SCHOOL OF COMPUTING & IT												
B.TECH COURSE STRUCTURE (IT) 2017-2021												
Third Semester												
Course Code	**Course Name**	**L**	**T**	**P**	**C**	**End Term Exam. Duration**		**Relative weightage (%)**				
						Th	**P**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
BB 1101	Value Ethics and Governance	2	0	0	2	2		30	-	30	40	-
MA1307	Engineering Mathematics-III	3	0	0	3	3		30	-	30	40	-
CS1301	Computer Organization & Architecture	3	1	0	4	3		30	-	30	40	-
CS1302	Switching Theory & Logic Design	3	1	0	4	3		30	-	30	40	-
CS1303	Data Structures	3	1	0	4	3		30	-	30	40	-
CS1304	Object Oriented Programming using Java	3	1	0	4	3		30	-	30	40	
CS1331	Data Structures Lab	0	0	2	1		2	-	70	-	-	30
CS1332	Object Oriented Programming using Java Lab	0	0	2	1		2	-	70	-	-	30
	Total	**17**	**4**	**4**	**23**							

Fourth Semester												
Course Code	**Course Name**	**L**	**T**	**P**	**C**	**End Term Exam. Duration**		**Relative weightage (%)**				
						Th	**P**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
*HS1401	Economics	3	0	0	3	3		30	-	30	40	-
MA1406	Engineering Mathematics-IV	3	0	0	3	3		30	-	30	40	-
CS1401	Operating Systems	3	1	0	4	3		30	-	30	40	-
CS1402	Relational Database Management Systems	3	1	0	4	3		30	-	30	40	-
CS1403	Microprocessor & Microcontrollers	3	0	0	3	3		30	-	30	40	-
-----	Open Elective-I	3	0	0	3	3		30	-	30	40	
CS1431	Operating Systems Lab	0	0	2	1		2	-	70	-	-	30
CS1432	Relational Database Management Systems Lab	0	0	2	1		2	-	70	-	-	30
CS1433	Microprocessor & Microcontroller Lab	0	0	2	1		2	-	70	-	-	30
	Total	**18**	**2**	**6**	**23**							

ABBREVIATIONS	
L	Lecture
T	Tutorial
P	Practical
C	Number of Credits
CWS	Class Work Sessional
MTE	Mid-Term Exam
PRE	End Term Practical Exam
PRS	Practical Sessional
ETE	End Term Exam

LIST OF (SCIT) OPEN ELECTIVE COURSES		
1	CS1490	Basics of Linux Programming
2	CS1491	OOPS using Java
3	CS1492	Data Structures & Algorithms
4	CS1493	Databases & ERP

Fifth Semester

Course Code	Course Name	L	T	P	C	End Term Exam. Duration		Relative weightage (%)				
						Th	P	CWS	PRS	MTE	ETE	PRE
CS 1501	Design & Analysis of Algorithms	3	1	0	4	3		30	-	30	40	-
CS 1505	Automata & Compiler Design	3	1	0	4	3		30	-	30	40	-
IT 1502	Software Engineering & Project Management	3	1	0	4	3		30	-	30	40	-
IT 1504	Data Communications	3	1	0	4	3		30	-	30	40	-
IT 15XX *	Department Elective-I	3	0	0	3	3		30	-	30	40	-
----- **	Open Elective-II	3	0	0	3	3		30	-	30	40	-
CS 1530	Design & Analysis of Algorithms Lab	0	0	2	1		2	-	70	-	-	30
IT 1532	Software Engineering & Project Management Lab	0	0	2	1		2	-	70	-	-	30
	Total	**18**	**4**	**4**	**24**							

Sixth Semester

Course Code	Course Name	L	T	P	C	End Term Exam. Duration		Relative weightage (%)				
						Th	P	CWS	PRS	MTE	ETE	PRE
MB 16XX	Management for Engineers	3	0	0	3	3		30	-	30	40	-
CS 1602	Computer Networks	3	1	0	4	3		30	-	30	40	-
IT 1603	Data Mining and Warehousing	3	1	0	4	3		30	-	30	40	-
IT 16XX *	Department Elective-II	3	0	0	3	3		30	-	30	40	-
----- **	Open Elective-III	3	0	0	3	3		30	-	30	40	-
CS 1630	Computer Networks Lab	0	0	2	1		2	-	70	-	-	30
IT1631	Data Mining and Warehousing Lab	0	0	2	1		2	-	70	-	-	30
IT1634	Minor Project	-	-	6	3		-	-	70	-	-	30
	Total	**15**	**2**	**10**	**22**							

* **Please see List of Department Elective**

** **Please see list of Open Electives**

ABBREVIATIONS	
L	Lecture
T	Tutorial
P	Practical
C	Number of Credits
CWS	Class Work Sessional
MTE	Mid-Term Exam
PRE	End Term Practical Exam
PRS	Practical Sessional
ETE	End Term Exam

Course Code	Department Elective 1
CS1551	Linux System and Shell Programming
CS1553	Digital Image Processing
IT1551	Graph Theory
IT1552	Python Programming
CC1551	Web Technologies
CC1552	Embedded Systems
Course Code	**Open Elective 2**
CS1593	Principles of Programing Languages
CS1594	Enterprise Resource Planning
IT1590	Cryptography
IT1591	Introduction to Python Programming
CC1590	Introduction to Web Technologies
CC1591	Software Testing

Course Code	Department Electives - 2
CC1651	Distributed Systems
CC1652	Advance Internet Technologies
CC1653	Internet of Things
CS1650	Distributed Databases
CS1653	Cloud Computing & Infrastructure Services
CS1654	Parallel Programming
CS1655	Agile Methodology
IT1652	Software Quality and Assurance
IT1653	Artificial Intelligence
IT1654	Data Science

Course Code	Open Elective – 3
CS1694	Process Mining
CS1698	Android Programming & App Development
IT1692	Introduction to Data Science
IT1693	Advanced Topics in Computing
CC1690	Open Source Technology
CC1691	Soft Computing Techniques

******: This Indicates a new course proposal**

Seventh Semester												
Course Code	**Course Name**	**L**	**T**	**P**	**C**	**End Term Exam. Duration**		**Relative weightage (%)**				
						Th	**P**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
IT 1701	Cryptography & Network Security	3	1	0	4	3		30	-	30	40	-
IT 1702	Advance Data Structure	3	1	0	4	3		30	-	30	40	-
IT17XX	Program Elective- III	3	0	0	3	3		30	-	30	40	-
IT17XX	Program Elective- IV	3	0	0	3	3		30	-	30	40	-
IT17XX	Program Elective- V	3	0	0	3	3		30	-	30	40	-
----	Open Elective - IV	3	0	0	3	3		30	-	30	40	-
IT1732	Cryptography & Network Security Lab	0	0	1	1		2	-	70	-	30	-
IT1733	Advance Data Structures Lab	0	0	1	1		2	-	70	-	30	-
	Total	18	2	2	22							

Eight Semester												
Course Code	**Course Name**	**L**	**T**	**P**	**C**	**End Term Exam. Duration**		**Relative weightage (%)**				
						Th	**P**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
IT 1881	Major Project	0	0	24	12	-	-	30	-	40	30	-
	Total	0	0	24	12							

Audit Course Simulation & Modeling

ABBREVIATIONS	
L	Lecture
T	Tutorial
P	Practical
C	Number of Credits
CWS	Class Work Sessional
MTE	Mid-Term Exam
PRE	End Term Practical Exam
PRS	Practical Sessional
ETE	End Term Exam

Course Code	**Program Electives - 3**
IT 1753	Mobile Computing
IT 1754	Software Define Networks
Course Code	**Program Electives - 4**
IT 1759	Social Network Analysis
IT 1760	Natural Language Processing
Course Code	**Program Electives - 5**
IT 1761	Advance Machine Learning Techniques
IT 1762	Semantic Web

Course Code	**Open Elective – 4**
IT 1791	Introduction to Real Time System
IT 1792	Information & Web Security

Syllabus

III SEMESTER

BB 1101 VALUE, ETHICS & GOVERNANCE [2 0 0 2]

Objective:

To improve understanding of values ethics & corporate governance so ensure that we produce responsible citizens for the larger society.

Contents:

Values: Meaning of value education, Three Gunas and their relevance, Nature and kinds of value, Understanding Harmony at various Levels: Nature, in existence; **Ethics and Business:** Values and attitudes for professional accountants, Legal frameworks, regulations and standards for business, Nature of ethics and its relevance; Rules-based and framework approaches to ethics; Personal development and lifelong learning; Personal qualities; Ethical principles; Concepts of independence, skepticism, accountability and social responsibility; **Ethical Conflict:** Relationship between ethics, governance, the law and social responsibility, Unethical behaviour, Ethical dilemmas and conflicts of interest; **Corporate Governance:** The role and key objectives of organizattional governance in relation to ethics and the law; development of organizattional governance internationally; the role of directors in relation to corporate governance; the role of the board, Types of board structures and corporate governance issues, Policies and procedures for 'best practice' companies, Rules and principles based approaches to corporate governance

Text / Reference Books:

1. Gaur R.R., Sangal R. and. Bagaria, G.P: "*A Foundation Course in Human Values*
   i. *Professional Ethics,"* Excel Books, 2010.
2. Sadri S & Sadri, J *Business Excellence Through Ethics & Governance*, 2nd edition, 2015.
3. Mathur, U C *Corporate Governance and business ethics,* MacMillan India Ltd, 2009.
4. Baxi, C V: *Corporate Governance*, Excel Books, 2009
5. Sadri S, Sinha A K and Bonnerjee, P: *Business Ethics: concepts and cases*, TMH, 1998.

