SCHEME OF INSTRUCTION AND SYLLABI

B.TECH DEGREE IN

COMPUTER SCIENCE AND ENGINEERING

EFFECTIVE FROM 2010-2011

National Institute of Technology Delhi

(NIT DELHI)

NATIONAL INSTITUTE OF TECHNOLOGY DELHI

B. Tech (Computer Science and Engineering) Course Structure

		B.Tech (CSE) I Year I Semester		
S. No.	**Course No.**	**Course Title**	**(L – T – P)**	**C**
1	MH 101	Mathematics – I	(4 – 0 – 0)	4
2	CY 101	Chemistry	(4 – 0 – 0)	4
3	EE 101	Basic Electrical Engineering	(3 – 0 – 0)	3
4	CE 102	Environmental Studies	(3 – 0 – 0)	3
5	CE 101	Engineering Mechanics	(4 – 0 – 0)	4
6	ME 102	Engineering Graphics	(2 – 0 – 3)	4
7	CY 102	Chemistry Lab	(0 – 0 – 3)	2
8	ME 103	Workshop Practice	(0 – 0 – 3)	2
9	EA 101	Extra Academic Activity	(0 – 0 – 3)	0
		Total	**(20 – 0 – 12)**	**26**
		B.Tech (CSE) I Year II Semester		
S. No.	**Course No.**	**Course Title**	**(L – T – P)**	**C**
1	MH 151	Mathematics – II	(4 – 0 – 0)	4
2	PH 101	Physics	(4 – 0 – 0)	4
3	EC 101	Basic Electronics Engineering	(3 – 0 – 0)	3
4	ME 101	Basic Mechanical Engineering	(3 – 0 – 0)	3
5	CS 101	Problem Solving and Computer Programming	(4 – 0 – 0)	4
6	MH 102	English for Communication	(3 – 0 – 2)	4
7	PH 102	Physics Lab	(0 – 0 – 3)	2
8	CS 102	Problem Solving and Computer Programming Lab	(0 – 0 – 3)	2
9	EA 101	Extra Academic Activity	(0 – 0 – 3)	0
		Total	**(21 – 0 – 11)**	**26**
		B.Tech (CSE) II Year I Semester		
S. No.	**Course No.**	**Course Title**	**(L – T – P)**	**C**
1	MH 201	Mathematics - III	(4 – 0 – 0)	4
2	EE 211	Network Analysis	(4 – 0 – 0)	4
3	EC 222	Digital Logic Design	(4 – 0 – 0)	4
4	CS 201	Discrete Mathematics	(3 – 1 – 0)	4
5	CS 202	Data Structures and Algorithms	(3 – 1 – 0)	4
6	EC 223	Basic Electronics Lab	(0 – 0 – 3)	2
7	CS 203	File Structures Lab	(0 – 0 – 3)	2
8	CS 204	Data Structures and Algorithms Lab	(0 – 0 – 3)	2
		Total	**(18 – 2 – 9)**	**26**
		B.Tech (CSE) II Year II Semester		
S. No.	**Course No.**	**Course Title**	**(L – T – P)**	**C**
1	MH 251	Mathematics - IV	(4 – 0 – 0)	4
2	EC 273	IC Applications	(4 – 0 – 0)	4
3	CS 251	Computer Architecture	(4 – 0 – 0)	4
4	CS 252	Programming Languages	(3 – 1 – 0)	4
5	CS 253	Systems Programming	(4 – 0 – 0)	4
6	EC 274	IC Applications Lab	(0 – 0 – 3)	2
7	CS 255	Object Oriented Programming	(0 – 0 – 3)	2
8	CS 256	Systems Programming Lab	(0 – 0 – 3)	2
		Total	**(19 – 1 – 9)**	**26**

		B.Tech (CSE) III Year I Semester		
S. No.	**Course No.**	**Course Title**	**(L – T – P)**	**C**
1	MH 301	Engineering Economics and Accountancy	(3 – 0 – 0)	3
2	EC 320	Microprocessors and Interfacing	(4 – 0 – 0)	4
3	CS 301	Theory of Computation	(3 – 1 – 0)	4
4	CS 302	Operating Systems	(3 – 1 – 0)	4
5	CS 303	Database Management Systems	(4 – 0 – 0)	4
6	CS 304	Operating Systems Lab	(0 – 0 – 3)	2
7	CS 305	DBMS Lab	(0 – 0 – 3)	2
8	EC 321	Microprocessors and Interfacing Lab	(0 – 0 – 3)	2
		Total	**(17 – 2 – 9)**	**25**
		B.Tech (CSE) III Year II Semester		
S. No.	**Course No.**	**Course Title**	**(L – T – P)**	**C**
1	EC 361	Communication Systems	(3 – 0 – 0)	3
2	CS 351	Language Processors	(4 – 0 – 0)	4
3	CS 352	Computer Networks	(4 – 0 – 0)	4
4	CS353	Data Warehousing and Data Mining	(4 – 0 – 0)	4
5	CS 354	Language Processors Lab	(0 – 0 – 3)	2
6	CS 355	Computer Networks Lab	(0 – 0 – 3)	2
7	CS 356	Knowledge Engineering Lab	(0 – 0 – 3)	2
8	CS 36X	Department Elective Course – 1 (36 series)	(3 – 0 – 0)	3
9	CS 36Y	Department Elective Course – 2 (36 series)	(3 – 0 – 0)	3
		Total	(21 – 0 - 9)	27
		B.Tech (CSE) IV Year I Semester		
S. No.	**Course No.**	**Course Title**	**(L – T – P)**	**C**
1	CS 401	Software Engineering	(4 – 0 – 0)	4
2	CS 402	Network Programming	(3 – 0 – 0)	3
3	CS 403	CASE Tools Lab	(0 – 0 – 3)	2
4	CS 404	Network Programming Lab	(0 – 0 – 3)	2
5	CS 405	Soft Computing Lab	(0 – 0 – 3)	2
6	CS 440	Industrial Training		2
7	CS 449	Project	(0 – 0 – 4)	2
8	CS 41X	Department Elective Course – 3 (41,51 series)	(3 – 0 – 0)	3
9	CS 41Y	Department Elective Course – 4 (41,51 series)	(3 – 0 – 0)	3
10	CS 41Z	Department Elective Course – 5 (41,51 series)	(3 – 0 – 0)	3
		Total	**(16 – 0 – 13)**	**26**
		B.Tech (CSE) IV Year II Semester		
S. No.	**Course No.**	**Course Title**	**(L – T – P)**	**C**
1	ME 446	Industrial Management	(3 – 0 – 0)	3
2	CS 451	Network Security	(3 – 0 – 0)	3
3	CS 452	Component Based Computing Lab	(0 – 0 – 3)	2
4	CS 491	Seminar	(0 – 0 – 3)	1
5	CS 499	Project	(0 – 0 – 6)	4
6		Open Elective	(3 – 0 – 0)	3
7	CS 46X	Department Elective Course – 6 (46,56,66 series)	(3 – 0 – 0)	3
8	CS 46Y	Department Elective Course – 7 (46,56,66 series)	(3 – 0 – 0)	3
9	CS 46Z	Department Elective Course – 8 (46,56,66 series)	(3 – 0 – 0)	3
		Total	**(12 – 0 – 12)**	**25**
		Total for B. Tech CSE Program	**(144 – 5 – 83)**	**207**

