UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

Bachelor of Computer Science & Engineering
&
Bachelor of Computer Science & Information Technology

3rd Year (V & VI Semester)

(Effective from Session: 2015-2016)

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY EVALUATION SCHEME

B. TECH. COMPUTER SCIENCE & ENGINEERING

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B. TECH. COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

YEAR THIRD, SEMESTER –V

(Effective from the session: 2015-16)

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NCS 501	Design and Analysis of Algorithm	3	1	0	30	20	50	100	150	4
2	NCS 502	Database Management System	3	1	0	30	20	50	100	150	4
3	NCS 503	Principle of Programming Language	3	1	0	30	20	50	100	150	4
4	NCS 504	Web Technology	3	1	0	30	20	50	100	150	4
5	NCS 505	Computer Architecture	2	1	0	15	10	25	50	75	3
6	NHU501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NCS 551	Design and Analysis of Algorithm Lab	0	0	3	10	10	20	30	50	1
8	NCS 552	DBMS Lab	0	0	3	10	10	20	30	50	1
9	NCS 553	Principle of Programming Language	0	0	2	10	10	20	30	50	1
10	NCS 554	Web Technology Lab	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	
		TOTAL	16	5	10					1000	25

STUDY EVALUATION SCHEME

B. TECH. COMPUTER SCIENCE & ENGINEERING

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B. TECH. COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

YEAR THIRD, SEMESTER –VI

(Effective from the session : 2015-16)

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NCS 601	Computer Networks	3	1	0	30	20	50	100	150	4
2	NCS 602	Software Engineering	3	1	0	30	20	50	100	150	4
3	NCS 603	Compiler Design	3	1	0	30	20	50	100	150	4
4		Departmental Elective-I	3	1	0	30	20	50	100	150	4
5		Departmental Elective-II	2	1	0	15	10	25	50	75	3
6	NHU 601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NCS 651	Computer Networks Lab	0	0	3	10	10	20	30	50	1
8	NCS 652	Software Engineering Lab	0	0	3	10	10	20	30	50	1
9	NCS 653	Compiler Design Lab	0	0	2	10	10	20	30	50	1
10	NCS 654	SEMINAR	0	0	2		50	50		50	1
11	NGP 601	GP						50		50	
		TOTAL	16	5	10					1000	25

Departmental Elective-I

1. NCS 061: Computational Geometry
2. NCS 062: Complexity Theory
3. NCS 063: Parallel Algorithm
4. NCS 064: Approximation & Randomized Algorithm
5. NCS 065: Concurrent System

Departmental Elective-II

1. NCS 066: Data Warehousing & Data Mining
2. NCS 067: Distributed Database
3. NCS 068: E-Commerce
4. NCS 069: Advance DBMS
5. NCS 070: Human Computer Interface

NCS- 501 Design and Analysis of Algorithms		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction** : Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.	8
II.	**Advanced Data Structures***:* Red-Black trees, B – trees, Binomial Heaps, Fibonacci Heaps.	8
III.	**Divide and Conquer** with examples such as Sorting, Matrix Multiplication, Convex hull and Searching. **Greedy methods** with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning trees – Prim's and Kruskal's algorithms, Single source shortest paths - Dijkstra's and Bellman Ford algorithms.	8
IV.	**Dynamic programming** with examples such as Knapsack. All pair shortest paths – Warshal's and Floyd's algorithms, Resource allocation problem. Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.	8
V.	Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.	8

Text books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

References:

1. Jon Kleinberg and Éva Tardos, *Algorithm Design*, Pearson, 2005.
2. Michael T Goodrich and Roberto Tamassia, *Algorithm Design: Foundations, Analysis, and Internet Examples*, Second Edition, Wiley, 2006.
3. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997
4. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.
5. Harsh Bhasin,"Algorithm Design and Analysis",First Edition,Oxford University Press.
6. Gilles Brassard and Paul Bratley,Algorithmics:Theory and Practice,Prentice Hall,1995.

