

Lesson Plan

Branch: Computer Engineering

Semester: VI

Year: 2022-23

Course Title: Mobile Computing (CSC603)	SEE: 3 Hours – Theory
Total Contact Hours: 39 Hours	Duration of SEE: 3 Hrs
SEE Marks: 80 (Theory) + 20 (IA)	
Lesson Plan Author: Dr. Ashok Kanthe	Date: 05/01/2023
Checked By:	Date:

Syllabus

Module		Content	Hrs
1		Introduction to Mobile Computing	4
	1.1	Introduction to Mobile Computing, Telecommunication Generations, Cellular systems.	
	1.2	Electromagnetic Spectrum, Antenna, Signal Propagation, Signal Characteristics, Multiplexing, Spread Spectrum: DSSS & FHSS.	
2		GSM Mobile services	8
	2.1	GSM Mobile services, System Architecture, Radio interface, Protocols, Localization and Calling, Handover, security (A3, A5 & A8)	
	2.2	GPRS system and protocol architecture	
	2.3	UTRAN, UMTS core network; Improvements on Core Network	
3		Mobile Networking	8
	3.1	Medium Access Protocol, Internet Protocol and Transport layer	
	3.2	Mobile IP: IP Packet Delivery, Agent Advertisement and Discovery, Registration, Tunneling and Encapsulation, Reverse Tunneling.	
	3.3	Mobile TCP: Traditional TCP, Classical TCP Improvements like Indirect TCP, Snooping TCP & Mobile TCP, Fast Re transmit/ Fast Recovery, Transmission/Timeout Freezing, Selective Re transmission.	
4		Wireless Local Area Networks	6
	4.1	Wireless Local Area Networks: Introduction, Infrastructure and ad-hoc Network.	
	4.2	IEEE 802.11: System architecture , Protocol architecture , Physical layer, Medium access control layer, MAC management, 802.11a, 802.11b	

		standard	
	4.3	Wi-Fi security : WEP ,WPA, Wireless LAN Threats , Securing Wireless Networks	
	4.4	Bluetooth: Introduction, User Scenario, Architecture, protocol stack	
5		Mobility Management	6
	5.1	Mobility Management : Introduction, IP Mobility, Optimization, IPv6	
	5.2	Macro Mobility : MIPv6, FMIPv6	
	5.3	Micro Mobility: CellularIP, HAWAII, HMIPv6	
6		Long-Term Evolution (LTE) of 3GPP	7
	6.1	Long-Term Evolution (LTE) of 3GPP : LTE System Overview,	
	6.2	LTE/SAE Requirements, SAE Architecture	
	6.3	EPS: Evolved Packet System, E-UTRAN, Voice over LTE (VoLTE), Introduction to LTE-Advanced.	
	6.4	Self Organizing Network (SON-LTE), SON for Heterogeneous Networks (HetNet), Comparison between Different Generations (2G, 3G, 4G and 5G), Introduction to 5G.	

Course Objectives:

1. To introduce the basic concepts and principles in mobile computing. This includes major techniques involved, and networks & systems issues for the design and implementation of mobile computing systems and applications.
2. To explore both theoretical and practical issues of mobile computing.
3. To provide an opportunity for students to understand the key components and technologies involved and to gain hands-on experiences in building mobile applications.

Course Outcomes:

Upon completion of this course students will be able to:

CSC603.1: To identify basic concepts and principles in computing, cellular architecture.

CSC603.2: To describe the components and functioning of mobile networking.

CSC603.3: To classify variety of security techniques in mobile network.

CSC603.4: To apply the concepts of WLAN for local as well as remote applications.

CSC603.5: To describe Long Term Evolution (LTE) architecture and its interfaces.