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Degree Requirements for the award of

B.Tech in Computer Science and Engineering

Category of Courses	Total Credits Offered	Minimum Credits to be Earned
Basic Science Core	**28**	**28**
Other Engineering Core	**53**	**53**
Department Core	**80**	**80**
Humanities and Social Sciences	**07**	**07**
Elective Courses	**27**	**10**
Mandatory Courses	**06**	**06**
Program Major Project	**06**	**06**
TOTAL	**207**	**190**

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Minimum Number of Credits through Department Electives – 07

Minimum Number of Credits through Open Elective – 03

CONSOLIDATED LIST OF COURSES FOR B.Tech (COMPUTER SCIENCE AND ENGINEERING)

Basic Science Courses			
MH 101	Mathematics – I	(4 – 0 – 0)	4
CY 101	Chemistry	(4 – 0 – 0)	4
CY 102	Chemistry Lab	(0 – 0 – 3)	2
MH 151	Mathematics – II	(4 – 0 – 0)	4
PH 101	Physics	(4 – 0 – 0)	4
MH 102	English for Communication	(3 – 0 – 2)	4
PH 102	Physics Lab	(0 – 0 – 3)	2
MH 201	Mathematics – III	(4 – 0 – 0)	4
MH 251	Mathematics – IV	(4 – 0 – 0)	4
Engineering Core Courses			
EE 101	Basic Electrical Engineering	(3 – 0 – 0)	3
CE 101	Engineering Mechanics	(4 – 0 – 0)	4
ME 102	Engineering Graphics	(2 – 0 – 3)	4
ME 103	Workshop Practice	(0 – 0 – 3)	2
EC 101	Basic Electronics Engineering	(3 – 0 – 0)	3
ME 101	Basic Mechanical Engineering	(3 – 0 – 0)	3
CS 101	Problem Solving and Computer Programming	(4 – 0 – 0)	4
CS 102	P SCP Lab	(0 – 0 – 3)	2
EE 211	Network Analysis	(4 – 0 – 0)	4
EC 222	Digital Logic Design	(4 – 0 – 0)	4
EC 223	Basic Electronics Lab	(0 – 0 – 3)	2
EC 273	IC Applications	(4 – 0 – 0)	4
EC 274	IC Applications Lab	(0 – 0 – 3)	2
EC 320	Microprocessors and Interfacing	(4 – 0 – 0)	4
EC 321	Microprocessors and Interfacing Lab	(0 – 0 – 3)	2
EC 361	Communication Systems	(3 – 0 – 0)	3
ME446	Industrial Management	(3 – 0 – 0)	3
Humanities and Social Science Core Courses			
MH 102	English for Communication	(3 – 0 – 2)	4
MH 301	Engineering Economics and Accountancy	(3 – 0 – 0)	3
Mandatory Courses			
CE 102	Environmental Studies	(3 – 0 – 0)	3
EA 101	Extra Academic Activity	(0 – 0 – 3)	0
EA 151	Extra Academic Activity	(0 – 0 – 3)	0
CS 440	Industrial Training		2
CS 491	Seminar	(0 – 0 – 3)	1
List of Courses Offered to Other Engineering Depts.			
CS 202	Data Structures and Algorithms	(3 – 1 – 0)	4
CS 204	Data Structures and Algorithms Lab	(0 – 0 – 3)	2
CS 211	Data Structures	(3 – 0 – 0)	3
CS 212	Data Structures Lab	(0 – 0 – 3)	2
CS 261	Object Oriented Programming and Operating Systems	(3 – 0 –3/2)	4
CS 262	Advanced Data Structures	(3 – 0 –3/2)	4
CS 263	Object Oriented Programming	(3 – 0 –3/2)	4
CS 311	Operating Systems and Applications	(3 – 0 – 0)	3
CS 312	Database Management	(3 – 0 – 0)	3
CS 313	Management Information System	(3 – 0 – 0)	3
CS 362	Internet Technologies and Programming	(3 – 0 –3/2)	4
CS 364	Web Programming	(3 – 0 –3/2)	4
	Open Elective Courses		
CS 463	Computer Graphics	(3 – 0 – 0)	3
CS 466	E-Commerce Technologies	(3 – 0 – 0)	3
CS 467	Internet and Web Programming	(3 – 0 – 0)	3

