Mukesh Patel School of Technology Management and Engineering
Computer Engineering Department

Course Policy

Program/Branch/Semester	**:**	BTI/Computer Sem XII
Academic Year	**:**	2024-25
Course Code & Name	**:**	Mobile Computing
Credit Details	**:**	L T P C 3 0 2 4
Course Coordinator Faculty	**:**	Prof. Deepa Krishnan
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Student Contact hours	**:**	1pm-2 pm (Wed,Saturday)
Other Course Faculty members teaching this course :		Prof. Anika Nagmote
Other Course Faculty		
Queries by Emails are encouraged.		

Course link	**:**	Portal Link: https://portal.svkm.ac.in/usermgmt/login MS Teams Link: Respective MS team of every faculty

1 Introduction to the Course

1.1 Importance of the course

Mobile computing is the set of IT technologies, products, services, and operational strategies and procedures that enable end users to gain access to computation, information, and related resources and capabilities with mobile. This course helps students to get familiarize with concepts of Mobile Computing that will help them to advance their future studies and also in career choices in telecommunication domain.

1.2 Objective of the Course

To educate students with wide knowledge base in Mobile Computing.

1.3 Pre-requisite

- NA

2 Course Outcomes (CO) and mapping with Program Outcomes (PO)

2.1 Course Outcomes

After completion of the course, students would be able to:

1. Understand the mobile computing architecture, operation systems and its app lications
2. Implement medium access control protocols.
3. Apply the concepts of Physical and logical Mobility for Mobile Computing
4. Analyze mobile databases, heterogeneous networks and concepts of WAP. nalyze the different protocols of the layered architecture of computer networks.

2.2 Program Outcome

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: 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.

4. Conduct investigations of complex problems: 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.

5. Modern tool usage: 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.

6. The engineer and society: 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.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: 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.

11. Project management and finance: 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.

12. Life-long learning: 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.

2.3 CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3		3					1			
CO2	1		2	3	1							
CO3	2			3	3	1		1			2	
CO4	2	3		2	3	1			1			2

Level 1- Low mapping (1)
Level 2 - Medium mapping (2)
Level 3 - High mapping (3)

3 Syllabus, Pre-class activity and References

3.1 Teaching and evaluation scheme

Teaching Scheme				**Evaluation Scheme**	
Lecture Hours per week	**Practical Hours per week**	**Tutorial Hours per week**	**Credit**	**Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)**	**Theory (3 Hrs, 100 Marks)**
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50

3.2 Syllabus

Unit	**Description**	**Duration**

1	**Introduction**: Introduction to mobile computing, application examples, mobile computing architecture, mobile devices	04
2	**Medium Access Control**: Motivation for special MAC: Hidden & Exposed Terminal, Near & Far Terminal. SDMA, FDMA, TDMA, CDMA, Aloha, Reservation Schemes, Collision avoidance, MACA, Polling, multiplexing schemes comparison.	06
3	**Logical Mobility**: Process migration, steps in process migration, advantages and application of process migration, alternatives to process migration, mobile agents, characteristics of mobile agents, requirements for mobile agent systems, Mobile agent Platform (Aglets object and event model, aglet communication)	06
4	**Physical Mobility**: Mobile IP, goals assumption and requirement, Entities and terminology, IP packet delivery, agent advertisement and discovery, Registration, tunnelling and encapsulation, Optimizations, Reverse tunnelling, IPv6; Dynamic host configuration protocol, Traditional TCP: Congestion control, slow start, fast Retransmit/ fast recovery, implications on mobility; indirect TCP, snooping TCP, Mobile TCP, fast retransmit/ fast recover, Transmission/ time-out freezing, selective Retransmission, Transaction oriented TCP,TCP over 2.5/3G wireless networks, Performance enhancing proxies	08
5	**Mobile Databases:** Design Issues, Problems in mobile databases, CODA file system – case study.	02
6	**Wireless Communication**: Components of Wireless Communication Systems, Bluetooth: Application, Protocol Stack, Services, Frame Structure, Architecture of Mobile Communication Systems, Wireless Networking Standards, WLAN	04
7	**Mobile Internet and Wireless web**: WAP programming model, WAP protocol stack, WAP 2.0, XHTML- M	04
8	**Mobile Ad-hoc Networks**: MANET characteristics, classification of MANETs, Routing in MANETs, DSDV, DSR, AODV, Zone routing protocol, hierarchical State routing protocol, power aware routing metric	08
9	**Mobile OS:** Case study of Android OS and Symbian OS	03
	Total hours	**45**

3.3 Pre-class activity

Outline for preliminary study to be done for each unit will be provided prior to commencement of each unit. Preliminary study material (NPTEL video, presentation, solved numerical examples etc) will be made available on the student portal. Students are expected to go through this material before attending the upcoming session. It is expected that the students put in at least two hours of self- study for every one hour of classroom teaching. During the lecture session, more emphasis will be given on in-depth topics, practical applications and doubt solving.

