CS-903 : Mobile Computing (MC)

1. Introduction to Android [2Hrs]

- History of Mobile Software Development
- The Open Handset Alliance
- The Android Platform
- Android SDK
- Building a sample Android application

Android Application Design Essentials [19Hrs]

- Anatomy of an Android applications **[1 Hr]**
- Android terminologies **[3Hrs]**
- Application Context, Activities, Services, Intents **[5Hrs]**
- Receiving and Broadcasting Intents **[3Hrs]**
- Android Manifest File and its common settings **[1 Hr]**
- Using Intent Filter, Permissions **[3Hrs]**
- Managing Application resources in a hierarchy **[2Hrs]**
- Working with different types of resources **[1 Hr]**

Android User Interface Design Essentials [8Hrs]

- User Interface Screen elements
- Designing User Interfaces with Layouts
- Drawing and Working with Animation

4. Using Common Android APIs [18Hrs]

- Using Android Data and Storage APIs **[3Hrs]**
- Managing data using SQLite **[1 Hr]**
- Sharing Data Between Applications with Content Providers **[5Hrs]**
- Using Android Networking APIs **[2Hrs]**
- Using Android Web APIs **[2Hrs]**
- Using Android Telephony APIs **[5Hrs]**

5. Deploying Android Application to the World [1Hr]

- Selling your Android application

Text Book:

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)

Reference Books:

1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd (2011)
2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd(2009)
3. Sayed Y Hashimi and Satya Komatineni, "Pro Android", Wiley India Pvt Ltd(2009)

Chapter wise Coverage from Text Book:

Chapters: 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 16, 29

CS – 904 : Biomformatics (Bio-I) (Elective-III)

Unit 1: Introduction of Bioinformatics:

Biology in the Computer Age, Computational Approaches to Biological Questions

Unit 2: Tools for Bioinformatics:

Biological Research on the Web, Sequence Analysis, Pairwise Alignment and Database Searching, Multiple Sequence Alignments, Trees, and Profiles

Unit 3: Protein Structure and Prediction:

Visualizing Protein Structures and Computing Structural Properties, Predicting Protein Structure and Function from Sequence, Tools for Genomics and Proteomics

Unit 4: Databases and Visualization:

Building Biological Databases, Visualization and Data Mining (20%)
Text Book:

(An introduction to Software Tools for Biological Applications)

Cynthia Gibas & Perl Jambeck, "Developing Bioinformatics Computer Skills", O'Reilly Publications

Chapter wise Coverage:
Unit 1: Chapters 1, 2
Unit 2: Chapters 6, 7, 8
Unit 3: Chapters 9, 10, 11
Unit 4: Chapter 13, 14

Reference Books:

1. Orpita Bosu & Simminder Kaur Thukral, "BIOINFORMATICS Databases, Tools and Algorithms", Oxford Publications
2. Jean-Michel Claverie & Cedric Notredame, "Bioinformatics - A Beginner's Guide", Wiley Publications
3. Zhumar Ghosh & Bibekanand Mallick, "BIOINFORMATICS Principles and Applications", Oxford Publications
4. Kenneth Baclawski and Tianhua Niu, "Bioinformatics", JAICO BOOKS Publications

. Laboratory Exercise

- Development of Data Warehouse for biological databases
- Developing Web-Based Software that interacts with databases
- Development of tools based on data mining techniques for pattern recognition from sequences
- Development of software for sequence conversion from one database form to another
- Development of sequence submission tool to the database
- Microarray Database creation and its management
- Identification of Single Nucleotide Polymorphism
- Identification of structure from sequences
- Identification and recognition of mutation from database
- Development of sequence comparison tools
- Development of Grid for bioinformatics
- Development of Structure Prediction tools
- Write a programs for DNA:
    - DNA Replication
    - DNA Transcription
    - DNA Translation
    - For given DNA sequence, find start codon and stop codon

CS: 905 Image Processing

Unit 1 : Introduction [10%]

- What is Digital Image Processing
- The origins of Digital Image Processing
- Examples of Fields that use Digital Image Processing
  - Gamma-Ray imaging
  - X.-Ray Imaging
  - Imaging in the Ultraviolet Band
  - Imaging in the visible and Infrared Bands
  - Imaging in the Microwave Band
  - Imaging in the Radio band
  - Other Imaging Modalities
- Fundamental steps in Digital Image processing
- Components of Image Processing system

Unit 2: Digital Image Fundamentals [10%]