NCS-502 Database Management System		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction:** An overview of database management system, database system Vs file system, Database system concept and architecture, data model schema and instances, data independence and database language and interfaces, data definitions language, DML, Overall Database Structure. **Data Modeling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationship of higher degree.	8
II.	**Relational data Model and Language:** Relational data model concepts, integrity constraints, entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus. **Introduction on SQL:** Characteristics of SQL, advantage of SQL. SQl data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	8
III.	**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.	8
IV.	**Transaction Processing Concept:** Transaction system, Testing of serializability, serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling. **Distributed Database:** distributed data storage, concurrency control, directory system.	8
V.	**Concurrency Control Techniques:** Concurrency control, Locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction, case study of Oracle.	8

Text books:

1.Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill 2.Date C J, " An Introduction to Database Systems", Addision Wesley

3. Elmasri, Navathe, " Fudamentals of Database Systems", Addision Wesley
4. O'Neil, Databases, Elsevier Pub.

References:

1.Leon & Leon,"Database Management Systems", Vikas Publishing House 2.Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications 3. Majumdar & Bhattacharya, "Database Management System", TMH

NCS- 503 Principle of Programming Language		3 1 0
Unit	Topic	Proposed Lectures
I.	Introduction The Role of Programming Languages: Why Study Programming Languages, Towards Higher-Level languages, Programming paradigms, Programming environments Language Description: Syntactic structure, language Translation Issues: Programming language Syntax, Stages in translation, Formal translation Models	8
II.	Language Properties Modeling Language Properties, Elementary Data Types, Encapsulation, Inheritance, Sequence Control, Subprogram Control	8
III.	Programming Paradigms Imperative Programming: Statements, Types, Procedure Activations Object-Oriented Programming: Grouping Of Data and Operations, object oriented programming Functional Programming: Elements, Programming in a Typed language, Programming with lists	8
IV.	Other Programming Paradigms Logic Programming, Concurrent Programming, Network Programming , Language Description: Semantic Methods	8
V.	Lambda Calculus Introduction to Lambda Calculus, Simple types, Subtyping	8

Text books:

1. "Programming Languages: Design and Implementations" , Terrance W.Pratt, Marvin V. Zelkowitz, T.V.Gopal,Fourth ed.,Prentice Hall
2. "Programming Language Design Concept", David A. Watt, Willey India
3. "Programming languages: Concepts and Constucts", Ravi Sethi, Second Ed.,Pearson.
4. "Types and programming Languages", Benjamin C. Pierce. The MIT Press Cambridge, Massachusetts London, England

References:

1. Concepts of Programming Languages, Robert W. Sebesta, 10th Ed.,Pearson

NCS- 504 Web Technology		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction:** Introduction and Web Development Strategies, History of Web and Internet, Protocols governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing. **Core Java:** Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers.	8
II.	**Web Page Designing:** HTML: list, table, images, frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML.	8
III.	**Scripting:** Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX, VB Script, Introduction to Java Beans, Advantage, Properties, BDK, Introduction to EJB, Java Beans API.	8
IV.	**Server Site Programming:** Introduction to active server pages (ASP), Introduction to Java Server Page (JSP), JSP Application Design, JSP objects, Conditional Processing, Declaring variables and methods, Sharing data between JSP pages, Sharing Session and Application Data, Database Programming using JDBC, development of java beans in JSP, Introduction to Servelets, Lifecycle, JSDK, Servlet API, Servlet Packages, Introduction to COM/DCOM/CORBA.	8
V.	**PHP (Hypertext Preprocessor):** Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form, mail, file upload, session, error, exception, filter, PHP-ODBC,	8

Text books:

1. Burdman, Jessica, “Collaborative Web Development” Addison Wesley
2. Xavier, C, “ Web Technology and Design” , New Age International
3. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication
4. Bhave, “Programming with Java”, Pearson Education
5. Herbert Schieldt, “The Complete Reference:Java”, TMH. 6. Hans Bergsten, “Java Server Pages”, SPD O’Reilly
6. Ullman, “PHP for the Web: Visual QuickStart Guide”, Pearson Education
7. Margaret Levine Young, “The Complete Reference Internet”, TMH
8. Naughton, Schildt, “The Complete Reference JAVA2”, TMH
9. Balagurusamy E, “Programming in JAVA”, TMH

