Regulation: GNITC - R18

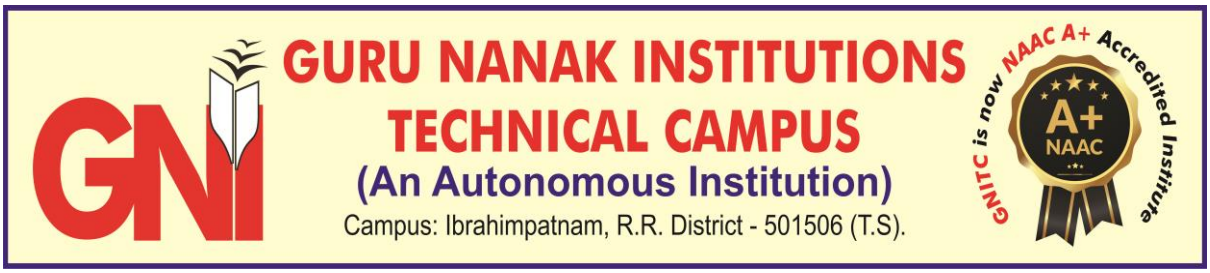
COURSE STRUCTURE
&
DETAILED SYLLABUS

for

II & III Year
B.Tech. Degree Course

(Applicable for the batch admitted from 2020-21)

DEPARTMENT OF
COMPUTER SCIENCE & ENGINEERING
(Data Science)



GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)
SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)
COURSE STRUCTURE
(Applicable for the Batch admitted from 2020-2021)

III SEMESTER (SECOND YEAR)

S. No.	Subject Code	Group	Subject	L	T	P	Cred
1	18ES0EC24	ESC	Analog & Digital Electronics	3	0	0	3
2	18PC0CS01	ESC	Computer Organization & Architecture	3	O	0	3
3	18PC0CS02	PCC	Data Structures	3	0	0	3
4	18PC0CS03	PCC	Discrete Mathematics	3	0	0	3
5	18PC0CS28	PCC	Python Programming	3	0	0	3
6	18PC0CS25	ESC	Analog & Digital Electronics Lab	0	0	4	2
7	18PC0CS05	PCC	Data Structures Lab	0	0	3	1.5
8	18PC0CS29	PCC	Python Programming Lab	0	0	3	1.5
9	18PC0CS06	PCC	IT Workshop Lab	0	0	2	I
10	18MC0CS02	MC	Fundamentals of Cyber Security				
5 Theory + 4 Lab			Total Credits	15	0	12	21

IV SEMESTER (SECOND YEAR)

S. No.	Subject Code	Group	Subject	L	T	P	Credits
1	18BS0MA06	BSC	Mathematical and Statistical Foundations	3	0	0	3
2	18PC0CS015	PCC	Formal Languages & Automata Theory	3	O	0	3
3	18PC0CS04	PCC	Object Oriented Programming through Java	3	0	0	3
4	18PC0CS09	PCC	Data Base Management System	3	0	0	3
5	18PC0CS10	PCC	Operating Systems	3	0	0	3
6	18PC0CS07	PCC	Object Oriented Programming through Java Lab	0	0	4	2
7	18PC0CSI2	PCC	Data Base Management System Lab	0	0	3	1.5
8	T8PC0CS 13	PCC	Operating Systems Lab	0	0	3	1.5
9	18PC0CS30	PCC	R Programming Lab	0	0	2	I
5 Theory + 4 Lab			**Total Credits**	**15**	**00**	**12**	**21**

L – Lecture **T** – Tutorial **P** – Practical

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)
SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)
COURSE STRUCTURE
(Applicable for the Batch admitted from 2020-2021)

V SEMESTER (THIRD YEAR)

S. No.	Subject Code	Group	Subject	L	T	P	Credits
1	18PC0DS01	PCC	Design and Analysis of Algorithms	3	0	0	3
2	18PC0DS02	PCC	Foundations of Data Science	3	0	0	3
3	18PC0DS03	PCC	Data Mining and Data warehousing	3	0	0	3
4		PEC	Professional Elective - I	3	0	0	3
5		OE	Open Elective – I	3	0	0	3
6		HSMC	Effective Technical Communication	3	0	0	3
7	18PC0DS04	PCC	Foundations of Data Science Lab	0	0	3	1.5
8	18PC0DS05	PCC	Data Mining and Data warehousing Lab	0	0	3	1.5
9	18MC0DS01	MC	Environmental Science	3	0	0	0
6 Theory + 2 Lab + 1 MC			**Total Credits**	**21**	**0**	**06**	**21**

VI SEMESTER (THIRD YEAR)