3.4 References

Text Books:

TB1: Kum Kum Garg, "Mobile Computing Theory and Practice" , Pearson Education, 2010

Reference Books:

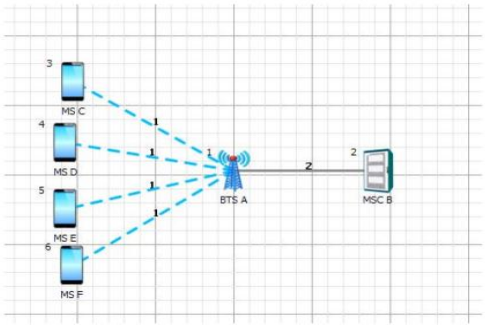
1. Jochen Schiller, "Mobile Communications", 2nd Edition, Pearson Education, 2008.
2. P. Ncopolitidis, M S Obaidat, et. al "Wireless Networks", Wiley India, 2009
3. C.Siva ram Murthy and B.S.Manoj, "Adhoc Wireless Networks Architectures and Protocols", Pearson Education, 2004.
4. Raj Kamal," Mobile Computing", Oxford University Press, 2007
5. Asoke K Talukder and Roopa R Yavagal, "Mobile Computing Technology, Application and Service Creation", 2nd Ed., TMH

4 Laboratory details

Knowledge of Operating system and programming languages concepts for laboratory exercise is a prerequisite. Students are expected to recall the fundamental theory concepts relevant to the exercise to be performed in the upcoming laboratory.

The following 10 programming exercises will form the submission for laboratorycoursework.

Sr.No	Practical List	Corresponding CO's
1.	To understand and analyse the evolution of Mobile Computing through the various GSM technologies **Task1**: Students need to explore the following topics and summarise briefly the following questions: a. Definition of Mobile Computing b. Types of Wireless Networks c. Evolution of 1G, 2G, 3G, 4G and 5G d. Comparison of 1G, 2G, 3G, 4G and 5G (Preferably as a Table) e. Applications of Mobile Computing f. Architecture of Mobile Computing **Task2 :** a. Identify the five technologies that offer foundations for 5G technologies. Briefly explain about each of these. Supplement explanation with diagrams. b. What are the advantages of technologies mentioned in Qn (a). c. Give the statistics for the 5G penetration by the various service providers in India. Show divide between rural and urban , age group, between various service providers. Prepare a bar chart or line chart to show the trend. Write in 200 words the observations	**CO1**
2.	To understand and analyse call blocking probability with the increase in the number of mobile nodes	**CO1**

	Task 1: Create a network scenario with 4 Mobile Stations, 1 MSC and 1 Base Station Station, Create Application  Task 2: Increase the number of mobile nodes and observe the call blocking probability	
3.	To Study the hidden node problem in WLAN	**CO1, CO3**
4.	To analyze the performance of 802.11g as the number of nodes are increased	**CO2**
5.	To Study how channel selection affects packet collisions in WLAN	**CO3**
6.	**Presentation for Assignment 1**	**CO1, CO2**
7.	To Study Quality of Service (QoS) in 802.11e based WLANs	**CO3**
8.	**Viva Experiments 1 to 5**	**CO1,CO2,CO3**
9.	To implement simple multi-hop communication in MANETs in NetSim	**CO4**
10.	To implement WML Programs	
11.	To implement WML programs with advance tags	**CO1, CO4**
12.	To setup and configure a Wireless LAN using Cisco Packet Tracer	**CO1, CO2,CO3, CO4**
13.	Case study Submission and Viva	**CO4**
14.	Viva Experiments 6 to 10	
15.	**ICA**	

5 Assessment Policy

5.1 Component wise Continuous Evaluation Internal Continuous Assessment (ICA) and Term End Examination (TEE)

Assessment Component	**ICA (100 Marks) (Marks scaled to 50)**				**TEE (100 marks) (Marks scaled to50)**
	Lab Performance ,Submission and Viva	**Poster Presentation and Viva Advanced Technologies**	**Class Participation**	**Class Test1 andClass Test 2**	**TEE**
Weightage	10%	10%	10%	20%	50%
Marks	10	10	10	10+10	100
Time Line	Weekly	Wk9	Daily	wk 6, wk 12	wk 18
	02/01 2025 - 10/04/2025	17/02/2025 – 21/02/2025	Regularity in class, answering questions in class, Quiz in class (per unit)	Mid Term Test I : 03/02/2025 Mid Term Test II : 17/03/2025	28.04.2025 onwards

Assessment Policy for Internal Continuous Assessment (ICA)

Assessment of ICA comprises of the following components.

