Các môn học ở kì 3 - UIT

I. Mathematics for Computer Science (Toán cho KHMT - CS115)

1. Assessment Components

Progress	End-term	Final Project
0.3	0.4	0.3

2. Contents
- **Week 1-3: Introducing and Revising**
  ‣ Introduction to Math for Computer Science.
  ‣ Revising Calculus.
  ‣ Revising Linear Algebra.
  ‣ Revising Probability & Statistics.
- **Week 4-6: Regression Analysis**.
  ‣ Maximum Likelihood Estimation - MLE.
  ‣ Linear Regression.
  ‣ Logistic Regression.
  ‣ Loss Function.
- **Week 7-9: Optimization**
  ‣ Introduction about Convex Optimization.
  ‣ Newton's method and Gradient descent.
  ‣ L1, L2, Regularization.
  ‣ Stochastic gradient descent.
  ‣ Momentum, Nesterov.
  ‣ Adagrad, RMSprop, Adadelta, Adam.
- **Week 10-12: Introduction to Neural Network**
  ‣ Multi-layer Perceptron.
  ‣ Computational Graph.
  ‣ Chain rule & Backprograpagation.
  ‣ Cross-validation.
  ‣ Batch normalization.
  ‣ Modifying Hyperparameters.
- **Week 13-15: About Final Project and Seminar about other topics**
  ‣ Linear discriminant Analysis(LDA).
  ‣ Singular Value Decomposition (SVD) & Principal Component Analysis (PCA).
  ‣ Support Vector Machine (SVM) & Kernels.
  ‣ Expectation Maximization.
  ‣ Hierarchical Clustering, Spectral Clustering.
  ‣ ...

3. References & Materials
- Gibert Strang. Linear Algebra and Learning from Data. Wellesley-Cambridge University Press (2019).
- Mykel Korchenderfer & Tim Wheeler. Algorithms for Optimization. MIT Press(2019).
- Zhang, Lipton, Li & Smola. Dive into Deep Learning.

- Marc Peter Deisenroth, A. Aldo Faisal & Cheng Soon Ong. Mathematics for Machine Learning, Cambridge University Press(2020).
- Kevin Patrick Murphy. Probalistic Machine Learning: An Introduction. MIT Press (2021).

II. Database (Cơ sở dữ liệu - IT004)

1. Assessment Components

Coursework + Practice	Mid-term	End-term
30%	20%	50%

2. Contents
- **Chapter 1: Overview of Databases**
  ‣ 1.1. Introduction
  ‣ 1.2. File System
  ‣ 1.3. Defining a Database
  ‣ 1.4. Database Users
  ‣ 1.5. Database Management System (DBMS)
  ‣ 1.6. Components of a Database System
  ‣ 1.7. Data Models

    – Network Data Model (Introduction)

    – ER Model (Entity-Relationship Model)

- **Chapter 2: Relational Data Model**

  ‣ 2.1. Introduction

  ‣ 2.2. Basic Concepts of the Relational Model
    – Relation
    – Attribute
    – Schema
    – Tuple
    – Domain

  ‣ 2.3. Integrity Constraints
    – Super Key
    – Key
    – Primary Key
    – Foreign Key
    – Referential Integrity

  ‣ 2.4. Properties of Relations

  ‣ 2.5. Mapping E/R Diagrams to Relational Model

- **Chapter 3: Relational Algebra**
  ‣ 3.1. Introduction
  ‣ 3.2. Relational Algebra
  ‣ 3.3. Set Operations
  ‣ 3.4. Selection

- – Basic Concepts
- – Armstrong's Axioms & Closure
  - ‣ 6.2. Normal Forms
    - – First Normal Form (1NF)
    - – Second Normal Form (2NF)
    - – Third Normal Form (3NF)
    - – Boyce-Codd Normal Form (BCNF)

- **Chapter 7: Review and Practice**

3. Coursework

Session	Content
1	**Introduction to tools in Microsoft SQL Server and implementation of data definition language (DDL) in DBMS** • Understand data types • Learn how to manipulate databases, tables, primary keys, and foreign keys using built-in tools in SQL Server Management Studio • Commands for creating databases, tables, primary keys, and foreign keys • Introduction to system stored procedures: sp_help, sp_tables, sp_columns, sp_pkeys, sp_fkeys, sp_helpconstraint, sp_helpsql, etc. • DROP, ALTER commands
2, 3	**Implementing data manipulation language (DML) and simple SQL queries in SQL Server** • Data manipulation commands: INSERT, DELETE, UPDATE • Query syntax: SELECT ... FROM ... WHERE • Introduction to SELECT ... INTO ..., VIEW
4, 5	**Performing basic query types in SQL Server** • Subqueries • Set operations: UNION, INTERSECT, EXCEPT
5, 6	**Performing advanced queries in SQL Server** • Division operator • Aggregate functions, grouping data
7, 8	**Understand how to declare integrity constraints (ICs)** • NULL, NOT NULL, RULE, CHECK • Using constraints across multiple relations (foreign keys, triggers)

4. Textbooks

- 1. Slides môn Cơ sở dữ liệu, Khoa hệ thống thông tin, Đại học Công nghệ Thông tin,

ĐHQG, HCM.

- 2. Hector Garcia-Molina, Jeffrey D. Ullman, and Jennifer Widom, Database Systems -

The Complete Book, Prentice Hall, ISBN: 0-13-031995-32002.

- 3. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, Third

Edition, McGraw Hill, 2003. ISBN: 0-07-246563-8.

- 4. C. J. Date, An Introduction to Database Systems, Eighth Edition, Addison Wesley,

2003. ISBN 0- 321-19784-4

- 5. Ramez Elmasri, Shamkant B. Navathe, Funamentals of Database Systems (SIXTH EDITION).

