# M.E. MOBILE AND PERVERSIVE COMPUTING

## II TO IV SEMESTER (FULL TIME) CURRICULUM AND SYLLABI

### SEMESTER II

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>CODE NO</th>
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SEMESTER II

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UNIT I  INTRODUCTION  9
Challenges for wireless sensor networks, Comparison of sensor network with ad hoc network,
Single node architecture – Hardware components, energy consumption of sensor nodes,
Network architecture – Sensor network scenarios, types of sources and sinks, single hop versus
multi-hop networks, multiple sinks and sources, design principles, Development of wireless
sensor networks.

UNIT II  PHYSICAL LAYER  9
Introduction, wireless channel and communication fundamentals – frequency allocation,
modulation and demodulation, wave propagation effects and noise, channels models, spread
spectrum communication, packet transmission and synchronization, quality of wireless channels
and measures for improvement, physical layer and transceiver design consideration in wireless
sensor networks, Energy usage profile, choice of modulation, Power Management.

UNIT III  DATA LINK LAYER  9
MAC protocols – fundamentals of wireless MAC protocols, low duty cycle protocols and wakeup
concepts, contention-based protocols, Schedule-based protocols - SMAC, BMAC, Traffic-
adaptive medium access protocol (TRAMA), Link Layer protocols – fundamentals task and
requirements, error control, framing, link management.

UNIT IV  NETWORK LAYER  9
Gossiping and agent-based uni-cast forwarding, Energy-efficient unicast, Broadcast and
multicast, geographic routing, mobile nodes, Data-centric routing – SPIN, Directed Diffusion,
Energy aware routing, Gradient-based routing – COUGAR, ACQUIRE, Hierarchical Routing –
LEACH, PEGASIS, Location Based Routing – GAF, GEAR, Data aggregation – Various
aggregation techniques.

UNIT V  CASE STUDY  9
Target detection tracking, Habitat monitoring, Environmental disaster monitoring, Practical
implementation issues, IEEE 802.15.4 low rate WPAN, Operating System Design Issues,
Introduction to TinyOS – NesC, Interfaces, modules, configuration, Programming in TinyOS
using NesC, Emulator TOSSIM.

TOTAL : 45 PERIODS

REFERENCES:
John Wiley publication, Jan 2006.
UNIT I  INTRODUCTION  9

UNIT II  DISTRIBUTED OPERATING SYSTEMS  9

UNIT III  DISTRIBUTED RESOURCE MANAGEMENT  9

UNIT IV  FAILURE RECOVERY AND FAULT TOLERANCE  9
Basic Concepts-Classification of Failures – Basic Approaches to Recovery; Recovery in Concurrent System; Synchronous and Asynchronous Checkpointing and Recovery; Checkpointing in Distributed Database Systems; Fault Tolerance; Issues - Two-phase and Non-blocking Commit Protocols; Voting Protocols; Dynamic Voting Protocols;

UNIT V  MULTIPROCESSOR AND DATABASE OPERATING SYSTEMS  9

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
UNIT I  ARCHITECTURES AND PROCESSES  9

UNIT II  COMMUNICATION AND NAMING  9

UNIT III  SYNCHRONIZATION, CONSISTENCY AND REPLICATION  9

UNIT IV  DISTRIBUTED RESOURCE MANAGEMENT  9

UNIT V  DISTRIBUTED OBJECT-BASED, WEB-BASED AND CO-ORDINATION BASED SYSTEMS  9
Architecture – processes – Communication – Naming – Synchronization – consistency and Replication, Faculty tolerance and security in distributed web based, object based and co-ordination based systems.

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
UNIT I  ISSUES AND CHALLENGES  9
Challenges of Concurrent and Networked Software: Service Access and Configuration – Other
and Technology Selection for Mobile Applications

UNIT II  APPLICATION AND USER INTERFACE DEVELOPMENT  9
Introduction to Mobile Development Frameworks and Tools Accessed today – Fully Centralized
WINDOWS CE – WAP – Symbian EPOC

UNIT III  UML AND USER INTERFACE DEVELOPMENT  9
Introduction to UML – Class diagrams – Object diagrams – Collaboration diagrams –
Sequence diagrams – Activity diagrams – State chart diagrams – Component diagrams –
Deployment diagrams – Use case diagrams – Device – Independent and Multi – channel
User Interface Development Using UML

UNIT IV  J2ME OVERVIEW  9
Technology – Radio Data Networks – Microwave Technology – Mobile Radio Networks –
J2ME Architecture and Development Environment – Runtime Environment – Midlet
Programming – J2ME Wireless Toolkit

UNIT V  J2ME USER INTERFACE  9
J2ME User Interface – Commands, Items and Event Processing – Exception Handling – High –
Level Display – Screens – Low Level Display – Canvas – User Interactions – graphics –
Clipping Regions – Animations.