S. No.	Subject Code	Group	Subject	L	T	P	Credits
1	18PC0DS06	PCC	Machine Learning	3	0	0	3
2	18PC0DS07	PCC	Computer Networks	3	0	0	3
3		PEC	Professional Elective – II	3	0	0	3
4	18PC0DS08	PCC	Natural Language Processing	3	0	0	3
5		PEC	Professional Elective – III	3	0	0	3
6		OE	Open Elective-II	3	0	0	3
7	18PC0DS09	PCC	Machine Learning Lab	0	0	3	1.5
8	18PC0DS10	PCC	Computer Networks Lab	0	0	3	1.5
9	18MC0DS02	MC	Fundamentals of Cyber Security	3	0	0	0
6 Theory + 2 Lab + 1 MC			**Total Credits**	**21**	**00**	**06**	**21**

L – Lecture **T** – Tutorial **P** – Practical

List of Electives

Professional Elective-1:

1. Principles of Software Development – 18PE0DS1A
2. Artificial Intelligence – 18PE0DS1B
3. DevOps – 18PE0DS1C

Professional Elective-2:

1. Social Media Analytics – 18PE0DS2A
2. Object-Oriented Analysis and Design through UML – 18PE0DS2B
3. Data Wrangling, Exploration, and Visualization – 18PE0DS2C

Professional Elective-3:

1. Time Series Analysis and its Applications – 18PE0DS3A
2. Data Visualization Techniques – 18PE0DS3B
3. Web Programming – 18PE0DS3C

List of Open Electives:

1. Data Science with Python – 18OE0DS01
2. R Programming – 18OE0DS02
3. DevOps – 18OE0DS03
4. Data Analysis using Python – 18OE0DS04

II Year B.Tech. Sem-I

L	T	P	C
3	0	0	3

COMPUTER ORGANIZATION & ARCHITECTURE (18PC0CS01)

PRE-REQUISITE:

1. A course on "Programming for Problem Solving"

CO-REQUISITE:

1. A course on "Analog & Digital Electronics"

COURSE OBJECTIVE:

This course is intended to pertain the knowledge of computer science and electronics engineering to computer hardware and assembly level programming

SYLLABUS:

UNIT – I

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt, Complete Computer Description.

UNIT – II

Micro Programmed Control: Control memory, Address sequencing, micro program example, design of control unit. Central Processing Unit: General Register Organization, STACK organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT – III

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation, Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT – IV

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access, Input –Output Processor (IOP).

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

UNIT – V

Reduced Instruction Set of Computer: CISC Characteristics, RISC Characteristics.

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing.

Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Inter processor arbitration, Inter processor communication and synchronization,

Cache Coherence.

TEXT BOOKS:

1. Computer System Architecture – M. Moris Mano, Third Edition, Pearson/PHI.
2. Computer Organization – Car Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition, McGraw Hill.

REFERENCE BOOKS:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson.

COURSE OUTCOMES:

By the end of the course, the students will be able to

CO 1: describe the basic structure and fundamentals of computer

CO 2: discuss the RTL, Micro operations and micro programmed control

CO 3: interpret the data and storage organization

CO 4: model the Computer Architectures

CO 5: write and examine the assembly language programs for various applications

II Year B.Tech. CSE Sem-I

L	T	P	C
3	0	0	3

DATA STRUCTURES (18PC0CS02)

PRE-REQUISITE:
1. A course on "Programming for Problem Solving"

CO-REQUISITE:
1. A course on "Discrete Mathematics"

COURSE OBJECTIVE:
This course provides a comprehensive study of abstract data types, basic data structures, solve the problems using different data structures and design techniques, compare their performance and tradeoffs

SYLLABUS:

UNIT - I
Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

UNIT - II
Dictionaries: linear list representation, skip list representation, operations - insertion, deletion and searching.
Hash table representation: hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

UNIT - III
Search Trees: Binary Search Trees, Definition, Implementation, Operations-Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black, Splay Trees.

UNIT - IV
Graphs: Graph Implementation Methods. Graph Traversal Methods.
Sortings: Heap Sort, External Sorting- Model for external sorting, Merge Sort.

UNIT - V
Pattern matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

TEXT BOOKS:
1. Fundamentals of data structures in C, 2nd Edition, E.Horowitz, S.Sahni and Susan Anderson Freed, Universities Press.
2. Data structures using C – A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

REFERENCE BOOKS:
1. Data structures: A Pseudocode Approach with C, 2 nd edition, R.F.Gilberg and B.A.Forouzan, Cengage Learning.
2. Introduction to data structures in c, 1/e Ashok Kamthane.

