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संगणक विज्ञान एंव अभियांत्रिकी विभाग / DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
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No:- **Date:**

CSX4278 Ubiquitous Computing

L-T-P-Cr: 3-0-0-3

Prerequisites: Computer Networks, Artificial Intelligence, Internet of Things.

Course Overview: The purpose of this course is to impart fundamental concepts of ubiquity and autonomy in computing and context awareness in intelligent interactions, relating to contemporary pervasive and autonomous systems.

Course Outcomes – After completing this course, students should be able to:

CO-1. *recall* principles of ubiquitous computing (UbiCom), human-computer interaction (HCI) and artificial intelligence (AI), as well as functioning of context-aware systems (CAS), intelligent systems (IS), and autonomous systems (AS);
[Bloom level: *Remember*; Mapped to: PO-1, PSO-1, PSO-2]

CO-2. *recognise* distinguishing features and design aspects incorporated in contemporary UbiCom systems, intelligent HCI (iHCI) systems, micro electromechanical systems (MEMS), embedded systems (ES), real-time systems (RTS), CAS, IS, and AS;
[Bloom level: *Remember*; Mapped to: PO-1, PSO-1, PSO-2]

CO-3. *explain* concepts and techniques in mobility, spatial and temporal aspects of context awareness, along with tagging, sensing and actuating in iHCI, as well as reflection, self-awareness and self-management in autonomic computing;
[Bloom level: *Understand*; Mapped to: PO-1, PO-2, PSO-1, PSO-2]

CO-4. *solve* exercises and problems on functioning of MEMS, ES, RTS, CAS, semantic knowledge base IS, AS, as well as ubiquitous communication and networks;
[Bloom level: *Apply*; Mapped to: PO-1, PO-2, PO-3, PSO-1, PSO-2]

CO-5. *determine* scheduling of resources supporting temporal awareness in specified information and communication technology (ICT) based systems;
[Bloom level: *Analyze*; Mapped to: PO-1, PO-2, PO-3, PSO-1, PSO-2]

CO-6. *evaluate* reflective, self-aware, self-regulated techniques of given contemporary UbiCom systems.
[Bloom level: *Evaluate*; Mapped to: PO-1, PO-2, PO-4, PO-5, PSO-1, PSO-2]

Mapping of COs to POs and PSOs (Course Articulation Matrix):

COs	Bloom levels	POs												PSOs	
		PO-1 (Engineering knowledge)	PO-2 (Problem analysis)	PO-3 (Design/development of solutions)	PO-4 (Conduct investigations of complex problems)	PO-5 (Modern tool usage)	PO-6 (The engineer and society)	PO-7 (Environment and sustainability)	PO-8 (Ethics)	PO-9 (Individual and team work)	PO-10 (Communication)	PO-11 (Project management and finance)	PO-12 (Life-long learning)	PSO-1 (Complex software & info mgmt. systems)	PSO-2 (Sustainable intelligent, secure computing solutions)
CO-1	Remember	3												3	3
CO-2	Remember	3												3	3
CO-3	Understand	3	3											3	3
CO-4	Apply	3	3	3										3	3
CO-5	Analyze	3	3	3										3	3
CO-6	Evaluate	3	3		3	3								3	3

Note: Strong relation = 3; Moderate relation = 2; Weak relation = 1; No relation = 0.

Syllabus:

UNIT I: **Lectures: 4**

Introduction: Ubiquitous computing, Modelling of ubiquitous computing properties, Ubiquitous system environment interaction.

Architectural design for UbiCom systems: Smart DEI, Model applications.

UNIT II: **Lectures: 10**

Human computer interaction: Hidden UI via basic smart devices, Human centred design (HCD).

User models: Acquisition and representation, iHCI design.

Tagging, Sensing and Controlling: Tagging of physical world, sensor and sensor networks.

Micro actuation and sensing: MEMS, Embedded systems and Real-time systems.

UNIT III: **Lectures: 6**

Context-aware systems: Modelling context awareness, mobility awareness, spatial awareness, temporal awareness, coordinating and scheduling, ICT system awareness.

UNIT IV: **Lectures: 10**

Intelligent systems (IS): IS architectures, Semantic KB IS.

Intelligent system interaction: Interaction multiplicity, IS interaction design, Intelligent interaction applications case study.

UNIT V: **Lectures: 12**

Autonomous systems and artificial life: Reflective and self-aware systems, self-management and autonomic computing, Complex systems, Artificial life.

Ubiquitous communication: Audio networks, Data networks, Wireless data networks, Universal and transparent audio, video and alphanumeric data network access, Ubiquitous networks, Network design issues.

Text/Reference Books

1) *Ubiquitous Computing: Smart Devices, Environments and Interactions* .Stefan Poslad, Wiley
2) *Pervasive Systems and Ubiquitous Computing.* Genco and S. Sorce, WIT Press, Boston.
3) *Ubiquitous Computing Fundamentals.* John Krumm,CRC Press.