

# PRINCIPAL SUBJECT AREA

## COMPUTER SCIENCE

### 300 LEVEL COURSES

#### **CS 303 Operating Systems Concepts (3 credits)**

(Prerequisite: CS 203)

Introduction, Distributed OS Techniques; Naming, Inter-process communications and remote procedure calls Data and process migration, transactions, file systems, Parallel OS Techniques; Process management, scheduling, synchronization, Data management, caching, coherency, consistency, file systems, Load balancing, Advanced OS Concerns; Memory management, virtual memory, garbage collection, Fault-tolerance, reliability, replication, Protection, authentication, security, cryptography, I/O models, Performance, benchmarking, and monitoring, Client - Server Model.

Recommended Texts:

1. Tanenbaum, A.S.; *Modern Operating Systems* ; Prentice Hall; 1992

#### **CS 304 Project in Computer Science I (3 credits)**

(Prerequisites: CS 311, CS 315, CS 303 which shall be taken concurrently).

Students of the batch are organized into teams of four to six students with a department advisor to analyze a problem proposed, to select a suitable solution, and to implement that solution. Students work in teams to solve typical commercial or industrial problems. Work involves planning, design, and implementation (The use of Computer programming in Java or/and Database Management package is essential). Oral and written work is required.

Recommended Texts:

1. Texts will be assigned by the instructor

#### **CS 305 Communication Networks (2 credits)**

(Prerequisite: CS 303)

Overview; Examples and concepts of layered architecture; overview of higher layer protocols. LAN - Network Topologies, Medium Access Control Methods, LAN Standards, WAN - Introduction to ISO/OSI Model, Introduction to Internet & TCP/IP Protocols, Transport layer; Internet addressing and Internet protocols; socket interface, Network layer, Taxonomies; relevant parameters of network and traffic, Multiple-access methods for broadcast networks, Taxonomies of multiple access methods; contention, methods; polling methods; reservation methods, Switched networks Architectures of switches; scheduling and admission control; routing, flow control, and congestion control, Interconnections of networks Logical data link protocols.

Recommended Texts:

1. Tanenbaum, A.S.; *Computer Networks*; Prentice Hall; 1996

#### **CS 306 Compiler Construction (3 credits)**

(Prerequisites: CS 315, CS 303)

Context-free languages and grammars, Bottom-up parsing, Syntax-directed translation, Storage allocation, Review of symbol tables, type checking, semantic analysis, Project logistics, Code generation, Basic blocks/dags, Expressions, Instruction selection, optimization, integrated, techniques, Control and data flow, Flow graphs, dominators, Iterative and interval analysis, Def-use, use-def, live variable analysis, Dead code, redundant computation elimination, Constant propagation, strength reduction, Program representations (SSA, PDG), Loop optimization, Register allocation, Garbage collection, Dynamic data structures, pointer analysis, aliasing, Code scheduling, pipelining, Dependence testing, Loop level optimization, Superscalar optimization, Profile-driven optimization, Debugging support, Incremental parsing, Type inference, Advanced parsing algorithms (Tomita/Early), Practical attribute evaluation, Function in-lining and partial evaluation.

Recommended Texts:

1. Aho et al; *Compiler Construction Principles, Techniques and Tools*; Addison Wesley; 1986

### **CS 307 Computer Graphics (3 credits)**

Students who registered for this course should also follow CS 308. (Prerequisite: CS 315)

Introduction; Overview of graphics systems, Components of graphics systems, Display devices, processors, software standards; introduction to GKS, PHIGS and OpenGL, Basic raster algorithms; Generation of output primitives, attributes (color, area filling, etc.), geometric transformations, Structure of graphics packages; 2-D viewing, structures /segments, hierarchical model, graphical user interfaces, interactive input methods, 3-D object representations and manipulations; Polygon mesh, spline surfaces, superquadrics, fractal geometry, octrees, visualization of 3-D, data sets, geometric transformations, 3-D viewing; Parallel and perspective projections, Visible surface identification methods, Illumination models and surface rendering; Constant intensity, Gouraud shading, Phong shading, ray tracing, radiosity, Color models; Basic concepts; RGB.

Recommended Texts:

1. Wright R. S. Jr., Sweet M. R.; *OpenGL SuperBible*, Waite Group; 1997

### **CS 308 Computer Graphics Programming (2 credits)**

(Prerequisite: CS 307)

Software, hardware, and mathematical tools for the representation, manipulation, and display of topological and two- and three-dimensional objects; applications of these tools to specific problems. Computer programming on PCs and Workstations.

Recommended Texts:

1. Wright R. S. Jr., Sweet M. R.; *OpenGL SuperBible* Waite Group; 1997
2. Neider J. et al ; *Open GL Programming Guide* Addison Wesley; 1993

### **CS 309 Object Oriented Analysis and Design (3 credits)**

(Prerequisites: CS 102, CS 201)

Fundamental of Object-oriented design: Encapsulation, classes and objects, information hiding, operator overloading, inheritance, overriding, delegation; Analyze problems, determine objects that are necessary to model the system, determine what attributes the objects need to have, determine what behaviors the objects need to exhibit, develop conceptual models, generate designs from the models, and implement the models.