MA1307 Engineering Mathematics III [3 0 0 3]

Sets, relations and functions: Sets and set operations, functions, binary relations, partial ordering relations and Hasse diagram, equivalence relations. Principle of mathematical induction. **Basic counting techniques**: pigeon-hole principle, inclusion and exclusion principle, permutations and combinations. Discrete numeric functions, recurrence relations and generating function. **Propositional Calculus:** propositions and logical operations, conditional statements, logical equivalence of statements, tautology and contradiction, Predicates and Quantifiers, rules of inference. **Algebraic structures**: Semi-group, monoid, group, cyclic group, permutation group, Boolean algebra. **Introduction to graph theory:** Graphs and graph models, graph terminology and types of graphs, Handshaking theorem, regular graph, complete graph, bipartite graph, graph isomorphism, subgraphs, walk, path, cycle, Eulerian graph.

Text Books:

2. K. H. Rosen, "Discrete Mathematics and its applications", Seventh Edition, McGraw Hill, 2014.
3. N. Deo, "Graph Theory with applications to engineering and Computer Science", PHI, 2004.

Reference Books:

1. R. Diestel, "Graph Theory", Springer International Edition, 2005.
2. B. Kolman, R. C. Busby, S. C. Ross, "Discrete Mathematical Structures", Pearson Education, 2004.
3. J.P. Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw-Hill, 2006.

CS1301 COMPUTER ORGANIZATION AND ARCHITECTURE [3 1 0 4]

Basic Structure of computers: Computer types, functional units, basic operational concepts, bus structures, software, performance; **Machine Instructions and programs**: Numbers, arithmetic operations and characters, Memory locations and addresses; Memory operations, Addressing modes; **Arithmetic**: Addition and subtraction of signed numbers, Adders, ALU design, Bit slice processor, Multiplication of positive numbers Signed operand multiplication, Fast multiplication, Integer division, Floating point numbers and operations; **Memory Systems**: Introduction, Basic concepts, Design methods; RAM memories, Read only memories, Speed size and cost, Cache memories, Performance considerations, Virtual memories, Memory, Management Requirements, Secondary storage; **Input / Output organization**: Accessing I/O devices, Interrupts, Direct memory access, Buses, Interface circuits; **Introduction to Parallel Processing:** Flynn Classification**,** Multi-Core Architecture, Pipelining.

Text Books:

1. C. Hamacher, Z. Vranesic, "*Computer Organization"*, Tata McGraw Hill (TMH), 5th Edition, 2002.

2. W. Stallings, "*Computer Organization and Architecture –Designing for Performance"*, PHI, 2009.

Reference Books:

1. David A. Patterson and John L. Hennessy, "*Computer Organization and Design: The Hardware/Software Interface*", 2003.

2. John P. Hayes, "*Computer Architecture and Organization*", Tata McGraw Hill (TMH) Publication, TMH, 3rd Edition, 1998.

CS1302 SWITCHING THEORY & LOGIC DESIGN [3 1 0 4]

Introduction to logic circuits: Variables and functions, Inversion, Truth tables, Logic gates and networks, Boolean algebra, **Introduction to VHDL:** Optimized implementation of logic functions, Synthesis using AND OR and NOT gates, Karnaugh map, Strategy for minimization, Minimization of POS forms, Incompletely Specified Functions, Multiple output circuits NAND and NOR logic networks, multilevel NAND and NOR circuits, Analysis of multilevel circuits; **Number representation and arithmetic circuits:** Positional number representation, Addition of unsigned numbers, Signed numbers, Fast adders, Design of arithmetic circuits using VHDL, BCD representation; **Combinational-Circuit building blocks:** Multiplexer, decoder, Encoder, Code converter, Arithmetic comparison circuits, VHDL for Combinational Circuits; Flip Flops, Registers, Counters; **Overview of semiconductor diode:** BJT, MOSFET, TTL–standard, High speed, low-power, low-power scotty, CMOS logic-NAND, NOR

Text Books:

1. S. Brown , Z. Vranesic, "*Fundamentals of Digital Logic with VHDL Design*", TMH, 2000.

2. M. Mano, "*Digital Design*", PHI Pvt. Ltd., 3rd Edition, 2000.

Reference Books:

1. P. Leach, A. Malvino and G. Saha, "*Digital Principles and Applications*", TMH, 6th Edition, 2006.

1. J. Bhasker, "*A VHDL Primer*", PHI Pvt. Ltd., 3rd Ed., 2005.

CS1303 DATA STRUCTURES [3 1 0 4]

Introduction: Algorithm specification; **Performance Analysis:** Time and Space Complexity, Asymptotic notation; pointer declaration and definition, memory allocation functions, array of pointers; The type definition, enumerated types, accessing structures, complex structures, arrays of structures, structures and functions; Recursive definition & processes, Recursion in C, writing recursive programs efficiency of recursion, **Examples:** Tower of Hanoi, GCD, Fibonacci Definition and examples, Representing stacks in C, Evaluation of expressions, multiple stacks and queues; **Applications:** infix, postfix and prefix and their conversions Linked lists representations, Singly, doubly, header node, circular, linked stacks and queues, polynomial and long integer arithmetic, union, intersection, Basic terminologies, binary tree representation, recursive/ non recursive, Binary search tree, AVL trees; **Applications:** Expression trees, inserting, deleting, searching, height of BST Terminology and representations, Graph operations, spanning trees, minimum cost spanning tree, shortest path and transitive closure, Binary and linear search, insertion, quick, merge, heap, radix sort Static Hashing

Text Books:

1. A. Forouzan, R. F. Gilberg, "*A Structured Programming Approach Using C*", Thomson, 2003.

2. A. Tannenbaum, J. Augenstein, "*Data Structures using C",* Pearson Education, 2006.

Reference Books:

1. E. Horowitz, S. Sahni, "*Fundamentals of Data Structures in C*", Silicon Press, 2nd Ed., 2007.

CS1304 OBJECT ORIENTED PROGRAMMING USING JAVA [3 1 0 4]

The History and Evolution of java: The Creation of Java, how java changed the internet, Java's Magic, Servlets, The java Buzzwords; An Overview of Java, arrays; **Introduction to classes**: Class fundamentals, declaring objects, Assigning Object reference variables, Introduction to methods, Constructors, this keyword, Garbage collection, finalize() method, Overloading, objects as parameters, argument passing, returning objects, recursion, access control, final, nested and inner classes, string class; **I/O Basics:** Reading Console Input, Writing Console Output, Files, Applet fundamentals; **Inheritance:** basics, super, multilevel hierarchy, overriding, abstract classes, final with inheritance; **Packages and Interfaces**: Exception Handling, Multithreaded programming; String Handling, Applet Class, Event Handling; **Introduction to AWT:** Classes, component, Container, Panel, Window, frame, Canvas, working with frame, working with Graphics, using AWT Controls.

Text Books:

1 H. Schildt, "*The Complete Reference Java Eight Edition*", Tata McGraw-Hill, reprint 2011.

Reference Books:

2.S. Holzner**,** "*Java 2 programming black book*", Dream Tech, New Delhi, reprint: 2005.

CS1331 DATA STRUCTURES LAB [0 0 1 1]

Review of C and programs on Recursion, Stacks, Stacks, Queues, lists, Trees, Graphs, using C language.

CS1332 OBJECT ORIENTED PROGRAMMING USING JAVA LAB [0 0 1 1]

Control statements and arrays, Stacks and Lists, Strings, Classes and methods, Inheritance, Packages, Interfaces, Exception Handling, Threads, Input/Output, Event Handling, Applets, involving AWT, Programs involving AWT

IV SEMESTER

HS1401 ECONOMICS [3 0 0 3]

Definition, nature and scope of Economics. Introduction to Micro and Macro Economics. Law of demand and supply, Elasticity of demand and supply. Cardinal and ordinal approaches of Utility. Production: Laws of production, Cost and revenue analysis various market situations, Break-even analysis, Capital Budgeting Macro Economics: National Income and it's Concepts, Value of money and its Changes, Foreign Exchange Rate, Monetary and fiscal Policies and other Macro concepts (Balance of Payment, Business Cycle etc.)

Text Book:

1. Peterson H C et.al. , "*Managerial Economics"*, Pearson 9th edition, 2012.

References:

1. P L Mehta, "*Managerial Economics",* Sultan Chand & Sons New Delhi (Latest Edition).
2. G. J. Tuesen, H. G. Tuesen, "*Engineering Economy",* PHI, New Delhi (Latest Edition).

MA1406 Engineering Mathematics IV [3 0 0 3]

Statistics: Probability, Random variables and generating functions, probability distributions: binomial, Poisson, normal, gamma and exponential distributions. Sampling distributions: t and F distributions. Testing of hypotheses. Markov chain, Queuing Theory. Integral Transforms: Laplace transforms of elementary functions, inverse transforms, convolution theorem, Application in solving ordinary and partial differential equations. Fourier transforms. Numerical Methods: Interpolation, Numerical differentiation, Numerical integration: Trapezoidal, Simpson's 1/3 and 3/8 Rule. Solution of system of linear algebraic equations: Gauss Jacobi, Gauss-Seidel methods.

Text Books:

1. V. Sundarapandian, "Probability, Statistics and Queuing Theory", PHI, 2013.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, Delhi, 2006
3. E. Kreyszig, "Advanced Engineering Mathematics", Wiley India Eastern, 2006.

