SCHOOL
OF
INFORMATION AND COMMUNICATION TECHNOLOGY

COURSE STURCTURE AND DETAILED SYLLABUS

3 YEARS M. TECH. ICT FOR SCIENCE GRADUATES

SPECIALIZATION:

INTELLIGENT SYSTEM

GAUTAM BUDDHA UNIVERSITY
GAUTAM BUDH NAGAR, GREATER NOIDA
2011-2012

3 Year M. Tech. (ICT) for Science Graduates **Effective from: 2011 -2012**

SEMESTER – I

Sr. No.	Courses Code	Courses	L-T-P	Credits
1	MA431	Engineering Mathematics	3-1-0	4
2	EC431	Digital Electronics	3-0-0	3
3	CS431 / CS203	Operating System	3-0-0	3
4	CS433 / CS202	Software Engineering	3-0-0	3
5	CS435	Problem Solving Using C	3-1-0	4
6	SS431	Technical Communication	2-0-0	2
7	EC483 / EC281	Digital Electronics Lab	0-0-2	2
8	CS483	Programming Lab	0-0-2	2
9	GP431	General Proficiency	------	1
		Total Credits		**24**
		Total Contact Hours	**17-2-4 =**	**23**

SEMESTER – II

Sr. No.	Courses Code	Courses	L-T-P	Credits
1	EC442	Communication Engineering	3-0-0	3
2	CS434	Object-Oriented Programming with JAVA	3-0-0	3
3	CS436 / CS206	Data Base Management System	3-0-0	3
4	CS438 / CS309	Computer Organization and Architecture	3-0-0	3
5	EC444 / EC205	Signal and Systems	3-1-0	4
6	EC446 / EC306	Microelectronics Engineering	3-0-0	3
7	CS484 / CS283	Object-Oriented Programming with Java Lab	0-0-2	2
8	EC480	Design Lab	0-0-2	2
9	GP432	General Proficiency	------	1
		Total Credits		**24**
		Total Contact Hours	**18-1-4 =**	**23**

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SEMESTER – III

Sr. No.	Courses Code	Courses	L-T-P	Credits
1	CS531	Data Structures and Algorithm Design	3-1-0	4
2	CS533	Principles of Compiler Design	3-0-0	3
3	EC553	Data Communication	3-0-0	3
4	EC555 / EC465	Principles of VLSI Design	3-0-0	3
5	EC557	Cellular Mobile Communication	3-0-0	3
6	EC559 / EC304	Microprocessors and Interfacing	3-0-0	3
7	CS583	Data Structures and Algorithms Design Lab	0-0-2	2
8	EC587 / EC384	Microprocessor and Interfacing Lab	0-0-2	2
9	GP531	General Proficiency	------	1
		Total Credits		**24**
		Total Contact Hours	**18-1-4 =**	**23**

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SEMESTER IV

Sr. No.	Courses Code	Courses	L-T-P	Credits
1	MA402	Simulation & Modeling	3-1-0	4
2	CS562	Soft Computing Techniques	3-0-0	3
3	CS564	AI Programming Languages	3-0-0	3
4		**Elective-1**	3-0-0	3
5		**Elective-2**	3-0-0	3
6	CS584	AI Programming Lab	0-0-2	2
7	CS592	Major Project	0-0-10	5
8	GP532	General Proficiency	------	1
		Total Credits		**24**
		Total Contact Hours	**15-1-12 =**	**28**

Electives (1 & 2)		
Sr. No.	**Courses Code**	**Courses**
1	CS566 / CS462	Knowledge Engineering
2	CS568 / CS464	Pattern Matching
3	CS570 / CS466	Neural Network
4	CS572 / CS468	Discourse Analysis and Natural Language Generation

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SEMESTER V

Sr. No.	Courses Code	Courses	L-T-P	Credits
1	CS661	Expert System	3-0-0	3
2	CS633	Research Techniques in ICT	3-0-0	3
3		**Electives - 3**	3-0-0	3
4		**Electives - 4**	3-0-0	3
5	CS683	Expert System Design Lab	0-0-2	2
6	CS691	Dissertation Part - I	0-0-14	7
7	GP631	General Proficiency	------	1
		Total Credits		**22**
		Total Contact Hours	**12-0-16 =**	**29**

Electives (3 & 4)		
Sr. No.	**Courses Code**	**Courses**
1	CS663/CS563	Intelligent Information Retrieval
2	CS665/CS565	Data Mining in AI
3	CS667/CS567	Speech Processing
4	CS669/CS569	Robotics

SEMESTER VI

Sr. No.	Courses Code	Courses	L-T-P	Credits
1	CS690	Dissertation Part - II	------	21
2	GP632	General Proficiency	------	1
		Total Credits		**22**

GRAND TOTAL CREDITS = 140

INTELLIGENT SYSTEM

(SEMESTER - I)

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ENGINEERING MATHEMATICS			
Course Code:	**MA431**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I ORDINARARY DIFFERENTIAL EQUATIONS

First order differential equations: Separable equations, exact differential equations, integrating factors, linear first order differential equations, variation of parameters, existence and uniqueness of solutions, homogenous linear equations of the second order, homogenous second order equations with constant coefficients, general solutions, homogenous linear equations of arbitrary order with constant coefficients, nonhomogenous linear equations.

UNIT II LAPLACE TRASFORM AND ITS APPLICATIONS

Laplace transform, linearity, Laplace transforms of derivatives and integrals, existence theorem, differentiation and integration of transforms, unit step function and Dirac Delta function, Laplace transform of periodic functions, inverse transform, solution of Initi as value problems.

UNIT III MATRICES

Algebra of matrices, rank of a matrices, Cramer's rule, homogeneous and non homogenous system of linear equations, Gauss's elimination method, eigenvalues and eigenvectors, reduction to diagonal form, Quadratic forms.

UNIT IV FOURIER SERIES AND PARTIAL DIFFERENTIAL EQUATIONS

Periodic functions, Fourier series, Euler's formulas, even and odd functions, functions having arbitrary period, half range expansions, determinations of Fourier coefficients without integration, methods for determining coefficients, Fourier integrals, orthogonal functions, Sturm-Liouville problem, vibrating string, one-dimensional wave equation, Method of separation of variables, D'Alemberts's solution of wave equation, one-dimensional heat flow, vibrating membrane, two-dimensional wave equation, Laplace's equation,

UNIT V COMPLEX VARIABLES

Function of complex variables, analytic functions, Cauchy-Riemann equations, Laplace's equation, line integral in the complex plane, Poles and singularities, Cauchy's integral theorem, Cauchy's integral formula, The derivative of an analytic function, Taylor series, Laurent series and applications, Cauchy residue theorem and its applications to evaluating real integrals..

Reference Books:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley, 2006
2. Complex Variables and Applications, Ruel V.Churchill, James Ward Brown, 8th edition, McGraw Hill, 2008.
3. Applied Complex Variables, John W Dettman, Dover Publications New York, 1984
4. Calculus and Analytic Geometry, George B. Thomas, Ross Finney, 9th edition, Narosa, 2003.
5. Introduction to Linear Algebra, Strang Gilbert, 4th edition, Wellesley Cambridge Press, 2009.

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DIGITAL ELECTRONICS			
Course Code:	**EC431**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I

Number systems & codes, Binary arithmetic Boolean algebra and switching function. Minimization of switching function, concept of prime implecant etc. Karnaugh's map method, Quine & McCluskey's method, cases with don't care terms and multiple outputs switching function. Logic gates, NAND, NOR realization of switching function; half-adder half-subtractor full-adders full-subtractor circuits. Series & parallel addition and BCD adders, look-ahead carry generator.

UNIT II

Linear wave shaping circuits, Bistable, monostable & astable multivibrators, Schmitt trigger circuits .Introduction to D/A converters. Various types of Analog to Digital & Digital to Analog converters sample & hold circuits and V-F converters.

UNIT III

Logic families: RTL, DTL, all types of TTL circuits, ECL, 12 L and PMOS, NMOS & CMOS logic etc. Gated flip-flops and gated multivibrators etc; Interfacing between TTL to MOS, vice-versa.

UNIT IV

Introduction to shift registers / ring counters synchronous & asynchronous counters and designing of combinational circuits like code converters & counters etc.

UNIT V

Semiconductor memories & designing with ROM and PLA: Decoders Encoders multiplexers & demultiplexers**.**

Text Books:

1. Tocci, "Digital Systems Principles & Applications".
2. M. Mano, "Digital Logic & Computer Design", (PHI).

Reference Books:

3. John F. Wakerly, Digital Design: Principles & Practices, Pearson Education.2003
4. Richard F.Tinder, Engineering Digital Design, 2/e, Harcourt India Private Ltd., 2001
5. William I. Fletcher, An Engineering Approach to Digital Design, Pearson Education
6. William H.Gothmann, Digital Electronics: An Introduction to Theory and Practice, Eastern Economy Edition, Prentice-Hall of India Private Limited, New Delhi. 2001.
7. Jacob Millman & Herbert Taub,Pulse,Digitaland Switching Waveforms,13th Reprint,Tata McGraw Hill Publishing Company Ltd.,NewDelhi, 1999

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OPERATING SYSTEM			
Course Code:	**CS431/CS203**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO OPERATING SYSTEM

Importance of operating systems, basic concepts and terminology about operating system, memory management functions, processor management functions, device management functions, information management functions.

UNIT II PROCESS MANAGEMENT

Elementary concept of process, job scheduler, process scheduling, operation on process, threads, overview, scheduling criteria, scheduling algorithms, algorithm evaluation process synchronization, synchronization hardware, semaphores, classical problem of synchronization, monitors and atomic transaction deadlocks: system model, deadlock characterization, deadlocks prevention, deadlocks avoidance, deadlocks detection, recovery from deadlock.

