1. **Course Number and Course Title:**
   COE533 Advanced Computer Architecture

2. **Credits Hours:**

   3 – 0 – 3

3. **Prerequisites and/or Co-Requisites:**
   Prerequisite: Admission to MSCoE Program
   Co-requisites: None

4. **Name and Contact Information of Instructor:**
   Dr. Tarik Ozkul
   Office: EB2-212
   Email: tozkul@aus.edu
   Phone: (06) 515-2455
   Office Hours: as posted on *iLearn*; also by appointment

5. **Course Description (Catalog Description):**
   Covers techniques of quantitative analysis and evaluation of modern computing systems. Emphasizes the major component subsystems of high-performance computers: pipelining, instruction level parallelism, memory hierarchies, input/output and network-oriented interconnections

6. **Textbook and other Supplemental Material:**
   Primary: Patterson D. and Hennessey J., "Computer Architecture: A Quantitative Approach", 5th Ed., 2006, Morgan Kaufman.

   Supplementary: Selected Readings in Computer Architecture

7. **Learning Outcomes:**
   This course requires the student to demonstrate the ability to:

   1. Understand manufacturing related issues during chip manufacturing and evaluate its effects on the design process
   2. Understand reliability related issues and be able to organize computer systems that matches required reliability conditions for given applications,
   3. Explain the factors that define computer performance
   4. Explain how to apply quantitative trade-off analysis in the design of a computer system
   5. Be aware of quantitative principles of computer design
   6. Explain modern memory system design techniques including single and multi-level cache and virtual memory
   7. Explain processor pipeline issues, including pipeline hazards and associated mitigation techniques
   8. Explain the advanced scheduling techniques and instruction-level parallelism used in modern super-scalar processors

9. Explain relevant design issues for multiprocessor systems, including cache coherency issues
10. Explain design principles and application of interconnection networks such as MPP network

8. Teaching and Learning Methodologies:

9. Course Topics and Schedule:

Topic	Weeks
Review: Perf/Cost Analysi, Amdhal's law, Tech Trends	0.5
Instruction Set Architecture	1
Pipelining, Hazards and Static Branch Prediction	2
ILP: Scoreboarding, Tomasulu, speculation	1
ILP: Dynamic Prediction Limits of ILP	1.5
Memory Hierarchy Design	1
Memory DRAM,VM and Banks	1
I/O: Metrics, Quieuing, Busses, Disks, RAID	2
Interconnection Networks	2
Multiprocessing	2
Review & Projects Presentation	2
Total:	16

10. Schedule of Laboratory and other Non-Lecture Sessions:

11. Out-of-Class Assignments with Due Dates:

Assignment	Due Date (tentative)
ISA HW	Week 2
Scoreboarding HW	Week 4
Tomosulu HW	Week 6
Dynamic prediction HW	Week 9

12. Student Evaluation:

Assignment	Due Date (tentative)
HW	%15
Quizzes	%15
Midterm exam	%20
Project	%25
Final exam	%30

13. Contribution of Course to Program Outcomes

Program Outcome	Extent of Contribution
Perform research emphasizing creativity, independent learning and scientific methods in a chosen area of computer engineering.	◑
Apply advanced mathematics and engineering knowledge in identifying, formulating and solving engineering problems.	○
Select and use techniques, skills and modern tools necessary for research or professional practice.	●
Communicate effectively	
Recognize the need for, and engage in, lifelong learning	◑
Attend to professional and ethical responsibilities	

Extent of contribution: ● high; ◑ medium; ○ low