COURSE OUTCOMES:

By the end of the course, students will be able to

CO 1: define and express algorithm correctness and time efficiency

CO 2: identify appropriate data structures for solving computing problems in respective language

CO 3: apply the data structure concepts for realistic problems using trees and graphs

CO 4: solve problems independently and critical thinking

CO 5: compare the various searching and sorting techniques along with their Implementations

II Year B.Tech. CSE Sem-I

L	T	P	C
3	0	0	3

DISCRETE MATHEMATICS (18PC0CS03)

PRE-REQUISITE:
1. A course on "Mathematics-I"

CO-REQUISITES:
1. A course on "Analog & Digital Electronics"
2. A course on "Data Structures"

COURSE OBJECTIVE:
This course is intended to acquire the ability to work with concepts of discrete structures that includes areas such as functions, relations, sets, predicate logic, combinatorics and graph theory

SYLLABUS:

UNIT-I

Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Disjunctive and Conjunctive Normal Form, Rules of Inference, The use of Quantifiers.

Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

UNIT-II

Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

UNIT-III

Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and Combination.

UNIT-IV

Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function.

UNIT-V

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring

Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.

TEXT BOOKS:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It's Application
to Computer Science, TataMcgraw-Hill
2. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented
Approach, 3rd Edition by, Tata McGraw – Hill
3. Abraham Kandel, Joe L. Mott, Theodore P. Baker, Discrete Mathematics for Computer
Scientists & Mathematicians, 2nd ed. , Pearson Education

REFERENCE BOOKS:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2. Susanna S. Epp, Discrete Mathematics with Applications,4th edition, Wadsworth
Publishing Co. Inc.
3. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press.
4. Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson, Discrete Mathematics,
TataMcGraw – Hill
5. Thomas Koshy, Discrete Mathematics with Applications, Elsevier.

COURSE OUTCOMES:

By the end of the course, students will be able to

CO 1: identify the validity of argument by using propositional and predicate calculus

CO 2: illustrate the basic terminology of relations, functions and lattices

CO 3: relate the basic counting techniques to solve the combinatorial problems

CO 4: produce the recurrence relations through recursively defined structures

CO 5: apply the basic concepts of graph theory to related theoretical problems

II Year B.Tech. CSE Sem-I

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3	0	0	3

PYTHON PROGRAMMING (18PC0CS28)

PRE-REQUISITE:

1. A course on "Programming for Problem Solving"

COURSE OBJECTIVE:

This course will enable students to learn Syntax and Semantics and create Functions, handle Strings and Files, understand Lists, Dictionaries and Regular expressions, implement Object Oriented Programming concepts in Python.

SYLLABUS:

UNIT-I

Python Basics, PythonObjects- Python Objects, Other Built-in Types, Internal Types,Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types,Unsupported Types.

Numbers - Introduction to Numbers, Integers, Double Precision Floating Point Real Numbers, Complex Numbers, Operators, Built-in and Factory Functions, Related Modules

Sequences - Strings, Lists, and Tuples, Mapping and Set Types, Conditionals and Loops

UNIT-II

Files: File Objects, File Built-in Function [open() and file()], File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules

Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management,*Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, *CreatingExceptions,Why Exceptions (Now)?, Why Exceptions at All?, Exceptions and the sys Module, RelatedModules

Functions and Functional Programming: Calling Functions, Creating Functions, Passing Functions, Formal Arguments, Variable-Lenth arguments, Functional Programming, Variable Scope, *Recursion, Generators.

Modules: Modules and Files, Namespaces, Importing Modules, Features of Module Import, ModuleBuilt-in Functions, Packages, Other Features of Modules

UNIT-III

Regular Expressions: Introduction, Special Symbols and Characters, REs and Python

Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the GlobalInterpreter Lock, Thread Module, Threading Module, Related Modules

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs

WEB Programming: Introduction, Wed Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application Advanced CGI, Web (HTTP) Servers

UNIT-IV

Database Programming: Introduction, Python Database Application Programmer's Interface (DBAPI),Object Relational Managers (ORMs), Related

Modules
Numpy, SciPy: Introduction, Basics of NumPy and SciPy, Examples using NumPy for Various Operations

UNIT-V

SymPy: Introduction, Basics of SymPy 1, Basics of SymPy2, Sets in SymPy, Matrices, The Equality Class and Eq, The Solvers Module of SymPy, The linsolve() Method, Calculus with SymPy
Pandas: Open Source Data Analysis and Manipulation Tool: Introduction, Basics of pandas, using pandas for Working on Files in Various Formats
Matplotlib: Introduction, Basic Concepts, Creating Multiple Subplots

TEXT BOOKS:

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.
2. Python Programming – Problem Solving, Packages, and Libraries, Anurag Gupta, GP Biswas, McGraw Hill

REFERENCE BOOKS:

1. Think Python, Allen Downey, Green Tea Press
2. Python for Data Science, Mohd.Abdul Hameed, Wiley
3. Introduction to Python, Kenneth A. Lambert, Cengage
4. Core Python Programming, R.Nageswara Rao, Dreamtech Press
5. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
6. Learning Python, Mark Lutz, O'Relly

