राष्ट्रीय प्रौद्योगिकी संस्थान पटना / NATIONAL INSTITUE OF TECHNOLOGY PATNA
संगणक विज्ञान एंव अभियांत्रिकी विभाग / DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
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No:- **Date:**

CSX4220 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.

UNIT I: **Lectures: 4**

Basics and Vision: Modelling the Key Ubiquitous Computing Properties, Ubiquitous System Environment Interaction Architectural Design for UbiCom Systems: Smart DEI Model Applications

UNIT II: **Lectures: 10**

Human Computer Interaction: Introduction, Hidden UI via Basic Smart Devices, Human Centred Design (HCD), User Models: Acquisition and Representation, iHCI Design

Tagging, Sensing and Controlling: Tagging the Physical World, Sensor and Sensor Networks, Micro Actuation and Sensing: MEMS, Embedded Systems and Real-time Systems

UNIT III: **Lectures: 6**

Context-Aware Systems: Introduction, Modelling Context Aware Systems, Mobility Awareness, Spatial Awareness, Temporal Awareness: Coordinating and Scheduling, ICT System Awareness

UNIT IV: **Lectures: 10**

Intelligent Systems (IS): Basic Concepts, IS Architectures, Semantic KB IS, Intelligent System Interaction: Interaction Multiplicity, IS Interaction Design, Some Generic Intelligent Interaction Applications

UNIT V: **Lectures: 12**

Autonomous Systems and Artificial Life: Basic Autonomous Intra-Acting Systems, 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, Further Network Design Issues

Text/Reference Books

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