TOTAL : 45 PERIODS

TEXT BOOKS
1. Reza B'Far, “Mobile Computing Principles: Designing and Developing Mobile Applications
   with UML and XML”, Cambridge University Press

MP9227  RFID & SENSOR NETWORKS LAB  L T P C
0 0 3 2

EXPERIMENTS ON RFID
1. Study of RFIDs in 125 KHz, 13.56 MHz and 8.2 to 9.15 MHz range.
2. ASK & FSK Modulation & Demodulation in RFID tags and readers
3. Design of Power Conversion circuits to convert RF into DC with RFID tag(Energy
   Harvesting)
4. Simple RFID application through API configuration using LF,HF and UHF reader.
5. RFIC transmitter & receiver circuit using Harmonic balance simulation
6. RFIC transmitter & receiver circuit using DC circuit simulation
7. Design of RFID reader antenna using Momentum Simulation
8. Design of RFID antenna using S-parameter simulation

TOTAL : 45 PERIODS
<table>
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<tr>
<th>S.No</th>
<th>Experiment name as prescribed in the syllabus</th>
<th>Required Resources</th>
<th>Available Quantity / Users</th>
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<tr>
<td>1</td>
<td>Study of RFIDs in 125 KHz, 13.56 MHz and 8.2 to 9.15 MHz range.</td>
<td>125KHz RFID Reader, HF Mullion Reader, UHF Handheld Reader</td>
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<td>2</td>
<td>ASK &amp; FSK Modulation &amp; Demodulation in RFID tags and readers</td>
<td>ADS</td>
<td>5 Users</td>
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<td>3</td>
<td>Design of Power Conversion circuits to convert RF into DC with RFID tag (Energy Harvesting)</td>
<td>ADS</td>
<td>5 Users</td>
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<td>4</td>
<td>Simple RFID application through API configuration using LF, HF and UHF reader</td>
<td>Microsoft Visual Basic, 125KHz RFID Reader, HF Mullion Reader, UHF Handheld Reader</td>
<td>25 Systems / 1 / 3 / 1</td>
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<td>5</td>
<td>RFIC transmitter &amp; receiver circuit using Harmonic balance simulation</td>
<td>ADS</td>
<td>5 Users</td>
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<tr>
<td>6</td>
<td>RFIC transmitter &amp; receiver circuit using DC circuit simulation</td>
<td>ADS</td>
<td>5 Users</td>
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<td>Design of RFID reader antenna using Momentum Simulation</td>
<td>ADS</td>
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<td>Design of RFID antenna using S-parameter simulation</td>
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</table>
LIST OF EXPERIMENTS

I STUDY EXPERIMENT:
To explore overall view about
- Pervasive Computing Architecture
- Communication protocols
- Software infrastructure
- Security mechanisms.

II TO DESIGN THE SOFTWARE FOR MOBILE PHONES
USING J2ME
1. Develop a small MIDLET program, and display the simple text message on the screen
2. With the different User Interface, construct the MIDLET program for simple applications
3. Write a MIDLET program, for displaying title, bars and grid using Chart canvas
4. Develop J2ME program, to add, change & Remove data from database
5. Write a J2ME program to find a specific records using RMS Interface
6. Develop communication Socket program using J2ME.
7. Design and Develop a J2ME code to communicate with a server through HTTP connection.

USING SYMBION OS
1. Text based Applications
   Coding and implementing a simple programme for basic text string handling.
   Example: Displaying a user defined text string
2. Simple Graphical Applications:
   Display a user defined text within a graphical window.
3. Dialog based Applications:
   Create a dialog box-attached with buttons such as “DISPLAY” (this will display a text string) and “CLOSE”, (which will close the dialog box)
4. Drawing Application
   Drawing basic shapes (points, lines, arcs, filled shapes and bitmaps within a graphical window
5. Basics of File handling:
   Implement the following file operations.
   1. Create
   2. Write text data
   3. Save
   4. Open
   5. Edit

6. CASE STUDIES. PROJECTS IN PERVASIVE COMPUTING:
   To explore wearable and handheld computing and their enabling technologies