COURSE OUTCOMES:

By the end of the course, students will be able to

CO 1: examine Python syntax and semantics and be fluent in the use of Python flow control and functions
CO 2: demonstrate proficiency in handling Strings and File Systems
CO 3: create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions
CO 4: interpret the concepts of Object-Oriented Programming as used in Python
CO 5: implement exemplary applications related to Network Programming, Web Services and Databases in Python

II Year B.Tech. CSE Sem-I

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0	0	4	2

DATA STRUCTURES LAB (18PC0CS05)

CO-REQUISITE:

1. A course on "Data Structures"

COURSE OBJECTIVE:

This lab course is intended to write and execute programs in C to solve problems using data structures such as linked lists, stacks, queues, trees, graphs, hash tables search trees, pattern matching techniques and implement various searching and sorting methods

SOFTWARE REQUIREMENTS:

Turbo C / Linux

SYLLABUS:

LIST OF PROGRAMS

1. Write a program that uses functions to perform the following operations on singly linked list.
   i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.
   i) Creation ii) Insertion iii) Deletion iv) Traversal
3. Write a program that uses functions to perform the following operations on circular linked list.
   i) Creation ii) Insertion iii) Deletion iv) Traversal
4. Write a program that implement stack (its operations) using
   i) Arrays ii) Pointers
5. Write a program that implement Queue (its operations) using
   i) Arrays ii) Pointers
6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
   i) Bubble sort ii) Merge sort iii) Heap sort
7. Write a program that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:
   i) Linear search ii) Binary search
8. Write a program to implement binary search tree
9. Write a program to implement the tree traversal methods
10. Write a program to implement AVL Tree
11. Write a program to implement the graph traversal methods
12. Write a program to implement pattern matching algorithms

TEXT BOOKS:

1. Fundamentals of data structures in C, 2 nd edition, E.Horowitz, S.Sahni and Susan
   Anderson Freed, Universities Press.
2. Data structures using c – A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

REFERENCE BOOKS:

1. Data structures: A Pseudocode Approach with C, 2 nd edition, R.F.Gilberg And B.A.Forouzan, Cengage Learning.
2. Introduction to data structures in c, 1/e Ashok Kamthane.

COURSE OUTCOMES:

Upon successful completion of this Lab, students will be able to:

CO 1: Identify the appropriate data structure for given problem

CO 2: Analyze the time and space complexity of algorithm or program

CO 3: Effectively use compilers including library functions, debuggers and trouble shooting

CO 4: Implement the various searching and sorting techniques

CO 5: Compare and contrast the abstract data types and pattern matching Algorithms

II Year B.Tech. CSE Sem-I **L T P C**
0 0 2 1

PROGRAMMING LAB (18PC0CS29)

CO-REQUISITE:

1. A course on "Python Programming"

COURSE OBJECTIVE:

This lab course is intended to introduce core programming basics and program design with functions using Python programming language and understand the high-performance programs designed to strengthen the practical expertise.

SOFTWARE REQUIREMENTS:

Python

SYLLABUS:

LIST OF PROGRAMS

1. Write a program to demonstrate different number data types in Python.
2. Write a program to perform different Arithmetic Operations on numbers in Python.
3. Write a program to create, concatenate and print a string and accessing sub-string from a given string.
4. Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST 2017"
5. Write a program to create, append, and remove lists in python.
6. Write a program to demonstrate working with tuples in python.
7. Write a program to demonstrate working with dictionaries in python.
8. Write a program to program to find largest of three numbers.
9. Write a Python program to convert temperatures to and from Celsius, Fahrenheit.
   [Formula: c/5 = f-32/9]
10. Write a Python program to construct the following pattern, using a nested for loop

```
*
* *
* * *
* * * *
* * * * *
* * * *
* * *
* *
*
```

11. Write a Python script that prints prime numbers less than 20.
12. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
13. Write a script named copyfile.py. This script should prompt the user for the names oftwo text files. The contents of the first file should be input and written to the second file.

14. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
15. Write a Python class to convert an integer to a roman numeral.
16. Write a Python class to reverse a string word by word.
17. Write a NumPy program to find the union of two arrays. Union will return the unique, sorted array of values that are in either of the two input array.
18. Write a Pandas program to produce a dataframe object consisting of 5 rows and 4 columns and containing random intergers between 0 and 10.
19. Write a Scipy program to solve the following system of linear equations using the linalg module of Numpy.

