SIR PADAMPAT SINGHANIA UNIVERSITY
Department of Computer Science & Engineering

Programme: B.Tech **Session:** 2011-15

Semester – IV

HU202	**L T P C**
Soft Skills Training	**0 2 0 2**

Objective- *To cover the gap in the areas of communication , teamwork , corporate etiquette and corporate work culture among engineering students.*

Course outline:
Business Communication Skills
Interpersonal and Intrapersonal skills
Personality grooming and confidence
Group Discussions
Presentations
Interview Skills

CS205	L T P C
Theory of Computation	3 0 0 3

Objective: *This course is designed to introduce and study abstract mathematical models such as Turing machines, formal grammars etc., and to use them to solve computational problems, by identifying both the intrinsic limitations of computing devices and the limitations imposed by resource constraints.*

Course outline:

Introduction: Introduction to defining language, Kleene closures, Arithmetic expressions, defining grammar, Chomsky hierarchy, Finite Automata (FA), Transition graph, generalized transition graph.

Automata: Nondeterministic finite Automata (NFA), Deterministic finite Automata (DFA), Construction of DFA from NFA and optimization, FA with output: Moore machine, Mealy machine and Equivalence, Applications and Limitation of FA

Lemma: Arden Theorem, Pumping Lemma for regular expressions, Myhill-Nerode theorem, Context free grammar: Ambiguity, Simplification of CFGs, Normal forms for CFGs, Pumping lemma for CFLs, Decidability of CFGs, Ambiguous to Unambiguous CFG.

Push Down Automata (PDA): Description and definition, Working of PDA, Acceptance of a string by PDA, PDA and CFG, Introduction to auxiliary PDA and Two stack PDA.

Turing machines (TM): Basic model, definition and representation, Language acceptance by TM, TM and Type – 0 grammar, Halting problem of TM, Modifications in TM, Universal TM, Properties of recursive and recursively enumerable languages, unsolvable decision problem, undecidability of Post correspondence problem, Church's Thesis, Recursive function theory, Godel Numbering.

Texts / Reference Books

1 Hopcroft, Ullman, "Introduction to Automata Theory, Language and Computation", Nerosa , Publishing House
2. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science(Automata, Languages and Computation)", PHI
3. Martin J. C., "Introduction to Languages and Theory of Computations", TMH
4. Papadimitrou, C. and Lewis, C.L., "Elements of theory of Computations", PHI
5. Cohen D. I. A., "Introduction to Computer theory", John Wiley & Sons
6. Kumar Rajendra, "Theory of Automata (Languages and Computation)", PPM

CS206	L T P C
Computer Organisation & Architecture	3 0 0 3

Objective: *This course introduces the concepts of architectural design and coherent the functions of digital components used in the making of a computer system.*

Course outline:

Digital Components and Data representation: Decoders, Encoders, Registers, Counters, RAM and ROM, Number representation, fixed and floating point representations and binary operations, other binary codes.

Arithmetic Components: Basics, Addition, subtraction and multiplication hardware and algorithms, floating point arithmetic hardware.

Register Transfers and Micro-operations: RTL, Representing Bus and Memory transfers, arithmetic, logic and shift transfers in RTL. Arithmetic Logic and Shift unit, Design of a basic computer using RTL.

Micro-programmed control: Control memory, Address sequencing, Micro-instruction formats, example micro-programs, Design of a control unit.

CPU Organization: General register and stack organization, instruction formats, addressing modes, Data transfers and manipulation, program control. RISC and CISC computers.

Memory Organization: Memory Hierarchy, main memory, auxiliary memory, associative memory, cache principles and cache memory, Virtual memory and associated hardware.

Input output Organization: Peripheral devices, I/O interface, Asynchronous data transfer, modes of transfer, priority interrupt, DMA, Input output processor, serial communication.

Introduction to parallel processing: Pipelining, Arithmetic and Instruction pipeline, Vector Processing and Array processing.

Texts / Reference Books

1. M. Morris Mano, Computer system architecture, Pearson Edu. 3rd edition, 2007.
2. Hayes J P , Computer Organisation and Architecture - 2nd Edition, Mc Graw Hill.
3. Stallings William, Computer Orginisation and Architecture, 6th Edition Pearson Education.
4. Tanenbaum A S , Structured Computer Organisation - 3rd Edition, Prentice Hall,

MA204	L T P C
Computer Based Numerical & Statistical Techniques	**3 0 1 4**

Objective: *In this course the student is familiarized with the basic numerical and statistical methods used in Computer Science and Engineering.*

Course outline:

Computer Arithmetic: Floating point numbers and machine numbers, Significant figures, Floating point Arithmetic, Mathematical preliminaries, Round off Errors.

