M.SC. ‘INFORMATICS ENGINEERING’

Department of Informatics Engineering

HMU

Course title & identity

- Title: **Distributed Systems and Applications**
- Objective(s)
  - Distributed System Principles, Design and Models
  - Distributed System Requirements and Challenges
  - Distributed Algorithms
  - Information Exchange
  - Coordination

- Members of staff
  - Assistant Prof. Harris Papadakis

Approach

- Three (3) hours lectures: (YES/NO)
- Laboratory classes: (YES/NO)
- Project
  - 1 programming assignment (groups of 2)
- Mid-semester assessment (YES/NO)
- Final assessment (YES/NO)
- Grade: FA*0.6+P*0.4

Lecture topics/structure

- Introduction
  - Types of Distributed Systems
  - Comparison with related systems
    - Parallel Processing
    - Grid computing
    - Cluster computing
  - Basic Design Principles – Goals
    - Transparency
    - Openess-Interoperability
    - Scalability
    - Robustness
  - Concepts of Distributed Operating Systems
  - Middleware

Lecture topics/structure

- Distributed Systems Models
  - Communication Models
    - Client/Server
    - P2P Paradigm
      - Unstructured
      - Structured
  - Distributed Systems Models
    - Synchronous Systems
    - Asynchronous Systems
- Basic Distributed Algorithms
  - Broadcasting
  - Convergence
  - Leader Election

Lecture topics/structure

- Causality
  - Logical Clocks
  - Vector Clocks
- Message Ordering
  - FIFO
  - Casual
  - Total
- Fault Tolerance
  - Crash
  - Byzantine
- Transactions
- Introduction to Clouds
  - Amazon EC2
  - Google Map/Reduce

Semester Project

- Design and Implementation of a scalable, fault-tolerant Distributed System
  - Examples:
    - Shared document editing
    - Memcache implementation using DHTs
    - Range queries over DHTs
    - P2P chatting
    - Blockchain document storage
  - Students are encouraged to propose additional projects

Specific details

- Technologies/Tools
  - C or Java programming language or any other
- Indicate type of learning materials
  - Distributed Systems: Principles and Paradigms, Andrew S. Tanenbaum, Maarten van Steen, Publisher: Prentice Hall (2003), ISBN: 0131217860
  - Course handouts with lecture slides

Specific details

- Specify expected outcomes
  - The students will be able to:
    - Understand the design and operational requirements of Distributed Systems
    - Understand the Design Models of Distributed Systems
    - Deep knowledge of basic and advanced Distributed Algorithms
    - Be able to design efficient Distributed Algorithms
    - Knowledge of main algorithms for specific problems

Applicant profile

- Pre-requisites and Skills
  - undergraduate courses in programming and algorithms would be of great help
  - C or Java or other programming language skills
- Expected weekly workload
  - Lecture Attendance
  - Work on projects will span the entire semester