1. **Class test 1 and 2**

   a. Two class tests will be conducted as per the academic calendar.
   b. It will be conducted offline for 10 marks each.

2. **Lab performance evaluation (10 marks)**

   a. Lab experiments (10 marks)
      i. Continuous assessment for laboratory experiments will be conducted. There are 10 practical's, each carrying weightage of 10 marks followed by viva.
      ii. Discussion of your work with your peers is allowed. However, each student is expected to submit his/her original work. Submissions which are very similar will be marked zero. Assessment of the lab work will be carried out based on parameters like timely completion of lab work file, understanding of the experiment performed, originality in the work, involvement of the student regularity, discipline etc. during the session.

iii. Assessment will be based on experiment performance (5 marks), Result or Output as expected (3marks), Timely Submission with detailed conclusion written, (2 marks) + Viva for each experiment (10 marks), Average of both will be taken to give final lab marks out of 10.

iv. Delay in submission will result in loss of 1 mark for each day and after a week the experiment marks will be graded to zero.

3. Poster Making and Presentation on Advanced Topics and viva (B) (10 marks)

A. Students need to make groups of 3 to 4 students and choose the latest topic in area of mobile computing
B. Get the topic Approval
C. Prepare one slide for making poster

Components	**Excellent (9-10 marks)**	**Good (7-8 marks)**	Needs Improvement (5-6 marks)	**Poor(0-4)**
Content	Thoroughly covers all required content with proper organization.	Mostly covers required content, but some parts are missing or lack organization.	Several key components missing, with gaps in content and organization.	Significant content missing with poor organization.
Presentation and Delivery	Very clear and effective delivery of content.	Delivery of content is good but has minor gaps.	Delivery is inconsistent, with noticeable gaps or confusion.	Poor presentation and unclear delivery.
Design	Very good design; visually appealing and easy to understand for viewers.	Moderate design; less clutter but could be more engaging.	Design lacks refinement and is somewhat difficult to follow.	Poor design; cluttered or hard to understand.
Question and Answers	All questions answered correctly, demonstrating clear understanding	Most questions answered correctly with minor errors or gaps in understanding.	Few questions answered correctly, with limited understanding shown.	Very few or no questions answered correctly, showing lack of understanding

4. Class Participation (10 Marks)

The evaluation for class participation, can be bifurcated as follows:

1. Punctuality (3 marks):

- Marks awarded for attending class on time. Late arrivals will result in a proportional deduction.

2. Active Engagement (3 marks):

- Participation in class discussions, answering questions, and contributing to group activities.

3. Unit-wise Quizzes (4 marks):

- Each quiz will assess understanding of the unit, with marks distributed as follows:
  - Conceptual Understanding (2 marks): For demonstrating a grasp of key concepts.
  - Application of Knowledge (1.5 marks): For solving problems or applying concepts to scenarios.
  - Timeliness and Accuracy (0.5 marks): For completing the quiz on time and providing correct answers.

Two quizzes of 4 marks (8 questions) one before M1 and one before M2. Average will be taken.

This combined evaluation ensures a holistic approach to assessing students' regularity, engagement, and academic performance.

5. Assessment Policy for Term End Examination (TEE)

A written examination of 100 marks for 3 hours duration will be conducted for the course as per the academic calendar.

6 Lesson Plan

Sr. No	**Topics to be covered**	**CO**	**Textbook Chapters & Readings**
Unit 1	**Introduction**		
1	Introduction to Mobile Computing	CO1	TB1
2	Mobile Computing Applications,	CO1	
3	Mobile Computing Architecture, Mobile Devices	CO1	TB1
Unit-2	Medium Access Control: Motivation for special MAC: Hidden and Exposed Terminal	CO2	TB2
3	Near and Far Terminal	CO2	TB2
4	Protocols and Standards, OSI and TCP/IP Model, Transmission Media.	CO2	

5	SDMA , FDMA	CO2	TB2
6	TDMA, CDMA	CO2	TB2
7	ALOHA, Reservation Schemes	CO2	TB2
8	Collision Avoidance	CO2	TB2
9	MACA, Polling	CO2	TB2
10	Multiplexing Schemes , Comparison	CO2	TB2
Unit-3 11	**Logical Mobility: Process Migration, Steps in Process Migration**	CO3	TB1
12	Advantages and Application of Process Migration	CO3	TB1
13	Alternatives to Process Migration, Mobile Agents	CO3	
14	Requirements for Mobile Agent Systems	CO3	
15	Mobile Agent Platform (Aglet object and event model, aglet communication	CO3	
Unit-4	**Physical Mobility**		
16	Mobile IP, Goals, Assumption and Requirement	CO3	TB2
17	Entities and Terminology, IP Packet Delivery, Agent Advertisement and Discovery	CO3	
18	Registration, Tunnelling and Encapsulation,	CO3	
	Class Test 1		
19	Optimizations, Reverse Tunnelling	CO3	
20	IPV6	CO3	
21	Dynamic Host Configuration Protocol	CO3	