UNIT III MEMORY MANAGEMENT

Memory management, logical versus physical address space, swapping, contiguous allocation, paging, segmentation, demand paging, page replacement, page replacement algorithms, allocation of frames, thrashing, demand segmentation.

UNIT IV STORAGE MANAGEMENT

File concept, directory structure, protection, file-system structure, allocation method, free-space management, directory implementation.

UNIT V I/O SYSTEMS

I/O hardware, Application of I/O interface, Overview of Kernel I/O subsystem, three types of I/O systems, memory based I/O, I/O based I/O, peripheral based I/O.

Reference Books:

1. Galvin, Wiley, Operating Systems Concepts, 8th edition, 2009.
2. James L Peterson, Operating Systems Concept, John Wiley & Sons Inc, the 6Rev edition, 2007.
3. Deitel H. M., An Introduction to Operating Systems, Addison-Wesley, 1990.
4. Stallings William, Operating Systems, PHI, New Delhi, 1997.
5. Madnick and Donavon, Operating Systems, McGraw Hill, International edition, 1978.
6. S. Tanenbaum Modern Operating Systems, , Pearson Education, 3rd edition, 2007.
7. Nutt, Operating System, Pearson Education, 2009.
8. S. Tanenbaum, Distributed Operating Systems, Prentice Hall, 2nd edition, 2007.
9. M. Singhal & N. Shivaratri, Advanced Concepts in Operating Systems, McGraw Hill, 2003.

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SOFTWARE ENGINEERING			
Course Code:	**CS433/CS202**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I SOFTWARE ENGINEERING

Introduction to software engineering: definitions, role of software engineering, planning a software project, defining the problem, developing a solution strategy, planning the development process, software engineering process paradigms, principles of software engineering, software engineering activities.

UNIT II REQUIREMENT ANALYSIS AND DESIGN

Software Requirement Specification (SRS): Introduction, need of SRS, significance, characteristics of SRS, Structure of SRS, IEEE standards for SRS design, functional and non-functional requirements, Requirement gathering and analysis, requirement engineering and management.

UNIT III SOFTWARE DESIGN PROCESS

Software Design: Introduction, design process activities: architectural design, Abstract specification, Interface design, component design, data structure design, algorithm design modular approach, top-down design, bottom-up design, design methods: data-flow model: data flow diagram, entity-relation-attribute model: E-R diagram, structural model: structure charts, context diagrams, object models: use case modeling, use case diagrams, sequence diagrams, cohesion and coupling.

UNIT IV SOFTWARE LIFE CYCLE MODELS

Software Development Life Cycle (SDLC), SDLC models, waterfall model and its variations, prototype model, iterative enhancement model, spiral model, RAD model, comparison of these models, software development teams, software development environments, validation and traceability, maintenance, prototyping requirements, Software project management.

UNIT V SOFTWARE TESTING AND MAINTENANCE

Testing Methods: unit testing, integration testing, system testing, acceptance testing, testing techniques: white box testing, black box testing, thread testing, regression testing, alpha testing, beta testing, static testing, dynamic testing, Evolution of software products, economics of maintenance, category of software maintenance, Role of product development life cycle, deployment model, adaptive maintenance, corrective maintenance, perfective maintenance, enhancement request, proactive defect prevention, problem reporting, problem resolution, software maintenance from customers' perspective, maintenance standard: IEEE-1219, ISO-12207.

Reference Books:

1. Pankaj Jalote, An Integrated Approach to Software Engineering, Narosa Publishing House, New Delhi 1997.
2. Ian Sommerville, Software Engineering, Pearson Education, 2009.
3. Pressman Roger S., Software Engineering: Practitioner's Approach, McGraw-Hill Inc., 2004.
4. Software Engineering: Software Reliability, Testing and Quality Assurance, Nasib S. Gill, Khanna Book Publishing Co (P) Ltd., New Delhi, 2002.

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PROBLEM SOLVING USING C			
Course Code:	**CS435**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3 +1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION

Introduction to problem solving, concept of algorithm, design of algorithms, iterative versus recursive style, top down design, program verification, efficiency of algorithms, concept of recursion, some simple example to illustrate these concepts like finding the GCD of two numbers, swapping two variables, summation of n given numbers, generation of Fibonocci sequence, reversing a given number, base conversion.

UNIT II INTRODUCTION TO C

C character set, delimiters, C keywords, identifiers, constants, variables, rules, type conversion, priority of operators and their clubbing, comma and conditional operator, arithmetic operators, relational operators, logical operators, bitwise operators, input in C, formatted and unformatted functions, library functions.

UNIT III MORE ABOUT C

If statement, if--- else statement, various forms of if-nested if-break statement, continue statement, go to statement, switch statement, nested switch statement, for statement, while statement do while statement to while statement, arrays, working with string and standard functions.

UNIT IV ADVANCED CONCEPTS OF C

Introduction to pointers, pointer declaration, arithmetic operations with pointers, pointers and arrays, pointers and two-dimensional arrays, array of pointers, pointers to pointers, pointers and strings, void pointers, function definition and declaration, proto types of functions, call by value and reference, functions returning more values, function as an argument, function with operators, function and decision statements, function and loop statements, function with arrays and pointers, recursion, pointer to function, storage classes.

UNIT V PROBLEM SOLVING

Reversal of an array, removal of duplicates in an ordered array, partitioning of an array, finding the Kth smallest of an element of an array, finding the longest monotone subsequence of an array, linear search, binary search, hash searching, bubble sort, merge sort, quick sort, insertion sort, selection sort, text processing, towers of Hanoi problem using recursion.

ADDITIONALS IN C: preprocessor directives, structures and unions, bit wise operators, files, command line arguments, dynamic memory allegation, graphics in C.

Text Books:

1 Ashok N.Kamthane, Programming with ANSI and Turbo C, Pearson Education, New Delhi.
2. R.G. Dromey, How to Solve it by computer, Prentice Hall of India Ltd, New Delhi.

Reference Books:

3. N.G. Venkateshmurthy, Programming techniques through C, Pearson Education, New Delhi.
4. Byron s Gottfried, Programming with C, Schaum's Outline series, Tata McGraw Hill New Delhi.
5. Jacqueline A.Jones & Keith Harrow, C programming with problem solving, Dreamtech publications, New Delhi.

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PROGRAMMING LAB			
Course Code:	**CS483**	**Credits:**	**2**
No. of Practical (Hrs/Week):	**2**		
Total No. of Lab Sessions:	**15**	**End Sem. Exam Hours:**	**2**

Programs/Experiments List:

1. Write a C Code to implement each of the following:
   Variable, constant, arithmetic operator, relational operator, logical operator, assignment operator, increment & decrement operator, conditional operator, bitwise operator.

2. Write a C Code to implement each of the following:
   Decision statement, loops statement and branch statements
3. Write a C Code to implement each of the following:
   Array: Single and Two dimensional arrays
4. Write C Code to generate the following output with the help of two dimensional array.

   7 14 21 28 35 42 49 56 63 70 Sum = 385
   5 10 15 20 25 30 35 40 45 50 Sum = 275
   3 6 9 12 15 18 21 24 27 30 Sum = 165

5. Write C Code to implement each of the following.
   Matrix Multiplication, Matrix Addition
6. Write a C Code to implement each of the following:
   Strings, Standard library string functions and array of pointers to strings
7. Write a C Code to implement each of the following sorting:
   Bubble Sort, Selection Sort, Insertion Sort, Merge Sort
8. Write a C Code to implement each of the following searching:
   Linear search, Binary search and Hash searching
9. Write a C Code to implement each of the following:
   Function: Implementation of function with call by values and call by reference
10. Write a C Code to implement each of the following:
    Pointers: Pointers declaration, array of pointers, pointers to pointers, pointers and strings
11. Write a C Code to implement recursion and tower of Hanoi problem using recursion.
12. Write a C Code to implement each of the following:
    Structure, Array of structure
13. Write a C Code to implement each of the following:
    Preprocessor, Macro Expansion and File Inclusion
14. Write a C Code to implement the following:
    File Handling
15 Develop a mini projects in C.

DIGITAL ELECTRONICS LAB			
Course Code:	**EC483/EC281**	**Credits:**	**2**
No. of Lab (Hrs/Week):	**2**	**End Sem Exam Hours:**	**3**
Total No. of Lab Sessions:	**15**		

List of Experiments

1. Verify the truth table of AND Gate
2. Verify the truth table of OR and NOT gates.
3. Verify the truth table of NAND , NOR Gates.
4. Verify the truth table of and EX-OR Gate.
5. Design a combinational circuit to realize the function f(ABC)=A(B+C) using NAND gates only.
6. Design a half adder using NOR gates only
7. Design full adder
8. Design a given size of Mux using gates.
9. Verify RS and JK flip flops
10. Verify D and T Flip flops
11. Design a up/down 3-bit counter
12. Design a 3 bit shift register.

INTELLIGENT SYSTEM

(SEMESTER - II)

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COMMUNICATION ENGINEERING			
Course Code:	**EC442**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I SIGNALS AND ITS REPRESENTATION

Review of Fourier transform, convention, signal transmission though linear systems, signal distortion in transmission, poley wiener criteria, bandwidth and rise time, energy and power signals, spectral density and persevall's theorem for energy of power signals, Hilbert transform.

UNIT II LINEAR MODULATION AND EXPONENTIAL MODULATION

Linear modulation: definition, necessity of modulation, principle of amplitude modulation, generation and detection of AM, Side bands, generation and detection of side bands, comparison of various AM systems, FDM, Synchronous detection, exponential modulation: definitions and relationship between PM and FM frequency deviation, Bessells function, spectrum and transmission BW of FM signals, NBFM, WBFM, phaser diagram of FM signal, multi tone FM, Generation and detection of FM Non linear effects in FM systems, comparison of AM and FM systems, TDM.