2x+3y+z=13
x-y+2x=7
3x+4y+z=22

20. Write a program to create three subplots in the form of 1 x 3 grid, i.e., 1row and 3 columns using Matplotlib.

TEXT BOOKS:

3. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.
4. Python Programming – Problem Solving, Packages, and Libraries, Anurag Gupta, GP Biswas, McGraw Hill

REFERENCE BOOKS:

1. Learning Python, Mark Lutz, O'Relly

COURSE OUTCOMES:

Upon successful completion of this Lab, students will be able to:

CO 1: analyze the basic concepts scripting and the contributions of scripting language

CO 2: explore python especially the object-oriented concepts, and the built-in objects of Python

CO 3: create practical and contemporary applications such as TCP/IP network programming, Web applications, discrete event simulations

II Year B.Tech. CSE Sem-I

L	T	P	C
0	0	3	1.5

IT WORKSHOP LAB (18PC0CS06)

CO-REQUISITE:

1. A course on "Computer Organization & Architecture"

COURSE OBJECTIVE:

This lab course is introduced to make the students learn about PC Hardware, install operating systems, Hardware and Software Troubleshooting, student how to use Internet and World Wide Web and to use the productivity tools

HARDWARE / SOFTWARE REQUIREMENTS:

A typical PC / MS Office / LaTeX

SYLLABUS:

LIST OF TASKS:

PC Hardware

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

Task 4: Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

Internet & World Wide Web

Task 5: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN. Customize browsers.

Task 6: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

Productivity Tools

LaTeX and Word

Task 7: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 8 : Creating a Newsletter : Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Excel

Task 9: Excel Orientation: The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the two tasks and features that would be covered in each. Using Excel – Accessing, overview of

toolbars, saving excel files, Using help and resources. Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text, calculating GPA

Power Point

Task 10: Students making their presentations interactive. Topic covered during this week includes: Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

TEXT BOOKS:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. Latex Companion –Leslie Lamport, PHI/Pearson.

REFERENCE BOOKS:

1 .Introduction to Computers, Peter Norton, 6/e Mc Graw Hill Publishers.
2. Upgrading and Repairing, PC's, 18th e, Scott Muller QUE, Pearson Education.
3. Comdex Information Technology course tool kit Vikas Gupt, WILEY Dreamtech.
4. IT Essentials PC Hardware and Softwre Companion Guide, Third Edition by David Anfinson
   and ken Quamme. –CISCO Press, Pearson Education.
5. PC Hardware and A+ Handbook—Kate J. Chase PHI (Microsoft)

COURSE OUTCOMES:

Upon successful completion of this Lab, students will be able to:

CO 1: Attain knowledge for computer assembling and software installation
CO 2: Analyze the hardware and software trouble shooting problems
CO 3: Effectively utilize internet and work on world wide web
CO 4: Apply the tools for personal and professional utilities
CO 5: Create the documents, presentations, and spreadsheets

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

(AUTONOMOUS)

II Year B.Tech. CSE Sem-I **L T P C**
3 0 0 3

FUNDAMENTALS OF CYBER SECURITY (18MC0CS02)

PRE-REQUISITES: NIL

COURSE OBJECTIVE:

This course is introduced to familiarize the need for cyber security, various threats, counter measures and cyber laws.

SYLLABUS:

UNIT-I

Introduction to Cyber Security: Basic cyber security concepts, motive of attackers, active attacks, passive attacks, cyber crime and information security, computer criminals, classification of cyber crimes: E-Mail spoofing, spamming, cyber defamation, internet time threat, salami attack, data diddling, forgery, web jacking, newsgroup spam, industrial espionage, hacking, online frauds, software piracy, computer sabotage, email bombing, usenet newsgroup as the source of cybercrimes, computer network intrusions, password sniffing, identity theft, cyber threats-cyber warfare, CIA traid.

UNIT-II

Cybercrime: Mobile and Wireless Devices :Introduction, proliferation of mobile and wireless devices, trends in mobility, credit card frauds in mobile and wireless computing era, security challenges posed by mobile devices, authentication service security, attacks on mobile/cell phones. Tools and methods used in cyber crime: phishing, password cracking.

UNIT-III

Cyber Law – The Legal Perspectives: Introduction, Cybercrime and the Legal Landscape around the World, Why do we need cyberlaws: the indian context, the indian IT act.

Cyber Forensics: Introduction, historical background of cyber forensics, digital forensics science, the need for computer forensics, cyber forensics and digital evidence, digital forensics lifecycle, challenges in computer forensics.

UNIT-IV

Cyber Security - Organizational implications: Introduction, cost of cyber crimes and IPR issues, web threats for organizations, security and privacy implications from cloud computing, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes, the psychology, mindset and skills of hackers and other cyber criminals.

UNIT-V

Cyber Crime Examples: Introduction, Real-life Examples: Official website of Maharashtra Government hacked, E-Mail spoofing instances, Indian banks lose millions of rupees, Parliament attack, Pune city police bust Nigerian racket.

Mini-Cases: The Indian case of online gambling, an Indian case of intellectual property crime, illustrations of financial frauds in cyber domain.