Program Core Courses			
CS 201	Discrete Mathematics	(3 – 1 – 0)	4
CS 202	Data Structures and Algorithms	(3 – 1 – 0)	4
CS 203	File Structures Lab	(0 – 0 – 3)	2
CS 204	Data Structures and Algorithms Lab	(0 – 0 – 3)	2
CS 251	Computer Architecture	(4 – 0 – 0)	4
CS 252	Programming Languages	(3 – 1 – 0)	4
CS 253	Systems Programming	(4 – 0 – 0)	4
CS 254	Object Oriented Programming	(0 – 0 – 3)	2
CS 255	Systems Programming Lab	(0 – 0 – 3)	2
CS 301	Theory of Computation	(3 – 1 – 0)	4
CS 302	Operating Systems	(3 – 1 – 0)	4
CS 303	Database Management Systems	(4 – 0 – 0)	4
CS 304	Operating Systems Lab	(0 – 0 – 3)	2
CS 305	DBMS Lab	(0 – 0 – 3)	2
CS 351	Language Processors	(4 – 0 – 0)	4
CS 352	Computer Networks	(4 – 0 – 0)	4
CS353	Data Warehousing and Data Mining	(4 – 0 – 0)	4
CS 354	Language Processors Lab	(0 – 0 – 3)	2
CS 355	Computer Networks Lab	(0 – 0 – 3)	2
CS 356	Knowledge Engineering Lab	(0 – 0 – 3)	2
CS 401	Software Engineering	(4 – 0 – 0)	4
CS 402	Network Programming	(3 – 0 – 0)	3
CS 403	CASE Tools Lab	(0 – 0 – 3)	2
CS 404	Network Programming Lab	(0 – 0 – 3)	2
CS 405	Soft Computing Lab	(0 – 0 – 3)	2
CS 451	Network Security	(3 – 0 – 0)	3
CS 452	Component Based Computing Lab	(0 – 0 – 3)	2
	Department Elective Courses		
CS 361	Design and Analysis of Algorithms	(3 – 0 – 0)	3
CS 363	System Analysis and Design	(3 – 0 – 0)	3
CS 365	Web and Visual Programming	(3 – 0 – 0)	3
CS 366	Unix Tools and Programming	(3 – 0 – 0)	3
CS 411	Advanced Compiler Design	(3 – 0 – 0)	3
CS 412	Machine Learning and Soft Computing	(3 – 0 – 0)	3
CS 413	Parallel Processing	(3 – 0 – 0)	3
CS 414	Distributed Object Technologies	(3 – 0 – 0)	3
CS 415	Computational Geometry	(3 – 0 – 0)	3
CS 416	Artificial Intelligence and Expert Systems	(3 – 0 – 0)	3
CS 417	Design Patterns	(3 – 0 – 0)	3
CS 418	Advanced Databases	(3 – 0 – 0)	3
CS 511	Object Oriented Software Engineering	(3 – 0 – 0)	3
CS 514	Information Security Auditing	(3 – 0 – 0)	3
CS 515	Advanced Topics in Theoretical Computer Science	(3 – 0 – 0)	3
CS 517	Programming Language Semantics	(3 – 0 – 0)	3
CS 461	Network Security	(3 – 0 – 0)	3
CS 462	Mobile Computing	(3 – 0 – 0)	3
CS 464	Intelligent Agents	(3 – 0 – 0)	3
CS 465	Intrusion Tolerant Databases	(3 – 0 – 0)	3
CS 466	E-Commerce Technologies	(3 – 0 – 0)	3
CS 468	Software Metrics and Software Project Management	(3 – 0 – 0)	3
CS 469	Software Testing and Reverse Engineering	(3 – 0 – 0)	3
CS 470	Advanced Computer Networks	(3 – 0 – 0)	3
CS 668	Cyber Laws and Rights	(3 – 0 – 0)	3

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SYLLABI OF COURSES FOR B.Tech (CSE)

CS 201 Discrete Mathematics 3 – 1 – 0 4

Sets, Relations, Functions – Fundamentals of Logic – Quantified propositions – mathematical Induction – Combinations and Permutations – Enumerations – Recurrence Relations – Generating Functions – Binary Relations – Lattices – Directed Graphs – Graphs – Spanning Trees – Planar Graphs – Euler Circuits – Hamiltonian Graphs

Text Books – Mott, Kandel, Baker, Discrete Mathematics for Computer Scientists and Mathematicians, II Ed, PHI, 2001.

CS 202 Data Structures and Algorithms 3 – 1 – 0 4

Prerequisites – CS 105

Algorithm Analysis – Ordered Lists – Stacks, Queues – Trees – Search Trees – BST, AVL – Hashing – Hash Tables – Priority Queues – Sorting – Internal, External – Disjoint Sets – Graph Algorithms – Shortest Paths – Spanning Trees

Text Books: Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson, II Ed, 2004

CS 203 File Structures Lab 0 – 0 – 3 2

Prerequisites – CS 105

Fundamental File Processing Operations – Object Oriented Support for Indexed, Entry-Sequenced Files of Data Objects – Sorting – Merging – Sort-Merging packages – Paged Binary Trees – B-Trees – B(+)-Trees – Multi list and Inverted Files – Indexed Sequential File Access – Hashing and Extendible Hashing

CS 204 Data Structures Lab 0 – 0 – 3 2

Pre/Par requisites: CS 202 Prerequisites – CS 102

Implementation of ordered lists – Generic Queues – conversion of expressions, evaluation, expression trees – Search Trees – BST – AVL Trees – Splaying – Sorting algorithms – Graph traversals – Shortest paths – Spanning Trees

CS 251 Computer Architecture 4 – 0 – 0 4

Prerequisite – EC 211

Basic Structure – Functional units – Bus structure – Addressing Methods – Machine program Sequence – 68000 example – Instructions – Assembly language program – Flow Control – Power PC example – Processing Unit – Hardwired control – Micro programmed Control – Memory – Performance Considerations – Arithmetic and Branching Conditions – Computer Peripherals – I/O – Interrupts – DMA – Synchronous and asynchronous busses – Standard I/O Interfaces