Solution of Algebraic and Transcendental Equation: Iteration Method: Bisection Method; Secant Method; Regula-Falsi Method; Newton-Raphson Method ,Methods of finding complex roots, Muller's method. Rate of convergence of Iterative methods.

Interpolation: Finite differences, Differences operators and their relationships, Factorial notation. Forward, Backward and Divided Differences. Newton's forward and backward interpolation formula, Lagrange's interpolation formula. Hermite's Interpolation.
Central Difference Formulae: Gauss forward and backward formula, Stirling's formula, Bessel and Everett formula.

Numerical Differentiation: Numerical differentiation using Newton's Forward and Backward Interpolation Formulas.

Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rule.

Solution of System of Linear Equations: Direct Methods: Gauss Elimination Method, Gauss-Jordan Method, Gauss-Seidel Method, LU Factorization Method.

Solution of Differential Equations: Picard's Method, Euler's Modified Method, Taylor's Series Method, Runge-Kutta Methods, Adams-Moulton Method.

Statistics: Frequency chart, Curve fitting by method of least squares- linear and non-linear, Correlation and Regression.

Texts / Reference Books

1. Rajaraman V — Computer Oriented Numerical Methods
2. Jain, Iyengar and Jain — Numerical Methods for Scientific and Engineering Computations
3. Grewal B S — Numerical methods in Engineering and Science
4. Niyogi P — Numerical Analysis and Algorithms
5. Sastry S. S — Introductory Methods of Numerical Analysis
6. Goyal, M. — Computer Based Numerical & Statistical Tech.
7. Balagurusamy E — Numerical Methods

CS207	L T P C
Java Programming	3 0 2 5

Objective: *This course is designed to provide knowledge of the essential features of JAVA. It also provides the skills required to use JAVA libraries to develop efficient applications.*

Course outline:

Overview of Java: Fundamentals of Java technology, analyzing and executing a simple Java technology application, Define modeling concepts: abstraction, encapsulation, and packages, code reusability, define class, member, attribute, method, constructor, and package, Scope and life time of a variable, invoking a method on a particular object, API online documentation

Identifiers, Keywords, Types and Flow Control, Arrays: comments, valid and invalid identifiers, keywords, eight primitive types, literals, primitive variable and reference variable, variable declaration, Object creation, initialization, reference variables, instance and local variables, initialization of an instance variables, operators, legal and illegal assignments of primitive types, boolean expressions and their requirements in control constructs, assignment compatibility and required casts in fundamental types, use if, switch, for, while, and do constructions and the labeled forms of break and continue as flow control structures in a program. Declare and create arrays of primitive, class, or array types, array initialization, multidimensional array, copying one array to another.

Classes and inheritance: Class fundamentals, declaring objects, assigning object reference variables, constructor and method overloading, static variables, methods, and initializers, final classes, final methods, and final variables, enumerated types, abstract classes and methods, the this keyword, garbage collection, using objects as parameters, argument passing, returning objects, recursion, Inheritance basics, using super, creating a multilevel hierarchy, method overriding, dynamic method dispatch, using abstract, using final with inheritance, the object class.

Packages, Interfaces, Exceptions and Assertions: Packages, access protection, importing packages, interfaces, define exceptions, use of try, catch, and finally statements, exception categories, common exceptions, defining own exceptions, assertions, appropriate and inappropriate uses of assertions, enable assertions at runtime

Multithreading: Define a thread, creating separate threads, controlling the code and data that are used by that thread, thread execution, difficulties when multiple threads share data, interthread communication, synchronization.

Console I/O and File I/O: Fundamentals of I/O: command-line arguments and system properties, Properties class, construct node and processing streams, serialize and deserialize objects, steams for reading and writing. Read and writing data from the console, describe files and file I/O

Collections and Generics Framework: Describe the general purpose implementations of the core interfaces in the Collections framework, map interface, the legacy collection classes, Comparable and Comparator interfaces, generic collections, type parameters in generic classes, Refactor existing non-generic code

GUIs Using the Swing API and Events: JFC Swing technology, define swing, swing packages, containers, components, and layout managers, top-level, general-purpose, and special-purpose properties of container, swing single-threaded model, building a GUI using Swing components. Define events and event handling, Java SE event model, GUI behavior, event listeners, concurrency in Swing-based GUIs, SwingWorker class

Networking: Code to set up the network connection, TCP/IP, use of ServerSocket and Socket classes to implement TCP/IP clients and servers

Texts / Reference Books

1. Core Java(TM), Volume I and II (Sun Core Series) by Cay S. Horstmann and Gary Cornell.
2. Java How to Program, 7th Edition by Harvey M. Deitel and Paul J. Deitel
3. Herbert Schieldt, The Complete Reference:Java, TMH
4. Patrik Naughton, The Complete Reference Java, Tata Mcgraw Hill