- Elements of Visual Perception
  - Structure of the Human
  - Image Formation in the Eye
  - Brightness Adaptation and Discrimination
- Light and Electromagnetic Spectrum
- Image Sensing and Acquisition
  - Image Acquisition using a Single sensor
  - Image Acquisition using a Sensor Strips
  - Image Acquisition using a Sensor Arrays
  - A sample Image Formation Model
- Image Sampling and Quantization
  - Basic Concepts and Sampling and Quantization
  - Representing Digital Image
  - Spatial and Gray level resolution
  - Aliasing and Moire Pattern
  - Zooming and Shrinking Digital Images
- Some basic Relationships between Pixels

- o Neighbors of a pixel
- o Adjacency,connectivity,regions and Boundaries
- o Distance Measures
- o Image Operations on a pixel basics

· Linear and Nonlinear Operations

Unit 3 : Image Enhancement in the spatial domain [20%]

· Background
· Some basic gray level transformation
· Histogram processing
· Enhancement using Arithmetic/Logic operations
· Basics of spatial filtering
· Smoothing spatial filters
· Sharpening spatial filters
· Combining Spatial Enhancement features

Unit 4: Image Restoration [20%]

· A model of the Image Degradation/Restoration process
· Noise Models
· Restoration in the presence of noise only spatial filtering
· Periodic noise reduction by Frequency domain filtering
· Linear, Position-invariant degradation
· Estimating the degradation functions
· Inverse filtering
· Minimum Mean Square Error (Wiener) filtering
· Constrained least squares filtering
· Geometric mean filter
· Geometric Transformations

Unit 5: Color Image Processing [15%]

· Color Fundamentals
· Color models
- o The RGB color model
- o The CMY and CMYK color models
- o The HSI color model

· Pseudo Color image processing
  o Intensity slicing
  o Gray level to color transformations
· Basics of full color image processing
· Color transformations
  o Formulation
  o Color complements
  o Color slicing
  o Tone and color corrections
  o Histogram processing
· Smoothing and sharpening
  o Color image smoothing
  o Color image sharpening
· Color segmentation
  o Segmentation in HSI color space, Segmentation in RGB vector space
  o Color edge detection
· Noise in color images , Color Image compression

Unit 6: Image Compression [25%]

· Fundamentals
  o Coding Redundancy , Interpixel Redundancy ,Psycho visual Redundancy,Fidelity criteria
· Image Compression models
  o The source encoder and decoder
  o The Channel encoder and decoder
· Elements of Information theory
  o Measuring information,The information channel,Fundamental coding theorems
  o Using information theorems
· Error free compression
  o Variable length coding,LZW coding ,Bit plane coding, Loss less predictive coding
· Lossy compression
  o Lossy predictive coding , Transform coding , Wavelet coding

Text Book :

Digital Image Processing (Second Edition)
By Rafael C. Gozales, Richard E. Woods. (Pearson Education)

CS : 906 Data Warehousing & Data Mining (DWDM)

1. Introduction to Data Warehousing, A Multi-dimensional Data Model & Schemas, OLAP Operations & Servers (6 Lect.)

- An overview and definition along with clear understanding of the four key-words appearing in the definition.
- Differences between Operational Database Systems and Data Warehouses; Difference between OLTP & OLAP
- Overview of Multi-dimensional Data Model, and the basic differentiation between "Fact" and "Dimension"; Multi-dimensional Cube
- Concept Hierarchies of "Dimensions" Parameters: Examples and the advantages
- Star, Snowflakes, and Fact Constellations Schemas for Multi-dimensional Databases
- Measures: Their Categorization and Computation
- Pre-computation of Cubes, Constraint on Storage Space, Possible Solutions
- OLAP Operations in Multi-dimensional Data Model: Roll-up, Drill-down, Slice & Dice, Pivot (Rotate)
- Indexing OLAP Data; Efficient Processing of OLAP Queries
- Type of OLAP Servers: ROLAP versus MOLAP versus HOLAP
- Metadata Repository

2. Data Warehouse Architecture; Further Development of Data Cube & OLAP Technology (3 Lect.)

- The Design of A Data Warehouse: A Business Analysis Framework; The Process of Data Warehouse Design
- A 3-Tier Data Warehouse Architecture; Enterprise Warehouse, Data mart, Virtual Warehouse
- Discovery-Driven Exploration of Data Cubes; Complex Aggregation at Multiple Granularity: Multi-feature Cubes
- Constrained Gradient Analysis of Data Cubes

3. P re-processing (7 Lect.)

- The need for Pre-processing, Descriptive Data Summarization
- Data Cleaning: Missing Values, Noisy Data, Data Cleaning as a Process
- Data Integration & Transformation
- Data Cube Aggregation; Attribute Subset Selection

