ADVANCED COMPUTER ARCHITECTURE

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Department of CSE
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PRE-REQUISITES : Computer Architecture (2nd year level)

INTENDED AUDIENCE : UG and PG students (Computer Science and Electrical Engineering)

INDUSTRIES APPLICABLE TO : Intel, AMD, IBM, Qualcomm, Texas Instruments

COURSE OUTLINE :
This course is on Advanced Computer Architecture. It will introduce students to advanced aspects of processor design and will specifically focus on out-of-order pipelines, GPUs, and compiler techniques for enhancing ILP. The course will subsequently move on to cache design and main memory technologies such as DDR-4. A substantial portion of the course will be devoted to the theory of on-chip networks and memory models. The last part of the course will cover aspects of low-power design, hardware security, and reliability.

ABOUT INSTRUCTOR :
Prof. Smruti R. Sarangi is an Associate Professor in the Computer Science and Engineering department at IIT Delhi. He has a Ph.D in computer science from the University of Illinois at Urbana Champaign, USA, and a B.Tech from IIT Kharagpur. Prior to his appointment as a faculty member in IIT Delhi in 2011, he spent 5 years working for IBM Research Labs, and Synopsys Research. He has published 60 papers in prestigious international conferences and journals, and holds 5 US patents. He is a member of the IEEE and ACM.

COURSE PLAN :

Week 1**:** In-order pipelines overview

Week 2**:** Out-of-order pipelines, Branch prediction

Week 3**:** Advanced branch prediction techniques

Week 4**:** Issue, select, and commit

Week 5**:** Aggressive speculation

Week 6**:** Compiler techniques for enhancing ILP

Week 7**:** Caches: Design, modeling, and optimizations

Week 8**:** On-chip networks

Week 9**:** Theory of memory models

Week 10**:** Coherence Protocols

Week 11**:** Low power design

Week 12**:** Reliability and Hardware Security