22	Traditional TCP: Congestion Control, Slow Start, Fast Re-transmit/Fast Recovery	CO3	
23	Implications on Mobility, Indirect TCP	CO3	
24	Open shortest path first protocol (OSPF).	CO3	
25	Snooping TCP, Mobile TCP, Fast Re-transmit/Fast Recover	CO3	
26	Transmission/Timeout Freezing, Selective Retransmission,	CO3	
27	Transaction Oriented TCP, TCP over 2.5/3 G Wireless Networks	CO3	
28	Performance enhancing proxies	CO3	
Unit-5	**Mobile Databases**		
29	Mobile databases, Design Issues, Problems in Mobile Databases	CO4	TB1
30	CODA File System- Case Study	CO4	
Unit 6	Wireless Communication		
31	Components of Wireless Communication Systems	CO4	
32	Bluetooth: Application, Protocol Stack, Services	CO4	
33	Frame Structure, Architecture of Mobile Communication Systems	CO4	
34	Wireless Networking Standards	CO4	
35	WLAN	CO4	
Unit-7	**Mobile Internet and Wireless Web**		
36	WAP Programming Model	CO4	TB1, TB2
37	WAP Protocol Stack, WAP 2.0	CO4	
38	XHTML-MP	CO4	
	Class Test 2		TB1, TB2
Unit 8 39	Mobile Ad-Hoc Networks, Manet Characteristics	CO3	TB1, TB2
40	Classification of MANETS, Routing in MANETS, DSDV	CO3	TB1, TB2
41	DSR, AODV	CO3	TB1, TB2
42	Zone Routing Protocol, Hierarchical State Routing Protocol, Power Aware Routing Metrics	CO3	TB1, TB2
43	**Unit 9 Mobile OS**	CO1	TB1
44	Android OS	CO1	TB1
45	Symbian OS	CO1	TB1

7 Teaching-learning methodology

Faculty will make a group of 2-3 students for any group based activity such as class participation, project, presentation etc. Lecture and laboratory session will be conducted as follows-

7.1 Lectures:

1. Outline for preliminary study to be done for each unit will be provided prior to commencement of each unit.
2. Deeper concepts and applications will be explained through Presentation and Video Lectures.
3. Numerical problems based on concept will be solved during the session on *smart board* or *MS OneNote.*

7.2 Laboratory:

1. Lab manual consisting of theory and algorithm to support the lab experiment will be uploaded on student portal.
2. Regular lab assessment and grading will be done. Students will be marked basedon parameters like completion of lab assignment, originality, logic developed, interaction during the lab, submission, punctuality and discipline

8 Active learning techniques

Active learning is a method of learning in which students are actively or experientially involved in the learning process. Following active learning techniques will be adoptedfor the course.

1. **Problem Solving**: Faculty will give a problem that can have multiple solutions, by which student can think more approaches to solve a problem.

2. **Think –pair share**: - pair of students will be created and one topic will be given to them they can discuss it within themselves and later on they will discuss it in front of whole class.

9. Course Material

Following course material is uploaded on the student portal: (give student portal link)

a. Course Policy
b. Lecture Notes
c. Lecture Videos
d. Lecture Presentations
e. Books / Reference Books
f. Assignments
g. Lab Manuals,
h. List of Program Outcomes

10. Course Outcome Attainment

Following means will be used to assess attainment of course learning outcomes.

a. Use of formal evaluation components of continuous evaluation, assignments, laboratory work, semester end examination
b. Informal feedback during course conduction

11. Academic Integrity Statement

Students are expected to carry out assigned work under Internal ContinuousAssessment (ICA) independently. Copying in any form is not acceptable and will invite strict disciplinary action. Evaluation of corresponding component will be affected proportionately in such cases. Plagiarism detection software will be used to check plagiarism wherever applicable. Academic integrity is expected from students in all components of course assessment.

12. Use of Generative AI

AI-Assisted Solutions: Use AI tools to generate initial ideas or draft solutions, emphasizing the need for refinement and human input.

Exploration of Possibilities: Encourage students to ask AI exploratory "what if" questions to deepen understanding or expand their solutions.

Scenario Simulations: Use AI to simulate potential outcomes or test hypothetical scenarios to answer questions more dynamically.