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, “Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley.
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, “Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives”, CRC Press.

REFERENCE BOOKS:

1. James Graham, Richard Howard and Ryan Otson, "Cyber Security Essentials", CRC Press.
2. Chwan-Hwa(john) Wu, J. David Irwin, "Introduction to Cyber Security", CRC Press.

COURSE OUTCOMES:

By the end of the course, students will be able to

CO 1: comprehend the basics of cyber security
CO 2: acquire knowledge on security for mobile and wireless devices
CO 3: realize the Indian and Global Act concerning cyber crimes
CO 4: identify the cyber etiquette and correlate to the organization
CO 5: employ security and privacy methods in the development of modern applications

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)
SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (CYBER SECURITY)
COURSE STRUCTURE
(Applicable for the Batch admitted from 2020-2021)

IV SEMESTER (SECOND YEAR)

S. No.	Subject Code	Group	Subject	L	T	P	Credits
1	18BS0MA06	BSC	Mathematical and Statistical Foundations	3	0	0	3
2	18PC0CS015	PCC	Formal Languages & Automata Theory	3	O	0	3
3	18PC0CS04	PCC	Object Oriented Programming through Java	3	0	0	3
4	18PC0CS09	PCC	Data Base Management System	3	0	0	3
5	18PC0CS10	PCC	Operating Systems	3	0	0	3
6	18PC0CS07	PCC	Object Oriented Programming through Java Lab	0	0	4	2
7	18PC0CSI2	PCC	Data Base Management System Lab	0	0	3	1.5
8	T8PC0CS 13	PCC	Operating Systems Lab	0	0	3	1.5
9	18PC0CS30	PCC	R Programming Lab	0	0	2	I
5 Theory + 4 Lab			**Total Credits**	**15**	**00**	**12**	**21**

L – Lecture **T** – Tutorial **P** – Practical

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

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II Year B.Tech. Sem-II

L	T	P	C
3	1	0	4

MATHEMATICAL AND STATISTICAL FOUNDATIONS

PREREQUISITES: Mathematics courses of first year of study.

COURSE OBJECTIVES:

- To understand the basic Number Theory concepts useful for computer organization and security, coding and cryptography.
- To understand the linear and multiple regression and correlation of the data.
- To know the linear and nonlinear fitting of the given data.
- To understand the theory of probability distributions of single and multiple random variables
- To gain the knowledge of the sampling theory and testing of hypothesis and making inferences
- To understand the Stochastic process and Markov chains.

UNIT - I

Greatest Common Divisors and Prime Factorization: Greatest common divisors, The Euclidean algorithm, The fundamental theorem of arithmetic, Factorization of integers and the Fermat numbers

Congruences: Introduction to congruences, Linear congruences, The Chinese remainder theorem, Systems of linear congruences.

UNIT - II

Regression and Correlation: Linear Statistical Models (no derivations): Simple linear regression & correlation, multiple regression and multiple correlation (three variables),
Fitting the linear and quadratic and exponential curves by the method of least squares to the given data.

Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability
distributions, Continuous Probability Distributions, Statistical Independence.
Discrete Probability Distributions: Binomial Distribution, Poisson distribution.

UNIT - III

Continuous Probability Distributions: Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial
Fundamental Sampling Distributions: Random Sampling, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, Sampling Distribution of S^2.

UNIT - IV

Estimation & Tests of Hypotheses: Introduction, Statistical Inference, Classical Methods of Estimation. Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Tolerance Limits, Estimating the Variance, Estimating a Proportion for single mean , Difference between Two Means, between Two Proportions for Two Samples and Maximum Likelihood Estimation, t–Distribution, F Distribution, Chi-square Distribution, Test of hypothesis for small & large samples.

UNIT - V

Stochastic Processes and Markov Chains: Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, n-step transition probabilities, Markov chain, Steady state condition, Markov analysis.

TEXT BOOKS:

1. Kenneth H. Rosen, Elementary number theory & its applications, sixth edition, Addison-Wesley, ISBN 978 0-321-50031-1
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statisticsfor Engineers & Scientists, 9th Ed. Pearson Publishers.
3. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications

REFERENCE BOOK:

1. T.T. Soong, Fundamentals of Probability And Statistics For Engineers, John Wiley & SonsLtd, 2004.
2. Sheldon M Ross, Probability and statistics for Engineers and scientists, Academic Press

COURSE OUTCOMES:

After learning the contents of this course, the student is able to

- Apply the concepts of number theory to cryptography domain.
- Find the quality and quantity of relationship among the given variables.
- Form the probability distribution of a random variable and apply the concepts of probability distributions to some case studies
- Make inferences of the population (from which data is taken) from the knowledge of the given data (testing of hypothesis)
- Understand the processes of functions of random variables