Reference Books:

1. S. Pal, S. C. Bhunia, "Engineering Mathematics", Oxford University Press, 2015.
2. P. Kousalya, "Probability, Statistics and Random Processes", Pearson, 2013.
3. R. A. Johnson, C.B. Gupta, "Probability and Statistics for Engineers", Pearson Education, 2009.
4. S. S. Sastry, "Introductory Methods of Numerical Analysis", PHI, 2005

CS1401 OPERATING SYSTEMS [3 1 0 4]

Introduction: Functions, Classification of Operating System, Operating System Structure and Operations, Process Management, Memory Management, Storage Management, Protection and Security, Special Purpose Systems, Operating System Services, User Operating System Interfaces, System Calls, Types of System Calls, System Programs, Operating System Structure, Virtual Machines, System Boot; **Processes:** Concept, Process Scheduling, Operations on Processes, Inter-process Communication Overview, Multithreaded Models, Thread Libraries, Threading Issues, Linux Threads, Basic Concepts; **CPU Scheduling:** Basic Concept, Scheduling Algorithms, Thread Scheduling, Linux Scheduling: **Process Synchronization** : Concept of Synchronization, Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classical problems on Synchronization, Monitors; **Deadlock:** Deadlock Concept, Deadlock Characterization, Methods for Handling Deadlock, Prevention, Avoidance, Detection, Recovery from Deadlock, Exercises; **Memory Management:** Concept of logical and Physical memory, Swapping, Contiguous Memory Allocation, Paging, Page Table Structure, Segmentation, Examples on The Intel Pentium; **Virtual Memory Management**: Demand Paging, Copy-On-Write, Page Replacement, Allocation of Frames, Thrashing, Memory Mapped Files, Allocating Kernel Memory; **Files:** File concept, Access Methods, Directory Structure, File System Mounting, File Sharing; **Security Problem:** The security problem, Program Threats, System and Network threats, User Authentication Design Principles, Firewalling to Protect Systems.; **Case study on Linux System**.

Text Books:

1. A. Silberschatz, P. B. Galvin, "*Operating System Concepts",* International student version, Wiley, 8th Edition, 2009.
2. W. Stallings, "*Operating Systems: Internals and Design Principles",* Pearson Ed., 2009.

Reference Books:

1. J. Harris, "*Operating Systems*", Tata McGraw-Hill publications, 2002.

CS1402RELATIONAL DATABASE MANAGEMENT SYSTEMS [3 1 0 4]

Introduction: Database-System Applications, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture; **Relational Algebra**: Fundamental Relational-Algebra Operations, Extended Relational-Algebra Operations, Null Values, Modification of the Database; **SQL:** Data Definition Language, Data manipulation language , SQL Data Types and Schemas, Integrity Constraints, Basic Structure of SQL Queries, Set Operations, Aggregate Functions, Null Values, Nested Sub-queries, Complex Queries, Views, Modification of the Database, Joined Relations, Authorization, Overview of the Design Process; **The Entity-Relationship Model:** Constraints, Entity-Relationship Diagrams, Entity-Relationship Design Issues, Weak Entity Sets, Extended E-R Features; **Normalization:** Anomalies, Referential integrity, 1NF, Functional Dependency, 2NF, 3NF, BCNF; **Hashing Techniques:** Dynamic Hashing; **Transactions:** Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Lock-Based Protocols, Log-Based Recovery, Recovery algorithms

Text Books:

1. S. Korth, "*Database System Concepts*", Mc-GrawHill, 6th Edition, 2011.
2. R. Elmasri and S. Navathe, "*Fundamentals of Database Systems*", Pearson Education, 2006.

Reference Books:

1. T. Connolly, C. Begg, "*Database Systems–A Practical Approach to Design, Implementation and Management*", Pearson Education, 3rd Edition, 2002.

CS1403 MICROPROCESSOR & MICROCONTROLLER SYSTEMS [3 0 0 3]

8086: internal architecture, programming the 8086, Addressing modes, Flags; Instruction Set: assembler and Assembler directives, Simple sequence programs, Jumps and conditional jumps, Loop instructions, Instruction timing and delay loops; String instructions, Writing and Using Procedures and Macros, 8255: Programmable Parallel ports and Handshake Input/ Output; Interrupts and Interrupt Responses: 8259 Priority Interrupt Controller, 8254 Software-Programmable Timer/counter; Software interrupts, Intel 8096-16-bitMicrocontroller: Overview; Instruction Set and Programming; Hardware features, , iRMX, ARM processor, Real-Time Executive: iRTX

Text Books:

1. D. V. Hall, "Microprocessors and Interfacing", TMH, Revised Second Edition, 2006.

2. N. S. Kumar, M. Saravanan, et. al. "Microprocessors and Microcontrollers", Oxford Higher Education, 2015.

3. C. Hamacher, Z. Vranesic, "Computer Organization", TMH, 2002.

4. Y. Liu, G.A. Gibson, "Microcomputer Systems- The 8086/8088 Family", PHI Learning private Ltd., 2011.

Reference Books:

1. B. B. Brey, "The Intel Microprocessors", Seventh Edition, Prentice Hall India, 2005.

2. A. Clements, "Microprocessor system design 68000 Hardware", Software, and Interfacing, PWS Publishing Company, Third Edition, 1997.

CS1431 OPERATING SYSTEMS LAB [0 0 1 1]

Testing the use of UNIX commands, UNIX shell commands, Basics of Shell Programming, UNIX System Calls, CPU Scheduling Algorithms, Deadlock Detection Algorithms, Deadlock Avoidance Algorithms, Page Replacement Algorithms, Memory Allocation Algorithms, Disk Scheduling Algorithms, and UNIX Inter Process Communication.

CS1432 RELATIONAL DBMS LAB [0 0 1 1]

DB application development with MS Access, Experiments on DDL and Basic SQL, Advanced SQL, ER diagrams using DIA tool, Data Integrity Constraints and Built-in Functions, Design and Implementing the data requirements of a simple DB application, Experiments on Basic PL/SQL, PL/SQL Exceptions and Transactions, PL/SQL Cursors, PL/SQL Procedures, Functions and Packages, DB application development with Java as front end

CS1433 Microprocessor & Microcontroller Lab [0 0 1 1]

Data and Address transfer Instructions, Simple Arithmetic Instructions, Arithmetic Instructions, BIT Manipulation Instructions: Program execution transfer Instructions, Program execution transfer Instructions, Array operations, String Operations

OPEN ELECTIVES

CS 1490 INTRODUCTION TO LINUX PROGRAMMING [3 0 0 3]

Introduction: UNIX System Overview, Program and Processes, Error Handling, User Identification, Signals, System Calls and Library Functions.: **File I/O:** File Descriptors, Function for File Modification, I/O Efficiency, File Sharing, Atomic Operations.; **Directories:** Stat, Fstat, and Lstat Functions, File Types, Set-User-ID and Set-Group-ID, File Access Permissions , Function for modifying file permission and ownership, Symbolic Links, **System Data Files and Information:** Password File, Shadow Passwords and Other Data Files.; **Process Environment**: Process Termination, Memory Layout of a C Program, Memory Allocation, setjmp and longjmp Functions.; **Process Control:** fork Function, vfork Function, exit Functions, wait and waitpid Functions, Race Conditions, Changing User IDs and Group IDs.; **Process Relationship:** Logins, Process Groups, Sessions, Controlling Terminal, Job Control.; **Signals:** Signal Concepts, Functions to raise and handle Signals, Program Termination, abort and system functions.; **Threads:** Thread Concepts, Creation, Termination and Synchronization, Threads Control, Threads and Signals, Threads and fork, Threads and I/O.;

Text Books:

1. W. R. Steven, S. A. Rago *"Advanced Programming in the Unix environment"*, Addison Wesley, 2011

Reference Books:

1. Y. P. Kanetkar *"Unix Shell Programming"*. BPB Publication, 2009.

CS 1491 **OOPS USING JAVA** **[3 0 0 3]**

Introduction to OOP: Features of Java, How Java is different from C++, Data types, Control Statements, identifiers, arrays, and operators. **Inheritance**: Multilevel hierarchy, method overriding, abstract classes, Final classes, String Class. **Packages and Interfaces**: Defining, Implementing and Importing Packages. **Exceptions**: Fundamentals, Types, Uncaught Exceptions, Multiple catch Clauses, Java's Built-in Exception. **Multithreading**: Creating, Implementing and Extending thread, thread priorities, synchronization suspending, resuming and stopping Threads. **String**: String Constructors, Various Types of String Operations. **Basic Packages of Java**: Java. Lang, Java.util, Java.i.o. **Event Handling:** Event Model, Event Classes, Sources of Events, Event Listener Interfaces **AWT**: Working with Windows, AWT Controls, Layout Managers Applet Class, Architecture, Skeleton, Display Methods. **Swings**: Japplet, Icons, labels, Text Fields, Buttons, Combo Boxes.

Text Books:

1. H. Schildt, *"Java the Complete Reference"*, 8th Edition, TMH, 2008.
   E. Balaguruswamy, *"Introduction to JAVA Programming"*, TMH, 2009.

