

# Birla Institute of Technology & Science, Pilani

## Instruction Division

### First Semester 2015-2016 Course Hand-out: Part-II

*In addition to part-I (General Hand-out for all courses appended to the timetable), this portion gives further specific details regarding the course.*

**Course Number: CS G 541 / SS G531**

**Course Title: Pervasive Computing**

**Instructor-in-Charge: Rahul Banerjee**

**Co-Instructors** (for other TP locations): Hyderabad: Dr. Murli Kavuri, Goa: TBA

#### [1]. Course Description

*The course is about the emerging discipline of Pervasive Computing, which is also known as ubiquitous computing. The key element here is the omnipresence of information devices. These devices can be embedded into cars, airplanes, ships, bikes, posters, signboards, walls and even clothes. This course focuses on independent information devices including wearable computers, mobile phones, smart phones, smart-cards, wireless sensor-compute nodes and the services made available by them. It includes human-computer interaction using several types of elements including sensing, text, speech, handwriting and vision.*

#### [2]. Scope and Objectives

*The course aims at providing a sound conceptual foundation in the area of Pervasive Computing aspects. The course attempts to provide a balanced treatment of the mechanisms and environments of pervasive computing and initiates senior CS students to the state-of-the-art in the area. At the end of this course, students should be able to conceptualize, analyze and design select classes of pervasive computing systems.*

#### [3]. Text Books:

*<No graduate level course can depend on only one book. Text book is being mentioned here only for providing a useful point of reference in keeping with the current practice.>*

*T1. Stefen Poslad: Ubiquitous Computing: Smart Devices, Environments and Interactions, Wiley, London, 2009, Indian reprint, 2014.*

#### [4]. Reference Material: *<Please see the topic-wise reading advisories at the Course Portal with effect from the first week of instruction!>*

*R1. Guruduth S. Banavar, Norman H. Cohen, Chandra Narayanaswami: Pervasive Computing: An Application-Based Approach, Wiley Interscience, 2012.*

*R2. Mohammad S. Obaidat, Mieso Denko, Isaac Woungang (Editors): Pervasive Computing and Networking, Wiley, 2012.*

#### [5]. Course Home Page:

*Please self-register and login at <http://any-learn.bits-pilani.ac.in> for participating in the course page once the official ERP registration process gets over. Those who get the course via late addition / substitution, may do the same after they get so permitted by the ERP.*

**[6]. Plan of Study and Lecture-Schedule**

The following table shows a tentative lesson-plan which may require due modification depending upon the way course contents are received by the intended population.