CS210	L T P C
Principles of Information Retrieval	**3 0 0 3**

Objective: *The course is intended to entail the Theories and methods for searching and retrieval of text and bibliographic information , Analysis of relevance and utility, Statistical and linguistic methods for automatic indexing and classification , Boolean and probabilistic approaches to indexing, query formulation, output ranking , Filtering methods , Measures of retrieval effectiveness and retrieval methodology.*

Course outline:

Introduction to Information Retrieval, Mathematical interpretation of Information Retrieval, Finding relevant documents, Intelligent Filtering, synthesizing and merging information

Conceptual Models of Information Retrieval Systems. Boolean Systems , Set Theory, Probabilistic Models, Natural Language Processing models, Document similarity measures.

Information Classification and Clustering , Classification and Clustering Concepts , Classification Techniques , Clustering Methods , Research Issues

Term and Language properties for IR collections , Zipf's law, Stochastic language models, Statistical distributions

Data and File Structures for Information Retrieval, Inverted files , Signature file, Other file structures (PAT trees, Grid Files, Hashing),DBMS-based Information Retrieval.

Automatic Indexing, Passage vs. document retrieval , Salton's Blueprint for automatic indexing , Stemming algorithms, Stemming and Morphological analysis, Part-of-speech tagging and Parsing , Phrase recognition - Syntactic and Collocational

Machine Learning Techniques in IR, Techniques for machine learning - Neural Networks, Genetic Algorithms, Symbolic Learning.

Texts / Reference Books

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schuetze. Introduction to Information Retrieval. Cambridge University Press, 2008. (Also preprint version available

online at http://www-csli.stanford.edu/~schuetze/information-retrieval-book.html)

2. Karen Sparck Jones and Peter Willett. Readings in Information Retrieval. San Francisco : Morgan Kaufmann, 1997 (ISBN 1-55860-454-5) Highly Recommended - there will be readings from this. Parts available through Google Books

3. David A. Grossman and Ophir Frieder. Information Retrieval: Algorithms and Heuristics. Second Edition. Dordrecht, The Netherlands: Springer, 2004 (ISBN 1-4020-3004-5).

4. Baeza-Yates and Ribeiro-Neto. Modern Information Retrieval, Addison Wesley, 1999.

5. W. Bruce Croft (ed). Advances in Information Retrieval: Recent Research from the Center for Intelligent Information Rerieval. Kluwer Academic Publishers, 2000; ISBN: 0-7923-7812-1.

EC209	L T P C
Principles of Communication Engineering	**3 0 1 4**

Objective: *The objective of this course is to introduce the working principles of analog, digital and data communication systems. Students would also gain conceptual skills about communication systems and standards.*

Course outline:

Introduction: Communication Process, Source of Information, Communication channels, need of modulation process, primary communication resources, analog versus digital communications

Amplitude modulation: Amplitude modulation, modulation index, frequency domain representation of AM wave, BW calculations, AM wave with full carrier, suppressed carrier systems, single side band transmission, AM transmitter & receiver, comparison of various AM systems.

Angle modulation: Frequency modulation, Narrow and wide band FM, BW calculations using Carlson rule, phase modulation, pre & de-emphasis , FM transmitter & receiver, comparison of angle modulated wave and amplitude modulated wave

Pulse modulation: Sampling theorem, flat top sampling, natural sampling, flat top sampling, generation and detection of PAM, PPM and PWM, Quantization, PCM, Delta Modulation, Comparison of PCM and DM. ,

Digital communications techniques: Coherent and Non coherent digital modulation methods, Amplitude Shift keying, Frequency Shift Keying, Phase shift keying, QPSK, comparison of digital communications techniques

Multiple access techniques: Frequency division multiplexing, Time division Multiplexing, Wavelength division multiplexing, Comparison of FDM , TDM and WDM systems, CDMA.

Introduction to Information Theory: Discrete messages, concepts of amount of information & its properties, average information, entropy, information rate, Mutual information, **source coding,** Shannon's theorem, Shanon-Fano coding, Huffman coding, Efficiency calculations.

Texts / Reference Books

1. B. P. Lath& digital communication", OXFORD Publications
2. Roddy Coolen: "Electronic Communication, Pearson Education,
3. Forouzan : Data Communication and Networking , TMH
4. Simon Haykin, "Communication Systems", John Wiley & Sons, 1999, III Ed.
5. Taub and schilling, "Principles of Communication Systems" TMH
6. W. Stalling : Data and Computer Communication , PHI
7. Kennedy : Electronic Communication System, TMH