Reference Books:

1. D. Young, *"Introduction to JAVA Programming"*, PHI, 2008.

CS 1492 DATA STRUCTURES AND ALGORITHMS [3 0 0 3]

Introduction, Algorithm specification; **Performance Analysis**: Time and Space Complexity, Asymptotic notation; pointer declaration and definition, memory allocation functions, array of pointers; The type definition, enumerated types, accessing structures, complex structures, arrays of structures, structures and functions; **Recursion:** Recursive definition & processes, Recursion in C, writing recursive programs efficiency of recursion, Example of Tower of Hanoi, GCD, Fibonacci Definition and examples, Representing stacks in C, Evaluation of expressions, multiple stacks and queues; **Applications**: infix, postfix and prefix and their conversions Linked lists representations, Singly, doubly, header node, circular, Applications: linked stacks and queues, polynomial and long integer arithmetic, union, intersection, Basic terminologies, binary tree representation, recursive/ non recursive, Binary search tree, AVL trees; **Applications**: Expression trees, inserting, deleting, searching, height of BST Terminology and representations, Graph operations, spanning trees, minimum cost spanning tree, shortest path and transitive closure, Binary and linear search, insertion, quick, merge, heap, radix sort Static Hashing

TEXT BOOKS:

1. S. Lipschutz, "*Data Structures with C*", Tata McGraw Hill Education, 2010

REFERENCES:

1. D.Forouzan, R. F. Gilberg, "*A Structured Programming Approach Using C*", Thomson, 2003.
2. A.S. Tenenbaum, J. Augenstein, "*Data Structures using C*", Pearson Education, 2006.
3. E. Horowitz, S. Sahni, "*Fundamentals of Data Structures in C"*, Silicon Press, Second Edition, 2007.

CS 1492 DATABASES & ERP [3 0 0 3]

Introduction to Databases and Transactions: What is database system, purpose of database system, view of data, relational databases, database architecture, transaction management; **Data Models:** The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction; Database Design ,**ER-Diagram and Unified Modeling Language:** Database design and ER Model: overview, ER-Model, Constraints, ER-Diagrams, ERD Issues, weak entity sets, Codd's rules, Relational Schemas; Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF); **Relational Algebra and Calculus:** What is constraints, types of constrains, Integrity constraints; **SQL:** data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers; **Transaction management and Concurrency control**: Transaction management, ACID properties, Serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks),Time stamping methods, optimistic methods, database recovery management; **ERP an Overview**: Enterprise – An Overview, Benefits of ERP, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP. ERP and Related Technologies, Business Process Reengineering (BPR).

TEXT BOOKS:

1. S. Korth, "Database System Concepts", Mc-GrawHill, 6th Edition, 2011.
2. R. Elmasri and S. Navathe, "Fundamentals of Database Systems", Pearson Education, 2006.
3. A. Leon, "ERP Demystified", Tata McGraw Hill, New Delhi, 2000

REFERENCES:

1. D.Forouzan, R. F. Gilberg, "*A Structured Programming Approach Using C*", Thomson, 2003.
2. A.S. Tenenbaum, J. Augenstein, "*Data Structures using C*", Pearson Education, 2006.
3. E. Horowitz, S. Sahni, "*Fundamentals of Data Structures in C"*, Silicon Press, Second Edition, 2007.
4. T. Connolly, C. Begg, "*Database Systems–A Practical Approach to Design, Implementation and Management*", Pearson Education, 3rd Edition, 2002.

B.TECH-I.T.
PROPOSED PROGRAMME SYLLABUS- 2015-19

Fifth Semester

CS 1501 Design and Analysis of Algorithms [3 1 0 4]

Prerequisites: Programming in C, Data Structures

Syllabus:

Algorithm Analysis: A priori and a posteriori Analysis, Time Space Tradeoff, Asymptotic Notations, Properties of asymptotic notations, Recurrence equations, Solving recurrence equations using Substitution method and Master's method; **Trees:** B-Tree, Red Black Tree**; Divide and Conquer:** Binary Search, Finding Maximum and Minimum, Merge Sort, Quick Sort, Matrix Multiplication; **Greedy Algorithms:** Knapsack Problem, Job Sequencing with deadline, Optimal Merge Pattern, Single Source Shortest Path, Minimum Cost Spanning tree; **Dynamic Programming:** Multistage Graphs, Matrix Chain Multiplication, All-Pair shortest paths, Optimal binary search trees, 0/1 Knapsack, Travelling salesperson problem, Graph Traversals, Connected Components, Spanning Trees, Bi-connected components; **Complexity Classes**: Introduction to NP-Hard and NP-Completeness; **Approximation Algorithm**, **Randomized Algorithm.**

Text Books:

1. E. Horowitz, S. Sahni and S. Rajasekaran, *"Computer Algorithms"*, 2nd Edition, University Press, 2007.
4. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, *"Introduction to Algorithms*", 3rd Edition, MIT press, 2009.

Reference Book:

4. A. V. Aho, J. E. Hopcroft and J. D. Ullman, "*The Design and Analysis of Computer Algorithms"*, 1st Edition, Pearson Education, 1999.

CS 1505 AUTOMATA AND COMPILER DESIGN [3 1 0 4]

Prerequisites: Operating System, Data Structures

Syllabus:

Automata introduction: Mathematical Preliminaries and Notation, Three basic concepts and Some Applications on: Deterministic Finite Accepters, Nondeterministic Finite Accepters, Equivalence of Deterministic and Nondeterministic Finite Accepters, Reduction of the Number of States in Finite Automata. Regular Expressions, Identifying Non regular Languages. Introduction to Context-Free grammars & writing grammars, Parsing and Ambiguity, Context-Free Grammars and Programming Languages; **Compiler Design:** Language Processors, The Structure of a Compiler. The Role of the Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, The Lexical-Analyzer Generator Lex. Top-Down Parsing, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars, Parser Generators. Syntax-Directed Definition, Construction of Syntax Trees. Variants of Syntax Trees**; Three-Address Code, Types and Declarations:** Type Expressions, Type Equivalence; **Translation of Expressions:** Operations within Expressions, **Type Checking**: Rules for Type Checking. Storage Organization, Stack Allocation of Space, Issues in the Design of a Code Generator, the Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs.

Text Books:

3. A. V. Aho, Monica S. Lam, R. Sethi and J. D. Ullman, "*Compilers Principles, Techniques and Tools*", Pearson Education, 2006.

Reference Books:

3. D. M. Dhamdhere, "*Systems Programming and Operating Systems*", Tata McGraw Hill, Second Revised Edition, 2001.
4. K.C. Louden, "*Compiler Construction - Principles and Practice*", Thomson, India Edition, 2007.

IT 1502 Software Engineering & Project Management [3 1 0 4]

Prerequisites: Object Oriented Programming

Syllabus:

Introduction to Software Engineering: Software Components, Software Characteristics, Software Crisis, Software Engineering Processes; **Software Development Life Cycle (SDLC) Models:** Water Fall Model, Prototype Model, Spiral Model; **Requirement Engineering Process:** Analysis, Documentation, Review and Management of User Needs, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS; **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; **Categories of Maintenance:** Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, **Reverse Engineering;** The Management spectrum- (The people, the product, the process, the project), Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO) and its types, SEI capability maturity model, Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models.

Text Books:

3. R. S. Pressman, "*Software Engineering: A Practitioners Approach*", McGraw Hill, 2009.
4. R. Mall, "*Fundamentals of Software Engineering"*, PHI Publication, 2014.
5. K. K. Aggarwal and Y. Singh, "*Software Engineering*", New Age International Publishers, 2008.
6. P. Jalote, "*Software Engineering*", Wiley, 2010.

Reference Books:

1. C. Ghezzi, M. Jarayeri and D. Manodrioli, "*Fundamentals of Software Engineering*", PHI Publication, 2002.
2. I. Sommerville, "*Software Engineering*", Addison Wesley, 2013.
3. K aleh,"*Software Engineering*", Cengage Learning, 2010.
4. P. Fleeger, "*Software Engineering"*, Macmillan Publication, 2009.

IT1504 **Data Communications** **[3 1 0 4]**

Syllabus:

Data Transmission: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments, Channel Capacity; **Transmission Media**: Guided Transmission Media, Wireless Transmission, Wireless Propagation, Line-of-Sight Transmission; **Signal Encoding Techniques**: Analog and Digital Signals, Digital-To-Digital Conversion: Line Coding Schemes, Block Coding, Scrambling, Analog-To-Digital Conversion: Pulse Code Modulation, Delta Modulation; **Digital Data Communication Techniques**: Asynchronous and Synchronous Transmission, Types of Errors, Error Detection, Error Correction, Line Configurations; **Data Link Control Protocols**: Flow Control, Error Control, High-Level Data Link Control (HDLC); **Multiplexing:** Frequency-Division Multiplexing (FDM), Time-Division Multiplexing (TDM), Code-Division Multiple Access (CDMA); **Spread Spectrum**: The Concept of Spread Spectrum, Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS); **Cellular Wireless Communication Techniques:** Introduction, Generations: 1G, 2G, 3G, 4G, and 5G.

Text Books:

2. W. Stallings, "*Data and Computer Communications*", Pearson Education, 2007
3. B. Forouzan, "*Data Communications & Networking*", MGH, 2012

Reference Books:

3. L. Peterson and T. Davie "*Computer Networks: A Systems Approach*", Morgan Kaufmann Publishers, 2012.
4. R. Stevens, *"TCP/IP Illustrated*", Addison-Wesley Publication, 2011.

CS1530 Design and Analysis of Algorithms Lab [0 0 2 1]

Prerequisites: Programming in C, Data Structures, Discrete Mathematics

Syllabus:

Sorting & Searching Algorithm –insertion sort, selection sort, binary search. **Basic data structures** stacks and queues, graphs and trees, binary trees. **Algorithmic paradigms -** Recursion, divide-and-conquer – Merge sort, Quick sort, Greedy – Knapsack, Huffman encoding, **Dynamic programming**, lower bounds and optimal algorithms. **Heaps** - Heaps, priority queues, min-max heaps, heap sort. **Dynamic search structures** - Binary search trees, height balancing, B-trees, skip lists, hashing. **Algorithms on arrays** - Linear-time median finding, sorting in linear time (counting sort, radix sort, bucket sort), **String matching** (Rabin-Karp and Knuth-Morris-Pratt algorithms). **Graph algorithms** Traversal (BFS, DFS, topological sort), **Minimum spanning trees** (Prim and Kruskal algorithms), shortest paths (Dijkstra's and Floyd-Warshal algorithms); **Mini-Projects & Case Studies.**

Reference Books:

1. E. Horowitz, S. Sahni and S. Rajasekaran, *"Fundamental of Computer Algorithms"*, 2nd Edition, Universities Press, 2007.
3. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, *"Introduction to Algorithms*", 3rd Edition, MIT press, 2009.