Text Books – Hamacher, Vranesic, Zaky, " Computer Organization", MGH, IV Ed

CS 252 Programming Languages 3 – 1 – 0 4

Prerequisites – CS 101, CS 202

Abstraction – Computational paradigms – Imperative languages –Symbol table – Scope – Side effects, aliasing – Data Types – Type constructs – Parameter Passing Mechanisms – Procedure environments – Abstract Data Types – Object Oriented languages – Classes and Methods – Design issues – implementation – Functional Programming – Delayed Evaluation – Recursive functions – Lambda Calculus

Text Books – Kenneth C. Louden, Programming Language Principles and Practices, II Ed, Thomson 2003

CS 253 Systems Programming 3 – 1 – 0 4

Pc Hardware – Assembly Language Basics – Program Logic and Control – Keyboard and Screen Processing – Macro definitions and Linking – Advanced Screen and Keyboard Processing – Disk Processing – DOS Memory Management – Assemblers – Macro processors – Linkers – Loaders

Text Books – Peter Abel, IBM PC Assembly Language and Programming, V Ed., Pearson Education, 2003.

CS 254 Object Oriented Programming Lab 0 – 0 – 3 2

Prerequisites: CS 204

CRC Case studies – Inheritance – Implementation of java AWT Classes – Exception Handling in Java

CS 255 Systems Programming Lab 0 – 0 – 3 2

Pre/par requisites – CS 253

Fixed Point Arithmetic – Text Processing – Keyboard and screen processing – Macro writing – Disk Processing – Memory Resident Programs – DOS file Management – Copy Protection schemes – Implementation of a simple editor – Construction of Assemblers, Macro processors – Adding Syntax directed facilities to an editor

CS 301 **Theory of computation** **3 – 1 – 0** **4**

Prerequisites – CS 201

Finite Automata – Deterministic, non-deterministic – Regular expressions – equivalence – Properties – Pumping Lemma – Context Free Grammars – Push Down Automata – Context Free Languages – Properties – Turing Machines – Computable Functions – Undecidability

Text Books – John E. Hopcroft, Rajeev Motwani, Jeffrey D Ullman, Introduction to Automata Theory, Languages and Computation, II Ed, Pearson, 2001

CS 302 **Operating Systems** **3 – 1 – 0** **4**

Prerequisite – CS 253

Batch, iterative, time sharing and real-time systems – operating system structure – concurrent processes – synchronization – CPU scheduling – Deadlocks – Memory management – Virtual memory – secondary storage management – file systems – I/O systems – Mass-storage structure – Protection – Security

Text Books: A. Silberschatz, Galvin, Gagne, "Operating System Concepts", John Wiley & Sons, Inc publishers, 2006

CS 303 **Database Management Systems** **3 – 1 – 0** **4**

Prerequisites – CS 202 (DSA)

Entity Relationship model, Relational model – structure and operations, query languages – relational algebra – relational calculus – Mapping ER model to relation form. Features of SQL. Functional Dependencies – normalization process. Multi valued dependencies. Query optimization Transaction processing concepts. Concurrency Control and recovery. Security and Authorization

Text Books: Elamsri , Navathe, Somayajulu and Gupta: Database Concepts, Pearson Edition, 2006

CS 304 **Operating Systems Lab** **0 – 0 – 3** **2**

Pre/par requisites – CS 302 Prerequisites – CS 255

Study of race conditions – Use of semaphores to solve concurrency problems – Implementation of critical region construct, monitor – comparison of different scheduling algorithms – Implementation of Dekker's algorithm – Implementation of memory manager

CS 305 **Database Management Systems Lab** **0 – 0 – 3** **2**

Pre/par requisites – CS 303 Prerequisites – CS 204

Familiarization of Oracle RDBMS. Features of SQL*Plus. Design and development database using Oracle, implementation of application with GUI. Implementation of relational operators using C/C++. DSL. Front end development. Case study/project.

CS 351 **Language Processors** **3 – 1 – 0** **4**

Prerequisites – CS 301

Phases of Compilers – Compiler Construction Tools – Bootstrapping – lexical analyzer – Parsing – Top-down – Operator precedence – LR Parsing – Ambiguous Grammars – Storage Allocation – Symbol Table – Syntax Directed Translation – Intermediate Code – Code Generation – Simple Code Generator – DAG – Peephole Optimization

Text Books – Aho, Ravi Sethi, Ullman, "Compilers – Principles Techniques and Tools", Pearson, 2002

CS 352 **Computer Networks** **3 – 1 – 0** **4**

Network structures – Network Architecture – OSI model – LAN protocols – IEE standard 802 – Ethernet – Token Bus and Token Ring – Error Detection and Correction – Sliding Window protocols – Routing algorithms – Congestion control algorithms – Internetworking – Network Layer in Internet IP – Transport Layer in Internet – UDP, TCP – Remote Procedure Call – Implementation and semantics of RPC – E-mail Protocol and File Transfer Protocol.

Text Books: A S Tanenbaum, Computer Networks, PHI, IV Ed, 2003.

CS 353 **Data Warehousing and Data Mining** **3 – 1 – 0** **4**

Prerequisites – CS 303, CS 305

Data Warehousing and OLAP technologies – Multi Dimensional modeling, data warehouse architecture, Data warehouse implementation – Data preprocessing - Concept description, characterization and comparison – Data Mining techniques – classification, clustering – prediction and mining Association rules – Advanced mining methods

Text Books: Jiawei Han and Kamber, M: Data Mining Concepts and techniques, 2nd Edition, Elsevier Publications, 2006.

CS 354 **Language Processors Lab** **0 – 0–3** **2**

Lex and Yacc – Generation of Intermediate Code for Expression Grammar – Construction of Predictive Parsing Table – LR Parsing Tables – Parsing Actions

Computer Networks Lab **0 – 0–3** **2**

CS 355

Pre/par requisites – CS 352

Error Correction and Detection – IP address Conversion functions - Client Server example using Pipes, FIFOs, Message Queues, Shared Memory – Connection Oriented Client Server with TCP – Connectionless Client Server with UDP – Concurrent Server – Multi-protocol Server – Internet Super Server – Chat Server – Mail Server.