CO-PO Mapping: (BL – Blooms Taxonomy, C – Competency, PI – Performance Indicator)

CO	BL	C	PI	PO	Mapping
CSC603.1	2	1.3	1.3.1	PO1	2

		1.4	1.4.1		
		2.1	2.1.2	PO2	2
		2.2	2.1.3		
CSC603.2	2	1.4	1.4.1	PO1	2
		2.2	2.2.2	PO2	3
		2.4	2.4.2		
		3.2	3.3.1	PO3	2
CSC603.3	2	1.3	1.3.1	PO1	2
		2.2	2.2.3	PO2	3
		2.6	2.2.3		
			2.4.3		
			2.4.4		
		3.2	3.2.1	PO3	1
		4.1	4.4.1	PO4	1
			4.1.2		
CSC603.4	3	1.3	1.3.1	PO1	2
		1.4	1.4.1		
		2.2	2.1.1	PO2	2
		3.1	3.1.1	PO3	2
CSC603.5	2	1.4	1.4.1	PO1	2
		2.2	2.2.3	PO2	2
		2.4	2.4.2	PO3	2
		5.1	5.1.1	PO5	2

CO-PO-PSO Mapping:

Relationship of course outcomes with program outcomes: Indicate 1 (low importance), 2 (Moderate Importance) or 3 (High Importance) in respective mapping cell.

Program Outcomes (POs)

Engineering Graduates will be able to

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 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 of 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 the 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 work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognized the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

(A) Program Specific Outcomes (PSOs)**Student will have an ability to**

1. Develop Artificial Intelligence and Machine Learning systems.
2. Apply Cyber Security mechanisms to ensure the protection of information technology assets.

	PO1 (Engg Know)	PO2 (Ana)	PO3 (De sign)	PO4 (inve stiga)	PO5 (tools)	PO6 (engg Soci)	PO7 (Env)	PO8 (Eth)	PO9 (ind Team)	PO10 (comm.)	PO11 (PM)	PO12 (life Long)
CSC603.1	2	1										
CSC603.2	2	1										
CSC603.3	2				1(NS2)							
CSC603.4	2											
CSC603.5	2				2							

CO	PSO1	PSO2
CSC603.1		
CSC603.2		
CSC603.3		
CSC603.4		
CSC603.5		

CO Assessment Tools:

Course Outcomes	Direct Method (80%)						Indirect Method (20%)	
	Unit Tests		Assignments			Practical	End Sem Exam	Course exit survey
	1	2	1	2	3	1		
CSC603.1	10%	--	10%	--	--	10%	60%	100%
CSC603.2	20%	--	--	20%	--	30%	60%	100%
CSC603.3	10%	10%	--	--	10%	15%	60%	100%
CSC603.4	--	10%	--	--	20%	15%	60%	100%
CSC603.5	--	10%	--	--	10%	30%	60%	100%

Attainment:**CO CSC603.1:**

Direct Method

$$A_{\text{CSC603.1D}} = 0.1 * \textit{Test1} + 0.2 * \textit{Assignment} + 0.1 * \textit{Practical} + 0.6 * \textit{SEE_Theory}$$

Final Attainment:

$$A_{\text{CSC603.1}} = 0.8 * A_{\text{CSC603.1D}} + 0.2 * A_{\text{CSC603.1I}}$$

CO CSC603.2:

Direct Method

$$A_{\text{CSC603.2D}} = 0.2 * \textit{Test1} + 0.1 * \textit{Assignment} + 0.1 * \textit{Practical} + 0.6 * \textit{SEE_Theory}$$

Final Attainment:

$$A_{\text{CSC603.2}} = 0.8 * A_{\text{CSC603.2D}} + 0.2 * A_{\text{CSC603.2I}}$$

CO CSC603.3:

Direct Method

$$A_{\text{CSC603.3D}} = 0.1 * \textit{Test1} + 0.1 * \textit{Test2} + 0.1 * \textit{Assignment} + 0.1 * \textit{Practical} + 0.6 * \textit{SEE_Theory}$$