UNIT III RADIO TRANSMITTER AND RECEIVERS

Different types of AM and FM transmitters and receivers, AM and FM standard broadcast transmitter and receivers, image rejection, mixer. Noise: classification and sources of noise, Noise calculations for single and cascaded stages, SNR, SNR in DSB, SSB, VSB, AM and FM systems, pre-emphasis and De-emphasis Sampling theorem, quantization, PCM, Companding intesymbol interface, eye patterns, Delta modulation, Adaptive delta modulation, DPCM, SIN performance of PCM and delta modulation, bandwidth of PCM and delta modulation.

UNIT IV DIGITAL MODULATION TECHNIQUES

ASK, BPSK, QPSK, M-ray PSK, DPSK, BFSK, M-ray FSK, Duobinary signalling baseband signal receiver, Probability of error, Optimum filter, Matched filter, Coherent and non-coherent detection, bit error rate, random signals, random variables and processes, cumnlative distribution function, probability density function, average value, variance, standard deviation moment and moment,] generating function, characteristics function, Tchebycheffs inequality, Binary, Poisson and Gaussian distributions, other distributions, central limit theorem.

UNIT V INFORMATION THEORY AND CODING

Unit of information, average information, joint and conditional entropy, mutual information, channel capacity efficiency, BBS and BEC, Shannon's Theorem, Shannon-Hartely theorem, bandwidth - SIN ratio trade-off. Coding separable codes, Prefix property, Coding efficiency, Source coding, Shannon - Fano code, Huffman code, Error connection codes, FEC and ARQ, Hamming distance, Minimum distance, Channel coding, block code, cyclic code, convolutional code.

Text Books:

1. S Haykin, Communication System, John Willey and Sons.
2. Taub Schilling, Principle of Communication, TMH.
3. B.P. Lathi, Modern Digital and Analog Communication System, Oxford Press.

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OBJECT-ORIENTED PROGRAMMING WITH JAVA			
Course Code:	**CS434**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I OBJECT-ORIENTED PROGRAMMING

Concept of object-oriented programming (OOP), benefits of OOP, application of OOP, Java history, Java features, Java streaming, Java and Internet, Java contribution to Internet: Java applets, security, portability; Java environment, Java library, Java program structure, Java program, Java Virtual Machine (JVM) architecture, Just In Time compiler (JIT), data type, variables and arrays, operators, control statements, object-oriented paradigms; abstraction, encapsulation, inheritance, polymorphism, Java class and OOP implementation

UNIT II DATA TYPE, OPERATORS AND CONTROL STATEMENT

Data types, Java key words, identifiers, constants, variables, declaration and scope of the variable, symbolic constant, type casting, arithmetic operator, relational operator, logical operator, assignment operator, increment and decrement operator, conditional operator, bitwise operator, ?: operator, arithmetic expressions, expressions, type conversions in expressions, mathematical functions, more data types: arrays, strings, vectors, wrappers classes, program control statements: decision making and branching: if, if….else, else….if, else if ladder, switch, decision making and looping: while, do….while, for.

UNIT III CLASSES, OBJECTS AND METHODS

Java class libraries, class fundamentals, object, methods, adding variables, add methods, creating objects, accessing class members, constructors, methods overloading, static members, nesting of methods, inheritance: extending a class, overriding methods, final variables and methods, final classes, finalizer methods, abstract methods and classes, visibility control, exception handling fundamental.

UNIT IV INTERFACES AND PACKAGES

Interfaces, extending interfaces, implementing interfaces, interfaces references, accessing interface variable, creating queue interface, variable in interfaces, packages, finding a packages and classpath, package and member access, Java API package, system package, naming conventions, creating package, accessing a package, adding a class to a package, hiding classes,

UNIT V MULTITHREADING AND APPLET PROGRAMMING

Multithreading programming: creating threads, thread class and runnable interface extending the thread class, stopping and blocking a thread, life cycle of a thread, thread methods, thread exceptions, thread priority, synchronization, thread communication using notify(), wait(), and notify all(), applet programming : applet basic, applets architecture, a complete applet skeleton, building applets code, applets life cycle, creating a executable applet, designing a web page, applets tag, passing parameters to applets, applets and HTML.

Test Books:

1. E. Balagurusawamy, Programming with JAVA, Tata McGraw Hill, 1998.

Reference Books:

2. Herbert Schildt, JAVA Beginner's guide, Tata McGraw Hill, 2007.
3. Deitel & Deitel, Java How to Program, Prentice-Hall, 1999.
4. Herbert Schildt, The Complete Reference JAVA 2, 7th Edition, Tata McGraw Hill, 2009.
5. Ken Arnold, James Gosling, The Java Programming Language, Addison-Wesley, 1996.
6. Peter Coffee, How to Program Java, Ziff-Davis Press, 1996.

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DATABASE MANAGEMENT SYSTEM			
Course Code:	**CS436/CS206**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I DATA BASE SYSTEM

Data base system vs. file system, view of data, data abstraction, instances and schemas, data models, ER model, relational model, database languages, DDL, DML, database access for applications programs, data base users and administrator, transaction management, data base system structure, storage manager, query processor, history of data base systems, data base design and ER diagrams, beyond ER design entities, attributes and entity sets, relationships and relationship sets, additional features of ER model, concept design with the ER model, and conceptual design for large enterprises.

UNIT II RELATIONAL MODEL

Introduction to the relational model, integrity constraint over relations, enforcing integrity constraints, querying relational data, and logical data base design, destroying /altering tables and views. relational algebra and calculus: relational algebra, selection and projection set operations, renaming, joins, division, relational calculus, tuple relational calculus, domain relational calculus, expressive power of algebra and calculus.

UNIT III BASIC SQL QUERY

Examples of basic SQL queries, nested queries, correlated nested queries set, comparison operators, aggregative operators, NULL values, comparison using null values, logical connectivity's, AND, OR and NOTR, impact on SQL constructs, outer joins, disallowing NULL values, complex integrity constraints in SQL triggers and active data bases.

UNIT IV SCHEMA REFINEMENT

Problems caused by redundancy, decompositions, problem related to decomposition, reasoning about FDS, FIRST, SECOND, THIRD normal form, BCNF, forth normal form, lossless join decomposition, dependency preserving decomposition, schema refinement in data base design, multi valued dependencies.

UNIT V OVERVIEW OF TRANSACTION MANAGEMENT

ACID properties, transactions and schedules, concurrent execution of transaction, lock based concurrency control, performance locking, and transaction support in SQL, crash recovery, concurrency control, Serializability and recoverability, lock management, lock conversions, dealing with dead locks, specialized locking techniques, concurrency without locking, crash recovery: ARIES, log, other recovery related structures, the write, ahead log protocol, check pointing, recovering from a system crash, media recovery, other approaches and interaction with concurrency control.

References Books:

1. Elmasri Navrate, Data Base Management System, Pearson Education, 2008.
2. Raghurama Krishnan, Johannes Gehrke, Data Base Management Systems, TMH, 3rd edition, 2008.
3. C. J. Date, Introduction to Database Systems, Pearson Education, 2009.
4. Silberschatz, Korth, Database System Concepts, McGraw hill, 5^{th} edition, 2005.
5. Rob, Coronel & Thomson, Database Systems Design: Implementation and Management, 2009.

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COMPUTER ORGANIZATION AND ARCHITECTURE			
Course Code:	**CS438/CS309**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I COMPUTER ARITHMETIC AND NUMBER SYSTEM

Number representation, number system, fixed and floating point number representation, arithmetic algorithms (addition, subtraction, booth multiplication).

UNIT II REGISTER TRANSFER AND MICROOPERATION

Register transfer language, bus and memory transfers, bus architecture, bus arbitration, arithmetic logic, shift microoperation, arithmetic logic shift unit, design of fast address.

UNIT III PROCESSOR DESIGN

Processor organization: general register organization, stack organization, addressing mode, instruction format, data transfer & manipulations, program control, reduced instruction set computer.

UNIT IV INPUT-OUTPUT ORGANIZATION

I/O Interface, synchronous and asynchronous data transfer, strobe, handshaking schemes, modes of transfer, interrupts & interrupt handling, direct memory access, input-output processor.

UNIT V MEMORY ORGANIZATION

Memory hierarchy, main memory (RAM and ROM Chips), organization of 2D and $2^{1/2}$D, auxiliary memory, cache memory, virtual memory, memory management hardware.

Text Books:

1. Patterson, Computer Organisation and Design, Elsevier Pub. 2009
2. John P Hays, "Computer Organization", McGraw Hill

References Books:

3. William Stalling, " Computer Organization", PHI
4. Vravice,Hamacher & Zaky, "Computer Organization", TMH
5. Mano," Computer System Architecture", PHI
6. Tannenbaum," Structured Computer Organization', PHI
7. P Pal Chaudhry, 'Computer Organization & Design', PHI

3 Year M. Tech. (ICT) for Science Graduates **Effective from: 2011 -2012**

SIGNAL AND SYSTEMS			
Course Code:	**EC444/EC205**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I LTI SYSTEMS

Continuous time and discrete time signals, even and odd signals, elementary continuous time and discrete time signals, classification of signals, causality; stability, time invariance, linearity, continuous time and discrete time LTI Systems, convolution integral and convolution sum, properties of LTI Systems, differential and difference equations, singularity functions.

UNIT II ANALYSIS OF PERIODIC SIGNALS

Fourier series representation of CTPS, convergence of FS, Properties of CTFS, Fourier series representation of DTFS, Fourier series and LTI Systems, filtering, RC low pass and high pass filters. recursive and non recursive Discrete Time filters, sampling theorem, sampling of continuous time signal with impulse train and zero order hold, reconstruction, aliasing, discrete-time processing of continuous time signals, digital differentiator, sampling of discrete time signals, decimation and Interpolation.