CS 356 **Knowledge Engineering Lab** **0– 0–3** **2**

Pre/Par requisites – CS 353 Prerequisites – CS 303, CS 305

This laboratory provides hands on exposure on building of warehouse, analyzing the data using OLAP tools, and implementation of mining techniques using mining tools like SPSS, Weka etc.

CS 401 **Software Engineering** **3 – 1 – 0** **4**

Introduction to Software Engineering – A generic view of process – Process models – Software Engineering Practice – System Engineering – Requirements Engineering – Building the Analysis model – Design Engineering – Creating an Architectural Design – Modeling Component level design - Testing Strategies – Testing –Tactics – Product Metrics – Project Management Metrics for Process and projects – Estimation – Project Scheduling – Risk Management – Quality Management – Change Management

Text Books – Roger S. Pressman, "Software Engineering – A Practitioner's Approach", sixth edition, Mc Graw Hill

CS 402 **Network Programming** **3 – 1 – 0** **4**

Prerequisites – CS 352

Advanced Socket System Calls – Reserved Ports, Stream Pipes, Asynchronous I/O, I/O Multiplexing, Remote Procedure Calls – Doors – Sun RPC – Advanced I/O Functions, Unix Domain Protocols – Passing File Descriptors – Routing Sockets – Broadcasting – Multicasting – Signal Driven I/O – Raw Sockets – Data Link Access - STREAMS

Text Books: W.Richard Stevens, Unix Network Programming Volume 1 & Volume 2, PHI, 2005

CS 403 **CASE Tools Lab** **0 – 0 –3** **2**

Pre/par requisites – CS 401

Problem Analysis and Project Planning - Software Requirement Analysis – Modeling – Software Developments and Debugging - Software Testing

CS 404 **Network Programming Lab** **0 – 0 –3** **2**

Pre/par requisites – CS 402

Advanced Socket I/O Functions – Asynchronous I/O – Passing File Descriptors – Routing Algorithms – IP Spoofing – IP Tunneling – libpcap functions usage – Email Gateways – Protocol Conversions - Policy Control Table Implementation

CS 405 **Soft Computing Lab** **0 – 0 – 3** **2**

Pre/Par requisite – CS 412

Artificial Neural Networks – Genetic Algorithms – Rule Learning – back-propagation

CS 451 **Network Security** **3 – 1 – 0** **3**

Prerequisites – CS 352, CS 402

Network Security – Attacks Services and Mechanisms – Conventional Encryption – Classical Techniques, Modern Techniques – Simplified DES – Block cipher Design Principles – Encryption algorithms – placement of encryption function – traffic confidentiality – The Data Encryption Standard (DES) – Public Key Encryption – The RSA algorithm – Diffie – Hellman Key Exchange – Key Management - Message Authentication – Authentication Requirements – Authentication Functions – Message Authentication Codes – Digital Signatures and Authentication Protocols – Digital Signatures – Digital Signature Standard (DSS) – Electronic Mail Security – S/MIME – IP Security – IP security Overview – IP Security Architecture – Authentication Header (AH) – Encapsulating Security Payload (ESP) – Firewalls – Firewall Design Principles – Trusted Systems.

Text Books: William Stallings, Cryptography and Network Security, the Principles and Practice, Pearson Education, II Ed, 2002

CS 452 **Component Based Computing Lab** **0 – 0 – 3** **2**

COM/DCOM : COM Interfaces – COM library – Type libraries – Registering Type Libraries – Active template library – Threading models and apartments – multithreaded components – Dll surrogates – security models

CORBA : OMG's object management architecture – CORBA services – CORBA business objects - 3-Tier client-server-object-style – Accessing distributed objects using applets – dynamic CORBA – multithreaded client-server programming

CS 261 **Object Oriented Programming and Operating Systems** **3 – 0 – 3/2** **4**

Prerequisite – CS 202

Object Oriented Programming: Introduction to object oriented features of C++ - Classes – Friend functions – function and operator overloading – Dynamic object creation, constructors and destructors – Inheritance, types of inheritance – Virtual functions - Abstarct classes – Templates – Exception handling

Operating Systems : Batch, iterative, time sharing and real-time systems – operating system structure – concurrent processes – synchronization – Deadlocks – Memory management – Secondary storage management – File systems

Text Books: Ira Pohl, "Object oriented programming using C++", AW.

A. Silberschatz, Galvin, Gagne, "Operating System Concepts", John Wiley & Sons, Inc publishers, 2006

CS 262 **Advanced Data Structures** **3– 0 – 3/2** **4**

Prerequisites – CS 202

Binary Search Trees–Height Balanced Trees – AVL – Splay Trees – Balanced Trees – B-Trees – Priority Queues – Binomial Heaps – Leftist Heaps– Skew Heaps–Binomial Queues–Top down Splay Trees – Red Black Trees – Skip Lists – AA Trees – Pairing Trees – Amortized Analysis

Text Books: Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Pearson, II Ed, 2004.

CS 263 **Object Oriented Programming** **3 – 0 - 3/2** **4**

Prerequisites – CS 202

Object Oriented Thinking – Messages and Methods – OO Design – Software Components – Design Paradigms – Inheritance – Mechanisms for software reuse – Polymorphism – AWT Class – Input output Streams

Text Books – Timothy Budd, "Understanding Object Oriented Programming with Java", AW

CS 311 **Operating Systems and Applications** **3 – 0 – 0** **3**

Operating Systems : Batch, iterative, time sharing and real-time systems – operating system structure – concurrent processes – synchronization – Deadlocks – Memory management – Secondary storage management – File systems

Text Books – Sillberschatz**,** Galvin, Gagne, "Operating System Concepts", John Wiley, 2006

CS 312 **Database Management** **3 – 0 – 0** **3**

Importance – Entity Relationship model, Relational model – structure and operations, query languages – relational algebra – relational calculus – Mapping ER model to relation form. Features of SQL. Functional Dependencies – normalization process. Multi valued dependencies. Query optimization

Text Books: Elamsri , Navathe, Somayajulu and Gupta: Database Concepts, Pearson Edition, 2006

CS 313 **Management Information Systems** **3– 0 – 0** **3**

This course discusses key issues pertaining to information systems in the managerial context. Focus is on the functional applications of management information systems and MIS practices in organizations. Information as a management resource Hierarchy of information systems Transaction processing, business information systems, decision support systems and expert systems. MIS - functional applications. Overview of information technology – hardware, software and telecommunications. Database management Current MIS trends in India.