5. Coursework Apps

- 1. Microsoft SQL Server

III. Introduction to Computer Networks (Nhập môn Mạng máy tính - IT005)

1. Assessment Components

Progress	Mid-term	Coursework	End-term
15%	20%	25%	40%

2. Contents

- **Chapter 1: Introduction to Computer Networks and Internet.**
  - ‣ History of Computer Networks and Internet.
  - ‣ Network Edge.
  - ‣ Network Core.
  - ‣ Network latency, Packet loss, Network throughput.
  - ‣ Protocols Layers & Service Models.
- **Chapter 2: Application Layer**
  - ‣ Basic Principles of Network Applications.
  - ‣ Web/HTTP Services.
  - ‣ Email/SMTP Services.
  - ‣ DNS Services.
  - ‣ Socket Programming with TCP and UDP Protocols.
- **Chapter 3: Transport Layer**
  - ‣ Transport Layer Services.
  - ‣ Multiplexing and Demultiplexing.
  - ‣ UDP Protocol.
  - ‣ Principles of Reliable Data Transfer.
  - ‣ TCP Protocol.
  - ‣ Principles of Congestion Control.
  - ‣ Congestion Control in TCP.
- **Chapter 4: Network Layer**
  - ‣ Introduction.
  - ‣ Virtual-Circuit and Datagram Networks.
  - ‣ Router Internal Structure.
  - ‣ IP Protocol.
  - ‣ Routing Algorithms.
  - ‣ Routing in the Internet.
- **Chapter 5: Data Link Layer**
  - ‣ Introduction.
  - ‣ Error Detection and Correction.
  - ‣ Multiple Access Protocols.
  - ‣ LANs: ARP, Ethernet, Switches, VLANs.
  - ‣ A General Scenario of a Web Query.

3. Coursework

- **Lab 1: Introduction to Wireshark**

- **Lab 2: HTTP Protocols**
- **Lab 3: TCP & UDP Protocols**
- **Lab 4: Crimping Ethernet cables**
- **Lab 5: Simulating with Packet Tracker**
- **Lab 6: Combined Coursework**

4. Textbooks
- Jim Kurose, Keith Ross, Computer Networking: A Top Down Approach Featuring the Internet, 8th eidition Pearson.

5. Coursework Apps
- Wireshark.
- Packet Tracker.
- Crimping tool, Network cable (Ethernet cable), RJ-45 connector.

IV. Operating Systems (Hệ Điều Hành - IT007)

1. Assessment Components

Progress	Mid-term	Coursework	End-term
15%	15%	20%	50%

2. Contents
- **Chapter 1: Introduction to Operating Systems**
  - ‣ 1.1 Definition of Operating System
  - ‣ 1.2 Components of a Computer System
  - ‣ 1.3 Operating System Types
  - ‣ 1.4 Interaction with the Operating System

- **Chapter 2: System Structure**
  - ‣ 2.1 Types of System Calls
  - ‣ 2.2 Types of Operating Systems
  - ‣ 2.3 System Call Errors
  - ‣ 2.4 System Software
  - ‣ 2.5 System Structure

- **Chapter 3: Process Management**
  - ‣ 3.1 Basic Concepts
  - ‣ 3.2 Process Control Block (PCB)
  - ‣ 3.3 Process States
  - ‣ 3.4 Process Scheduling
  - ‣ 3.5 Context Switching
  - ‣ 3.6 Process Communication
  - ‣ 3.7 Process Creation
  - ‣ 3.8 Threads

- **Chapter 4: CPU Scheduling**
  - ‣ 4.1 Basic Concepts
  - ‣ 4.2 Scheduling Criteria
  - ‣ 4.3 Scheduling Algorithms
    - – FCFS

- **Chapter 9: Linux and Windows OS**
  - ‣ 9.1 Linux
    - – Components
    - – Process Management
    - – Memory Management
    - – Scheduling
    - – Interprocess Communication
  - ‣ 9.2 Windows
    - – Components
    - – Process Management
    - – Memory Management
    - – Scheduling
    - – Interprocess Communication

3. Coursework

- Lab 1: Guide to installing VirtualBox, installing Ubuntu OS, and practicing basic commands in the Linux shell.

- Lab 2: Programming in the Ubuntu shell environment.

- Lab 3: Practicing operations related to processes in the Ubuntu operating system.

- Lab 4: Programming to simulate CPU scheduling algorithms learned in theory, such as: First Come First Served (FCFS), Round Robin (RR), Shortest Job First (SJF) , Shortest Remaining Time (SRT).

- Lab 5: Working with threads. Using semaphore and mutex libraries to perform synchronization between processes and threads.

- Lab 6: Summary exercises.

4. Textbooks

- Textbook:
  - ‣ Trần Hạnh Nhi, Lê Khắc Nhiên Ân (2005). Operating Systems Textbook. Publisher: Vietnam National University - Ho Chi Minh City.

- Reference Materials:
  - ‣ Silberschatz, Galvin, Gagne. Operating System Concepts, 10th edition, John Wiley & Sons, 2018.
  - ‣ Nguyễn Phú Trường. Operating Systems Textbook. Can Tho University, 2005.

5. Coursework Apps

- Oracle (October 10th, 2022/VirtualBox 7.0.0 released). VirtualBox.
- Ubuntu 22.04 LTS.

V. Political Economics of Marxism and Leninism (Kinh Tế Chính Trị Marx - Lenin - SS008); History of Vietnamese Communist Party (Lịch Sử ĐCS VN - SS010)

Progress	Mid-term	End-term
30%	20%	50%