IT 1532 Software Engineering & Project Management Lab [0 0 2 1]

Syllabus:

Design Strategies, Unified Modeling Language (UML 2.0): Use case diagrams, Class diagram, Object diagram, Activity diagram, sequence diagram, component diagram, deployment diagram, state chart diagram, ER Diagrams and DFD Designing Test Cases, SQA plans.

Text Book:

2. W. Boggs and M. Boggs, "Mastering UML with Rational Rose with CDROM" SYBEX Inc., Alameda, CA, USA, 1999.

Sixth Semester

CS1602 **Computer Networks** **[3 1 0 4]**

Prerequisites: Data Communications

Syllabus:

Network Layer: Network layer design issues, routing algorithms, congestion control algorithms, Quality of service, MPLS. Classfull addressing, Sub-netting, Classless addressing, variable length blocks, address allocation; ***Protocols*****:** *ARP & DHCP*: Introduction, Packet Format, message types, IPV4 header format, fragmentation, options, checksum. *ICMP*: Message format, message types. *Dynamic routing protocols*: RIP, OSPF & BGP, *Multicasting Protocol;* **Transport Layer:** Transport services, state diagram, *Elements of Transport Protocols*: addressing, Connection establishment, connection release, Error control and Flow Control, Multiplexing, *Congestion Control:* Bandwidth allocation, regulating the sending rate, *UDP:* UDP header, *TCP:* TCP service model, TCP segment header, TCP connection establishment, TCP connection release, TCP window management, Timer management; **Application Layer:** *DNS*: Name space, domain resource records, *Electronic Mail:* SMTP, POP, IMAP, MIME, HTTP, HTTPS, SNMP; **Network Security:** Security Goals, Attacks, Attack prevention techniques, Firewall, IDS, DMZ, IPsec.

Text Books:

3. A S Tanenbaum, "*Computer Networks*", 5th Ed., Pearson, 2010.
4. B.A. Forouzan, "*TCP/IP Protocol Suite*", 4th Ed., TMH, 2010.

Reference Books:

4. D E. Comer, "*Internetworking with TCP/IP Principles, Protocols and Architecture*," 6th Ed., Pearson Pubs, 2013.

IT 1603 **Data Mining and Warehousing** **[3 1 0 4]**

Pre-requisite: Relational Database Management System

Syllabus:

Data warehousing Components: Building a Data warehouse, Mapping Data Warehouse to a Multiprocessor Architecture, DBMS Schemas for Decision Support , Data Extraction, Data Clean-up, Data Transformation Tools, Metadata; **Business analysis :** Reporting and Query tools and Applications ,Tool Categories, The Need for Applications ,Congo's & Impromptu; Online Analytical Processing (OLAP); **Data mining:** Introduction Data, Types of Data, Data Mining Functionalities ,Interestingness of Patterns, Data Mining Systems , Data Mining, Integration of a Data Mining System with a Data Warehouse; **Pre-processing;** association rule mining and classification: Mining Frequent Patterns, Associations and Correlations Mining ,Mining Various

Kinds of Association Rules , Correlation Analysis, Constraint Based Association Mining; **Classification and Prediction :** Basic Concepts , Decision Tree, Induction, Bayesian, Rule Based, Back propagation, Support Vector Machines Associative Classification, Lazy Learners, Prediction; **clustering and applications and trends in data mining:** Cluster Analysis, Types of Data, Categorization of Major Clustering Methods: K-means, Partitioning Methods , Hierarchical, Density Based, Grid Based, Model-Based Clustering- Web Mining, Text Mining, Spatial Mining, Case study on Data mining with data sets.

Text Books:

5. A. Berson and S. J. Smith, "*Data Warehousing, Data Mining & OLAP*", Tata McGraw – Hill Edition, Tenth Reprint 2007.
6. J.Han and M. Kambher, "*Data Mining Concepts and Techniques*", Second Edition, Elsevier, 2007.

References Books:

3. P. N. Tan, M. Steinbach and V. Kumar, "*Introduction to Data Mining*", Person Education, 2007.
4. K.P. Soman, S. Diwakar and V. Ajay, "*Insight into Data mining Theory and Practice*", Easter Economy Edition, Prentice Hall of India, 2006.

CS1631 Computer Networks Lab [0 0 2 1]

Flow control protocols, error detection and correction techniques, Bit stuffing and character stuffing. Implementation of link state routing protocol, distance vector routing protocol and other routing protocols. TCP and UDP socket programming. Remote method invocation (RMI). Packet analyzer- Wireshark. Network Simulator - 3 Tool.

Reference Books:

2. A S Tanenbaum, *"Computer Networks"*, 5th Edition, Pearson, 2010.
3. B.A. Forouzan, "*TCP/IP Protocol Suite*", 4th Edition, TMH, 2010.
4. L. Laura Chappell, J. Aragon and G. Combs*, "Troubleshooting with Wireshark: Locate the Source of performance Problems*", Laura Chappell University, 2014.
5. Network Simulator – 3 User Manual.

IT1631 Data Mining and Warehousing Lab [0 0 2 1]

Reading data from files and working with datasets, Graphs, Classifiers: Lazy, Decision Trees, Clustering: K-Means, Partitioning Method, Hierarchical Method, Regression, Analysis of variance (ANOVA), Matrices, Functions using R Programming

Text Books:

3. A. Berson and S. J. Smith, "*Data Warehousing, Data Mining & OLAP*", Tata McGraw – Hill Edition, Tenth Reprint 2007.
4. J.Han and M. Kambher, "*Data Mining Concepts and Techniques*", Second Edition, Elsevier

IT 1634 Project [0 0 6 3]

The objective of the project is to motivate them to work in emerging / latest technologies, help the student to develop ability to apply theoretical and practical tools/techniques to solve real life problems related to industry, academic institutions and research laboratories, this project will helps the student make ease and provides enough experience to carry out the Dissertation/thesis work in the 8th semester

Program Elective-I

IT 1551 **Graph Theory** **[3 0 0 3]**

Syllabus:

Fundamental concepts: basic definitions, operations, properties, proof styles; **Trees**: properties, distances and centroids, spanning trees, enumeration; **Matching**: bipartite graphs, general graphs, weighted matching; **Connectivity**: vertex and edge connectivity, cuts, blocks, k-connected graphs, network flows; **Traversibility:** Eulerian tours, Hamiltonian cycles; **Coloring**: vertex and edge coloring, chromatic number, chordal graphs; **Planarity**: duality, Euler's formula, characterization, 4-color theorem; **Advanced topics:** perfect graphs, matroids, Ramsay theory, external graphs, random graphs, Applications.

Text Books:

2. D. B. West, "*Introduction to Graph Theory*", Prentice Hall of India, 2012
3. N. Deo, *"Graph Theory with Applications to Engineering and Computer Science",* Prentice-Hall, 2009

Reference Books:

5. R. Ahuja, T. Magnanti, et al., "*Network Flows: Theory, Algorithms, and Applications*", Prentice-Hall, 2009

IT 1552 **Python Programming** **[3 0 0 3]**

Pre-requisite: OOP's using Java (CS 1304)

Syllabus:

Python Concepts: Introduction to Python, Features, History, Version, Applications, Install, Path, Example, Execute, Variables, Keywords, Identifiers, Literals, Operators, Comments. **Python IDE:** Introduction to Python IDE, Use of Python IDE (Pycharm, Pydev, VIM etc.**). Control Statement:** If, If else, else if, nested if, for loop, while loop, do while, break, continue, pass. **Python OOPs**: OOPs Concepts, Object, Class, Constructors, Inheritance, Multilevel Inheritance, Multiple Inheritance. **Data structures:** List, Set, Dictionary (mapping), Tuple, Graph (from a third-party library), List Slicing (sub list), List comprehension (shorthand for a loop), Mutable and immutable data structures, Distinction between identity and (abstract) value. **Functions:** Procedural abstraction, Functions as values, recursion, Function design methodology. **The Python Library:** String and Text Handling, Data Structures and Algorithms, Threading, Networking, Web Programming, Graphical Programming, Database Access. **Python GUI:** Introduction to python GUI framework, Use of Python GUI.

Text books:

3. A. Martelli, "*Python in a Nutshell*", Second Edition., 2012
4. J. Georzen, T. Bower, B. Rhodes, "*Foundations of Python Network Programming: The comprehensive guide to building network applications with Python*", APress, 2010.

References books:

2. D. M. Beazley, *"Python Essential Reference"*, Amazon Books, 2010.
3. M. Lutz, *"Programming Python, 4th Edition"*, O'Reilly Media, 2010

Open Elective – II (OEC-2)

IT 1590 CRYPTOGRAPHY [3 0 0 3]

Introduction: Security Goals, Cryptographic Attacks, Services and Mechanisms; **Symmetric Ciphers:** Classical Encryption Techniques, Block Ciphers and Data Encryption Standard, Multiple Encryption and Triple DES, Modes of operation of Block Ciphers, Algebraic Structures, GF (2^n) Fields, Advanced Encryption Standard; **Number Theory:** Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, Miller-Rabin Algorithm, Chinese Remainder Theorem, Discrete Logarithms; **Public-Key Cryptography:** RSA Cryptosystem, Diffie-Hellman Key Exchange, ElGamal Cryptosystem, Elliptic Curve Cryptosystem; **Authentication and Key Management:** Cryptographic Hash Functions, Digital Signature, Entity Authentication, Key Management.

