

# Reading List for the Computers Specialization PhD Comprehensive Exam

## **Part I: Software Systems: Data Structures/Operating Systems**

**Responsible Faculty: Prof. Dr. Aly Hassan Fahmy, Professor of Computer Systems, Faculty of Engineering, Cairo University.**

### **a) Data Structures**

Linked Data Structures: Linear Linked Lists (Single, and Doubly), Circular Lists, In-order Lists, Stacks, Queues.

Reference:

Chapters 7, 8, and 9 from “Data Structures via C++”, A. Michael Berman, Oxford University Press, 1997.

OR

Chapters 3 and 4 from “Data Structures and Algorithms in C++”, Adam-Drozdek, Thomson Learning Press, 2001.

### **b) Operating Systems**

You may want to read chapter 1 and 2 from the textbook “Operating Systems Concepts” (see below) to be able to work on the content of the exam.

**i) CPU Scheduling:** Scheduling Criteria, Scheduling Algorithms and their Performance, Multiple-Processor Scheduling, Real-Time CPU Scheduling.

Reference:

Sections 6.1, 6.2, 6.3, 6.5, 6.6 from Chapter 6 of “Operating Systems Concepts”, Abraham Silberschatz, 9<sup>th</sup> edition, Wiley, 2013.

**ii) Virtual Memory:** Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames.

Reference:

Sections 9.1, 9.2, 9.3, 9.4, 9.5 from Chapter 9 of “Operating Systems Concepts”, Abraham Silberschatz, 9<sup>th</sup> edition, Wiley, 2013.

## **Part II: Pattern Recognition**

**Responsible Faculty: Prof. Dr. Talaat Elsheikh, Professor of Pattern Recognition and Neural Networks, Cairo University.**

### **Topics**

Definitions  
Typical application areas  
Introduction  
Classifiers Based on Bayes Decision Theory  
Discriminant Functions  
Estimation of Unknown Probability Density Functions  
System Evaluation  
Bayesian Networks  
Linear Classifiers  
Non Linear Classifiers  
Clustering Techniques  
Feature Selection and Extraction

### **Text Book:**

- 1- Course Notes for the postgraduate course "Pattern Recognition"
- 2- Theodoridis, S and Koutroumbas, K, "Pattern Recognition", Academic Press, third edition, 2006. [Chapters 1, 2, 3, 4, 10, 13]

## **Part III: Computer Networks**

**Responsible Faculty: Prof. Dr. Mahmoud El-Hadidi, Professor of Communication Networks, Cairo University.**

### **I) Undergraduate Curriculum**

#### **The Internet**

IP Protocol (Operation - Frame Format) - Routing in the Internet (Shortest Path Routing - OSPF Routing - BGP Routing) - TCP Protocol (Connection Management – Automatic Repeat Request Protocols - Sliding Window - Timer Management)

#### **Local Area Networks**

Types of LANs - The IEEE 802.x family of protocols - Ethernet Protocol Architecture - Multiple Access Techniques and Simplified Performance of the CSMA/CD protocol - LAN Interconnection and Extended LANS - Spanning Trees - Prim's Algorithm for MCST

#### **Textbooks and Reading Material**

- 1) Communication Networks: A First Course, Jean Warland, McGraw-Hill, 1998, Chapters: 3 and 4.
- 2) Computer Networking: A Top-Down Approach Featuring the Internet, Jim Kurose and Keith Ross, Addison-Wesley, July 2004. Chapters: 3 and 4.
- 3) Slides by Dr. Khaled Elsayed for 4th Year (available by request).

### **II) Graduate Curriculum**

#### **Queueing Theory and Network Dimensioning**

- Little's Formula
- Markov chains
- Exponential and Poisson distributions
- M/M/1
- M/M/1/B
- M/M/C
- M/M/C/C Erlang-B
- Packet vs. Circuit Switching
- Networks of queues

#### **Textbooks and Reading Material**

- 1) D. Bertsekas and R. Gallager, *Data Networks*, 2nd edition, 1992. Chapter 3.
- 2) Dr. Khaled Elsayed Slides for Graduate Course (available by request).

## **Part IV: Computer Organization**

**Responsible Faculty: Prof. Dr. Mohamed Watheq El-Kharashi, Professor of Computer Systems, Ain Shams University.**

Reference: Computer Organization and Architecture, Fifth Ed.  
By W. Stallings, Prentice Hall, 2000.

Reference: Computer Organization and Design: The Hardware/Software Interface, 5th Edition by  
David Patterson and John Hennessy, Morgan Kaufmann, 2013.

Chapter 4 The Processor, from Section 4.1 to Section 4.10, excluding Section 4.2

Chapter 5 Large and Fast: Exploiting Memory Hierarchy, from Section 5.1 to Section 5.10,  
excluding Sections 5.5 and 5.6

Chapter 6 Parallel Processors from Client to Cloud, from Section 6.1 to Section 6.8, excluding  
Section 6.6

**Part V: Subject Selected by Adviser**

Responsible Faculty: The head of the advising committee of the student.