tutorial 5**		
25.	To practice how to get a new IP address known as care-of-address (COA) by agent discovery process	Dynamic Host Configuration Protocol	T-1,C-5
26.	To show how to offer the novel services such as E-Mail, Web Browsing and enterprise solution	Traditional TCP	T-1,C-6
27.	To suggest how to split the TCP layer into tow TCP-sub layers	Indirect TCP	T-1,C-6
28.	To learn how to examine the TCP connection	Snooping TCP	T-1,C-6
29.	To suggest how to split the TCP layer into two TCP sub layer in order to reduce the window size to zero	Mobile TCP	T-1,C-6
	UNIT-III: Mobile Ad hoc Network, Wireless Sensor and Local Area Networks		
30.	To describe the key roles of Mobile Ad hoc and Wireless Sensor networks	Introduction, Properties	T-1,C-11
31.		Applications, Limitations	
32.	To learn about refinement approach based on decomposition	Routing Issues	T-1,C-11
33.		Routing Algorithms – Proactive (DSDV & OLSR)	T-1,C-11
34.	To understand how to use the terms and process of sending and retrieving the packets from source to destination	Reactive (DSR & AODV)	T-1,C-11
35.	To study the Mobile Ad hoc Networks (MANETs) in terms of computation, communication and networking	Introduction	T-1,C-11
36.		Architecture	T-1,C-11

	capabilities		
37.	**Tutorial 6**		
38.	To learn the key application systems of MANETs	Applications	T-1,C-11
39.	To explore how to spatially distribute the MANETs in an open environment	Security In Ad Hoc Networks	T-1,C-11
40.	**Tutorial 7**		
41.	To describe the wireless communication in order to understand Wireless LAN architecture and protocol	Wireless Networking	T-1,C-12
42.		Wireless LAN	T-1,C-12
43.	To study the major addressing units in WLAN architecture	WLAN IEEE 802.11 Architecture	T-1,C-12
44.	**Tutorial 8**		
45.	To study about the multiple layer in a communication networks	IEEE 802.11 Protocol Layers	T-1,C-12
	UNIT-IV: Network Simulator, Mobile OS and WAP		
46.	To describe the overall ns-3 software organization	Overview on different network simulators	R-4,C-1
47.	To learn how ns-3 supports a number of random variable objects	NS3	R-4,C-1
48.	**Tutorial 9**		
49.	To learn how to produce deterministic or random result	Seeding and Independent Replications	R-4,C-1
50.	To learn how to move randomly and organize the nodes arbitrarily	Configuration of MANET Using NS3	R5
51.	To learn how to move randomly and organize the sensor nodes arbitrarily	Configuration of WSN Using NS3	R6
52.	To learn the functions of an OS and its provisioning services for Middleware and APIs for the Mobile Application Systems	Overview on different mobile OSs,	T-1,C-14

53.	To learn how to design an application system for a specific hardware	Android OS	T-1,C-14
54.	**Tutorial 10**		
55.	To learn how to create a wide array of devices and form factors	Android OS Architecture	R7
56.	To learn how to incorporate the fundamental skills for creating cross platform web applications	App Development Examples	R8
57.	**Tutorial 11**		
58.	To learn how to deploy HTTP worldwide in order to access over Internet to access the website	Wireless Application Protocol	T-1,C-12
59.	To study about the three-layer protocols in WAP	WAP 1.1 Architecture	T-1,C-12
60.	To describe how the protocol conversion is used between two end-mobile clients and http server	WAP 1.1 Gateway	T-1,C-12

Evaluation scheme:

Component	Duration (Minutes)	Marks	% of Weightage	Date & Time	Venue
Sessional Test – 1	90	20	20 (Best 2 Tests Average)	01–01–2018 To 06–01–2018 9:00 AM – 10.30 AM	Block-5
Sessional Test – 2	90	20		19–02–2018 To 24–02–2018 9:00 AM – 10.30 AM	Block-5
Sessional Test – 3	90	20		02–04–2018 To 07–04–2018 9:00 AM – 10.30 AM	Block-5
Comprehensive Quiz	20	10	10	08–04–2018 To 09–04–2018 9:00 AM – 10.30 AM	Block-5
Semester End Examination	**180**	**70**	70	16–04–2017 To 28–04–2017	Block-5

Chamber Consultation Hour:		Each sectional student is informed to meet the respective subject faculty at least once in a week regarding doubt clarification and assignment report submission.
Notices	**:**	Circular regarding this course is **mutually** read in all the sections and displayed on department notice board for your kind follow-up.

Signature of the Instructor

Mr. Srinivasan Nagaraj

Dr. B. D. Deebak

Course Coordinator

Dr. B. D. Deebak