TOTAL : 45 PERIODS
### MP 9226 – Requirement for Pervasive Computing Lab

<table>
<thead>
<tr>
<th>S.No</th>
<th>Experiment name as prescribed in the syllabus</th>
<th>Required Resources</th>
<th>Available Quantity / Users</th>
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<tr>
<td>1</td>
<td>Develop a small MIDLET program, and display the simple text message on the screen</td>
<td>J2ME (Free Software)</td>
<td>25 Systems</td>
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<td>2</td>
<td>With the different User Interface, construct the MIDLET program for simple applications</td>
<td>J2ME (Free Software)</td>
<td>25 Systems</td>
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<tr>
<td>3</td>
<td>Write a MIDLET program, for displaying title, bars and grid using Chart canvas</td>
<td>J2ME (Free Software)</td>
<td>25 Systems</td>
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<tr>
<td>4</td>
<td>Develop J2ME program, to add, change &amp; Remove data from database</td>
<td>J2ME (Free Software)</td>
<td>25 Systems</td>
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<tr>
<td>5</td>
<td>Write a J2ME program to find a specific records using RMS Interface</td>
<td>J2ME (Free Software)</td>
<td>25 Systems</td>
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<tr>
<td>6</td>
<td>Develop communication Socket program using J2ME</td>
<td>J2ME (Free Software)</td>
<td>25 Systems</td>
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<td>7</td>
<td>Design and Develop a J2ME code to communicate with a server through HTTP connection.</td>
<td>J2ME (Free Software)</td>
<td>25 Systems</td>
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<tr>
<td>8</td>
<td>Text based Applications-Coding and implementing a simple programme for basic text string handling. Example: Displaying a user defined text string</td>
<td>Symbion OS, Carbide C++, Professional Edition</td>
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<td>Simple Graphical Applications: Display a user defined text within a graphical window.</td>
<td>Symbion OS, Carbide C++, Professional Edition</td>
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<td>Dialog based Applications: Create a dialog box-attached with buttons such as “DISPLAY” (this will display a text string) and “CLOSE”, (which will close the dialog box)</td>
<td>Symbion OS, Carbide C++, Professional Edition</td>
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<td>Drawing Application Drawing basic shapes (points, lines, arcs, filled shapes and bitmaps within a graphical window</td>
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MP9251 RFID AND ITS APPLICATIONS L T P C 3 0 0 3

UNIT I  RF FUNDAMENTALS 9
RF operating principle – Frequency divider – Coupling – Inductive coupling, Electromagnetic back scatter coupling, close coupling, Electrical coupling – Frequency ranges used in RF Coding - Digital Modulation – ASK, FSK, PSK.

UNIT II  RFID SYSTEM PRINCIPLES 9

UNIT III  RFID SYSTEM ARCHITECTURE 9

UNIT IV  RFID MIDDLEWARE FOR APPLICATIONS 9
Motivations – Logical Architecture – Application Level Events Specification – Commercial RFID Middleware – Example

UNIT V  RFID APPLICATIONS 9

TOTAL : 45 PERIODS

TEXT BOOK
REFERENCES
1. Bill Glover and Himanshu Bhatt, RFID Essentials, Oreilly, 2006

MP9252 XML AND WEB SERVICES L T P C 3 0 0 3

UNIT I XML TECHNOLOGY FAMILY

UNIT II ARCHITECTING WEB SERVICES
CORBA and DCOM – Service – oriented Architecture (SOA) – Architecting web services –
Implementation view – web services technology stack – logical view – composition of web
services – deployment view – from application server to peer to peer – process view – life in the
runtime

UNIT III WEB SERVICES BUILDING BLOCK
Transport protocols for web services – messaging with web services – protocols – SOAP –
describing web services – WSDL – Anatomy of WSDL – manipulating WSDL – web service
policy – Discovering web services – UDDI – Anatomy of UDDI – Web service inspection – Ad –
Hoc Discovery – Securing web services.

UNIT IV IMPLEMENTING XML IN E – BUSINESS
systems – ebXML – Rosetta Net Applied XML in vertical industry – web services for mobile
devices.

UNIT V XML AND CONTENT MANAGEMENT
Semantic Web – Role of Meta data in web content – Resource Description Framework – RDF
schema – Architecture of semantic web – content management workflow – XLANG – WSFL.

TOTAL: 45 PERIODS

TEXT BOOKS
2. Sandeep Chatterjee and James Webber, “Developing Enterprise Web Services: An

REFERENCES
2. Keith Ballinger, “.NET Web Services Architecture and Implementation”, Pearson Education,
2003.
UNIT I 9

UNIT II 9

UNIT III 9

UNIT IV 9
Localization and management - Group communication - Coordination and Communication Problems in WASNs - Localization in Sensor Networks - Sensor Management - Adapting to the inherent dynamic nature of WSNs, and Sensor Networks and mobile robots.