CS 361 **Design and Analysis of Algorithms** **3– 0 – 0** **3**

Prerequisites – CS 202

Algorithm Analysis – Asymptotic notation – Amortization – Greedy method – Divide and conquer – Dynamic programming – example problems in each case of design methods – Sorting Algorithms – Graph Algorithms – Shortest path, search algorithms, Minimum spanning tree, Max flow min cut Algorithms – Strings and Pattern matching Algorithms – Backtracking, and Branch and Bound methods – Network Algorithms - P, NP, NP-hard, NP-complete classes.

Text Books: M T Goodrich, Roberto Tamasia. Algorithm Design John Wiley & Sons

Horowitz, Sartaj Sahni, S Rajasekaran. Fundamentals of Algorithms. Galgotia.

CS 363 **System Analysis and Design** **3 – 0 – 0** **3**

Information systems – People involved – System life cycle – gathering information – project planning – feasibility – evaluation – Modelling tools – DFD – ER diagrams – Alternate models – Process descriptions – structured English – Data Dictionary – Design – logical and physical models – User Interfaces – Relational Analysis – Database design – program design – structure chart – HIPO – SSADM – Alternate Life cycles – Prototypes.

Suggested Reading: Haryszkiewycz, "Introduction to Systems Analysis and Design", II Ed. PHI 1995.

James A Senn : Analysis and Design of Information Systems, McGraw Hill 1989.

CS 365 **Web and Visual Programming** **3 – 0–3/2** **3**

Creating home pages – Online shopping – online examination – chat system – mailing system – Visual C++ controls usage – Mouse and Keyboard integrating applications – Timers and dialog boxes – menus – bitmaps – drawing – tool bars – ODBC and ADO database programming – Multi tasking – Networking and WEB applications

Text Books: Deitel, Deitel & Nieto, "Internet and Worldwide Web how to Program?", Pearson

Lars Klander, "Core Visual C++ 6", Pearson Education, PHI

CS 366 **Unix Tools and Programming** **3– 0 – 0** **3**

Prerequisites – CS 202, CS 204

Shell programming – Unix commands – Text processing – sed and awk utilities – grep utility – Introduction to Lex, Yacc utilities – Introduction to Perl programming.

Text Books: Kernighan and Pike, "Unix Programming Environment", PHI

CS 411 **Advanced Compiler Design** **3– 0 – 0** **3**

Prerequisite: CS 351

Compiler optimizations : Processing intermediate code – Interpreters – DAG code generation technique – Loop simplifications – Redundancy elimination – Re-association – Loop invariant code optimization - Procedure call optimizations - Register allocation - Instruction Scheduling - Low level loop and branch optimizations – Inter procedural analysis

Parallelizing compilers : Data dependence, Data dependence decision algorithms: GCD test, Banerjee's Inequality, Exact algorithm for a single loop index, Exact algorithm for Multiple indices, Vectorization, Concurrentization

Text Books: Steven S. Muchnick. "Advanced Compiler Design and Implementation". *Harcourt Asia and Morgan Kaufmann.* 2000.

Michael Wolfe, "High performance compilers for parallel computing", AW 1996

CS 412 **Machine Learning and Soft Computing** **3– 0 – 0** **3**

The concept learning task. General-to-specific ordering of hypotheses. Version spaces. Inductive bias. Decision Tree Learning. Rule Learning: Propositional and First-Order, Over-fitting, Cross-Validation. Experimental Evaluation of Learning Algorithms Instance-Based Learning: k-Nearest-neighbor algorithm, Radial basis functions. Case-based learning. Computational Learning Theory: probably approximately correct (PAC) learning. Sample complexity. Computational complexity of training. Vapnik-Chervonenkis dimension. Artificial Neural Networks: Linear threshold units, Perceptrons, Multilayer networks and backpropagation, recurrent networks. Probabilistic Machine Learning Maximum Likelihood Estimation, MAP, Bayes Classifiers Naive Bayes. Bayes optimal classifers. Minimum description length principle. Bayesian Networks, Inference in Bayesian Networks, Bayes Net Structure Learning Unlabelled data: EM, preventing overfitting, cotraining Gaussian Mixture Models, K-means and Hierarchical Clustering, Clustering and Unsupervised Learning, Hidden Markov Models, Reinforcement Learning Support Vector Machines Ensemble learning: boosting, bagging.

CS 413 **Parallel Processing** **3 – 0 – 0** **3**

Prerequisites – CS 202, CS 361

Parallel processing terminology – PRAM algorithms – Processor organizations – Interconnection networks – Mapping and Scheduling – Matrix multiplication , sorting and searching algorithms – graph algorithms – combinatorial search algorithms

Text Books: Michael J. Quinn, "Parallel Computing", TMH, 1994.