Final Attainment:

$$A_{\text{CSC603.3}} = 0.8 * A_{\text{CSC603.3D}} + 0.2 * A_{\text{CSC603.3I}}$$

CO CSC603.4:

Direct Method

$$A_{\text{CSC603.4D}} = 0.1 * \textit{Test2} + 0.2 * \textit{Assignment} + 0.1 * \textit{Practical} + 0.6 * \textit{SEE_Theory}$$

Final Attainment:

$$A_{\text{CSC603.4}} = 0.8 * A_{\text{CSC603.4D}} + 0.2 * A_{\text{CSC603.4I}}$$

CO CSC603.5:

Direct Method

$$A_{\text{CSC603.5D}} = 0.1 * \textit{Test2} + 0.2 * \textit{Assignment} + 0.1 * \textit{Practical} + 0.6 * \textit{SEE_Theory}$$

Final Attainment:

$$A_{\text{CSC603.5}} = 0.8 * A_{\text{CSC603.5D}} + 0.2 * A_{\text{CSC603.5I}}$$

CO CSC603.5:

Direct Method

$$A_{\text{CSC602.5D}} = 0.1 * \textit{Test2} + 0.2 * \textit{Assignment} + 0.1 * \textit{Practical} + 0.6 * \textit{SEE_Theory}$$

Final Attainment:

$$A_{\text{CSC603.6}} = 0.8 * A_{\text{CSC603.6D}} + 0.2 * A_{\text{CSC603.6I}}$$

Course Level Gap (if any): Nil

Content beyond Syllabus: Nil

(2022-2023)

Lesson Plan: Mobile Computing (Div. A)

Semester VI

Year: 2022-23

Module	Contents	Hours	Planned date	Actual date	Content Delivery Method	Remark	
Module 1 1	Introduction to Mobile Computing, Telecommunication Generations,	4	11-01-23	11-01-23	PPT & Board		
	2		Cellular systems. Electromagnetic Spectrum,	12-01-23	12-01-23	PPT & Board	
	3		Antenna, Signal Propagation, Signal Characteristics,	13-01-23	13-01-23	PPT & Board	
	4		Multiplexing, Spread Spectrum: DSSS & FHSS.	18-01-23	18-01-23	PPT & Board	
Module 2 5	GSM Mobile services- GSM Mobile services	8	20-01-23	19-01-23	PPT & Board		
	6		System Architecture, Radio interface, Protocols,	24-01-23	20-01-23	PPT & Board	
	7		Localization and Calling, Handover,	25-01-23	24-01-23	PPT & Board	
	8		Security (A3, A5 & A8)	27-01-23	25-01-23	PPT & Board	
	9		GPRS system and protocol architecture	31-01-23	27-01-23	PPT & Board	
	10		UTRAN	01-02-23	21-02-23	PPT & Board	
	11		UMTS core network;	03-02-23	31/01/2023	PPT & Board	
	12		Improvements on Core Network	07-02-23	03/02/23	PPT & Board	Assignment 1 given
Module 3	Mobile Networking- Medium Access Protocol	8	08-02-23	07-02-23	PPT &		

