4th Semester

CSE-2201: Algorithms [3.0 credits, 45 Hours Lecture]

Techniques for analysis of algorithms; Methods for the design of efficient algorithms: divide and conquer, greedy method, dynamic programming, back tracking, branch and bound; Basic search and traversal techniques; Topological sorting; Connected components, spanning trees, shortest paths; Flow algorithms; Approximation algorithms; Parallel algorithms; Algebraic simplification and transformations; Lower bound theory; NP-completeness, NP-hard and NP-complete problems.

CSE-2202: Algorithms Lab. [1.5 credits, 45 Hours Lecture]

Laboratory work based on CSE 2201.

CSE-2203: Database Management System [3.0 credits, 45 Hours Lecture]

Concepts of database systems; Models: Entity-Relationship model, Relational model; Relational algebra; SQL; Integrity constraint; Relational database design; File organization and retrieval, file indexing; Transaction manager; Concurrency controller; Recovery manager; Security system; Database administration; Advanced database management systems: distributed, multimedia, object-oriented, object-relational; Some applications using SQL.

CSE-2204: Database Management System Lab. [1.5 credits, 45 Hours Lecture]

Laboratory works based on CSE 3101.

CSE-2205: Computer Architecture [3.0 credits, 45 Hours Lecture]

Information representation; Measuring performance; Instructions and data access methods: operations and operands of computer hardware, representing instruction, addressing styles; Arithmetic Logic Unit (ALU) operations, floating point operations, designing ALU; Processor design: datapaths â€“ single cycle and multicycle implementations; Control Unit design - hardwared and microprogrammed; Hazards; Exceptions; Pipeline: pipelined datapath and control, superscalar and dynamic pipelining; Memory organization: cache, virtual memory, channels; DMA and Interrupts; Buses; Multiprocessors: types of multiprocessors, performance, single bus multiprocessors, multiprocessors connected by network, clusters.

CSE-2207: Data Communication [3.0 credits, 45 Hours Lecture]

Signal and random processes; Review of Fourier Transform; Hilbert Transform, continuous wave modulation: AM, PM, FM; Sampling theorem; Pulse modulation: PAM, PDM, PPM, PCM, companding, delta modulation, differential PCM; Multiple access techniques: TDM, FDM; Digital modulation: ASK, PSK, BPSK, QPSK, FSK, MSK, constellation, bit error rate (BER); Noise; Echo cancellation; Intersymbol Interference; Concept of channel coding and capacity.

STAT-2209: Statistics and Probability [3.0 Credits, 45 Hours Lectures]

Statistics – definition and scope: definitions of statistics – past and present, its nature and charateristics, population and sample, descriptive and inferential statistics, scope and applications of statistics, abuse of

statistics, sources of statistical data, primary and secondary sources. Data collection tools, types, etc. Construction of questionnaire and other field problems of data collection. Types of data, cross sectional, longitudinal, follow-up and panel data.

Processing of data: measurement scales, variables, attributes, classification, characteristic and basis of classification, array formation, tabulation, different types of tables, frequency distribution.

Presentation of data: graphical presentation of data, details of different types of graphs and charts with their relative merits and dements, concept of explorative data analysis, stem-and-leaf plot, schematic plots, extremes and median, hinges, outlieres and 5 number summaries.

Characteristics of statistical data: measures of location, dispersion, skewness, kurtosis and their properties, moments box -and- whiskers plots, trimean, trimmed mean, interpretation of dat with these measures.

Correlation analysis: bivariate data, scatter diagram, simple correlation, rank correlation, correlation ratio, multiple and partial correlations, intraclass and biserial correlation.

Regression analysis: basic concept of regression, regression model, estimation of parameters (OLS method) in regression model, properties of estimators, interpreting the constants, some ideas of polynomial regression, 3-variable regression, estimation of parameters, standard error and other properties.

Association of attributes: concepts of independence, association and disassociation, contingency table, measure of association for nominal and data in contingency tables, partial association: different forms of correlation table.

Elements of set theory: fundamentals of set, operations with set, laws of set.

Elements of probability: experiment, random experiment, sample spacem events, event space, union and intersection of events, different types of events.
Basic concepts of probability: different approaches of defining probability- classical, axiomatic, empirical and subjective, laws and theorems of probability, conditional probability, Bayes' theorem and its importance in statistics.
Random variable and its probability distribution: discrete and continuous random variables, probability mass function, probability density function, distribution function, function of random variable and its distribution, joint distribution, marginal and conditional distributions, independence of random variables.
Mathematical expectation: concept, expectations of sums and products of random variables, conditional expectation and conditional variance, moments and moment generating functions, cumulants and cumulant generating functions, relation between moments and cumulants, probability generating functions, characteristic function.
Some basic distributions: detailed study of bionomial, Poisson, normal, uniform, geometric, negative binomial, hypergeometric, exponential, gamma, beta distributions.

MATH-2211: Vectors, Fourier Analysis, and Laplace Transforms [3.0 credits, 45 Hours Lecture]

Vector Spaces: Definition and properties, subspaces, basis and dimension, change of basis; Linear Transformation (LT): definition and properties, linear operator matrix, geometry of LT, standard plane LT.
Vector Algebra: Scalars and vectors, equality of vectors; Addition and subtraction of vectors; Multiplication of vectors by scalars; Scalar and vector product of two vectors and their geometrical interpretation; Triple

products and multiple products; Linear dependence and independence of vectors.

Vector Calculus: Differentiation and integration of vectors together with elementary applications; Definition of line, surface and volume integrals; Gradient, divergence and curl of point functions, various formulae, Gauss theorem, Stoke theorem, Green theorem.

Fourier Analysis: Real and complex form of Fourier series; Finite transform; Fourier Integral; Fourier transforms and their uses in solving boundary value problems of wave equations.

Laplace Transforms: Definition; Laplace transforms of some elementary functions; Sufficient conditions for existence of Laplace transforms; Inverse Laplace transforms; Laplace transforms of derivatives. The unit step function; Periodic function; Some special theorems on Laplace transforms; Partial fraction; Solutions of differential equations by Laplace transforms; Evaluation of improper integrals.