- Dimesionality Reduction: Basic Concepts only
- Numerosity Reduction: Regression & Log-linear Models, Histograms, Clustering, Sampling
- Data Dicretization & Concept Hierarchy Generation
- For Numerical Data: Binning, Histogram Analysis, Entropy-based Discretization, Interval Merging by χ^2 Analysis, Cluster Analysis, Discretization by Intuitive Partitioning
- For Categorical Data

4. Data Mining: Introduction (4 Lect.)

- An Overview; What is Data Mining; Data Mining - on What Kind of Data
- Data Mining Functionalities - What Kind of Patterns Can be Mined; Concept/Class Description: Characterization & Discrimination; Mining Frequent Patterns, Associations, and Correlations; Classification & Prediction; Cluster Analysis; Outlier Analysis
- Are All of the Patterns Interesting
- Classification of Data Mining Systems
- Data Mining Task Primitives
- Integration of a Data Mining System with a Database or Data Warehouse System
- Major Issues in Data Mining

5. Attribute-Oriented Induction: An Alternate Method for Data Generalization & Concept Description (4 Lect.)

- Attribute-Oriented Induction for Data Characterization, and Its Efficient Implementation; Presentation of the Derived Generalization
- Mining Class Comparisons: Discrimination between Different Classes
- Class Descriptions: Presentation of both Characterization & Comparison

6. Mining Frequent Patterns, Associations, and Correlations (4 Lect.)

- Basic Concepts: Market Basket Analysis; Frequent Itemsets, Closed Itemsets, and Association Rules; Frequent Pattern Mining: A Roadmap
- Apriori Algorithm: Finding Frequent Itemsets Using Candidate Generation; Generating Association Rules from Frequent Itemsets; Improving the Efficiency of Apriori
- From Association Mining to Correlation Analysis; Strong Rules Are Not Necessarily Interesting: An Example; From Association Analysis to Correlation Analysis

7. Classification & Prediction (9+2 Lect.)

- Introduction to Classification and Prediction; Basics of Supervised & Unsupervised Learning; Preparing the Data for Classification and Prediction; Comparing Classification and Prediction Methods
- Classification by Decision Tree Induction, Attribute Selection Measures; Tree Pruning; Scalability and Decision Tree Induction
- Rule-based Classification: Using IF-THEN Rules for Classification; Rule Extraction from a Decision Trees; Rule Induction Using a Sequential Covering Algorithm
- Bayesian Classification: Bayes' Theorem, Naive Bayesian Classification; Bayesian Belief Networks
- An Overview of Other Classification Methods (2 Lectures)
- Prediction: Linear Regression; Non-linear Regression; Other Regression Models
- Classifier Accuracy and Error Measures: Classifier Accuracy Measures; Predictor Error Measures
- Evaluating the Accuracy of a Classifier or Predictor: Holdout Method and Random Sub-sampling; Cross Validation; Bootstrap
- Ensemble Methods - Increasing the Accuracy: Bagging; Boosting

8. Cluster Analysis (6+2 Lect.)

- Introduction to Cluster Analysis; Types of Data in Cluster Analysis; A Categorization of major Clustering Methods
- Partitioning Methods; Centroid-Based Technique: K-Means Method; Overview of Other Clustering Methods
- An Overview of Other Clustering Methods (2 Lectures)
- Outlier Analysis; Statistical Distribution-based Outlier Detection; Distance-based Outlier Detection; Density-based Outlier Detection; Deviation-based Outlier Detection

9. Data Mining Applications (3 Lect.)

- Data Mining for: (a) Financial Data Analysis; (b) The Retail Industry; (c) The Telecommunication Industry; (d) Biological Data Analysis; (e) Other Scientific Applications; (f) Intrusion detection
- Data Mining Systems: (a) How to Choose; (b) Examples of Commercial Data Mining Systems

Text Book:

1. Jiawei Han & Micheline Kamber, "Data Mining: Concepts & Techniques", Morgan Kaufmann Publishers (2002)

Other Reference Books:

1. W. H. Inmon, "Building the Data Warehouse", Wiley Dreamtech India Pvt. Ltd.
2. Mohanty, Soumendra, "Data Warehousing: Design, Development and Best Practices", Tata McGraw Hill (2006)
3. Pieter Adriaans & Dolf Zentinge, "Data Mining", Addison-Wesley, Pearson (2000) Rs. 195/-
4. Daniel T. Larose, "Data Mining Methods & Models", Wiley-India (2007)