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

(AUTONOMOUS)

II Year B.Tech. Sem-II

L	T	P	C
3	0	0	3

FORMAL LANGUAGES & AUTOMATA THEORY (18PC0CS15)

PRE-REQUISITE:

1. A course on "Discrete Mathematics"

COURSE OBJECTIVE:

This course is intended to comprehend the theoretical foundations of computer science from the perspective of formal languages and classify machines by their power to recognize languages

SYLLABUS:

UNIT - I

Introduction to Finite Automata:Structural Representations, the Central Concepts of Automata Theory – Alphabet, Strings, Languages, Problems, Applications of finite automata. Deterministic Finite Automata: Definition, How a DFA Process strings, The language of DFA - Designing DFAs, Non-deterministic Finite Automata:Formal Definition, How a NFA Process strings, The language of NFA - Designing NFAs,Conversion of NFA to DFA, Equivalence and Minimization of Automata.Finite Automata with Epsilon-Transitions, Conversion of NFA with €-transitions to NFA without €-transitions.

UNIT - II

Finite Automata with output - Moore and Mealy machines, inter-conversions, designing moore and mealy machines.

Regular Expressions and Regular Grammars: Recursive definition of Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions. Pumping Lemma for regular languages, Closure Properties, Decision Properties, Grammar Formalism: Regular Grammars, Inter-conversions: Finite automata and Regular Grammar.

UNIT – III

Context-Free Grammars:Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, Sentential Forms, Parse Trees, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages.

Push Down Automata: Definition of Pushdown Automaton, the Languages of a PDA, Acceptance by final state, Acceptance by empty stack,Equivalence of PDA and CFG: from CFG to PDA, from PDA to CFG, Deterministic Pushdown Automata.

UNIT – IV

Minimization of CFG: Eliminating useless symbols and productions, Eliminating €-Productions, Eliminating Unit productions. Normal Forms for Context- Free Grammars: Chomsky Normal form, Griebach Normal form, Conversion of CFG to CNF, Conversion of CFG to GNF. Pumping Lemma for CFLs, Closure Properties of CFLs, Decision Properties of CFLs.

UNIT – V

Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine, Types of Turing machine, universal turing machine, counter machine, church's hypothesis, halting problem, undecidability, Recursive Enumerable Languages, Recursive languages, Properties of recursive enumerable and recursive languages, Posts Correspondence Problem, Modified Post Correspondence problem.

TEXT BOOKS:

1. Introduction to Automata Theory, Languages, and Computation, 3rd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekaran, 2nd Edition, PHI.

REFERENCE BOOKS:

1. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. A Text book on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
4. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.
5. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.

COURSE OUTCOMES:

By the end of the course, students will be able to:

CO 1: Design the finite automata for the recognized languages
CO 2: Write regular expressions for the languages
CO 3: Demonstrate context-free grammars/languages, derivations and parse trees
CO 4: Design push down automata and turing machines for the languages
CO 5: Comprehend language classes & grammars, relationship among them with the help of Chomsky hierarchy
CO 6: Participate in competitive examinations like GATE, PGECET etc.

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L	T	P	C
3	0	0	3

OBJECT ORIENTED PROGRAMMING THROUGH JAVA (18PC0CS04)

PRE-REQUISITE:

1. A course on "Programming for problem solving"

COURSE OBJECTIVE:

The aim of this course is to comprehend object oriented programming concepts and apply them in problem solving

SYLLABUS:

UNIT – I

OOP concepts: Classes and objects, data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, procedural and object oriented programming paradigm; Java programming: History of java, comments data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow statements, jump statements, simple java stand alone programs, arrays, console input and output, formatting output, constructors, methods, parameter passing, static fields and methods, access control, this reference, overloading methods and constructors, recursion, garbage collection, exploring string class.

UNIT – II

Inheritance: Inheritance hierarchies, super and subclasses, member access rules, super keyword, preventing inheritance: final classes and methods, the object class and its methods; Polymorphism: Dynamic binding, method overriding, abstract classes and methods; Interface: Interfaces vs Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface; Packages: Defining, creating and accessing a package, understanding CLASSPATH, importing packages.

UNIT – III

Exception Handling: Benefits of exception handling, the classification of exceptions, exception hierarchy, checked and unchecked exceptions, usage of try, catch, throw, throws and finally, re-throwing exceptions, exception specification, built in exceptions, creating own exception sub classes. Multithreading: Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter thread communication.

UNIT – IV

Files: Streams, byte streams, character stream, text input/output, binary input/output, random access file operations, file management using file class; Connecting to Database: Connecting to a database, querying a database and processing the results, updating data with JDBC.