UNIT V 9
Broadcast Authentication protocols - TELSA - Variation of TELSA - BiBa - HORNS - Sensor network simulators.

TOTAL : 45 PERIODS

REFERENCES

TinyOS 2.0 Simulation Working Group http://tinyos.stanford.edu:8000/SimWG
OBJECTIVE:
To examine and debate current research topics in wearable computing and to impart expertise to the student n the design and implementation of wearable computing solutions.

UNIT I
Introduction- Basic Concepts-Augmented Reality-Technology- A survey of Tracking Technologies for Virtual Environments-optical versus video see through head mounted displays-Augmenting reality using affine object representations.

UNIT II

UNIT III
Wearable computers - Computational clothing and accessories – Situation aware computing with wearable computers - collaboration with wearable computers - computer networks for wearable computing

UNIT IV
Human Computer Interaction-Context awareness and adaptive user interface Design and development of wearable user interface-Evaluation of user interface

UNIT V
Applications of wearable computing- Military Applications-Medical Application constructing wearable computers for maintenance application

TOTAL : 45 PERIODS

REFERENCES:
4. Maria-Isabel Sanchez-Segura, Developing Future Interactive Systems. Idea Group Inc (IGI) 2004
OBJECTIVE:
This course will introduce the students to the evolution of human-computer interaction, complexities in the interaction of people with machines, enumerate the types of hardware and focus on the various design paradigms. The students will learn how to design, Manage, maintain, train, refine and evaluate the user interface of interactive systems.

UNIT I  INTRODUCTION  THE HUMAN AND COMPUTER  9

UNIT II  INTERACTION  9

UNIT III  DESIGNING  9

UNIT IV  MODELS  9

UNIT V  APPLICATIONS  9

TOTAL : 45 PERIODS

REFERENCES:
OBJECTIVE:
The objective of this course is to enable students to understand various high performance communication networking technologies, switching, delay and congestion control, optical network, ISDN and their performances. Wireless high speed network and future technology along issues and challenges.

UNIT I OVERVIEW OF HIGH PERFORMANCE COMMUNICATION NETWORKS

UNIT II CONGESTION CONTROL
Integrated Services - Differentiated service method, Congestion control - effects of congestion control, congestion control in packet switching networks - Frame relay congestion control- Flow control at link level, TCP congestion control.

UNIT III VOICE OVER IP AND ISDN

UNIT IV ATM AND HIGH SPEED LAN NETWORKS
Frame relay - Packet switching networks, Frame relay networks - Asynchronous Transfer mode - ATM protocol architecture, ATM logical connections, ATM cells, ATM service categories, AAL - High speed LANs- Emergency of high speed LAN, Ethernet, Fiber channel, WLAN.

UNIT V ADVANCED WIRELESS NETWORKS
Wireless WAN - GSM and TDMA technology, CDMA technology, Mobile data networks – Ad -hoc networking and WPAN - Wireless Geolocation System.

TOTAL: 45 PERIODS

REFERENCES:
OBJECTIVE:
This course will teach students the basics of context-aware systems. Perspectives
from Artificial Intelligence machine learning, sensors and effectors, embedded devices,
information visualization, philosophy and psychology are explored. The course also
covers how the problem of context is treated and discusses the design of context-
sensitive hardware and software.

UNIT I  INTRODUCTION AND CLASSIFICATIONS
Introduction to context-aware computing, Philosophical & Mathematical Positions on
Context, Context Aware Computing Approaches, Types of context, Low level and high
level context, Active and Passive context.

UNIT II  CAPABILITIES
Sensing, Adaptation, Resource discovery, Augmentation, Information delivery
approaches, AI, Agents and System Reflection.

UNIT III  MODELING AND EVALUATION
Interaction design for applications and evaluation, Experimental design, Modeling
and evaluation: context modeling, task modeling, User modeling, Systems modeling,
committed action in context-aware systems, Context management.

UNIT IV  LEARNING AND RECOGNITION
Learning, machine learning, common sense applications of Context aware
computing, Designer learning, reasoning and uncertainty Recognizing and interpreting

UNIT V  SOFTWARE SUPPORT AND APPLICATION
Context toolkits, Middleware support for Context Aware Computing Case studies
and Applications of context-aware computing, Limitations of Context Aware Computing.

REFERENCES:
2. Gay, Geri and Hem Brooke, Helene. Activity-centered design: an ecological
   approach to designing smart tools and usable systems. Cambridge, MA: MIT Press,
   2004.
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