Recommended Texts:

1. An Introduction to Object-Oriented Analysis and Design and the Unified Process Second Edition. Craig Larman, 2002.

### **CS310 Server Side Web Programming (3 credits)**

(Prerequisites: CS104, CS 105, CS203, CS204)

Introduction to HTML, Introduction to Client Side Scripting *Java Script*: JavaScript syntax, JavaScript object model, JavaScript objects, Static objects, Forms object (Submit () and Reset () methods), Event handling - Mouse related events, Keyboard events, Document events, Output in JavaScript, Introduction to VB Script, *ASP.net*; Implement ASP.net with VBScript, Use SQL & ADO to Interact with ASP.net Databases, Write Cookies on the Client Using ASP.net *J2EE - Java Enterprise Edition*; JDBC, JSP, Servlet, *Hypertext Preprocessor* ;Program structure, Use php to process html forms, Regular expressions for form validation and other applications, Read and write files, Database applications. *XML*; Understand the role of XML, Write XSL Documents to Describe how XML Documents are to HTML, Create Simple DTD & Schema Files to Describe the Grammar of XML, Differences between DTD's & Schema, Differences between Cascading Style Sheets & XSL, *Other new trends in Web development*; Eg. SOAP, WSDL

Recommended Texts:

1. Benoit Marchal (1999/2001). *XML by Example* (1st or 2nd Edition).Que Publishers
2. *Java 2 with Swing*: Deitel and Deitel
3. *Internet & World Wide Web How to Program* (Second Edition) 2002

### **CS 311 Software Engineering (2 Credits)**

(Prerequisites: CS 201)

Overview of software engineering: software process; classic life cycle model, iterative models, incremental model. Project planning; Fundamentals of project and system planning, Requirements analysis, Software design fundamentals; Stepwise refinement, bottom-up approach, modularity, Design techniques; Use of UML and design patterns, Testing: Testing objectives, test case design, white box vs. black box testing, overview of testing strategies, Maintenance; Overview of maintenance issues and software configuration management

Recommended Texts:

1. Ian Somerville, *Software Engineering*, 6th edition, Addison Wesley, 1999.
2. *Design Patterns*, 1<sup>st</sup> edition, Addison Wesley, 1996.

### **CS 312 Human Computer Interaction Design (2 Credits)**

(Prerequisites: CS 201, CS 315)

*Designing User-System Interactions*: User-centered and participatory design approaches, Prototyping, Creative Design Methods, Analytical Design Methods, Conceptual Design. *Evaluating User-System Interactions and Improving Designs*: Planning and conduct of lab- and field-based evaluation, Advanced Evaluations Techniques (eye tracking, physiological methods), Field trials, living labs. *Emerging technologies and their specific usability issues*: Mobile technologies, E-commerce systems, Multimedia, entertainment and games, Virtual and mixed-reality environments, IT Security and Security Systems

Recommended Texts:

1. Alan Dix, Janet E Finlay, Gregory D Abowd: *Human-Computer Interaction* 3rd edition 2003 Prentice

### **CS 313 Digital Image Processing (2 Credits)**

(Prerequisites: CS 315)

Introduction to digital images: why digital images, the digital camera, data types and 2D, 3D and higher dimensional representations, fundamental steps in digital image processing, elements of visual perception, light and electro-magnetic spectrum, image sensing and acquisition, sampling and quantization, relationships between pixels, Image transformations: histogram processing, spatial filtering, fuzzy techniques, Filtering in the frequency domain: Fourier transform, DFT, filtering, Morphological image processing: erosion, dilation, opening, closing, hit-or-miss transform, gray scale morphology, Image segmentation: point, line and edge detection, threshold, region based segmentation, watersheds, Representation and description: boundary descriptors, regional descriptors, Object recognition: patterns, pattern classes, classification, Color image processing: color models, image segmentation based on color. Performance evaluation and ROC analysis

Recommended Texts:

1. Gonzalez, R & Woods, R.: *Digital Image Processing*, 3rd ed., Prentice Hall, 2008.

### **CS 314 Image Processing practical (1 Credit)**

(Prerequisites: CS 313)

Introduction, digital image representations, reading, displaying and writing images, data classes, image types, histogram processing, filtering, morphological processing, image segmentation, classification, Final group assignment

Recommended Texts:

1. Gonzalez, R & Woods, R.: *Digital Image Processing*, 3rd ed., Prentice Hall, 2008.
2. Gonzalez, R & Woods, R., Eddins S.: *Digital Image Processing using MATLAB*, 1st ed., Prentice Hall, 2004.

### **CS 315 Design and Analysis of Algorithms (2 Credits)**

(Prerequisites: CS 201, CS 202)

Analysis of algorithms: time complexity, big O notation. Sorting algorithms: bubble sort, selection sort, insertion sort, quick sort, heap sort, merge sort and external sorting methods. Hashing: hash functions and collision resolution: separate chaining, linear probing and double hashing. Classification of Algorithms by Implementation and Design Paradigm: Divide & Conquer Algorithms, Dynamic Programming, Greedy Algorithms, Recursive Algorithms, Backtracking, Alfa-Beta pruning, Branch & Bound Search; Analysis of Algorithms, NP- completeness; Classification by Field of Study: Searching, Sorting, String matching, Graph, Machine Learning; Genetic algorithms

Recommended Texts:

1. Sara Baase, Allen Van Gelder (2000), *Computer Algorithms - Introduction to Design & Analysis*, Addison-Wesley
2. Thomas H. Cormen, Charles E. Leiserson & Ronald L. Rivest (2000), *Introduction to Algorithms*, McGraw-Hill

**BC 301 Basic Computing II (2 credits)**

(Prerequisites: BC 201, BC 202)

Database Management Systems: Advantages of DBMS Approach, E-R Modelling, Normalization, Data Sub Languages - SQL.

Introduction to Systems Analysis and Design: Software Life Cycle, Problem Definition, Requirement Specification, Analysis and Design tools, Software Design, CASE tools.

Recommended Text:

1. Pressman, R. S. & Ince, D.; *Software Engineering: A practitioner's Approach*; McGraw-Hill; 2000

**BC 302 Micro Computer Applications II (1 credit)**

(Followed concurrently with BC 301)

Lab Course consisting of Practicals using a DBMS Package.

Recommended Text:

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