CS 414 **Distributed Object Technologies** **3 – 0 – 0** **3**

COM/DCOM : Introduction to COM - COM Interfaces and Interface languages – COM library – Type libraries specification – Registering Type Libraries – Active template library – Developing Components using ATL - Threading models and apartments – Multithreaded components – Dll surrogates – Security models

CORBA : OMG's object management architecture – CORBA services – CORBA business objects - 3-Tier client-server-object-style – Accessing distributed objects using applets – Dynamic CORBA – Multithreaded client-server programming

Text Books: Guy Eddon and Henry Eddon, "Inside DCOM", Microsoft Press, 1998

Dan Harkey and Robert Orfali, "Client/Server programming with CORBA/Java", John Wiley and Sons

CS 415 **Information Security and Auditing** **3 – 0 – 0** **3**

Computer Auditing: System Access Control, Data Access Control, Security Administration, System Design; Hardware Security Auditing, Software Security Auditing and controls – Security Policies

Database Security Auditing: Audit Trail Comparison of Database and Operating System Access, Field checks, Change logs, Integrity checks, User authentication, Precision checks, Access Control Procedures.

Network & Telecommunication Security Auditing: Confidentiality, Accuracy & Integrity, Availability; Tools: encryption, trusted system processing, and firewalls. Detect: security violation, misrouted data, components failure, and signal interception.

Microcomputer Security Auditing: Audit Trail, Auditing Virus Infection, Performing a security Audit; Issue: Future trends, challenges.

Text Books: Deborah Russell, Computer Security Basics, O'Reilly & Associate, 1991.

Karen A. Forcht, Computer Security Management, 1994; Donald A. Watne, Peter B.B. Turney, "Auditing EDP Systems", 2nd PH 1990.

CS 416 **Artificial Intelligence and Expert Systems** **3 – 0 – 0** **3**

Problems and Search – Problem Space – Problem Characteristics – Heuristic Search Techniques – Knowledge Representation – Predicate Logic – Resolution – Rules – Logic Programming – Forward and Backward Reasoning – Matching – Semantic Nets – Frames – Game Playing – The Blocks World – Natural Language Processing – Expert Systems

Text Books – Elaine Rich, Kevin Knight, "Artificial Intelligence", TMH

CS 417 **Design Patterns** **3 – 0 – 0** **3**

Introduction. - A Case Study: Designing a Document Editor. - Design Pattern Catalog - Creational Patterns - Structural Pattern - Behavioral Patterns. What to Expect from Design Patterns, a Brief History, and the Pattern Community.

Text Books: Erich Gamma "Design Patterns" Addison-Wesley

CS 418 **Advanced Databases** **3 – 0 – 0** **3**

Prerequisites – CS 303, CS 305

Object Oriented Databases: Persistent Programming Languages, Object Identity and its implementation, Clustering, Indexing, Client Server Object Bases, Cache Coherence. Parallel Databases: Parallel Architectures, performance measures, shared nothing/shared disk/shared memory based architectures, Data partitioning, Intra-operator parallelism, Pipelining, Scheduling, Load balancing, query optimization. Distributed Databases: Query processing, semi-joins, query optimization, Concurrency control Heterogeneity issues. Advanced Transaction Models: Save-points, Sagas, Nested Transactions, Multi Level Transactions. Recovery: Multi-level recovery, Shared disk systems, Distributed systems 2PC, 3PC, replication and hot spares. Recursive query processing: Top-down and bottom-up evaluation, Magic optimization.

Text Books: Introduction to Object Oriented Databases, Won Kim, MIT Press, 1989. Readings in Object Oriented Database Systems, S. Zdonik and D. Maier, First Edition, Morgan Kauffman, 1990. Readings in Database Systems, M. Stonebraker, Second Edition, Morgan Kauffman, 1993. Distributed Databases Principles and Systems, S. Ceri and G. Pelaggati, McGraw Hill, 1985. Selected research papers from various journals and conferences.

CS 511 **Object Oriented Software Engineering** **3 – 0 – 0** **3**

The Software Process – Requirements, Specification, Design, Implementation and Maintenance – Cohesion – Data Encapsulation – Reusability – Software Life Cycle – Use-case modeling – Data flow Analysis – Transaction Analysis – 4GL – Coding Standards – Module reuse – Module Testing – CASE tools for integration and Complete Software Process

Text Books – Stephen R Schach, "Object Oriented and Classical Software Engineering" , TMH V Ed

CS 514 **Information Security and Auditing** **3– 0 – 0** **3**

System Access Control, Data Access Control, Security Administration, System Design; Hardware Security Auditing, Software Security Auditing and controls – Security Policies – Audit Trail Comparison of Database and Operating System Access, Field checks, Change logs, Integrity checks, User authentication, Precision checks, Access Control Procedures. Encryption, trusted system processing, and firewalls. Detect: security violation, misrouted data, components failure, and signal interception. Audit Trail, Auditing Virus Infection, Performing a security Audit; Issue: Future trends, challenges.

Text Books: Deborah Russell, Computer Security Basics, O'Reilly & Associate, 1991.

Karen A. Forcht, Computer Security Management, 1994; Donald A. Watne, Peter B.B. Turney, "Auditing EDP Systems", 2nd PH 1990.

CS 515 **Advanced Topics in Theoretical Computer Science** **3– 0 – 0** **3**

Turing machines and non-determinism, models of computation like RAM and pointer machines. Relations between complexity classes. Time-space tradeoffs for some fundamental problems. Reductions and completeness, Randomized complexity classes, Boolean circuit complexity. Cryptography and one-way functions. Polynomial hierarchy, P-space completeness, Interactive proofs and Hardness of approximation, Parallel complexity classes.

CS 517 **Programming Language Semantics** **3 – 0 – 0** **3**

Operational Semantics – Inductive definitions – Denotational Semantics – Axiomatic Semantics – Domain Theory – Recursion Techniques – Languages with Higher Types – Information systems – Recursive Types

Text Books – Winskel. "The Formal Semantics of Programming Languages", MIT Press

CS 461 **Network Security** **3 – 0 – 0** **3**

Prerequisites – CS 352, CS 402

Network Security – Attacks Services and Mechanisms – Conventional Encryption – Classical Techniques, Modern Techniques – Simplified DES– Block cipher Design Principles – Encryption algorithms – placement of encryption function – traffic confidentiality – The Data Encryption Standard (DES) – Public Key Encryption – The RSA algorithm – Diffie – Hellman Key Exchange – Key Management - Message Authentication – Authentication Requirements – Authentication Functions – Message Authentication Codes – Digital Signatures and Authentication Protocols – Digital Signatures – Digital Signature Standard (DSS) – Electronic Mail Security – S/MIME – IP Security – IP security Overview – IP Security Architecture – Authentication Header (AH) – Encapsulating Security Payload (ESP) – Firewalls – Firewall Design Principles – Trusted Systems.