13					Board	
14	Internet Protocol and Transport layer		10-02-23	08-02-23	PPT & Board	
15	Mobile IP: IP Packet Delivery,		14-02-23	10-02-23	PPT & Board	
16	Mobile TCP: Traditional TCP,		15-02-23	14-02-2023	PPT & Board	
17	Agent Advertisement and Discovery ,Registration,		17-02-23	14-02-2023	PPT & Board	
18	Classical TCP Improvements like Indirect TCP,		21-02-23	15-02-23	PPT & Board	
19	Transmission/Timeout Freezing,		22-02-23	17-02-23	PPT & Board	
20	Selective Re transmission.		24-02-23	21-02-23	PPT & Board	
Module 4 21	Wireless Local Area Networks -Introduction, Types of WLANs,	6	25-02-23 (Extra)	22-02-23	PPT & Board	
22	Hidden station problem, MACA		01-03-23	22-02-23	PPT & Board	
23	, IEEE 802.11 WLAN standards system architecture, IEEE 802.11 protocol		03-03-23	08-03-23	PPT & Board	
24	physical layer, IEEE 802.11 MAC sublayer		08-03-23	14-03-23	PPT & Board	
25	Bluetooth : User scenario , architecture , protocol stack		10-03-23	14-03-23	PPT & Board	
26	Wireless Local Area Networks -Introduction, Types of WLANs, Hidden station problem, MACA		14-03-23	15-03-23	PPT & Board	Assignment 2
Module 5 27	Mobility Management Mobility Management : Introduction	6	15-03-23	17-02-23	PPT & Board	
28	IP Mobility, Optimization,		17-03-23	17-02-23	PPT & Board	
29	IPv6		21-03-23	17-02-23	PPT &	

					Board	
30	Macro Mobility : MIPv6, FMIPv6		24-03-23	11-04-23	PPT & Board	
31	Micro Mobility: CellularIP		28-03-23	11-04-23	PPT & Board	
32	HAWAII, HMIPv6		31-03-23	11-04-23	PPT & Board	
Module 6	Long-Term Evolution (LTE) of 3GPP : LTE System Overview,	7	05-04-2023	13-04-23	PPT & Board	
33						
34	LTE/SAE Requirements,		11-04-23	13-04-23	PPT & Board	
35	SAE Architecture		12-04-23	13-04-23	PPT & Board	
36	EPS: Evolved Packet System,		17-04-23 (Extra)	13-04-23	PPT & Board	
37	LTE higher protocol layers,		19-04-23	13-04-23	PPT & Board	
38	Self Organizing Network (SON-LTE), SON for Heterogeneous Networks (HetNet),		21-04-23	13-04-23	PPT & Board	
39	SON-LTE, HetNet, Introduction to 5G		21-04-23	13-04-23	PPT & Board	

Lesson Plan: Mobile Computing (Div. B)

Module	Contents	Hours	Planned Date	Actual Date	Content Delivery Method /Learning Activities
M-1	Introduction to Mobile Computing, Telecommunication Generations,	4	09-01-23	09-01-23	Blackboard Teaching, PPT
1.	Cellular systems. Electromagnetic Spectrum,		10-01-23	10-01-23	Blackboard Teaching, PPT
2	Antenna, Signal Propagation, Signal Characteristics,		12-01-23	12-01-23	Blackboard Teaching, PPT
3					

4	Multiplexing, Spread Spectrum: DSSS & FHSS.		16-01-23	17-01-23	Blackboard Teaching, PPT
M-2 5	GSM Mobile services- GSM Mobile services	8	17-01-23	18-01-23	Blackboard Teaching, PPT
6	System Architecture, Radio interface, Protocols,		19-01-23	23-01-23	Blackboard Teaching, PPT
7	Localization and Calling, Handover,		23-01-23	24-01-23	Blackboard Teaching, PPT
8	Security (A3, A5 & A8)		24-01-23	27-01-23	Blackboard Teaching, PPT
9	GPRS system and protocol architecture		27-01-23	30-01-23	Blackboard Teaching, PPT
10	UTRAN		30-01-23	03-02-23	Blackboard Teaching, PPT,
11	UMTS core network;		31-01-23	06-02-23	Blackboard Teaching, PPT
12	Improvements on Core Network		03-02-23	06-02-23	Blackboard Teaching, PPT
M-3 13	Mobile Networking- Medium Access Protocol	8	06-02-23	07-02-23	Blackboard Teaching, PPT
14	Internet Protocol and Transport layer		07-02-23	10-02-23	Blackboard Teaching, PPT
15	Mobile IP: IP Packet Delivery,		08-02-23	13-02-23	Blackboard Teaching
16	Mobile TCP: Traditional TCP,		13-02-23	13-02-23	Blackboard Teaching, PPT
17	Agent Advertisement and Discovery, Registration,		14-02-23	13-02-23	Blackboard Teaching, PPT
18	Classical TCP Improvements like Indirect TCP,		17-02-23	14-02-23	Blackboard Teaching, PPT
19	Transmission/Timeout Freezing,		20-02-23	14-02-23	Blackboard Teaching, PPT
20	Selective Re transmission.		21-02-23	14-02-23	Blackboard Teaching, PPT
M-4 21	Wireless Local Area Networks- Introduction, Types of WLANs,	6	24-02-23	17-02-23	Blackboard Teaching, PPT

