



# INSTITUTE OF AERONAUTICAL ENGINEERING

(AUTONOMOUS)

Dundigal, Hyderabad - 500 043

## COMPUTER SCIENCE AND ENGINEERING

### COURSE DESCRIPTION FORM

<b>Course Title</b>	<b>MOBILE COMPUTING</b>			
<b>Course Code</b>	A70536			
<b>Regulation</b>	R15 – JNTUH			
<b>Course Structure</b>	Lectures	Tutorials	Practicals	Credits
	5	-	-	4
<b>Course Coordinator</b>	Mr. C Raghavendra, Assistant Professor, CSE			
<b>Team of Instructors</b>	Ms. K. Radhika, Associate Professor, CSE Ms. M Geetha Yadav, Assistant Professor, CSE Ms. K Mayuri, Assistant Professor, CSE			

#### I. COURSE OVERVIEW

This course is offered for those who are interested in understanding and building systems support mechanisms for mobile computing systems including client-server web/database/file systems, and mobile ad hoc and sensor networks for achieving the goal of anytime, anywhere computing in wireless mobile environments. The technologies involved to realize such a system will be covered and the fundamental concepts of mobile computing are introduced. These include mobility and service management, data management, routing in mobile ad hoc and sensor networks, and security issues for mobile systems. While mobile computing covers many topics, in this course our main focus will be on mobility, data and service management, and security issues in mobile computing environments.

#### II. PREREQUISITE(S):

Level	Credits	Periods/ Week	Prerequisites
UG	4	5	Computer Networks, Operating Systems

#### III. MARKS DISTRIBUTION:

Sessional Marks	University End Exam marks	Total Marks
There shall be 2 midterm examinations. Each midterm examination consists of subjective test. The subjective test is for 20 marks, with duration of 2 hours. Subjective test of each semester shall contain 5 one mark compulsory questions in part-A and part-B contains 5 questions, the student has to answer 3 questions, each carrying 5 marks. First midterm examination shall be conducted for the first two and half units of syllabus and second midterm examination shall be conducted for the remaining position. Five marks are earmarked for assignments. There shall be two assignments for every theory course. Marks shall be awarded considering the average of two assignments in each course. Five marks are earmarked for assignments. There shall be two assignments.	75	100

#### IV. EVALUATION SCHEME:

S.NO	Component	Duration	Marks
1	I Mid Examination	80 minutes	20
2	I Assignment	-	05
3	II Mid Examination	80 minutes	20
4	II Assignment	-	05
5	External Examination	3 hours	75

#### V. COURSE OBJECTIVES:

**At the end of the course, the students will be able to:**

- I. Able to understand the concept of mobile computing paradigm, its novel applications and limitations.
- II. Learn the typical mobile networking infrastructure through a popular GSM protocol as well as their architecture.
- III. Illustrate the issues and solutions of various layers of mobile networks, namely MAC layer, Network layer and transport layer.
- IV. Estimate the database issues in mobile environments and data delivery models and also issues in the QoS.
- V. Familiar with the ad hoc networks, applications and their challenges.
- VI. Learn the platforms and protocols used in mobile environment.

#### VI. COURSE OUTCOMES:

**After completing this course the student must demonstrate the knowledge and ability to:**

1. Understand the concept of mobile computing
2. Analyze the GSM architecture, protocols and their new data services
3. Estimate the MAC protocols for GSM and wireless LANs
4. Identify the collision avoidance for protocols.
5. Explain about the mobile IP Network layer.
6. Understand the database issues
7. Classify the transport layer protocols for mobile networks.
8. Develop new ad hoc network applications and algorithms or protocols.
9. Understand and develop any existing or new protocol related to mobile environment.
10. Apply the protocols and platforms mobile computing WAP.
11. Differentiate the different operating Systems like Palm OS, Windows CE, Symbian OS, Linux for Mobile devices.
12. List out the Advanced technologies for developing the mobile networks

## VII. HOW PROGRAMS ARE ACCESSED:

Program		Level	Proficiency assessed by
PO1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	H	Lectures
PO2	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	H	Lectures, Assignments, Exams
PO3	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	H	Problem Solving Seminars, Exercises
PO4	<b>Conduct investigations of complex problems:</b> Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	H	Lectures, Assignments, Exams
PO5	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	H	Lectures, Assignments, Workshops
PO6	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	S	--
PO7	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	N	--
PO8	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	S	--
PO9	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	H	Assessments Discussions,
PO10	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	N	--
PO11	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	S	--
PO12	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	S	--

## VIII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Level	Proficiency assessed by
PSO1	<b>Professional Skills:</b> The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer based systems of varying complexity.	H	Lectures, Assignments
PSO2	<b>Problem-Solving Skills:</b> The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.	H	Future scope or projects discussion
PSO3	<b>Successful Career and Entrepreneurship:</b> The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.	S	Projects

N-None

S-Supportive

H - Highly Related

## IX. SYLLABUS:

### UNIT – I: Introduction

Mobile Communications, mobile computing- Paradigm, Promises/Novel Applications and Impediments and Architecture: Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices.