4. Chapter wise Coverage from the Text Books:

5. Unit-1: 3.1, 3.1.1, 3.2, 3.2.1 to 3.2.6, 3.4.1 to 3.4.3, 3.3.4, 3.3.5
   Unit-2: 3.3, 3.3.1, 3.3.2, 4.2.1 to 4.2.3
6. Unit-3: 2.1, 2.2, 2.2.1 to 2.2.3, 2.3.1 to 2.3.3, 2.4.1, 2.4.2, 2.5.1, 2.5.2, (Introductory Portion of 2.5.3), 2.5.4, 2.6, 2.6.1, 2.6.2
7. Unit-4: 1.1 to 1.3: 1.3.1 to 1.3.4, 1.4, 1.4.1 to 1.4.5, 1.5 to 1.9
8. Unit-5: 4.3.1 to 4.3.5
9. Unit-6: 5.1.1 to 5.1.3, 5.2.1 to 5.2.3, 5.4, 5.4.1, 5.4.2
10. Unit-7: 6.1, 6.2, 6.2.1, 6.2.2, 6.3, 6.3.1 to 6.3.4, 6.5, 6.5.1 to 6.5.3, 6.4, 6.4.1 to 6.4.3, 6.11, 6.11.1 to 6.11.3, 6.12, 6.12.1, 6.12.2, 6.13, 6.13.1 to 6.13.3, 6.14, 6.14.1, 6.14.2
    Unit-8: 7.1, 7.2, 7.2.1 to 7.2.5, 7.3, 7.4, 7.4.1, 7.11, 7.11.1 to 7.11.4
    Unit-9: 11.1, 11.1.1 to 11.1.6, 11.2, 11.2.1, 11.2.2

Laboratory Exercise

The objective of the lab exercises is to use data mining techniques to identify customer segments and understand their buying behavior and to use standard databases available to understand DM processes using WEKA (or any other DM tool)

1. Gain insight for running pre- defined decision trees and explore results using MS OLAP Analytics.
2. Using IBM OLAP Miner - Understand the use of data mining for evaluating the content of multidimensional cubes.
3. Using Teradata Warehouse Miner - Create mining models that are executed in SQL.

BI Portal Lab: The objective of the lab exercises is to integrate pre-built reports into a portal application

4. Publish cognos cubes to a business intelligence portal.

Metadata & ETL Lab: The objective of the lab exercises is to implement metadata import agents to pull metadata from leading business intelligence tools and populate a metadata repository. To understand ETL processes

5. Import metadata from specific business intelligence tools and populate a metadata repository.
6. Publish metadata stored in the repository.
7. Load data from heterogeneous sources including text files into a pre-defined warehouse schema.

Major Tools for Lab Exercise

1. Weka (an Open Source) by The University of Waikato
2. IBM Intelligent Miner
3. MS OLAP Analytics
4. XLMiner
5. Programming in "R"

CS-907: Advanced Data Base Management Systems (ADBMS)

1. Getting Started with Database Architecture and Managing Data Storage (10%)
   Introduction to Database, Database System Environment - an Example, Data Models, Schema and Instances, Three Schema Architecture of Database, Component Modules of Database Systems, Database System Utilities, Memory Hierarchy and Storage Devices, Storage of Databases, Buffering of Blocks, Places File Record on Disk, Files of Unordered Records and Unordered Records

2. Database Tuning and Database Security (20%)
   Physical Database Design in Relational Database, Overview of Database Tuning and Relational Systems, Database Security and its Issues, Granting and Revoking Privileges, Role Based Access Control for Multilevel Security, Encryption and PKI

3. Backup & Recovery in Database and Database Indexing (20%)
   Providing Backup and Recovery, Recovery Concepts, Recovery Techniques Based on Deferred Update and Immediate Update, Recovery in Distributed Database, Distributed Database in Oracle, Types of Single Level Ordered Indexes, Primary Index, Cluster Index, Secondary Index, Multilevel Index

4. Managing Different Databases and Distributed Databases (20%)
   Overview of Temporal and Deductive Databases, Temporal Database Concepts, Deductive Database, Distributed Database Concepts, Data Fragmentation, Allocation Techniques for Distributed Database Design, Types of Distributed Database Systems

Emerging Database Technologies and Object-Relational Databases (20%)

Overview of Object Relational Features, Current Trends of Database Technology, Implementation and Relational Issues of Extended Type, Nested Relational Model, Mobile Databases, Multimedia Databases, Geographic Information Systems, Genome Database Systems