Text Books

2. W. Stallings, "*Cryptography and Network Security*", 4th Edition, PHI, 2003.
3. B. A. Forouzan, D. Mukhopadhyay, *"Cryptography and Network Security*", 2nd Edition, Mc-Graw Hill, 2008.

Reference Books:

2. N. Koblitz, "*A Course in Number Theory and Cryptography*", 2nd Edition, Springer, 2012.
3. D. R. Stinson, *"Cryptography: Theory and Practice*", 3rd Edition, CRC Press, 2006.

IT 1591 Introduction to Python Programming [3 0 0 3]

Syllabus:

Python Concepts: What is Python, Python Features, Python History, Python Version, Python Applications, Python Install, Python Path, Python Example, Execute Python, Python Variables, Python Keywords, Python Identifiers, Python Literals, Python Operators, Python Comments. **Python IDE:** Introduction to Python IDE, Use of Python IDE (Pycharm, Pydev, VIM etc.**).**

Control Statement: Python If, Python If else, Python else if, Python nested if, Python for loop, Python while loop, Python do while, Python break, Python continue, Python pass. **Python OOPs**: Python OOPs Concepts, Python Object, Class, Python Constructors, Python Inheritance, Multilevel Inheritance, Multiple Inheritance. **Data structures:** List, Set, Dictionary (mapping), Tuple, Graph (from a third-party library), List Slicing (sub list), List comprehension (shorthand for a loop), Mutable and immutable data structures, Distinction between identity and (abstract) value. **Functions:** Procedural abstraction, Functions as values, recursion, Function design methodology.

Text-books:

2. A. Martelli, "*Python in a Nutshell*", Second Edition., 2012

3. J. Georzen, T. Bower, B. Rhodes, "*Foundations of Python Network Programming: The comprehensive guide to building network applications with Python*", APress, 2010.

Reference books:

4. D. M. Beazley, *"Python Essential Reference"*, Amazon Books, 2010.
5. M. Lutz, *"Programming Python, 4th Edition"*, O'Reilly Media, 2010

Program Elective – II

IT 1652 SOFTWARE QUALITY & ASSURANCE [3 0 0 3]

Pre-Requisite: Software Engineering & Project Management

Syllabus:

Software Metrics : Definition , categories of Metrics , Token Count, Data Structure Metrics, Informational Flow Metrics, Object Oriented Metrics, Project Metrics, Metrics Analysis; Case Study on Metrics **Software Reliability**: Basic concept, Failures and Faults, Reliability Models-Basic Execution Time Model, Logarithmic Poisson Execution Time Model, Calendar Time component, The Jelinski-Moranda Model. Reliability Metrics, Case Study on Reliability; **Software Quality** - Quality attribute, Quality Criteria, Boehm Model, ISO 9126, Bug Seeding Model, Capability Maturity Model; Software Testing, Structural Testing, **Top Down and Bottom up integration:** System integration, Scenario Testing, Defect Bash, Functional versus Non-functional testing, Design/Architecture verification, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing; Acceptance Testing**,** Regression testing, Regression test process, Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing; Ad hoc Testing; **Software Test Automation:** Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection, Testing in Object Oriented Systems, Case Study on software testing. Software Certification.

Text Books:

4. S. Desikan, G. Ramesh, "*Software Testing: Principles and Practices*", Pearson Education, 2006.

5. A. P. Mathur, "*Fundamentals of Software Testing*", Pearson Education, 2008.

Reference Books:

5. K. K. Aggarwal, Y. Singh, "*Software Engineering*", Third Edition, New Age International Publication, 2008.

6. R. Mall,*" Fundamentals of Software Engineering"*, PHI, India 2004

IT 1653 Artificial intelligence [3 0 0 3]

Pre-requisite(s): **Programming in C, Data Structures, Engineering Mathematical - III, Design and Analysis of Algorithms**

Syllabus:

Introduction: What is Artificial Intelligence, Current Trends in AI, **Intelligent Agents:** Agent v/s Software Program, Classification of Agents, Working of an Agent, Single and Multi-Agent System, Performance Evaluation of Agents, Architecture of Intelligent Agents, **AI Problems**-Problem Space, Problem analysis, **Problem Solving Techniques:** Heuristic search Techniques, **Knowledge Representation**: Semantic Networks, Propositional and Predicate Logic: Propositional and Predicate calculus, semantics for predicate calculus, theorem prover, inference rules, unification, Resolution, Refutation in predicate logic, **Natural Language Processing**: Introduction, parsing using context free grammars, Chomsky hierarchy, case grammar, **Learning**-Supervised, unsupervised**, Symbolic learning:** Rote Learning, learning by taking, learning by example, explanation based learning, learning by parameter adjustment, **Soft Computing**: **Neural Networks:** Perceptron, Back Propagation, Hop-field Networks, **Introduction to Genetic Algorithms**-a simple GA algorithm, Application to GA - robot path Planning, optimization

Text Books:

1. E. Rich, K. Knight, and S.B. Nair, "*Artificial Intelligence*", 3rd Ed., Tata McGraw Hill, 2009.

2. S. Russell, and P. Norvig, "*Artificial Intelligence: A Modern Approach*", Prentice Hall, 2011.

Reference Books:

1. N. J. Nilsson , "*Artificial Intelligence: A New Synthesis*", Morgan, 2009.

IT 1654 **Data Science** **[3 0 0 3]**

Pre-requisite: Python Programming

Syllabus:

Descriptive Statistics: Introduction, Descriptive Statistics, Probability Distribution; **Inferential Statistics:** Inferential Statistics through Hypothesis Testing, Permutation and Randomization Test; **Regression and ANOVA:** regression analysis, analysis of variance; **Machine Learning:** Differentiating algorithmic and model based framework, OLS, RIDGE & LASSO regression, KNN & classification; **Supervised Learning with regression and Classification technique:** Bias-Variance Dichotomy, Logistic Regression, LDA, QDA, Regression and Classification Trees, SVM, Ensemble Methods, random Forest; **Prescriptive Analysis:** Creating Data through Designed Experiments, Active learning, Reinforcement Learning.

Text-books:

1. H. Trevor et al., "*the elements of statistical learning*", Vol. 2. No.1.New York, Springer, 2009.

References Books:

1. C. Douglas and C. George, "*Applied Statistics and Probability for Engineers*", John Wiley and Sons, 2010

Open Elective – III (OEC-3)

IT 1692 **Introduction to Data Science** **[3 0 0 3]**

Course Objectives: To understand the Fundamentals of the data science by extending the various data mining models to large data Set.

Syllabus:

Descriptive Statistics: Introduction, Descriptive Statistics, Probability Distribution; **Inferential Statistics:** Inferential Statistics through Hypothesis Testing, Permutation and Randomization Test; **Regression and ANOVA:** regression analysis, analysis of variance; **Machine Learning:** Differentiating algorithmic and model based framework, OLS, RIDGE & LASSO regression, KNN & classification; **Supervised Learning with regression and Classification technique:** Bias-Variance Dichotomy, Logistic Regression, LDA, QDA, Regression and Classification Trees.

Text-books:

1. H. Trevor et al., "*the elements of statistical learning*", Vol. 2. No.1.New York, Springer, 2009.

References Books:

2. C. Douglas and C. George, "*Applied Statistics and Probability for Engineers*", John Wiley and Sons, 2010

IT 1693 Advanced Topics in Computing [3 0 0 3]

Prerequisites: None

Syllabus:

System models for advanced computing: clusters, Distributed computing, grid computing and Cloud computing, Features of grid and cloud platform, Virtualization and Cloud Computing, Cloud Computing services models and features in Saas, Paas and Iaas, Service oriented architecture and web services; Features of cloud computing architectures and simple case studies; **Introduction to Big data**: characteristics of Big data and dimensions of scalability (5 V), Data and Data Science Capability as a Strategic Asset, Data-Analytic Thinking, Case study on Big data analysis; **Introduction to super computers**: basic concepts of parallelism, case study on application of supercomputing in different domains; **Introduction to security**: Security attributes, security attacks and counter measures, Symmetric & Asymmetric key encryption, Case study on security attacks.

Text Books:

1. K.G. C. Fox, J. J. Dongrra, "*Distributed and Cloud Computing*", Elsevier India 2012
2. R.K. Buyya, C. Vecchiola and S. Selvi, "*Mastering Cloud Computing*", TMH, 2012.
3. W. Stallings, "*Cryptography and Network Security*", Prentice Hall, 2015.

Reference Books:

1. J. Hurwitz, A. Nugent, F. Halper, M. Kaufman, "*Big Data for Dummies*", Wiley publications, 2012.
2. P. Pacheco, "*An Introduction to Parallel Programming*", Elsevier publication, 2011.

Cryptography & Network Security [3 1 0 4]

Elements of Number Theory : Euclid Algorithm, Prime Number Theorem, Euler's, Fermat's Little theorems, Entropy ; **Classical Cipher Techniques**: Caesar, Affine, Mono-alphabetic, Transposition, Polyalphabetic Ciphers; **Security Attacks**: Active V/S Passive, Security Services; **Symmetric Encryption:** Fiestel Cipher, Confusion and Diffusion, DES Algorithm; **Asymmetric Encryption**: Principles of Public Key Cryptosystems, RSA Algorithm; Message Authentication & Hashing; **Digital Signatures**: RSA Based, El-Gamal Signatures; **Key distribution; User Authentication Protocols**; **E-Mail Security**: PGP, S/MIME; **IPsec**: AH & ESP; **SSL; TLS**; **Intrusion Detection**: Statistical Anomaly Detection, Rule based detection, honeypots; **Password Protection**.