UNIT III ANALYSIS OF APERIODIC SIGNALS

Continuous Time Fourier Transform (CTFT), convergence of FT, properties of CTFT, Discrete Time Fourier Transform (DTFT), properties of DTFT, system characterized by Linear constant co-efficient differential equations, magnitude and phase spectrum, group delay, time domain and frequency domain aspects of ideal non-ideal filters, first order and second order continuous time and discrete time systems.

UNIT IV LAPLACE TRANSFORM

Laplace transform, region of convergence for Laplace transform, inverse Laplace transform, geometric evaluation of Fourier transform from pole zero plot, first order, second order and all pass systems. Properties of Laplace transform, analysis and characterization of LTI systems using the Laplace transform. Causality, stability, differential equations, Butterworth and Chebychev filters, unilateral Laplace transform, its properties and uses.

UNIT V Z-TRANSFORM

Basic principles of z-transform, z-transform definition, region of convergence, properties of ROC, properties of z-transform, Poles and Zeros, inverse z-transform using Contour integration, Residue Theorem, power series expansion and partial fraction expansion, relationship between z-transform and Fourier transform.

Reference Books:

1. Oppenheim Willsky and Nawab, Signals and Systems, PHI.
2. Simon Haykin, Signals and Systems, John Wiley.
3. Taub and Schilling, Principles of Communication Systems, TMH.
4. Dungan F R, Electronic Communication Systems, Thomas-Delmar.

MICROELECTRONICS ENGINEERING			
Course Code:	**EC446/EC306**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I MOSFETS

Device Structure and physical operation, V-I Characteristics, MOSFET circuits at DC, biasing in MOS amplifier circuits, small signal operation and models, MOSFET as an amplifier and as a switch, biasing in MOS amplifier circuits, small signal operation, MOSFET internal capacitances and high frequency mode, CMOS digital logic inverter, detection type MOSFET.

UNIT II SINGLE STAGE IC AMPLIFIER

IC Design philosophy, comparison of MOSFET and BJT, current sources, current mirrors and current steering circuits, high frequency response, CS and CF amplifiers, CG and CB amplifiers, cascade amplifiers, CS and CE amplifiers with source (emitter) degeneration source and emitter followers, some useful transfer parings, current mirrors with improved performance.

UNIT III DIFFERENTIAL AND MULTISTAGE AMPLIFIERS

MOS differential pair, small signal operation of MOS differential pair, the BJT differences pair, other non-ideal characteristics and differential pair, differential amplifier with active loads, frequency response and differential amplifiers, multistage amplifier.

UNIT IV FEEDBACK AND OPERATIONAL AMPLIFIERS

General Feedback structure, properties of negative feedback, basic feedback topologies, loop gain, Stability problem, effect of feedback on amplifier poles, stability analysis by Bode plots, frequency compensation, two stage CMOS Op-amp, folded cascade CMOS op-amp, 741 op-amps, data converters, A-D and D-A converters.

UNIT V DIGITAL CMOS CIRCUITS

Overview, design and performance analysis of CMOS inverter, logic gate circuits, pass-transistor logic. dynamic logic circuits.

Text Book:

1. Microelectronic Circuits, Adel Sedra and K.C. Smith, 5th Edition, Oxford Uni. Press, 2004.
2. Microelectronic Circuit Design, Richard C. Jaeger and Blalock, 3rd Edition, TMH 2007

References Books:

3. Fundamentals of Microelectronics, Behzad Razavi, John Wiley, 2008

OBJECT-ORIENTED PROGRAMMING WITH JAVA LAB			
Course Code:	**CS484**	**Credits:**	**2**
No. of Practical (Hrs/Week):	**2**		
Total No. of Lab Sessions:	**15**	**End Sem. Exam Hours:**	**2**

Programs/Experiments List:

1. Write a separate Java Code to implement each of the following:
   Class, Command Line Argument, how to enter value through keyboard

2. Write a separate Java Code to implement each of the following data types:
   Variable, Constant, Arrays, Strings, Vectors, Wrappers Classes, Type Casting

3. Write a separate Java Code to implement each of the following operators:
   Arithmetic operator, Relational operator, Logical operator, Assignment operator, Increment & Decrement operator, Conditional operator, Bitwise operator, ?: operator

4. Write a separate Java Code to implement each of the following control statements:
   Decision statement, Loops statement and Branch statements

5. Write a separate Java Code to implement each of the following sorting:
   Bubble Sort, Selection Sort, Insertion Sort, Merge Sort

6. Write a separate Java Code to implement each of the following:
   Class, Object, Constructors, Method, Method Overloading and Method Overriding

7. Write a separate Java Code to implement each of the following:
   Final variable, final class, final method, abstract class, abstract method and concrete method

8. Write a separate Java Code to implement each of the following OOPs concepts:
   Abstraction, Polymorphism, Encapsulation, Inheritance
9. Write a separate Java Code to implement each of the following:
   Exception handling with Try, Catch, Throw, Throws, Finally
   Multiple catch statement with the following exceptions :
   ArithmeticException, ArrayOutOfBoundsException and ArrayStoreException

10. Write a separate Java Code to implement each of the following:
    Visibility Controls: Private, Public and Protected

11. Write a separate Java Code to implement each of the following:
    Interface, extending and implementing interface

12. Write a separate Java Code to implement each of the following:

Multithreading: Create thread with thread class and runnable interface, thread priorities, synchronization

13. Write a separate Java Code to implement each of the following:

Packages : Create package A with following methods and import this package A into another Java program to show the result of methods of package A.

i) First method: Factorial number with the help of recursion.

ii) Second method: Fibonacci Series

iii) Third Method: Generate first 10 prime numbers and show the sum of first 10 prime numbers.

14. Write Java Code to generate the following output on applet with the help of two dimensional array and show the result with the help of HTML file.

7 14 21 28 35 42 49 56 63 70	Sum = 385
5 10 15 20 25 30 35 40 45 50	Sum = 275
3 6 9 12 15 18 21 24 27 30	Sum = 165

15. Write a Java Code to design the following web page with the help of applet and HTML.

School of Information and Communication Technology
GAUTAM BUDDHA UNIVERSITY
GREATER NOIDA

- **Student Name:**
- **Enrollment Number:**
- **Programme Name:**
- **Semester:**
- **Course Name:**
- **E-Mail ID:**
- **Mobile Number:**
- **Blood Group:**

Design Lab LAB			
Course Code:	**EC480**	**Credits:**	**2**
No. of Lab (Hrs/Week):	**2**	**End Sem Exam Hours:**	**3**
Total No. of Lab Sessions:	**15**		

List of Experiments

13. Characterization of JFET.
14. Characterization of MOSFET
15. Design of Inverter Using MOSFET.
16. Design of an Inverting Amplifier using OP-AMP.
17. Design of noninverting Amplifier using OP-Amp.
18. Design of an integrater using Op-Amp.
19. Design of Astable Multivibrator using 555 Timer.
20. Design of Schmitt trigger using 555 timer
21. Design an 8-bit A/D Converter.
22. Design an 8-bit D/A Converter.
23. Verify the truth table of AND, OR and NOT gates.
24. Verify the truth table of NAND , NOR and EX-OR Gate.
25. Design a combinational circuit to realize the function f(ABC)=A(B+C) using NAND gates only.
26. Design a half adder using NOR gates only
27. Design full adder
28. Design a given size of Mux using gates.
29. Verify RS and JK flip flops
30. Verify D and T Flip flops
31. Design a up/down 3-bit counter
32. Design a 3 bit shift register.

INTELLIGENT SYSTEM
(SEMESTER - III)

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DATA STRUCTURES AND ALGORITHM DESIGN			
Course Code:	**CS531**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION

Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off.

Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.

Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal

UNIT II STACKS AND QUEUE:

Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Queue, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Dequeue and Priority Queue.

UNIT III TREES

Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm, Convex hull , Searching. Greedy methods. Binary Search Trees(BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees, Red-Black trees, Binomial Heaps, Fibonacci Heaps, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms,

UNIT IV GRAPH

Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm.

UNIT V SEARCHING AND SORTING

Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting. Dynamic programming with examples such as Kanpsack, All pair shortest paths – Warshal's and Floyd's algorithms, Resource allocation problem.

Text books:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C++" , PHI
2. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.

Reference Books:

3. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication
4. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill
5. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education
6. Lipschutz, "Data Structures" Schaum's Outline Series, TMH

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PRINCIPLES OF COMPILER DESIGN			
Course Code:	**CS533**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**2**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO COMPILER

Introduction to compiler, Analysis and synthesis model of Compiler, Analysis of Source Program, Lexical Analysis, Syntax Analysis, Semantic Analysis, Phases of Compiler, Symbol table Management, Error Detection and Reporting Preprocessors, Assemblers, Front-End and Back-End, Compiler Construction Tools

UNIT II LEXICAL ANALYSIS

Introduction to Lexical Analysis, Role of Lexical Analyzer, Issues in Lexical Analysis, Tokens, Patterns Lexemes, Specification of Tokens, String and Language, Operations on Languages, Regular Expression, Recognition of tokens Transition Diagram, Finite Automata, Nondeterministic Finite Automata, Deterministic Finite Automata, Conversion of NFA to DFA, Construction of NFA from Regular Expression,

UNIT III SYNTAX ANALYSIS I

Introduction to Syntax Analysis, Role of Parsers, Syntax Error, Error Recovery Strategy, Context Free Grammars, Parse tree and Derivatives, Ambiguity and its elimination, Regular expression Vs Context Free Grammar, Elimination of Left Recursion, Left Factoring, Top-Down Parsing, Recursive-Descent Parsing, Non Recursive Predictive Parsing, FIRST and FOLLOW, Construction of Predictive Parsing

UNIT IV **SYNTAX ANALYSIS II**

Bottom-Up Parsing, Shift reduce parsing, Stack Implementation of Shift Reduce Parsing, Operator-Precedence parsing, Precedence function and Associativity, LR parsers, the canonical collection of LR(0) items, constructing SLR parsing tables, constructing canonical LR parsing tables, constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator.

