

PRINCIPAL SUBJECT AREA

COMPUTER SCIENCE

200 LEVEL COURSES

CS 201 Data Structures (2 credits)

(Prerequisites: CS 101, CS 104, CS 105)

Data Structures: linear and non linear data structures. Arrays, lists: linked list, ordered linked list, and doubly linked list; push down stacks; queues: FIFO queue and deque. Tree structures – trees in general, binary search tree (BST), root insertion to BST, splay tree, 2-3-4 trees, radix tree and red-black tree; Graphs; Implementation of depth first search, breadth first search; Hashing: initial hash, collisions, separate chaining.

Recommended Texts:

1. Sedgwick R., Algorithms in C, Addison Wesley, 1998
2. Standish T. A.; *Data Structures in Java*; Addison-Wesley; 1998
3. Gregory L., Heilemen; Data Structures, Algorithms, & Object-Oriented programming; McGraw-Hill

CS 202 Data Structures Practicals (1 credits)

(Prerequisites: CS 104, CS105, CS 201)

Implementation of data structures studied in CS 201 using C, C++ and Java.

Recommended Texts:

1. Standish T. A.; *Data Structures in Java*; Addison-Wesley; 1998
2. Deitel, H. M.; Deitel, P. J.; *Java how to Program*; Prentice Hall; 1999

CS 203 Database Management Systems (2 credits)

(Prerequisites: CS 101, CS 104, CS 105)

Overview: What is a database? Data and metadata. *Conceptual Modeling:* Entities, attributes, associations, functional determination, 3-level structure, graphical representation. *Relational Databases:* Relational algebra, Relational databases and tables, Query languages. The entity-relationship model, Logical organization of databases; Physical organization of databases; Characteristics of disks and disk blocks, Storage of relations, Query processing and optimization, Concurrency control; Transactions, Serializability, Locking, Recovery, Functional dependencies and forms, Introduction to Distributed DBMS, OO DBMS, ORDBMS.

Recommended Texts:

1. Connolly, Begg; *Database Systems: A Practical Guide to Design, Implementation and Management*; 3rd Edition; Addison-Wesley; ISBN:0-201-70857-4.
2. Ramez Elmasri and Shamkant B. Navathe; *Fundamentals of Database Systems*; 5th Edition; ISBN-10: 0321369572
3. Date, C. J.; *An Introduction to Database Systems*; Addison-Wesley; 2000

CS 204 Programming using Database Management Systems (1 credits)

(Prerequisites: CS 104, CS 105, CS 202, CS 203)

Computer programming using database management packages such as Informix, Sybase, Oracle and FoxPro on PCs and workstations. Programming assignments: A variety of progressively more complex assignments.

Recommended Texts:

1. Loney, K.; Koch, G.; *Oracle 8i: The complete reference*; McGraw Hill ; 2000

CS 205 Computer Architecture (3 credits)

(Prerequisites: CS 101, CS 102)

Computer structure: processor, memory, I/O, Secondary storage, buses, clocks, sequential operation, Fetch-Execute cycle. Data representation: Binary and hex integer representations and conversions. Fixed-length arithmetic. 2's complement representation. IEEE FP representation, Analogue versus digital. Memory organization: Addresses. Memory organization into bytes, words, longs. Memory-mapped i/o. Processor: Simple internal structure. Registers, program counter etc. The execution cycle. Instructions: The CPU instruction set – syntax and semantics. Addressing modes, Encoding and decoding. Basic hardware: Structure and operations of basic hardware devices from transistor to memory devices. Simple I/O: Handling simple devices: the interface and the peripheral Device registers and polling Interrupts and interrupts hardware interrupt vectors. More complex devices: Programmable devices, Block-mode devices. DMA: system structure and operation. Magnetic and optical storage: Basic bit storage Tapes and disks: structure and operation of discs Organization of

disc blocks into files. Memory management: Paging page tables MMUs Page faults associative page table caches. Performance enhancements: Pipelining caches memory. RISC vs CISC architectures superscalar architectures VLIW multi-threaded and trace-based architectures. Micro controllers: Role: low cost, low power, small size computer systems I/O systems: analogue and digital. Assembly Language Programming and Introduction to Parallel Processing

Recommended Texts:

1. M.Morris Mano, Charles R. Kime, Logic and Computer Design Fundamentals
2. Thomas C. Bartee, Computer Architecture & Logic Design
3. Thomas P.Skinner; An Introduction to Assembly Language Programming for 8086 Family

CS 206 Computer Device interfacing (2 credits)

(Prerequisite: CS 205)

Review of basic features of computer hardware and software; Lab: Introduction to equipment, demo, simple experiment. Input/Output (I/O) concepts and examples; Lab: Experiment involving parallel I/O; More concepts and examples; Lab: Experiment involving serial I/O. Interfacing to the analog world; Lab: Experiment using digital-to-analog (D/A) conversion; Lab: Experiment using analog-to-digital (A/D) conversion. Techniques for analysis of acquired data; Lab: Experiment requiring digital signal processing. Interfacing to local area network (LAN); Lab: Experiment using LAN.

Recommended Texts:

1. Horowitz P. & Hill W.; *The art of Electronics*; Cambridge Univ. Press; 1989

CS 209 Concurrent Programming (1 credits)

(Prerequisite: CS 105, CS 201)

Program development: Java applets, *GUI's* with Swing. Using tools such as an IDE, Ant and version control. The principles of test-driven development and refactoring. Concurrent Programs: Architecture of concurrent systems. Using and managing threads in Java. Synchronization Primitives: Mutual Exclusion in Java. Semaphores. Monitors and condition variables. Java thread synchronization synchronized methods and synchronized statements. Simple reasoning about correctness of Concurrent Program: Starvation and Deadlocks, Liveness and Progress, Safety. Example systems: Distributed Systems: message passing. Distributed Systems: rendez-vous (Java/RMI). Database concurrency and transactions: Two-phase commit protocol

Recommended Texts:

1. Concurrent Programming in Java: Design Principles and Patterns. Doug Lea. Second edition published by Addison-Wesley. 1999.
2. Developing Java Software. Russel Winder and Graham Roberts. Third Edition. Wiley. 2006

BC 201 Basic Computing I (2 credits)

(Prerequisites: CS 100)

Introduction to Computers: Basic concepts, General computer Architecture - Components of Computers, Data representation in Computers, Computer Configurations, Hardware and Software, High Level and Low Level Programming Languages.

Structured Programming Concepts: Introduction to Programming, Top-Down Design Methodology, Concept of Modularity, Structured Programming.

Recommended Text:

French C.S.; (1990) *Computer Science*; DP Publications;

BC 202 Micro Computer Applications I (1 credit)

(Followed concurrently with BC 201)

Lab Course consisting of Practicals using Operating Systems and the Application Packages.

Recommended Text:

Habraken, J.; Habraken, J.W.; 1999 *Microsoft Office 2000 8 in1*; McMillan Computer Publ.