References:

1. Ramesh Bangia, “Internet and Web Design” , New Age International
2. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication
3. Deitel, “Java for programmers”, Pearson Education
4. Chris Bates, “Web Programing Building Internet Applications”, 2nd Edition, WILEY, Dreamtech
5. Joel Sklar , “Principal of web Design” Vikash and Thomas Learning
6. Horstmann, “CoreJava”, Addison Wesley

NCS- 505 Computer Architecture		2 1 0
Unit	Topic	Proposed Lectures
I	**Introduction**:. Digital computer generation, computer types and classifications, functional units and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. **Central Processing Unit:** Addition and subtraction of signed numbers, look ahead carry adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation Processor organization, general register organization, stack organization and addressing modes.	8
II	**Control Unit:** Instruction types, formats, instruction cycles and subcycles (fetch and execute etc) , micro-operations, execution of a complete instruction. Hardwire and microprogrammed control: microprogramme sequencing, wide branch addressing, microinstruction with next address field, pre-fetching microinstructions, concept of horizontal and vertical microprogramming.	8
III	**Memory:** Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues 9 performance, address mapping and replacement) Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.	8
IV	**Input / Output:** Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.	8

TEXT BOOK:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, Fifth Edition, Tata McGraw Hill, 2002.
2. William Stallings, “Computer Organization and Architecture – Designing for Performance”, Sixth Edition, Pearson Education, 2003.

REFRENCE BOOKS:-

1. Patterson, Computer Organisation and Design, Elsevier Pub. 2009
2. Vravice,Hamacher & Zaky, “Computer Organization”, TMH
3. Mano,” Computer System Architecture”, PHI
4. John P Hays, “ Computer Organization”, McGraw Hill
5. Tannenbaum,” Structured Computer Organization’, PHI 6.
P Pal chaudhry, ‘ Computer Organization & Design’, PHI

NCS 551 Design and analysis of algorithms Lab

Objective :-

1. Program for Recursive Binary & Linear Search.
2. Program for Heap Sort.
3. Program for Merge Sort.
4. Program for Selection Sort.
5. Program for Insertion Sort.
6. Program for Quick Sort.
7. Study of NP-Complete theory.
8. Study of Cook's theorem.
9. Study of Sorting network.

NCS 552 DBMS Lab

Objectives:-

1. Installing oracle.
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE /MYSQL: a)Writing basic SQL SELECT statements. b)Restricting and sorting data. c)Displaying data from multiple tables. d)Aggregating data using group function. e)Manipulating data. e)Creating and managing tables.
4. Normalization in ORACLE.
5. Creating cursor in oracle.
6. Creating procedure and functions in oracle.
7. Creating packages and triggers in oracle.

NCS 553 Principles of programming languages

1. Define a LISP function to compute sum of squares.
2. Define a LISP function to compute difference of squares. (if x > y return x^2 -y^2 , otherwise y^2 - x^2)
3. Define a Recursive LISP function to solve Ackermann's Function.
4. Define a Recursive LISP function to compute factorial of a given number.
5. Define a Recursive LISP function which takes one argument as a list and returns last element of the list. (do not use last predicate)
6. Define a Recursive LISP function which takes one argument as a list and returns a list except last element of the list. (do not use but last predicate)
7. Define a Recursive LISP function which takes one argument as a list and returns reverse of the list. (do not use reverse predicate)
8. Define a Recursive LISP function which takes two arguments first, an atom, second, a list, returns a list after removing first occurrence of that atom within the list.