UNIT V TYPE CHECKING AND CODE GENERATION

Type Checking, Type Expression, Specification of Simple Type Checking, Type Conversion, Symbol table, Intermediate Code Generation, three address code, Assignment statements, input to code generation, Memory Management, Register Allocation, basic blocks and flow graphs, optimization of basic blocks.

Reference Books:

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
2. V Raghvan, " Principles of Compiler Design", TMH
3. Kenneth Louden," Compiler Construction", Cengage Learning.
4. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson

DATA COMMUNICATION			
Course Code:	**EC553**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO DATA COMMUNICATION AND NETWORKS

Data communication, networks, physical structures; different topologies, categories of networks: LAN, MAN, WAN, interconnection of networks, Internet, protocols and standards, standards organizations. network models, layered tasks, OSI model, different layers in OSI model, TCP/IP protocol suite; different layers, addressing, physical, logical, port and specific addresses, analog and digital, digital signals-Bit length, digital signal as a composite analog signal, transmission of digital signals, data rate limits-noiseless channel, noisy channel.

UNIT II PHYSICAL LAYER

Digital-to-digital conversion, line coding, line coding scheme, block coding, scrambling, multiplexing, frequency division, wavelength division, synchronous time division, statistical time division multiplexing, circuit switched networks, three phases, efficiency, delay, datagram networks, routing table, efficiency, delay, datagram networks in the internet. virtual circuit networks, addressing, three phases, efficiency, delay, circuit switched technology in WANs, structure of circuit and packet switches, dial-up modems, digital subscriber line - ADSL, ADSL Lite, HDSL, SDSL, VDSL, cable TV for data transfer- bandwidth, sharing, CM and CMTS, data transmission schemes.

UNIT III DATA LINK LAYER

Introduction, types of errors, redundancy, detection vs correction, forward error correction vs retransmission, modular arithmetic, block coding, error detection, error correction, hamming distance, minimum hamming distance, linear block codes, cyclic codes, cyclic redundancy check, hardware implementation, polynomials, cyclic code analysis, advantages, checksum, framing, fixed and variable, size, flow and error control, protocols, noiseless channels, simplest and stop-and-wait protocols, noisy channels, stop-and-wait automatic repeat request, go-back-n automatic repeat request, selective repeat automatic repeat request.

UNIT IV MEDIUM ACCESS

Random Access- ALOHA, Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), controlled access-reservation, polling, token passing, channelization, Frequency Division Multiple Access (FDMA), Time-Division Multiple Access (TDMA), Code-Division Multiple Access (CDMA), IEEE standards, standard ethernet, changes in the standard, fast ethernet, gigabit ethernet, IEEE 802.11-Architecture, MAC sub layer, addressing mechanism, physical layer, Bluetooth, architecture, radio Layer, baseband Layer, L2CAP.

UNIT V CONNECTING LANS

Connecting devices, passive hubs, repeaters, active hubs, bridges, two-layer switches, three-layer switches, gateway, backbone networks-bus, star, connecting remote LANs, Virtual LANs -Membership, configuration, communication between switches, network layer, logical addressing - IPv4Addresses- address space, notation, classful addressing, classless addressing, Network Address Translation (NAT). IPv6 addresses - structure and address space, internetworking - need for network layer, internet as a datagram network, internet as a connectionless network, IPv4, datagram, fragmentation, checksum, options, IPv6 advantages, packet format, extension headers, transition from IPv4 to IPv6, address mapping- logical to physical address, physical to logical address, routing, delivery forwarding techniques and processes, routing table, unicast routing protocols, optimization, inter domain, intra domain, distance vector, link state and path vector,

routing, Multicast routing protocol, unicast, multicast and broadcast, applications, multicast routing and routing protocols.

Text Books:

1. B. A. Forouzan and Sophia Chung Fegan: Data Communications and Networking, 4th Ed, TMH.
2. W. Tomasi: Introduction to Data Communications and Networking, Pearson Education.
3. A. S. Tanenbaum: Computer Networks, Pearson Education.
4. W. Stalling: Data and Computer Communication, Pearson Education.

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PRINCIPLE OF VLSI DESIGN			
Course Code:	**EC555/EC465**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I MOS TRANSISTOR THEORY AND PROCESS TECHNOLOGY

NMOS and PMOS transistors, threshold volt age- Body effect- Design equations- second order effects. MOS models and small signal AC characteristics, basic CMOS technology.

UNIT II INVERTERS AND LOGIC GATES

NMOS and CMOS inverters, stick diagram, inverter ratio, DC and transient characteristics , switching times, Super buffers, driving large capacitance loads, CMOS logic structures, transmission gates, static CMOS design, dynamic CMOS design.

UNIT III CIRCUIT CHARACTERIZATION AND PERFORMANCE ESTIMATION

Resistance estimation, capacitance estimation, inductance, switching characteristics, transistor sizing, power dissipation and design margining, charge sharing, scaling.

UNIT IV VLSI SYSTEM COMPONENTS CIRCUITS & SYSTEM LEVEL PHYSICAL DESIGN

Multiplexers, decoders, comparators, priority encoders, shift registers, arithmetic circuits, ripple carry adders, carry look ahead adders, high-speed adders, multipliers, physical design, delay modeling ,cross talk, floor planning, power distribution, clock distribution.

UNIT V VERILOG HARDWARE DESCRIPTION LANGUAGE

Overview of digital design with Verilog HDL, hierarchical modeling concepts, modules and port definitions, gate level modelling, data flow modeling, behavioral modeling, task & functions, test bench.

Text Books:

1. Neil H.E. Weste and Kamran Eshraghian, Principles of CMOS VLSI Design, Pearson Education ASIA, 2nd edition, 2000.
2. Pucknell, “Basic VLSI Design”, Prentice Hall of India Publication, 1995.

Reference Books:

3. John P.Uyemura “Introduction to VLSI Circuits and Systems”, John Wiley & Sons, Inc., 2002.
4. Samir Palnitkar, “Verilog HDL”, Pearson Education, 2nd Edition, 2004.
5. Eugene D.Fabricius, Introduction to VLSI Design McGraw Hill International Editions,1990.
6. J.Bhasker, B.S.Publications, “A Verilog HDL Primer”, 2nd Edition, 2001.
7. Wayne Wolf “Modern VLSI Design System on chip. Pearson Education.2002.

3 Year M. Tech. (ICT) for Science Graduates **Effective from: 2011 -2012**

CELLULAR MOBILE COMMUNICATION			
Course Code:	**EC557**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I

Introduction to cellular mobile system, basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning and cellular system, elements of cellular radio system design: general description of problem, concept of frequency channels, co-channel interface reduction factor, hand off, cell splitting, consideration of the components of cellular systems.

UNIT II

Interface: introduction to co-channel interface, real time co-channel interface, co-channel measurement, design of antenna system, antenna parameter and their effects, diversity receiver non co-channel interface different types.

UNIT III

Cell coverage for signal and traffic: general introduction, obtaining the mobile point-to-point mode propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point-to-point prediction model-characteristics, cell site, antenna heights and signal coverage cells, Mobile-to-mobile propagation.

UNIT IV

Cell site antennas and mobile antennas: antennas at cell site, mobile antennas, frequency management and channel assignment: frequency management, fixed channels assignment, non-fixed channel assignment, traffic and channel assignment.

UNIT V

Digital cellular system: GSM, architecture, layer modeling, transmission, GSM channels, multiple process, CDMA, terms, power limits & control modulation characteristics, call processing, hand off.

Text Books:

1. Lee, Cellular and Mobile Communication, McGraw Hill.
2. Faher Kamilo., Wireless Digital Communication, PHI.

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MICROPROCESSORS AND INTERFACING			
Course Code:	**EC559/EC304**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I

Introduction to 8085 microprocessor: pin diagram, architecture, programming model, instruction set, and classification of instruction set, instruction and data format, timing diagram of instructions, basic concept of programming, addressing modes of 8085 microprocessors.

UNIT II

Microprocessor 8086 architecture, BIU and EU, registers, pin diagram, memory addressing, clock generator 8284, buffers and latches, maximum and minimum modes.

UNIT III

Addressing Modes, Instruction set of 8086, assembly language programming, assemblers, procedures, macros, interrupts, 8086 based multiprocessor systems

UNIT IV

Interfacing Chips- IC 8155 (Static Ram with I/O Ports and Timer), 8755 (EPROM with I/O Ports), 8251A (USART), 8255A (Programmable Peripheral Interface), 8253/8254 (Programmable Interval Timer/Counter), 8257 (DMA Controller), 8259A (Programmable Interrupt Controller).

UNIT V

The 8051 architecture Microprocessor and Microcontroller, Comparison of microprocessors and microcontrollers Microcontroller survey, microcontrollers of different word length, make and features, selection criteria for microcontroller ,8051 microcontroller hardware, I/O pins and internal architecture internal RAM, ROM organization, I/O port circuits ,connecting external memory, addressing modes, instruction set and assembly language programming.