**GSM:** Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS, CSHSD, DECT.

### UNIT – II: Wireless Medium Access Control (MAC)

Motivation for a specialized MAC (Hidden and exposed terminals. Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN (IEEE802.11).

**Mobile Network Layer:** IP and mobile IP Network Layers, Packet Delivery and handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization, DHCP

### UNIT – III: Mobile Transport Layer

Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, other transport layers protocols for Mobile Networks.

**Database Issues:** Database Hoarding & Caching Techniques, C-S Computing & Adaptation, Transactional Models, Query Processing, Data Recovery Process & QoS Issues.

### UNIT – IV:

Data Dissemination and Synchronization: Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination Broadcast Models, Selective Tuning and Indexing Methods, Digital Audio and Video Broadcasting (DAB & DVB). Data Synchronization- Introduction, Software, and Protocols.

### UNIT – V: Mobile Ad hoc Networks (MANETs)

Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, etc., Mobile Agents, Service Discovery.

Protocols and Platforms for Mobile Computing: WAP, Bluetooth, XML, J2ME, JavaCard, PalmOS, Windows CE, SymbianOS, Linux for Mobile Devices, Android.

### Text Books:

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, 2e, 2004.
2. Raj Kamal, "Mobile Computing", Oxford University Press, 2007, ISBN: 0195686772.

### References:

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, 2e, 2004.
2. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002, ISBN: 047141908.
3. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", Cambridge University Press, Oct 2004, ISBN: 0521817331

## X. COURSE PLAN:

At the end of the course, the students are able to achieve the following course learning outcomes:

Lecture No.	Topics to be covered	Course Learning Outcomes	Reference
1-3	Introduction to mobile communications, mobile computing- paradigm, applications, architecture and limitations of mobile and hand held devices.	Understand the basic concept of mobile computing	T1:1.1-1.8, T2:1.2
4-7	GSM Services, system architecture, radio interfaces, protocols, CSHSD, DECT.	Describe the GSM and GPRS architecture	T1:3.3-3.7 T2:2.3
8-9	Localization, calling, handover, security, new data services.	Discuss about the GSM services	T1:3.3 T2:2.3
10	Wireless Medium Access Control (MAC), motivation for a specialized MAC (Hidden and exposed terminals. Near and far terminals).	Explain about MAC layer	T1:4.1
11-12	MAC protocols for GSM and Wireless LAN (IEEE 802.11)	Discuss about MAC protocols	T1:4.1
13-14	Collision Avoidance : MACA, MACAW Protocols	Generalize the Collision Avoidance protocols	T1:3.8, 4.1 T2:2.5-3.1
15-17	<b>Mobile IP Network Layer</b> : IP and mobile IP network layers, packet delivery and handover management	Demonstrate about the mobile IP network Layer	T1:4.4
18-21	Location management and registration, tunneling and encapsulation, route optimization, DHCP	Describe about the location management and registration	T1:4.5, 4.6, 4.7
22-24	Mobile transport layer, conventional TCP/IP protocols, indirect TCP, snooping TCP	Explain about the mobile transport layer protocols	T1:4.9, 6.1
25-28	Mobile TCP and other transport protocols	Summarize about the Mobile TCP	T1:5.2
29-32	Database hoarding & caching techniques, C-Computing & adaptation.	Discuss about the database issues	T1:5.1.5.4
33-37	Transactional models, query processing, data recovery process & QoS issues.	Explain about the transactional models	T1:8.1-8.6
38-41	Data dissemination and synchronization, communications asymmetry, classification of data delivery mechanisms, data dissemination broadcast model.	Describe about the data dissemination and synchronization	T1:6.1-6.7
42-46	Selective tuning and indexing methods, digital audio and video broadcasting (DAB & DVB). data synchronization- introduction, software, and protocols.	Illustrate about the selective tuning and indexing methods	T1:7.6, 7.7
47-51	Mobile Adhoc networks (MANETs) introduction, applications & challenges of a MANET	Interpret the MANETs and their applications	T1:10.1-10.5
52-55	Classification of routing algorithms such as DSR, AODV, DSDV, etc	Discuss about the routing algorithms	T1:11.3
56-59	Mobile agents, service discovery and protocols.	Explain about the MANET services	T1:11.3
60-61	Protocols and platforms for mobile computing WAP, Bluetooth, XML, J2ME	Analyze about the protocols and platforms	T1:10.6-10.13
62-63	Java Card, Palm OS, Windows CE, Symbian OS, Linux for Mobile Devices, Android	Understand various operating systems	T2:9.1

**XI. MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:**

Course Objectives	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
I			H						S				H	H	
II				S	H								S	H	
III			H	S									H		S
IV			S						H						
V					H				S					S	
VI					S				H				H	H	

**S – Supportive                      H - Highly Related**

**XII. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:**

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	H								H				H		
2		H	H	H									H		
3		H	H					S	H				H		
4	H	S											S		
5	H								S				H		
6	H		S												
7			S	H	H									H	S
8			H	S	H									H	S
9			H	H	S						H		S	H	S
10	H												H		
11	H												H		
12	H								S				H		

**S – Supportive                      H - Highly Related**

**Prepared by:**  
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**HOD, CSE**