6. Oracle Net, Utilities, Backup and Recovery (10%)

Oracle Net Configuration, Concept of Service Name, Listener, Using Oracle Net Configuration Assistant, Using Oracle Net Manager, Bulk Insert : Using SQL*Loader, Managing Large Databases

Text Books:

1. Ramesh Elmasari, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson Education, 5th Edition
2. Kevin Loney, Maklene Therialt, "Oracle 9i, DBA Handbook", Oracle Press, TMGH Publications

Reference Books:

1. Sam R. Alapati, "Expert Oracle9i Database Administration", Apress,
2. Bob Bryla, Kevin Loney, "Oracle Database 11g DBA Handbook", Oracle Press, TMGH Publication
3. S. K. Singh, "Database Systems Concepts, Design & Applications", Pearson Education

Chapter wise Coverage from Text book(s):

Book #	nit #	Contents
1	nit 1	Chps. 1.1,1.2, 2.1, 2.2, 2.4.1, 2.4.2, 13.1, 13.1.1, 13.1.2, 13.3, 13.4
	nit 2	Chps. 16.1.1, 16.1.2, 16.2, 23.1, 23.2, 23.3, 23.6

	nit 3	Chps. 1.6, 19.1, 19.2, 19.3, 25.5, 25.7, 14.1, 14.2
	nit 4	Chps. 24.2, 24.4, 25.1, 25.2, 25.3
	nit 5	Chps. 22.1, 22.2, 22.5, 22.6, 30.1, 30.2, 30.3, 30.4
2	nit 6	Pgs. 521 - 538, 318 - 323, 552 - 561, 589 - 590

CS – 908 Geographical Information Systems (GIS)

Unit - 1 - Introduction to GIS and Digital Geographic Data & Maps [12 Lectures] [25%]

Introduction to Digital Geographic Data:

Introduction to Geographic Information Systems, Spatial Measurement, Spatial Location and Reference, Spatial Patterns, Geographic Data Collection

Map Basics:

Abstract Nature of Maps, Map Scale, More Map Characteristics, Map Projection, Grid Systems for Process, Map Symbolism

GIS Data Models:

Computer File Structure, Database Structure, Graphic Representation of Entities and Attributes, GIS data Models for Multiple MAPS,

Unit - 2 - Input, Storage and Editing [08 Lectures] [15%]

The Input Subsystem:

Primary Data, Input Devices, Vector Input, Raster Input, Remote Sensing Data Input, GPS Data Input, Metadata and Metadata Standards.

Data Storage and Editing:

Storage of GIS Databases, Detecting and Editing Errors of Different Types, Dealing with Projection Changes, Edge Matching, Rubber Shitting.

Unit - 3 - Analysis [25 Lectures] [50%]

Elementary Spatial Analysis:

GIS Data Query, Defining Spatial Characteristics, Working with Higher - Level Objectives

Measurement:

Measuring Length of Linear Objectives, Polygons, Shape and Distance

Classification:

Classification Principal, Elements of Reclassification, Neighborhood Functions, Roving Windows, Buffers

Statistical Surfaces:

Surface Mapping, Sampling the Statistical Surface, The DEM, Raster Surface, Interpolation, Terrain Reclassification, Slicing the Statistical Surface, Cut and Fill

Spatial Arrangement

Point, Line and Area Arrangement, Point Patterns, Thiessen Polygons, Area Patterns, Distance and Adjacency, Polygon Arrangement Measures, Linear Patterns, Directionality of Linear and Areal Objective, Connectivity of

Linear Objects, Gravity Model, Routing and Allocation, The Missing Variables

Comparing Variables Among Maps:

The Cartographic Overlay, Point-in-Polygon, Line-in-Polygon, Polygon Overlay, Automating the Overlay, Types of Vector Overlay, CAD-Type Overlay, Dasymetric Mapping

Cartographic Modeling:

Model Components, The Cartographic Models, Types of Cartographic Models, Inductive and Deductive Modeling, Factor Selection, model Flowcharting, Model implementation, Model Verification

Unit - 4 - GIS Output **[05 Lectures] [10 %]**

The Output from Analysis:

Output: The Display of Analysis, Cartographic Output, The Design Process, Map Design Controls, Noncartographic Output

Text Book:

1. Michael N DeMers, "Fundamentals of Geographic Information Systems", Wiley India Education

Reference Books:

1. Kang-tsung Chang, "Introduction to Geographic Information Systems", McGraw-Hill Publication
2. YEUNG, ALBERT K. W., LO, C. P., "Concepts and Techniques of Geographic Information Systems", PHI Learning