Text Books:

1. A. K. Ray : Advanced Microprocessors and Interfacing, 2nd edition,TMH
2. Mazidi and Mazidi: The 8051 Microcontroller and Embedded Systems, Pearson Education

References:

3. B. B. Brey: The Intel Microprocessors, Architecture, Programming and Interfacing, Pearson Education.
4. Liu Gibson: Microcomputer Systems: The 8086/8088 Family- Architecture, Programming and Design, PHI
5. D. V. Hall: Microprocessors and Interfacing, TMH.
6. Ayala Kenneth:- The 8051 microcontroller, Third Edition, Cengage Learning
7. A. V. Deshmukh: Microcontroller (Theory and Application), TMH.
8. Raj Kamal: Embedded Systems- Architecture, Programming and Design, TMH, New Delhi.
9. R S Gaonkar, Microprocessor, Architecture, Programming, and Applications with the 8085, Penram International Publication, 5/e
10. P.K. Ghosh and P. R. Sridhar, 0000 to 8085 Introduction to microprocessor for Engineers and Scientists, PHI, 2/e

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Data Structures and Algorithms Design Lab			
Course Code:	**CS583**	**Credits:**	**2**
No. of Lab (Hrs/Week):	**2**	**End Sem Exam Hours:**	**2**
Total No. of Lab Sessions:	**15**		

List of Experiments

1. Write a program that implements tower of hanoii.
2. Write a program that implements insertion sort, Selection Sort.
3. Write a program that implements heap sort.
4. Write a program that implements quick sort.
5. Write a program that implements merge sort.
6. Write a program that implements binary search.
7. Write a program that implements Prim's algorithm.
8. Write a program that implements Kruskal's algorithm.
9. Write a program that implements make a change using greedy.
10. Write a program that implements knapsack using greedy.
11. Write a program that implements Dijkstra's algorithm.
12. Write a program that implements Longest Common Subsequence.
13. Write a program that implements N-queen Problem.
14. Write a program that implements knapsack using backtracking
15. Write a program that implements make a change using dynamic.
16. Write a program that implements All pair shortest path problem

Microprocessor and Interfacing Lab			
Course Code:	EC587 / EC384	**Credits:**	**2**
No. of Lab (Hrs/Week):	**2**	**End Sem Exam Hours:**	**3**
Total No. of Lab Sessions:	**15**		

List of Experiments

1. Addition of two 8-bit numbers, result 8-bit.
2. Addition of two 8-bit numbers, result 16-bit.
3. Subtraction of two 8-bit numbers.
4. Addition of two 16-bit numbers.
5. Multiplication of two 8-bit numbers.
6. Division of two 8-bit numbers.
7. 2's Compliment of a 8-bit number.
8. Arrange the array in ascending order.
9. Arrange the array in descending order.
10. Moving the block of data from one memory location to another memory location.
11. Largest number in an array.
12. Smallest number in an array.
13. BCD to HEX conversion.
14. HEX to BCD conversion.
15. HEX to ASCII conversion.
16. ASCII to HEX conversion.
17. Square of a number using lookup table method.
18. Interfacing of 8255.
19. Interfacing of 8253/8354.
20. Interfacing of 8237/8257.
21. Interfacing of 8259.
22. Interfacing of 8251.

INTELLIGENT SYSTEM

(SEMESTER - IV)

SOFT COMPUTING TECHNIQUES			
Course Code:	**CS562**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I FUZZY LOGIC

Introduction to fuzzy logic, classical and fuzzy sets, overview of fuzzy sets, membership function, fuzzy rule generation, operations on fuzzy sets: compliment, intersection, union, combinations on operations, aggregation operation.

UNIT II FUZZY ARITHMETIC

Fuzzy numbers, linguistic variables, arithmetic operations on intervals & numbers, uncertainty based information, information and uncertainty, no specificity of fuzzy and crisp sets, fuzziness of fuzzy sets.

UNIT III NEURAL NETWORK

Overview of biological neurons, computational neuron, mathematical model of neurons, ANN architecture, single layer and multilayer architectures, activation function, threshold value, self learning and forced learning algorithms, feed forward and feedback architectures.

UNIT IV LEARNING FUNDAMENTALS

Learning paradigms, supervised and unsupervised learning, reinforced learning, ANN
training, algorithms perceptions, training rules, delta, back propagation algorithm, multilayer perception model, Hopfield networks, associative memories, applications of artificial neural networks,

UNIT V GENETIC ALGORITHMS

History of genetic algorithm, terminology of genetic algorithm, biological background, creation of offspring, working principles of genetic algorithms, fitness function, reproduction: Roulette wheel selection, Boltzmann selection, cross over mutation, inversion, deletion, and duplication, generation cycle.

UNIT VI CONCEPT OF UNCERTAINTY

Presence of uncertainty in real world problems, handling uncertain knowledge, degree of belief, degree of disbelief, uncertainty and rational decisions, decision theory, utility theory, concept of independent events, Bay's rule, using Bay's rule for combining events.

Text Books:

1. Artificial Neural Networks: An introduction to ANN Theory and Practice, Peteus J. Braspenning, PHI publication, 2005.
2. Fuzzy Logic: A spectrum of Theoretical and Practical issues, Paul P. Wang, pearson publication 2004.

Reference Books:

3. Fuzzy Sets, Fuzzy logic, and Fuzzy Systems: Selected Papers- Lotfi Asker Zadeh, George J. Kilr, Bo yuan, 2005.
4. Foundations of Fuzzy logic and Soft Computing: 12th International Fuzzy conference proceeding, 2005.
5. Neural Networks Theory, Particia Melin, Oxford University press, 2003
6. Neural Networks Theory and Application, Oscar Castillo, Wiley Eastern publication

AI PROGRAMMING LANGUAGES			
Course Code:	**CS564**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I PROPOSITIONAL CALCULUS

Syntax and semantics of propositional calculus, Atomic symbol, logical connectives, the semantics of propositional calculus, well formed formula, properties of statements, inferencing in propositional logic, concept of inferencing, modus ponen and modus tollen rules, equivalence, validity, and satisfiability, agent based propositional logic.

UNIT II PREDICATE LOGIC

Syntax of predicate logic, predicate logic symbols, constants, variables, functions, terms, predicates, connectives, quantifiers, semantics of predicate logic, representation of facts using predicate logic, quantifiers, inferencing in predicate logic.

UNIT III RESOLUTION

Concept and process of resolution, concept of theorem proving, disjunctive and conjunctive normal form, conversion of a wff statement into clausal form, Solemnization, resolution algorithm, completes of resolution, types of resolution, unit resolution, binary resolution, linear resolution, unification, unification algorithm, applications of resolution.

UNIT IV LOGIC PROGRAMMING

The order of logic, first order logic, existential and universal quantifier, nested quantifier, The concept of programming, algorithm development for the facts represented in form of logic, techniques of standard program design, writing example programs.

UNIT V PROLOG and LISP LANGUAGE

Syntax of Prolog, basic data types of PROLOG, properties and array list, control structures, input output statements, creating rule base in PROLOG, writing programs in Prolog, Syntax of LISP, properties of LIST, representation and storage of list, function, basic data types of LISP, input output statements, control structure of LISP, writing programs in LISP.

Text Books:

1. Prolog Programming, Russel Norvig, Addison Wisely publication 2006.
2. LISP programming, James Martin, PHI publication, 2002.

Reference Books:

1. Artificial Intelligence, Winston, Addison Wisely publication, 2005.
2. Prolog Programming for Artificial Intelligence , Brakta L, Addison wisely publication, 2006.
3. Programming Expert System in OPS5: An Introduction to Rule Based Programming Browston, 2005.

AI PROGRAMMING LAB			
Course Code:	**CS584**	**Credits:**	**2**
No. of Lab (Hrs/Week):	**2**	**End Sem Exam Hours:**	**3**
Total No. of Lab Sessions:	**15**		

List of Experiments

1. Logic and AI Programming lab to write a programme in lisp to fined fibroins size up to terms.
2. Write a programme a lips to credit a lips to five notes store and individual data print a aliments of list.
3. Write a programme a lips to read an area print in it rivers order.
4. Write a programme a lips aliment of area in ascending order.
5. Write a in C programme a star a algorithm.
6. Write a programme in C language to implement minimex surch processor.
7. Write a programme in C to implement minimex surch with Alfa Beta cut of.
8. Write a programme in C to implement unification algorithim.

INTELLIGENT SYSTEM

(ELECTIVES - 1 & 2)

KNOWLEDGE ENGINEERING			
Course Code:	**CS566/CS462**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I FUNDAMENTALS OF KNOWLEDGE

Concept of knowledge, types of knowledge, declarative knowledge, procedural knowledge, inheritable knowledge, inferential knowledge, relational knowledge, heuristic knowledge, commonsense knowledge, explicit knowledge, tacit knowledge, uncertain knowledge.

UNIT II KNOWLEDGE REPRESENTATION

The need of knowledge representation, levels of knowledge representation, granularity of knowledge representation, granularity vs. size of knowledgebase, techniques of knowledge representation, frames, reasoning with frames, frame based knowledge representation, semantic network, partitioned semantic nets, conceptual graphs, scripts.

UNIT III KNOWLEDGE STORAGE AND ACQUISITION

Need of knowledge storage, characteristic of good knowledge representation, knowledge acquisition, indexing techniques, fuzzy distance calculation, issues in knowledge acquisition, requirements of knowledge acquisition techniques, issues in knowledge acquisition in organization, knowledge organization and management, consistency of knowledge representation.

UNIT IV KNOWLEDGE ORGANISATION AND MANAGEMENT

Need of organizing the knowledge, techniques of knowledge organization, forward reasoning and backward reasoning, combination of forward and backward chaining, matching, conflict resolution, information retrieval from knowledge base, indexing, matching, RETE matching algorithm.