TEXT BOOKS:

III S. Williams, "*Cryptography and Network Security: Principles and Practices*", Pearson Education, 2008.

JJJ A. Kahate, "*Cryptography and Network Security*", Tata Mc-Graw Hill, 2006.

REFERENCES:

5. K. Charlie, "*Network Security: Private Communication in a Public World*", Pearson Education, 2008.
6. V. Bagad, I. Dhotre, "*Cryptography and Network Security* ", Technical Publications, 2008.

B.A. Forouzan, "*Network Security* ", Tata Mc-Graw Hill, 2007.

IT 1702 ADVANCES DATA STRUCTURES [3 1 0 4]

Advanced Trees: Definitions, **Red Black Trees:** Height of a Red Black Tree, Red Black Trees Bottom-Up Insertion, Top Down Red Black Trees, Top-Down Deletion in Red Black Trees, Analysis of Operations. **2-3 Trees:** Advantage of 2-3 trees over Binary Search Trees, Search and Update Operations on 2-3 Trees, Analysis of Operations, Dictionaries; **Fibonacci Heaps** : Structure of Fibonacci Heaps, Merge able Heap Operations, Decreasing key and deleting a node, bounding the maximum degree, Binomial Trees, Implementing Binomial Heaps and its Operations, **Graph Theory Algorithms**: Algorithms for Connectedness, Finding all Spanning Trees in a Weighted Graph, The Lightest Hamiltonian Circuit (Travelling Salesman's Problem) :The Annealing Algorithm and the Karp–Held Heuristics, Maximum Matching in Bipartite Graphs: The Hungarian Algorithm, Maximum Flow in a Transport Network : The Ford–Fulkerson Algorithm; **Sorting Network**: Comparison network, zero-one principle, bitonic sorting and merging network sorter. Priority Queues and Concatenable Queues using 2-3 Trees. Operations on Disjoint sets and its union-find problem, Implementing Sets; **Number Theoritic Algorithm**: Number theoretic notions, Division theorem, GCD, recursion, Modular arithmetic, Solving Modular Linear equation, Chinese Remainder Theorem, power of an element, Computation of Discrete Logarithms, primality Testing and Integer Factorization.

Text Books:

5. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, *"Introduction to Algorithms*", 3rd Edition, MIT press, 2009.
6. Narshing Deo, "*Graph Theory with Applications to Engineering and Computer Science*", 1979.

Reference Book:

1. E. Horowitz, S. Sahni and S. Rajasekaran, *"Computer Algorithms"*, 2nd Edition, University Press, 2007.
4. V. Aho, J. E. Hopcroft and J. D. Ullman, "*The Design and Analysis of Computer Algorithms"*, 1st Edition, Pearson Education, 1999

IT1732 Cryptography & Network Security Lab [0 0 1 1]

The aim of this laboratory is to introduce the student to the areas of cryptography and cryptanalysis. This course develops a basic understanding of the algorithms used to protect users online and to understand some of the design choices behind these algorithms. Our aim is to develop a workable knowledge of the mathematics used in cryptology in this course. The course emphasizes to give a basic understanding of previous attacks on cryptosystems with the aim of preventing future attacks.

Implementation of Ceaser Cipher using Java or Python.

Affine Cipher with equation c=3x+12, polyalphabetic Cipher,
Hill Cipher.

DES Algorithm.

Euclidean Algorithm.

Simple RSA Algorithm with small numbers,
Hashing Algorithms using Java or Python.

IT1733 Advance Data Structures Lab [0 0 1 1]

This laboratory provides a concise introduction to the fundamental concepts in Advance Data Structure and data types. The main objective is to understand heap and various tree structures like AVL, Red-black, B and Segment trees, the problems such as line segment intersection, convex shell and Voronoi diagram. The major lab components includes

Min/Max Heap

Leftist Heap

AVL Trees

Red-Black Trees

B-Trees Segment

Trees Line

segment intersection

Convex Hull

Voronoi Diagram

Program Electives

IT 1753 **Mobile Computing** **[3 0 0 3]**

Course Objectives: To let the students know the basics of wireless/mobile communication and related concepts and the working of mobile computing systems

Syllabus: Evolution of mobile radio communication, Transmission fundamentals; **Modulation techniques:** Signal encoding criteria, Overview of ASK, PSK, FSK, MSK, Spread spectrum modulation; **Cellular concepts:** Frequency reuse, Channel assignment strategies, Handoff strategies; **Wireless LAN:** Overview of Wireless LAN Technology; Infrared LANS, Spread Spectrum LANs, Narrowband microwave LANS; IEEE 802 Protocol Architecture, IEEE 802.11 Architecture and Services, IEEE 802.11 Medium Access Control and IEEE 802.11 Physical Layer. **Bluetooth:** Radio Specification; Baseband Specification; Link Manager Specification; Logic Link Control and Adaptation Protocol; HiperLAN 1 and HiperLAN 2; Wireless Sensor Networks. **Mobile Computing:** Mobile IP, ubiquitous and nomadic computing; Wireless LANS & the wireless world wide web; Mobile agent technology and standards; **Case studies** :Agent TCL, aglets, PMADE, system design.

TEXT BOOKS:

7. T.S. Rappaport, "*Wireless Communications - Principle and Practice*", Second Edition, PHI, 2005.
8. W. Stallings, "*Wireless Communication and Network",*' Second Edition, PHI, 2004.

REFERENCES:

5. R. Pandya "*Mobile and Personal Communication systems and services*", PHI, 2001.
6. M. Ciampa, "*Guide to Designing and Implementing wireless LANs*", Thomson learning, Vikas Publishing House, 2001.

IT 1754 **Software Define Networks** **[3 0 0 3]**

Syllabus: Software Defined Networking (SDN), Separation of Control Plane and Data Plane, IETF Forces, Active Networking; **Control and Data Plane Separation**: Concepts, Advantages and Disadvantages, the Open Flow protocol; **Network Virtualization:** Concepts, Applications, Existing Network Virtualization Framework (VMWare and others), Mininet based examples; **Control Plane:** Overview, Existing SDN Controllers including Floodlight and Open Daylight projects; **Customization of Control Plane:** Switching and Firewall Implementation using SDN Concepts; **Data Plane:** Software-based and Hardware-based, Programmable Network; **Hardware Programming SDNs:** Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs, Network Functions **Virtualization (NFV) and Software Defined Networks:** Concepts, Implementation and Applications; **Data Center Networks:** Packet, Optical and Wireless Architectures, Network Topologies; **Use Cases of SDNs:** Data Centers, Internet Exchange Points, Backbone Networks, Home Networks, Traffic Engineering. Programming Assignments for implementing some of the theoretical concepts listed above.

TEXT BOOKS:

4. T. D. Nadeau, K. Gray *"SDN: Software Defined Networks, An Authoritative Review of Network Programmability Technologies"*, O'Reilly Media, August 2013.
5. P. Goransson, C. Black, *"Software Defined Networks: A Comprehensive Approach",* Morgan Kaufmann, June 2014.

REFERENCES:

5. F. Hu, *"Network Innovation through Open Flow and SDN: Principles and Design",* CRC Press, 2014.
6. V. Tiwari, *"SDN and Open Flow for Beginners"*, Amazon Digital Services, Inc., ASIN, 2013.

IT 1759 **Social Network Analysis** **[3 0 0 3]**

Syllabus:

Introduction to Social Web: Nodes, Edges and Network measures, Describing Nodes and Edges, Describing Networks, Layouts; **Visualizing Network features:** The role of Tie Strength, Measuring Tie Strength, Tie Strength and Network Structure, Tie Strength and Network Propagation, Link Prediction, Entity Resolution; **Link Prediction:** Case Study Friend Recommendation, Introduction to Community Discovery, Communities in Context, Quality Functions; **Algorithms:** The Kernighan-Lin algorithm, Agglomerative Algorithms, Spectral Algorithms, Multi-level Graph Partitioning, Markov Clustering, Other Approaches; **Introduction to Social Influence**: Influence Related Statistics, Social Similarity and Influence, Homophile, Existential Test for Social Influence, Influence and Actions, Influence and Interaction, Influence Maximization in Viral Marketing

TEXT BOOKS:

2 J. Goldbeck, *"Analyzing the Social Web",* Morgan Kaufmann Publications, 2013.

3 C. C. Aggarwal, "*Social Network Data Analytics*", Springer Publications, 2011.

REFERENCES:

4. J. Scott, *"Social Network Analysis", (3e),* SAGE Publications Limited, 2013.

5. Jay Goldman, *"Facebook Cookbook",* O'Reilly, 2009.

6. S.Kumar, F. Morstatter, H. Liu, "Twitter Data Analytics", Springer Publications, 2013

IT 1760 **Natural Language Processing** **[3 0 0 3]**

Syllabus:

Introduction: Human languages, models, ambiguity, processing paradigms; Phases in natural language processing, applications. Text representation in computers, encoding schemes; **Linguistics resources:** Introduction to corpus, elements in balanced corpus, WordNet, VerbNet; **Part of Speech** tagging- Stochastic POS tagging, HMM, Transformation based tagging (TBL), Handling of unknown words, named entities, multi word expressions; **Natural language grammars**: lexeme, phonemes, phrases and idioms, word order, agreement, tense, aspect and mood and agreement, Context Free Grammar, spoken language syntax; **Parsing-** Unification, probabilistic parsing, Tree-Bank; **Semantics:** Meaning representation, semantic analysis, lexical semantics, WordNet; **Word Sense Disambiguation**: Selection restriction, machine learning approaches, dictionary based approaches; **Discourse:** Reference resolution, constraints on co-reference, algorithm for pronoun resolution, text coherence, discourse structure; **Applications of NLP**: Spell-checking, Text Summarization and Information Retrieval ; **IBM Watson Machine Translation:** Overview, Sentiment Analysis; Text Entailment, Textual Alignment, Skip Bigram, LFACS, Logical Form Graphs

Text Book:

1. D. Jurafsky , J. H. Martin, *"Speech and Language Processing",* 2e, Pearson Education, 2009.

Reference Books:

3. C. Eugene, *"Statistical Language Learning",* MIT Press, 1999.
4. T. Siddiqui , U. S. Tiwary, *"Natural language processing and Information retrieval",* OUP, 2008.