22	Hidden station problem, 6MACA		27-02-23	17-02-23	Blackboard Teaching, PPT
23	, IEEE 802.11 WLAN standards system architecture, IEEE 802.11 protocol		28-02-23	17-02-23	Blackboard Teaching, PPT
24	physical layer, IEEE 802.11 MAC sublayer		03-02-23	13-02-23	Blackboard Teaching, PPT
25	Bluetooth : User scenario , architecture , protocol stack		06-02-23	13-02-23	Blackboard Teaching, PPT
26	Wireless Local Area Networks -Introduction, Types of WLANs, Hidden station problem, MACA		10-02-23	13-02-23	Blackboard Teaching, PPT
Module 5 27	Mobility Management Mobility Management : Introduction	6	13-02-23	14-03-23	Blackboard Teaching, PPT
28	IP Mobility, Optimization,		14-02-23	14-03-23	Blackboard Teaching, PPT
29	IPv6		17-02-23	14-03-23	Blackboard Teaching, PPT
30	Macro Mobility : MIPv6, FMIPv6		20-03-23	17-03-23	Blackboard Teaching, PPT
31	Micro Mobility: CellularIP		21-03-23	17-03-23	Blackboard Teaching, PPT
32	HAWAII, HMIPv6		24-03-23	17-03-23	Blackboard Teaching, PPT
Module 6 33	Long-Tem Evolution (LTE) of 3GPP : LTE System Overview,	7	27-03-23	03-04-23	Blackboard Teaching, PPT
34	LTE/SAE Requirements,		28-03-23	03-04-23	Blackboard Teaching, PPT
35	SAE Architecture		31-03-23	13-04-23	Blackboard Teaching, PPT
36	EPS: Evolved Packet System,		03-04-23	13-04-23	Blackboard Teaching, PPT
37	LTE higher protocol layers,		10-04-23	13-04-23	
38	Self Organizing Network (SON-LTE), SON for Heterogeneous Networks (HetNet),		11-04-23	13-04-23	

39	SON-LTE, HetNet, Introduction to 5G		17-04- 23	13-04-23	
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Text Books/ Reference Books:

Text Books:

- 1 Jochen Schiller, "Mobile Communication", Addison Wesley, Pearson Education.
- 2 William Stallings "Wireless Communications & Networks", Second Edition, Pearson Education.
- 3 Christopher Cox, "An Introduction to LTE: LTE, LTE-Advanced, SAE and 4G Mobile Communications", Wiley publications.
- 4 Raj Kamal, "Mobile Computing", 2/e, Oxford University Press-New.

Reference Books:

- 1 Seppo Hamalainen, Henning Sanneck , Cinzia Sartori, "LTE Self-Organizing Networks (SON): Network Management Automation for Operational Efficiency", Wiley publications
- 2 Ashutosh Dutta, Henning Schulzrinne "Mobility Protocols and Handover Optimization: Design, Evaluation and Application", IEEE Press, Wiley Publication.
- 3 Michael Gregg, "Build your own security lab", Wiley India edition.
- 4 Dipankar Raychaudhuri, Mario Gerla, "Emerging Wireless Technologies and the Future Mobile Internet", Cambridge.
- 5 Andreas F. Molisch, "Wireless Communications", Second Edition, Wiley Publication.