UNIT V APPLICATIONS OF KNOWLEDGE

Knowledge reuse technique in the designing of expert systems, components of knowledge engineering based problem solution methodology: identification of task, assembly of relevant knowledge, identification of lexicon, encoding general and domain specific knowledge, choosing inference procedure, identifying the bugs, rule based systems, blackboard architectures.

Text Books:

1. Artificial Intelligence and Knowledge Engineering, Winston, PHI publication , 2004.
2. Conceptual Information Processing, R.C Schank, Amsterdum North Holland, 2003.

Reference Books:

1. The basic concepts of knowledge engineering by Shank and J.G. Carbonell, PHI publication, 2003.
2. Principles of Artificial intelligence, Nillson, N.J., Morgan Kaufmann publication, 2004.
   Knowledge Management, by Shelda Debowski, John Wiley & Sons publication,

PATTERN MATCHING			
Course Code:	**CS568/CS464**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION AND BAYESIAN DECISION THEORY

Introduction to pattern recognition, Systems, design cycles, learning and adaptation, Bayesian decision theory, minimum error-rate classification, classifiers, discriminate functions and decisions surfaces.

UNIT II MAXIMUM – LIKELIHOOD AND BAYESIAN PARAMETER ESTIMATION

Maximum – Likelihood estimation, Bayesian estimation, Bayesian parameter estimation, Gaussian case and general theory, problems of dimensionality, Hidden Markov models, rules for pattern matching, incremental forward chaining, matching with known facts, data complexity.

UNIT III NONPARAMETRIC TECHNIQUES

Density estimation, parazen windows, Kn – Nearest neighbor estimation, nearest neighbor node metric technique.

UNIT IV LINEAR DISCRIMINATE FUNCTIONS

Linear discriminate functions and decision surfaces, generalized linear discriminate functions, two category uniformly separate case, minimizing the perception criterion function, relaxation procedures, nonseperable behavior, minimum squared-error procedures, Ho–Kashyap Procedures, support vector machines, multicategory generalization.

UNIT V UNSUPERVISED LEARNING

Clustering mixture densities and identifiability, maximum, likelihood estimation, application to normal mixtures, unemperouses, Bayesian learning, Data descriptions and controls, criterion function for clustering, interface, optimization, hierarchical clustering, component analysis, low dimension representation and multidimensional scaling.

Text Books:

1. Pattern Classification Richard O. Duda, Peter E. Hart and David G. Stork," 2nd Edition, John Wiley, 2003.
2. Introduction to the theory of Neural Computation, John Hertz, Andres Krogh & Richard G. Palmer, Addison Wesley, 2004.

References:

1. "Learning from Data-Concepts, Theory and Methods, Cherkassky V., F. Kulier, John Wiley, New York, 1998.
2. Neurocomputing: Foundations of Research, MIT Press, Cambridge Anderson J.A., E. Rosenfield, MA, 1988.
3. Self-Organizing Maps, Kohonen T., 2nd Ed., Springer Verlag, Berlin, 1997.
   Pattern Recognition by Devrophi publication, 1996.

NEURAL NETWORK			
Course Code:	**CS570/CS466**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO NEURAL NETWORKS

Biological Neuron, analogy of biological and artificial neuron, architecture classification, neural models, learning paradigm and rule, single unit mapping and the perception.

UNIT II FEED FORWARD NETWORKS

Review of optimization methods, back propagation, variation on back propagation, FFANN mapping capability, activation function of neural networks, network structures, single layer feed forward neural networks (perceptions'), Learning rate of neuron, multilayer feed forward neural network, Kernel function, boosted neural network, support vector machine, virtual support machine, shape matching.

UNIT III MULTILAYER NEURAL NETWORKS

Feed forward operations and classifications, back propagation algorithm, error factors, back propagation as feature & mapping, back propagation, buyer theory and probability, practical techniques for improving back propagation, regularization, complexity adjustment and pruning.

UNIT IV MATHEMATICAL PROPERTIES OF NEURAL NETWORKS

Formulation of mathematical model of FFANN's, Generalization, Bios & variance Dilemma, Radial Basis Function networks, back propagation algorithm, nearest neighbor and instance based learning methods.

UNIT V APPLICATION OF NEURAL NETWORK

PCA, SOM, LVQ, Hopfield networks, associative memories, RBF Networks, applications of Artificial Neural Networks (ANN) to function approximation, regression, classification, blind source separation, time series and forecasting.

Text Books:

1. Neural Networks-A Comprehensive Foundations, Haykin S., Prentice-Hall International, New Jersey, 1999.
2. An Introduction to Neural Networks, Anderson J.A., PHI, 1999.

Reference Books:

1. Introduction to the Theory of Neural Computation, Hertz J, Krogh A, R.G. Palmer, " Addison-Wesley, California, 1991.
2. Introduction to the Theory of Neural Computation, Hertz J, Krogh A, R.G. Palmer, , Addison-Wesley, California, 1991.
3. Neural Networks: Algorithms, Applications and Programming Techniques, Freeman J.A., D.M. Skapura, , Addison-Wesley, Reading, Mass, (1992).

DISCOURSE ANALYSIS AND NATURAL LANGUAGE GENERATION			
Course Code:	**CS572/CS468**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO DISCOURSE

Concept of discourse, characteristics of discourse, difference between normal text and discourse, basic terminology used in analysis of discourse, coherence phenomenon, text analysis, different cohesive relations like anaphoric, cataphoric, endophoric and exophoric, analytical treatment of cohesive relations.

UNIT II BASIC REFERENCE PHENOMENON

Concept of anaphora, types of anaphora, indefinite noun phrase, definite noun phrase, pronoun, syntactic and semantic constraints on co-reference, number agreement, person and case agreement, gender agreement.

UNIT III PERENCES IN PRONOUN INTERPRETATION

Recency, grammatical role, repeated mention, parallelism, verb semantics, Lappin and Leass algorithm for anaphora resolution, tree search algorithm, cantering algorithm, inference based anaphora resolution algorithm,

UNIT IV DIALOGUE AND CONVERSATIOANL AGENTS

Difference between a dialogue and text, turns and utterances, grounding, conversational implicature, dialogue acts, automatic interpretation of dialogue acts, cue based interpretation of dialogue acts, dialogue structure and coherence dialogue managers in conversational agents.

UNIT V INTRODUCTION TO NATURAL LANGUAGE GENERATION

Features of language generation, difference between language analysis and language generation, components of language generation, case study of language generation systems, block diagram of natural language generator, content selection, lexical selection, sentence structure, aggregation, referring expression, discourse structure.

Reference Books:

1. Towards a Computational Theory of Definite Anaphora Comprehension in English discourse, Sidner, Pearson publication 2005.
2. Alternative Grammatical Encoding, Sampson, PHI publication, 2004.
3. Artificial Intelligence, Russel Norvig, PHI publication 2005.
4. Analysis of Syntax Based Pronoun Resolution Methods, Tetreault J.R. Wiley Eastern publication, 2000.
5. Machine Learning and Statistical Modeling Approaches to Image Retrieval, Chen, Li, and Wang, , Kluwer, 2004.

INTELLIGENT SYSTEM

(SEMESTER - V)

3 Year M. Tech. (ICT) for Science Graduates **Effective from: 2011 -2012**

EXPERT SYSTEM			
Course Code:	**CS661**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO EXPERT SYSTEM

Block diagram of expert system, features of expert system, characteristics of expert system, components of expert system, applications of expert systems, some standard expert systems.

UNIT II COMPONENTS OF EXPERT SYSTEM

Block diagram of expert system, design issues of expert systems, concept of interface design, issue of knowledgebase design, learning module design, limitations of expert systems, rule based systems.

UNIT III HUMAN INTELLIGENCE VS EXPERT SYSTEM

Comparison of skills of human experts and artificially developed expert systems, characteristics of expert systems, knowledge acquisition in expert system, methods of knowledge acquisition in expert system.

UNIT IV DESIGN CRITERIA OF EXPERT SYSTEM

Elementary concepts about designing of an expert system, the issues involved in designing of knowledgebase, user interface module, inferencing information from knowledge base.

UNIT V KNOWLEDGE MANAGEMENT IN EXPERT SYSTEM

Knowledge management (KM) principles and purposes, dynamic nature of KM system, Knowledge system technologies, KM subsystems, knowledge management system development, selecting the system and / or its relevant components, implementing and maintain the knowledge management systems.

Reference Books:

1. Measuring and Managing Knowledge for Expert System , Mc. Graw- hill Boston, 2001.
2. Dendral: Expert System, Feigenbaum et al, by PHI publication, 1992.
3. Modal Operators in expert systems, Berners Lee, Mc Garw hill publication, 2002.
4. The Frame Based Knowledge Representation in Expert Systems, Mc Carthy and Hays, PHI publication, 2003.
5. Decision Theoretic Expert Systems, Russel, Wiley Eastern publication, 2002.

3 Year M. Tech. (ICT) for Science Graduates **Effective from: 2011 -2012**

RESEARCH TECHNIQUES IN ICT			
Course Code:	**CS633/CS503**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO RESEARCH TECHNIQUES

Meaning of research, objectives of research, motivation in research, types of research (Introduction to experimental test bed, algorithmic research, simulation research, mathematical modeling approach), characteristics and prerequisites of research, significance of research, research process, sources of research problem, criteria of identifying the problem, necessity of defining the problem, errors in selecting research problem, technique involved in defining the problem, report and paper writing.

UNIT II DATA ANALYSIS AND STATISTICAL TECHNIQUES

Data and their analyses, quantitative methods and techniques, Measure of central tendency, measures of variation, frequency distribution, analysis of variance, methods, Correlation analysis, regression analysis, time series and forecasting, introduction to discriminant analysis, factor analysis, cluster analysis, conjoint analysis, probability distribution, binomial distribution, poisson distribution, uniform distribution, exponential distribution, and normal distribution, sampling methods, test of hypothesis.