IT1761 Advance Machine Learning Techniques [3 0 0 3]

Syllabus:

Introduction: overview of machine learning, related areas, applications, software tools, course objectives; **Parametric regression:** linear regression, polynomial regression, locally weighted regression, numerical optimization, gradient descent, kernel methods; **Generative learning:** Gaussian parameter estimation, maximum likelihood estimation, MAP estimation, Bayesian estimation, bias and variance of estimators, missing and noisy features, nonparametric density estimation, Gaussian discriminant analysis, naive Bayes; **Discriminative learning:** linear discrimination, logistic regression, logit and logistic functions, generalized linear models, softmax regression; **Neural networks:** the perceptron algorithm, multilayer perceptron's, back propagation, nonlinear regression, multiclass discrimination, training procedures, localized network structure, dimensionality reduction interpretation; **Support vector machines:** functional and geometric margins, optimum margin classifier, constrained optimization, Lagrange multipliers; **Unsupervised learning:** K-means clustering, expectation maximization, Gaussian mixture density estimation, mixture of naive Bayes, model selection; **Dimensionality reduction:** feature selection, principal component analysis, linear discriminant analysis, factor analysis, independent component analysis, multidimensional scaling, manifold learning.

TEXT BOOKS:

5. Hastie T., Tibshirani R., Friedman J., "*The Elements of Statistical Learning*", 2e, Pearson 2008

6. P. Harrington, "*Machine Learning in Action*", Manning Publication, 2012.

REFERENCES:

5. D. Barber, "*Bayesian Reasoning and Machine Learning*", Cambridge University Press, 2012.
6. S. Ben-David, S. Shalev- Shwartz, "*Understanding Machine Learning: From Theory to Algorithms"*, Cambridge University Press, 2014.

IT 1762 **Semantic Web** **[3 0 0 3]**

Syllabus:

Introduction to advanced web technology: Technological issues, XML processing, RDF processing; **Middleware technologies:** DCOM ,CORBA, IIOP, RMI, RPC; **Taxonomies and ontologies for advanced web applications:** Ontology modeling, Languages for representing ontologies on the web, Rules and inferences; **Web services**: Design and modeling of web services, Technologies for Implementing web services, SOA, SOAP,Current applications of advanced web technologies. **Metadata classification:** from Syntax to Semantics. Metadata representation and choices for annotation. Extracting metadata from semi-structured data including research, techniques and tools. Extracting metadata from unstructured text including research, techniques and tools. Comprehensive literature review. **Automatic Classification**: Overview of research and techniques for automatic classification. Statistical, Machine Learning, Language Based and Knowledge Based techniques. Classifier committee.

TEXT BOOKS:

7. G. Antoniou, F. V. Harmelen, *"Semantic Web Primer",* MIT Press , 2008
8. J. C. Jackson, *"Web Technologies: A Computer Science Perspective",* Prentice Hall , 2006

REFERENCES:

1. P.K. Yuen, V. Lau, *"Practical Web Technologies"*, Addison Wesley, September 9, 2003

OPEN ELECTIVES

IT 1791 Introduction to Real Time Systems [3 0 0 3]

Syllabus:

Introduction: Modeling Timing constraints; **Scheduling Real-Time Tasks**: Types of Schedulers, table-driven, Cyclic, EDF, and RMA; **Handling Resource**: sharing among real-time tasks; **Multiprocessor Scheduling:** Scheduling Real-Time Tasks in Multiprocessor and Distributed systems; **Commercial Real-time operating systems:** General concepts, Unix and Windows as RTOS, Survey of commercial RTOS, Real-Time Communication, Real-Time Databases.

TEXT BOOKS:

1. J. W. Liu, "*Real-Time Systems*" Pearson Education, 2005.

REFERENCES:

5. K. Shin, "*Real-TIme Systems*" Tata McGraw Hill, 2009.
6. A.C. Shaw, "*Real-Time Systems and Software*", Wiley, 2001.
7. R. Mall, "*Real-Time Systems: Theory and Practice*", Pearson Education, 2009.

IT 1792 **Information & Web Security** **[3 0 0 3]**

Syllabus:

Introduction: Security mindset, Computer Security Concepts (CIA), Threats, Attacks, and Assets. **Software Security:** Vulnerabilities and protections, malware, program analysis. Malicious software (Viruses, trojans, rootkits, worms, botnets) Memory exploits (buffer overflow, heap overflow, integer overflow, format string).**Practical Cryptography:** Encryption, authentication, hashing, symmetric and asymmetric cryptography, Digital Signatures and Certificates. **Network Security:** Network security issues, Sniffing, IP spoofing, Common threats, E-Mail security, IPSec, SSL, PGP, Intruders, Virus, Worms, Firewalls-need and features of firewall, Types of firewall, Intruder Detection Systems. **Cyber Security:** Cyber Crime and security, Security tools, Introduction to Digital Forensic, OS fingerprinting, TCP/IP stack masking, Social Engineering. **Web Security and special topics:** Web application Security, Privacy and Anonymity, public policy, User authentication, authentication-via-secret and session management. Cross Site Scripting, Cross Site Request Forgery, SQL Injection.

TEXT BOOKS:

6. W. Stallings, L. Brown, *"Computer Security: Principles and Practice" 4th edition,* Pearson Education Limited, 26-Jan-2015.

REFERENCES:

5. M. Bishop, *"Introduction to Computer Security"*, Addison-Wesley, 2004
6. J. A.Buchmann, *"Introduction to Cryptography"*, Springer Verlag, 2001.

IT 1881 **Major Project** **[0 0 0 12]**

Major Project targeting students who wish to pursue research & development in industries or higher studies in field of Information technology. The duration of B.Tech final year project is one Semester along with coursework of 8th semester. Students are required to undertake innovative and research oriented projects, which not only reflect their knowledge gained in the earlier semesters but also additional knowledge gained from their own effort. They must show the phase wise development of their project submitting the appropriate documents at the end of each phase. The student must put in effort to find answers to questions about the applications, which will also enhance the value of the project report. There will be one interim and one final seminar for evaluation of the project.

Design and model a system based on real life application.

Plan and execute well defined objectives.

Work in team at component level and system level, Integrate or reuse with-existing components.

Derive performance metrics and assess quantitatively the performance of system Report and present the findings in standard formats.

The duration of B.Tech final year project is one Semester along with coursework of 8th semester. Students are required to undertake innovative and research oriented projects, which not only reflect their knowledge gained in the earlier semesters but also additional knowledge gained from their own effort. They must show the phase wise development of their project submitting the appropriate documents at the end of each phase. The student must put in effort to find answers to questions about the applications, which will also enhance the value of the project report. There will be one interim and one final seminar for evaluation of the project. The student staying at MUJ must complete one audit course on Simulation and Modelling.

AUDIT COURSE

Simulation and Modeling [3 1 0 4]

Introduction to Simulation: Simulation, Advantages, Disadvantages, Areas of application, System environment, components of a system, Model of a system, types of models, steps in a simulation study; **Simulation Examples:** Simulation of Queuing systems, Simulation of Inventory System, Other simulation examples; **General Principles:** Concepts in discrete - event simulation, event scheduling/ Time advance algorithm, simulation using event scheduling; **Random Numbers:** Properties, Generations methods, Tests for Random number- Frequency test, Runs test, Autocorrelation test; **Random Variety Generation:** Inverse Transform Technique- Exponential, Uniform, Weibull, Triangular distributions, Direct transformation for Normal and log normal Distributions, convolution methods- Erlang distribution, Acceptance Rejection Technique; **Optimization Via Simulation:** Meaning, difficulty, Robust Heuristics, Random Search. **Analysis of Simulation Data Input Modelling:** Data collection, Identification and distribution with data, parameter estimation, Goodness of fit tests, Selection of input models without data, Multivariate and time series analysis; **Verification and Validation of Model**: Model Building, Verification, Calibration and Validation of Models; **Output Analysis:** Types of Simulations with Respect to Output Analysis, Stochastic Nature of output data, Measures of Performance and their estimation, Output analysis of terminating simulation, Output analysis of steady state simulations**; Simulation Softwares:** Selection of Simulation Software, Simulation packages, Trend in Simulation Software.

Text Books:

6. J. Banks, et.al, *"Discrete Event system Simulation"*, Pearson Education, Asia, 4th Edition, 2007
7. G. Gordon, *"System Simulation"*, Prentice Hall publication, 2nd Edition, 1978

Reference Books:

5. A. M. Law, W. D. Kelton, *"Simulation Modelling & Analysis"*, McGraw Hill International Editions – Industrial Engineering series, 2007.
6. N. Deo, *"Systems Simulation with Digital Computer"*, PHI Publication (EEE), 3rd Edition, 2004.