NCS 554 Web Technology Lab

Objectives:-

1. Write HTML/Java scripts to display your CV in navigator, your Institute website, Department Website and Tutorial website for specific subject
2. Design HTML form for keeping student record and validate it using Java script.
3. Write an HTML program to design an entry form of student details and send it to store at database server like SQL, Oracle or MS Access.
4. Write programs using Java script for Web Page to display browsers information.
5. Write a Java applet to display the Application Program screen i.e. calculator and other.
6. Writing program in XML for creation of DTD, which specifies set of rules. Create a style sheet in CSS/ XSL & display the document in internet explorer.
7. Using ASP for server side programming, ASP for user name and password and to retrieve & match the value. It display success and failure messages. ASP for creating text file local drive, ASP for keeping the student record in database.
8. Program to illustrate JDBC connectivity. Program for maintaining database by sending queries. Design and implement a simple servlet book query with the help of JDBC & SQL. Create MS Access Database, Create on ODBC link, Compile & execute JAVA JDVC Socket.
9. Design and implement a simple shopping cart example with session tracking API.

NCS-601 Computer Networks		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.	8
II	Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.	8
III	Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.	8
IV	Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.	8
V	Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.	8

TEXTBOOKS:

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press

REFRENCES:

1. Anuranjan Misra, “Computer Networks”, Acme Learning
2. G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media

NCS- 602 Software Engineering		3 1 0
Unit	Topic	Proposed Lectures
I	**Introduction:**Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.	8
II	**Software Requirement Specifications (SRS)** Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. **Software Quality Assurance (SQA):** Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.	8
III	**Software Design:**Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	8
IV	**Software Testing:**Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.	8
V	**Software Maintenance and Software Project Management** Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.	8

Textbooks:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4. Pankaj Jalote, Software Engineering, Wiley

5.Deepak Jain,"Software Engineering:Principles and Practices",Oxford University Press.

NCS-603 Compiler Design		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	8
II	Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: 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, implementation of LR parsing tables.	8
III	Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.	8
IV	Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.	8
V	Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	8

Textbooks:

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 Education

Refrences:

1.K. Muneeswaran,Compiler Design,First Edition,Oxford University Press.
2.J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill,2003.
3.Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.

DEPARTMENTAL ELECTIVE-I

NCS-061 Computational Geometry		3 1 0
Unit	Topic	Proposed Lectures
I	Convex hulls: construction in 2d and 3d, lower bounds; Triangulations: polygon triangulations, representations, point-set triangulations, planar graphs.	8
II	Voronoi diagrams: construction and applicat ions, variants; Delayney triangulations: divide-and-conquer, flip and incremental algorithms, duality of Voronoi diagrams, min-max angle properties	8
III	Geometric searching: point-location, fractional cascading, linear programming with prune and search, finger trees, concatenable queues, segment trees, interval trees; Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems	8
IV	Arrangements of lines: arrangements of hyper planes, zone theorems, many-faces complexity and algorithms; Combinatorial geometry: Ham- sandwich cuts.	8
V	Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	8

Textbooks:

1. Computational Geometry: An Introduction by Franco P. Preparata and Michael Ian Shamos; Springer Verlag
2. Mark de Berg , Marc van Kreveld , Mark Overmars , and Otfried Schwarzkopf, Computational Geometry, Algorithms and Applications , Springer-Verlag,
3. Ketan Mulmuley, Computational Geometry: An Introduction Through Randomized Algorithms, Prentice-Hall
4. Joseph O'Rourke, Computational Geometry in C, Cambridge University Press

NCS-062 Complexity Theory		3 1 0
Unit	Topic	Proposed Lectures
I	Models of Computation, resources (time and space), algorithms, computability, complexity.	8
II	Complexity classes, P/NP/PSPACE, reduction s, hardness, completeness, hierarchy, relationships between complexity classes.	8
III	Randomized computation and complexity; Logical characterizations, incompleteness; Approximability.	8
IV	Circuit complexity, lower bounds; Parallel computation and complexity; Counting problems; Interactive proofs.	8
V	Probabilistically checkable proofs; Communication complexity; Quantum computation	8

Textbooks:

1. Christos H. Papadimitriou., Combinatorial Optimization: Algorithms and Complexity , Prentice-Hall
2. Sanjeev Arora and Boaz Barak , Complexity Theory: A Modern Approach, Cambridge University Press
3. Steven Homer , Alan L. Selman , Computability and Complexity Theory , Springer

NCS-063 Parallel Algorithms		3 1 0
Unit	Topic	Proposed Lectures
I	Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.	8
II	Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Cost- optimality, An example of illustrate Cost-optimal algorithms- such as summation, Min/Max on various models.	8
III	Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC, Parallel Sorting Networks on CREW/EREW/MCC/, linear array.	8
IV	Parallel Searching Algorithm, Kth element, Kth element in X+Y on PRAM, Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication, Solution of Linear Equation, Root finding.	8
V	Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms-Permutation, Combinations, Derrangements.	8

Textbooks:

1. M.J. Quinn, “Designing Efficient Algorithms for Parallel Computer”, McGrawHill. 2. S.G. Akl, “Design and Analysis of Parallel Algorithms”
3. S.G. Akl, ”Parallel Sorting Algorithm” by Academic Press

NCS-064 Approximation and Randomized Algorithms		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction to probability and randomized algorithms. Examples of randomized algorithms . Basic inequalities, Random variables.	8
II	Max-cut and derandomization. Permutation routing in a hypercube. Basic Chernoff bound. Markov chains and random walks (2-SAT example, random walk on a path example). Cover times. Universal traversal sequences.	8
III	Generation of combinatorial arrays. Random constructions and derandomized algorithms.	8
IV	Introduction to Approximation Algorithms, Set cover, TSP ,Knapsack, bin packing, Euclidean TSP	8
V	LP duality introduction; set cover randomized rounding, Set cover via primal - dual , k-median on a cycle, Max-Sat, Multiway cut, Steiner forest, Group Steiner trees	8

References:

1. Rajeev Motwani and Prabhakar Raghavan. Randomized Algorithms. Cambridge University Press, Cambridge, England, June 1995.
2. Michael Mitzenmacher and Eli Upfal. Probability and Computing. Cambridge University Press, 1st edition, 2005.
3. Sheldon M. Ross. Probability Models. Academic Press, Inc., 7th edition, 2000 4. V. Vazirani, Approximation Algorithms, Springer, 2001.

NCS-065 Concurrent Systems		3 1 0
Unit	Topic	Proposed Lectures
I	**Introduction to concurrent systems and Formal Methods:** Reactive systems, Formal methods for reactive systems, Labelled transition systems, Operational semantics for concurrent processes.	8
II	**Process Algebras**: Operators for process modelling, CCS, CSP, Pi-calculus	8
III	Asynchronous Pi Calculus	8
IV	Distributed Pi Calculus, Introduction to type systems	8
V	**Tools and Techniques:** Experimental practice on mobility workbench (MBW), concurrency workbench (CWB-NC), CTMC.	8

References:

1. Robin Milner: Communicating and mobile systems: The π-Calculus,Cambridge University Press, 1999
2. Matthew Hennessy: A distributed Pi-Calculus, Cambridge University Press, 2007
3. Davide Sangiorgi and David Walker: The π -Calculus: A theory of Mobile Processes, Cambridge , University Press, 2001
4. Manuals of MBW, CWB-NC,CTMC.

DEPARTMENTAL ELECTIVE-II

NCS-066 Data warehousing & Data Mining		2 1 0
Unit	Topic	Proposed Lectures
I	Data Warehousing: Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.	8
II	Data Warehouse Process and Technology: Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design, Data Extraction, Cleanup & Transformation Tools, Warehouse Metadata	8
III	Data Mining: Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree.	8
IV	Classification: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms. Clustering: Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Association rules: Introduction, Large Itemsets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.	8
	Data Visualization and Overall Perspective: Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining.	8

Textbooks:

1. Alex Berson, Stephen J. Smith “Data Warehousing, Data-Mining & OLAP”, TMH
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, “ Data Warehousing: Architecture and Implementation”, Pearson
3. Margaret H. Dunham, S. Sridhar,”Data Mining:Introductory and Advanced Topics” Pearson Education
4. Arun K. Pujari, “Data Mining Techniques” Universities Press
5. Pieter Adriaans, Dolf Zantinge, “Data-Mining”, Pearson Education

NCS-067 Distributed Database		2 1 0
Unit	Topic	Proposed Lectures
I	Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.	8
II	Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler.	8
III	Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.	8
IV	Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.	8
V	Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques.	8

TextBooks:

1. Silberschatz, orth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education .

Refrences:

1.Ceei and Pelagatti,'Distributed Database', TMH

2.Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

NCS-068 E-Commerce		2 1 0
Unit	Topic	Proposed Lectures
I	Introduction: Definition of Electronic Commerce, E-Commerce: technology and prospects, incentives for engaging in electronic commerce, needs of E-Commerce, advantages and disadvantages, framework, Impact of E-commerce on business, E-Commerce Models.	8
II	Network Infrastructure for E- Commerce: Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY). Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device.	8
III	Web Security: Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.	8
IV	Encryption: Encryption techniques, Symmetric Encryption: Keys and data encryption standard, Triple encryption, Secret key encryption; Asymmetric encryption: public and private pair key encryption, Digital Signatures, Virtual Private Network.	8
V	Electronic Payments: Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking. EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.	8

Text Books:

1. Ravi Kalakota, Andrew Winston, “Frontiers of Electronic Commerce”, Addison-Wesley.
2. Pete Lohsin , John Vacca “Electronic Commerce”, New Age International 3. Goel, Ritendra “E-commerce”, New Age International
4. Laudon, “E-Commerce: Business, Technology, Society”, Pearson Education
5. Bajaj and Nag, “E-Commerce the cutting edge of Business”, TMH
6. Turban, “Electronic Commerce 2004: A Managerial Perspective”, Pearson Education

NCS-069 Advanced DBMS		2 1 0
Unit	Topic	Proposed Lectures
I	Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.	8
II	Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler	8
III	Distributed Transactions Management, Data Distribution,fragmentation and Replication Techniques,Distributed Commit, Distributed Locking schemes, Long duration transactions,Moss Concurrency protocol.	8
IV	Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems,Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.	8
V	Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques	8

Text Books:

1. Silberschatz, Korth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill

References:

1. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education 2. Ceei and Pelagatti,'Distributed Database', TMH
3. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

NCS-070 Human Computer Interaction		2 1 0
Unit	Topic	Proposed Lectures
I	**Introduction** : Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.	8
II	**Design process** – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.	8
III	**Screen Designing** : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.	8
IV	**Windows** – New and Navigation schemes selection of window, selection of devices based and screen based controls. **Components** – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.	8
V	**Software tools** – Specification methods, interface – Building Tools. **Interaction Devices** – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.	8

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in HumanComputer Interaction, Wiley, 2010.

REFERENCE:

1. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0-321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

NCS 651 Computer Networks Lab

1. Programs using TCP Sockets (like date and time server & client, echo server & client, etc.)
2. Programs using UDP Sockets (like simple DNS)
3. Programs using Raw sockets (like packet capturing and filtering)
4. Programs using RPC
5. Simulation of sliding window protocols

NCS 652 Software Engineering Lab

For any given case/ problem statement do the following;

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java.(Model to code conversion)
10. Perform reverse engineering in java.(Code to Model conversion)
11. Draw the deployment diagram.

NCS 653 Compiler Design Lab

1. Implementation of LEXICAL ANALYZER for IF STATEMENT
2. Implementation of LEXICAL ANALYZER for ARITHMETIC EXPRESSION
3. Construction of NFA from REGULAR EXPRESSION
4. Construction of DFA from NFA
5. Implementation of SHIFT REDUCE PARSING ALGORITHM
6. Implementation of OPERATOR PRECEDENCE PARSER
7. Implementation of RECURSIVE DESCENT PARSER
8. Implementation of CODE OPTIMIZATION TECHNIQUES
9. Implementation of CODE GENERATOR