UNIT III MATHEMATICAM MODELING

Steps of modeling, operations research models like queuing theory, stochastic processes, application of models, conceptual framework development and validation techniques, optimization techniques.

UNIT IV ALGORITHMIC RESEARCH

Algorithmic research problems, types of algorithmic research, types of solution procedure, steps of development of algorithm, steps of algorithmic research, design of experiments,

UNIT V SIMULATION AND SOFT COMPUTING TECHNIQUES

Introduction to soft computing, artificial neural network, genetic algorithm, fuzzy logic and their applications, tools of soft computing, need for simulation, types of simulation, simulation language, fitting the problem to simulation study, simulation models, output analysis, data simulation packages like MATLAB, NS2, ANSYS, Cadence.

Reference Books:

1. Research Methodologies, R. Panneerselvam, Prentice Hall, 2007.
2. Research in Education, Best John V. and James V Kahn, Wiley eastern, 2005.
3. Elements of Educational Research, Sukhia, S.P., P.V. Mehrotra, and R.N. Mehrotra, PHI publication, 2003.
4. Methodology of Research Education, K. Setia, IEEE publication, 2004.
5. Research methodology, Methods and Techniques, Kothari, C.R., 2000.

INTELLIGENT SYSTEM

(ELECTIVES - 4 & 5)

3 Year M. Tech. (ICT) for Science Graduates **Effective from: 2011 -2012**

INTELLIGENT INFORMATION RETRIEVAL			
Course Code:	**CS663/CS563**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INFORMATION RETRIEVAL FUNDAMENTALS

Text based information retrieval, examples of information retrieval, need of maintain the global information base, use of information for planning, reliability of information storage, redundancy in information storage, report on 21st Century Intelligent Systems, role of intelligent systems in e-governance.

UNIT II INFORMATION RETRIEVAL MODELS

Information retrieval using the Boolean model, dictionary and postings, dictionary based approaches of information retrieval, lists, adhoc information retrieval method, Indexing, scoring and term weighting, random vs. sequential search methods, the content based information retrieval system, consistency of retrieved information, accuracy and precision of retrieved information.

UNIT III INTERNET BASED INFORMATION RETRIEVAL METHODS

Vector space retrieval, relevance feedback and query expansion, XML retrieval probabilistic information retrieval, language models for information retrieval, text classification and Naive Bayes, web search basics, web crawling and indexes, evaluating information retrieval methods, concept of precision and recall.

UNIT IV AGENT-BASED INFORMATION RETRIEVAL

Ontology-based web agents, searching for Information in unstructured knowledge domains, intelligent adaptive Information agents, designing of agent for information retrieval, incorporation of AI concepts for design of intelligent agent,

UNIT V INFORMATION RETRIEVAL TECHNIQUES

Intelligent systems for finding Genes in DNA, using Information content to evaluate semantic similarity in information taxonomy.

Text Books:

1. Machine Learning and Statistical Modeling Approaches to Image Retrieval, Chen, Li, and Wang, , Kluwer, 2004.
2. Information Representation and Retrieval in the Digital Age, ASIS, Chu, Heting, , 2003.

Reference Books:

1. The Modern Algebra of Information Retrieval, Dominich, Sandor, Springer 2008.
2. Feldman, R. and Sanger, J. The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data. Cambridge U. Press, 2006.
3. The Subject Approach to Information, Foskett, A. C., London, Lib. Assoc. Publ, 1996.

3 Year M. Tech. (ICT) for Science Graduates **Effective from: 2011 -2012**

DATA MINING IN AI			
Course Code:	**CS665/CS565**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION

Data warehousing, data warehouse vs relational databases, various schemas, architecture, Data mining definition & task, KDD versus data mining, data mining architecture, data mining query languages.

UNIT II ELEMENTARY DATA MINING TECHNIQUES

Clustering techniques, classification and regression rules, characterization and discrimination, outlier analysis, evolution analysis, association rules.

UNIT III MINING ASSOCIATION RULES

The Apriori Algorithm, generating association rules, mining multilevel association rules, mining multidimensional association rules from relational databases, metarule-guided mining of association rules, constraint pushing, mining guided by rule constraints, Incremental mining.

UNIT IV CLUSTERING TECHNIQUES

Cluster analysis, partitioning methods: *k*-Means and *k*-Medoids, hierarchical methods, agglomerative and divisive hierarchical clustering, density- based methods, constraint based clustering.

UNIT V WEB MINING AND DATABASE MINING

Mining complex data objects, spatial databases, multimedia databases, time series and sequence data; mining text databases, web content mining, web structure mining, web usage mining, web mining techniques, role of agents in web mining.

Text Books:

1. Data Warehousing In the Real World, Sam Anahory & Dennis Murray, 1997.
2. Data Mining- Concepts & Techniques, Jiawei Han & Micheline Kamber, 2001, Morgan Kaufmann.

References:

1. Data Mining Techniques, Arun Pujar, University Press, Hyderbad, 2001.
2. Data Mining, Pieter Adriaans & Dolf Zantinge, Pearson,1997.
3. Data Warehousing, Data Miniing and OLTP; Alex Berson, 1997, Mc Graw Hill.
4. Data warehousing System; Mallach,Mc Graw Hill, 2000.

3 Year M. Tech. (ICT) for Science Graduates **Effective from: 2011 -2012**

SPEECH PROCESSING			
Course Code:	**CS667/CS567**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION AND OVERVIEW

Fundamentals of speech processing, ambiguity and uncertainty in speech processing, representation of speech signal in electrical format, manipulation of speech signal, acquisition of speech signal, storage of speech signal.

UNIT II WAVE SHAPING OF SPEECH SIGNAL

Basic concept of wave shaping, Fourier series, representation of signal using Fourier series, calculation of bandwidth, sending a signal through the limited bandwidth channel, multiplexing and de-multiplexing of a signal.

UNIT III STRING EDIT DISTANCE

Key algorithmic tool: dynamic programming, use of dynamic programming in optimal alignment of sequences, string edit operations, edit distance, and examples of use in spelling correction, and machine translation.

UNIT IV PROBABILITY

Introduction to probability theory, concepts related to modern speech processing, events and counting, joint and conditional probability, marginal's, independence, Bayes rule, combining evidence. application of probability in speech processing, **non-probabilistic methods of speech processing.**

UNIT V INFORMATION THEORY

Concept of information, measurement of information in bits, characteristics of noiseless and noisy channel. Entropy, cross-entropy, information gain, application of information theory to some language phenomenon, probabilistic language modeling and its applications.

Text Books:

1. Introduction to Theory of Neural Computation, John Hertz, Andres Krogh & Richard G. Palmer, Addison Wesley, 2004.
2. A New Approach to Speech Processing, Russel S, and Norvig Prentice hall publication, 2003.

References:

1. Evolutionary speech processing by Sampson G, Mc. Graw Hill publication, 2004.
2. The Speech Translation, A New Perspective, Schank, R.C 2003.
3. "Mathematical Methods for Neural Network Analysis and Design", Golden R.M., MIT Press, Cambridge, MA, 1996.
4. Information Retrieval, Salton, Mc Graw Hill 1983.

3 Year M. Tech. (ICT) for Science Graduates **Effective from: 2011 -2012**

ROBOTICS			
Course Code:	**CS669/CS569**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I THE KINEMATICS OF ROBOTICS

Forward and inverse kinematics, motion kinematics, low-level and high-level trajectory planning. static force and torque relations, internal sensory devices: position and velocity sensors, external sensory devices: force, tactile and proximity sensors, machine vision, robot programming: multi-level approach, programming techniques, world modeling, off-line programming and simulation.

UNIT II BASIC ROBOT FUNCTIONING

History of robots, types of robots, uses of robots, present status and future trends in robotics, overview of robot subsystems, Issues in designing and controlling robots: resolution, repeatability and accuracy, transmission, Robot configurations and concept of workspace, mechanisms and transmission, motion planning obstacle avoidance, configuration space, road map methods, graph search algorithms, potential field methods.

UNIT III SPATIAL DESCRIPTIONS

Descriptions, postings, orientations, and frames, mappings, operators : translations, rotations, and transformations, transformation arithmetic, transform equations, transformation of free vectors, computational considerations.

UNIT IV ROBOT ANATOMY

End effectors and actuators, Different types of grippers, vacuum and other methods of gripping. pneumatic, hydraulic and electric actuators, Sensors and controllers, internal and external sensors, position, velocity and acceleration sensors, proximity sensors, force sensors, laser range finder, camera, micro-controllers, centralized controllers, real time operating systems.

UNIT V TASK SPECIFICATION OF ROBOT

Point to point and continuous motion specifications for typical applications, joint interpolation, task space interpolation, executing user specified tasks, Robot analysis, position and orientation of rigid bodies, spatial mechanism description, Denavit-Hartenberg notation, homogenous transformation, forward and inverse position analysis, velocity mapping, static force analysis, singularities, acceleration mapping, robot control Independent joint control, PD and PID feedback, actuator models, nonlinearity of manipulator models, issues in nonlinear control, force feedback, hybrid control, Case studies: Robot in assembly (Puma). Mobile robot (Nataraj)

Reference Books:

1. Introduction to Robotics, Mechanics and control, John J. Craig, Pearson Education publication, 2004.
2. Robotic moments, S Mujtaba and R. Goldman , PHI publication, 2003.
3. An Advance Robotic Programming, A. Gilbert, American Robot corporation 1984.
4. Design of an Interactive Manipulator Programming environment, UMI Research Press, 1985.
5. Mechanical Engineering design, J Shigley, 3rd edition, Mc, Graw hill, New York 1977.