Text Books: William Stallings, Cryptography and Network Security, the Principles and Practice, Pearson Education, II Ed, 2002.

CS 462 **Mobile Computing** **3 – 0 – 0** **3**

Prerequisites – CS 352

Applications of Mobile Communications – Wireless Transmission – Medium Access Control – Telecommunication Systems – Satellite Systems – Wireless Lan – 802.11 – HIPERLAN – BlueTooth – Wireless ATM – Mobile Network Layer – Mobile IP – Mobile Transport Layer – Support for Mobility – File Systems – Wireless Application Protocol

Text Books: Jochen Schiller, Mobile Communications, Pearson Edition Asia, III Ed, 2001.

CS 463 **Computer Graphics** **3 – 0 – 0** **3**

Overview of Graphics Systems – Output Primitives – Attributes – Two-dimensional Geometric Transformations – Viewing – Modeling – GUI – Three-dimensional Concepts – Representations – Transformations – Viewing – Visible Surface Detection Methods

Text Books – Hearn, Baker, "Computer Graphics – C Version", Pearson, II Ed

CS 464 **Intelligent Agents** **3 – 0 – 0** **3**

Agents and Objects – Evaluation of Agents – Agent Design Philosophies – Multi-agent System – Mobile Agents – Agent Communication – Knowledge query and Manipulation Language – Case Study

Text Books – Latest Research Papers and Technical Reports

CS 465 **Intrusion Tolerant Databases** **3– 0 – 0** **3**

This course is based on latest emerging topics of Databases pertaining Intrusion Detection, database security and damage assessment, damage control, recovery methods.

CS 466 **E-Commerce Technologies** **3 – 0 – 0** **3**

Overview – E-commerce Infrastructure – Wireless Technology – Web Architecture – Data interchange – Web content delivery – Access Security – Public Key Encryption – Electronic Payment System – Mass Personalization – Search Engines – Data Mining and Privacy – Intelligent Agents – Auction Models

Text Books – Kenneth C Louden, "E-Commerce: Business, technology, Society"

CS 467 **Internet and Web Programming** **3– 0 – 0** **3**

Introduction to TCP/IP protocols – Application protocols DNS, Email, FTP, Telnet, HTTP – Introduction to Web site design – HTML tags – Client side Java script (functions, arrays, Objects) – Style Sheets – Object model - Event Model – Server side scripting with Perl, Servlets and ASP (form processing, business logic, database connectivity and cookies)

Text Books: Deitel, Deitel & Nieto, "Internet and Worldwide Web how to Program ?", Pearson Education, PHI.

Ivan Bayross, "Web enabled commercial application development using HTML, DHTML, JavaScript, PERL & CGI, BPB publications.

Text Books – Achyut S Godbole, Atul Kahate, "Web Technologies", Tata MC-Graw Hill, 2003

CS 468 **Software Metrics and Software Project Management** **3– 0 – 0** **3**

The Basics of Measurement – A goal-based framework for software measurement –Empirical investigation – Measuring internal product attributes – measuring external product attributes – Making process predictions. Software Project Management – General Management - Introduction to Project Management - Project Planning and Evaluation - Project Monitoring & Control - CASE STUDIES.

Text Books – Norman E. Fenton , Shari Lawence pfleeger , " Software Metrics – A Rigorous & practical Approach" , Second Edition. Thomson Brooks /Cole

Royce, "Software Project Management" – Pearson Education Inc. Delhi, Pankaj Jalote, "Software Project Management in Practice" – Pearson Education Inc. Delhi, 2002

CS 469 **Software Testing and Reverse Engineering** **3– 0 – 0** **3**

Introduction – The Taxonomy of Bugs – Flow graphs and Path Testing – transaction – flow testing – Data Flow testing- Domain Testing – Me Complexity - syntax testing - logic based testing states, state graphs and transition testing- graph metrics and applications – implementation

Text Books :- Boris Beizer , "Software Testing Techniques" , Dream Tech Press

CS 470 **Advanced Computer Networks** **3– 0 – 0** **3**

Prerequisites – CS 352

Internetworking – Network Layer in Internet IP – Transport Layer in Internet – UDP, TCP – Remote Procedure Call – Implementation and semantics of RPC – E-mail Protocol and File Transfer Protocol, Network Security - Modern Techniques – Simplified DES – Block cipher Design Principles – Encryption algorithms – placement of encryption function – traffic confidentiality – The Data Encryption Standard (DES) – Public Key Encryption – The RSA algorithm - Digital Signatures – Digital Signature Standard (DSS) – Electronic Mail Security – S/MIME – IP Security – IP security Overview – IP Security Architecture – Authentication Header (AH) – Encapsulating Security Payload (ESP) – Firewalls – Firewall Design Principles – Trusted Systems- Wireless Markup Language Authoring – URLs Identify Content – Events, Tasks and Bindings – Miscellaneous Markup – Sending Information – Document Type Declarations

CS 688 **Cyber Laws and Rights** **3 – 0 – 0** **3**

Cyber laws and rights in today's digital age – IT Act – Intellectual Property Issues – Information Warfare – Threats to information resources – Countermeasures – authentication, encryption, auditing, monitoring, intrusion election, and firewalls – Cyberspace law and law enforcement, information warfare and the military, and intelligence in the information age. Information warfare policy and ethical Issues.

Text Books - Hon C Graff, "Cryptography and E-Commerce" - Wiley Tech 2001.