| L. No. | Topic(s)                                                                                                                                                                                                                                                                                                                                                                                                      | Sections in the T1      |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| 1-2    | <i>Introductory concepts, brief history, How to model involved fundamental attributes / properties relevant to ubiquitous / pervasive computing? HCI as relevant to everywhere computing, Architectural Elements of Pervasive Computing Systems</i>                                                                                                                                                           | 1.1, 1.2, 1.3, 1.4, 1.5 |
| 3-4    | <i>Select Case Studies in Past, Contemporary and In-research Pervasive Computing Systems and related products / applications, Current Status and Emerging Trends in Pervasive / Ubiquitous / Everywhere / Invisible Computing</i>                                                                                                                                                                             | 2.1-2.4                 |
| 5-6    | <i>Pervasive Computing Device Technologies and Service Architectures: Device types, Device Characteristics, Pervasive Computing Service Architectural Paradigms, Service / Resource Discovery basics, Elements of service composition, invocation and deployment</i>                                                                                                                                          | 3.1-3.3                 |
| 7-8    | <i>Select concepts in Operating Systems, Virtualization and their relevance to Pervasive Computing, select example Operating Systems of relevance</i>                                                                                                                                                                                                                                                         | 3.4                     |
| 9-11   | <i>Smart Phones, Smart Cards and related hardware / software concepts (OS included), select case studies, connectivity through Gateway services: the OSGi approach</i>                                                                                                                                                                                                                                        | 4.1, 4.5                |
| 12-14  | <i>Human-Computer Interactions (HCI) in Pervasive Computing: basics, select representative approaches to the HCI, invisible / hidden UI techniques and technologies</i>                                                                                                                                                                                                                                       | 5.1-5.4                 |
| 15     | <i>HCI and the Human-Centred Design (HCD), fundamentals of User modelling, the iHCI paradigm</i>                                                                                                                                                                                                                                                                                                              | 5.5-5.7                 |
| 16-17  | <i>Passive, Active and Semi-Active Tagging fundamentals and applications: the RFID approach, the Internet of Things paradigm and role of the RFID tags</i>                                                                                                                                                                                                                                                    | 6.1,6.2                 |
| 18-20  | <i>Introduction to sensors, sensor-compute nodes, sensor networks and wireless sensor networks (WSNs)</i>                                                                                                                                                                                                                                                                                                     | 6.3                     |
| 21     | <i>Fundamentals of real-time and non-real-time embedded systems of relevance, select examples</i>                                                                                                                                                                                                                                                                                                             | 6.5                     |
| 22-25  | <i>Fundamentals of Context-Aware Computing, Context Modelling, Mobility aspects of awareness and its implications, Spatial aspects of awareness and its implications, Temporal aspects of awareness and its implications, complementary aspects of awareness and its role in service adaptation</i>                                                                                                           | 7.1-7.6                 |
| 26-28  | <i>Elements of intelligent / smart pervasive computing systems, Environments and Architectures of relevance, brief discussion on major types / classes of Intelligent Systems (ISes) and their relevance to Ubiquitous Computing Environments, Multi-Agent ISes, generic, / social networking / media-exchange / recommender and referral systems and associated work flow aspects in pervasive computing</i> | 8.1-8.79.3.5, 9.3-9.4   |
| 29-31  | <i>Basics of Autonomous Systems and Intelligent Life paradigm of computing</i>                                                                                                                                                                                                                                                                                                                                | 10.1-10.6               |
| 32-34  | <i>Communication Networking aspects of Pervasive / Ubiquitous Computing</i>                                                                                                                                                                                                                                                                                                                                   | 11.1-11.7               |
| 35-36  | <i>Principal challenges, issues and contemporary approaches in pervasive computing</i>                                                                                                                                                                                                                                                                                                                        | 13.1-13.13.9            |
| 37-38  | <i>Recent advances in Pervasive / Ubiquitous Computing, select case studies</i>                                                                                                                                                                                                                                                                                                                               | Online lecture notes    |
| 39-40  | <i>Designing Real-life Pervasive Computing Systems</i>                                                                                                                                                                                                                                                                                                                                                        | Online lecture notes    |

**[7]. Evaluation Scheme:**

| <b>Evaluation Component</b>                                                                                                                                                                                                                                   | <b>Type</b>                                                                                                                                                                                                                                                         | <b>Duration</b>                                                                                            | <b>Weight</b> | <b>Date, Time &amp; Venue</b>                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------|
| Experiments / Mini-Projects (from the list that would be made available at the course portal after second week, students, in groups of two members each, may also come up with their own ideas of relevance and get them approved by the team of instructors) | Learning by Doing<br>(Choice between experiments and Mini-projects shall be made on the local basis based on available infrastructure and expertise)                                                                                                                | To be spread out, in phases, over the semester but to be completed latest by second week of November 2015. | 25%           | Not applicable                                         |
| Mid-Semester Test                                                                                                                                                                                                                                             | Closed Book                                                                                                                                                                                                                                                         | 90 Min.                                                                                                    | 25%           | TBA                                                    |
| Research Seminars                                                                                                                                                                                                                                             | Local Seminar Presentations with open Q & A.<br>(One pre-approved topic per student, chosen / assigned within the first month of the course. A list of select topics shall be made available at the course portal for this purpose, by the end of the first month.) | 30 Minutes<br>(Minimum)                                                                                    | 20%           | These seminars must be conducted locally (not over TP) |
| Comprehensive Exam.                                                                                                                                                                                                                                           | 20% Open Book,<br>10% Closed Book                                                                                                                                                                                                                                   | Three Hours<br>(2: OB+1: CB)                                                                               | 30%           | December 7, 2015,<br>Afternoon Session                 |

[8]. **Notices:** All notices shall be displayed electronically only at the Course Page of the [Any-Learn](#) LMS portal.

[9]. **Make-up Policy:** On a case-by-case basis, Make-ups shall be allowed by the local Instructor in consultation with the Instructor-in-Charge.

[10]. **Grading Policy:** While teaching shall be centrally done via Telepresence and the same Mid-Semester & End-Semester (Comprehensive Examination) question papers shall be used for all participating campuses, evaluation of all components as well as grading shall be locally done by associated co-instructor in respective campuses.

[11]. **Chamber Consultation Hours:** TBA in respective campuses. At Pilani campus, it shall be every Tuesday, 3 PM.

**Instructor-in-charge**