Course Title : **Advanced Computer Architecture**
Course Code : COM 608.3
Semester : Second Semester
Credit : 3
Class Load : 3 hours
Evaluation :

	Theory	Practical	Total
Sessional	50	-	50
Final	50	-	50
Total	100	-	100

Course Objective:

To make the student familiar with the fundamentals of the technology behind the design and architectural aspects of computer system, processor organization, storage system organization, parallel processing and multiprocessing concepts, and performance measures.

Course Contents:

1. **Fundamentals of Computer Design** **(5 hrs)**
   Introduction, Technology trends; Cost, Price and their trends; Measuring Performances; Quantitative issues.

2. **Instruction Set Architecture** **(6 hrs)**
   Classification, Memory Addressing and modes, Type and size of operands, Operations in the instruction set, Control flow instruction, Instruction set encoding.

3. **Memory and Storage System** **(12 hrs)**
   Basic Concepts of Memory, Internal Organization of Memory Devices, Cache Memory, Cache Miss Penalty and Reducing Cache Misses, Reducing Cache Hit Time, Main Memory, Virtual Memory, Issues in the Design of Memory Hierarchies, Fallacies and Pitfalls in the Design of Memory Hierarchies. Storage Systems, Types of Storage Devices, Busses, I/O Performance Measures, Reliability, Availability and RAID, Interfacing to Processor, Memory and OS, Designing an I/O System, Unix File System Performance.

4. **Pipelining and Parallelism** **(12 hrs)**
   Basic concepts of Pipelining, DLX Pipeline, Pipeline Hazards, Data and Control Hazards, Difficulties in Implementation, Instruction Set Design and Pipelining, Concepts and Challenges of Instruction Level Parallelism, Overview of Data Hazards with Dynamic Scheduling, Reducing Branch Penalties with Dynamic Hardware Prediction, ILP with Multiple Issue, Hardware Support for Extracting More Parallelism, Exploiting ILP with software approaches

5. **Multiprocessors and Thread level Parallelism** **(6 hrs)**
   Multiprocessing and characteristics of application domain, Symmetric Shared-Memory Architectures, Distributed Shared-Memory Architectures, Performance Metrics, Synchronization, Multithreading and related issues

6. **Interconnection and Cluster Computing** **(4 hrs)**
   Interconnection requirements, Issues for interconnection networks, Clusters; Cluster design and other trends.

References

1. J. L. Henessy and D.A. Patterson, *Computer Architecture – A Quantitative Approach*, Third Edition, Morgan Kaufmann Publishers.
2. V. C. Hammacher, Z. G. Vranesic, and S. G. Zaky, *Computer Organization*, McGraw Hills
3. K. Hawang, Advanced Computer Architecture, McGraw Hills
4. J. L. Hennessy and D.A. Patterson, *Computer Organization and Design*, Second Edition, Morgan Kaufmann Publishers.
5. D. Sima, T. Fountain, and P. Kacsak, Advanced Computer Architecture – A Design Space Approach, Addison Wesley