UNIT – V

GUI programming with Java: The AWT class hierarchy, introduction to swing, swing Vs AWT, hierarchy for swing components, containers, JFrame, JApplet, JDialog, JPanel; Overview of some swing components: JButton, JLabel, JTextField, JTextArea, simple applications; Layout management: Layout manager types: Border, grid and flow; Applets: Inheritance hierarchy for applets, differences between applets and applications, life cycle of an applet, passing parameters to applets.

TEXT BOOKS:

1. Herbert Schildt, Dale Skrien, "Java Fundamentals: A Comprehensive Introduction", McGraw Hill, 1st Edition, 2013.
2. Herbert Schildt, "Java the Complete Reference", McGraw Hill, Osborne, 8th Edition, 2011.
3. T. Budd, "Understanding Object Oriented Programming with Java", Pearson Education, Updated Edition (New Java 2 Coverage), 1999.

REFERENCE BOOKS:

1. P.J. Deitel, H. M. Deitel, "Java: How to Program", Prentice Hall, 6th Edition, 2005.
2. P. Radha Krishna, "Object Oriented Programming through Java", Universities Press, CRC Press, 2007.
3. Bruce Eckel, "Thinking in Java", Prentice Hall, 4th Edition, 2006.
4. Sachin Malhotra, Saurabh Chaudhary, "Programming in Java", Oxford University Press, 2nd Edition, 2014.

COURSE OUTCOMES:

By the end of the course, students will be able to

CO 1: describe the concepts of OOP and basics of java programming.
CO 2: express the programming skills in problem solving.
CO 3: solve the exceptions and handle the exceptions in programming.
CO 4: outline the GUI based applications.
CO 5: extend their knowledge of java programming further on their own.

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II Year B.Tech. Sem-II

L	T	P	C
3	0	0	3

DATA BASE MANAGEMENT SYSTEMS (18PC0CS09)

PRE-REQUISITE:
1. A course on "Data Structures"

COURSE OBJECTIVE:
This course is introduced to describe the basic concepts of SQL, build queries using SQL commands and generate applications of database systems

SYLLABUS:

UNIT I:
Database System Applications: database system Vs. file system, view of data, data abstraction, instances and schemas, data models, the ER model, relational mode. database languages, DDL, DML, database access for application programs, database users and administrator, transaction management, database system structure, history of data base systems, data base design and ER diagrams, beyond ER design entities, attributes and entity sets, relationships and relationship sets, additional features of ER model, concept design with the ER Model.

UNIT II:
Introduction to the Relational Model: integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views, form of basic SQL query, introduction to nested queries, correlated nested queries, set comparison operators, aggregation operators, NULL values, comparison using null values, logical connectivity's, AND, OR and NOT, outer joins, disallowing NULL values, complex integrity constraints in SQL, triggers and active data bases.

UNIT III:
Relational Algebra: Selection and projection, set operations, renaming, Joins, Division, Examples of Algebra overviews, Relational calculus.
Schema refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, dependency preserving decomposition, , multi valued dependencies, FOURTH normal form, FIFTH normal form.

UNIT IV:
Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity.
Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with loss of nonvolatile storage, ARIES Recovery, Remote Backup systems.

UNIT V:

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

TEXT BOOKS:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, V edition.

REFERENCE BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
3. Introduction to Database Systems, C.J.Date Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah,PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

COURSE OUTCOMES:

By the end of the course, students will be able to:

CO 1: Describe the basic fundamentals of DBMS, database design and normal forms
CO 2: Identify the appropriate SQL commands for retrieval and management of data
CO 3: Analyze the schema refinement and normal forms
CO 4: Identify data models for relevant problems
CO 5: Model database storage structures and access techniques

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

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II Year B.Tech. Sem-II

L	T	P	C
3	0	0	3

OPERATING SYSTEMS (18PC0CS10)

PRE-REQUISITES:

1. A course on "Programming for problem solving"
2. A course on "Computer Organization & Architecture"

COURSE OBJECTIVE:

The purpose of this course is to realize the concepts of input- output, storage and file management in Unix/Linux

SYLLABUS:

UNIT – I

Introduction: What Operating Systems do, Computer System Organization, Storage management, Single Processor Systems, Multiprocessor systems, Clustered Systems, Distributed Systems, Special Purpose Systems, OS Services, System Calls, Structure of an OS - Simple, Layered Microkernel Operating Systems, Virtual Machines.

UNIT – II

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR**;**

UNIT – III

Inter-process Communication: Race Condition, The Critical Section problem , Peterson's Solution, Synchronization hardware, Semaphores, Monitors, Classical IPC Problems: Bounded Buffer Problem, Reader's & Writer Problem, Dinning Philosopher Problem etc.

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

UNIT – IV

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition– Internal and External fragmentation and Compaction; Paging: Basic Concept , Hardware support for paging, Protection and sharing,` Segmentation.

Virtual Memory Management: Basics of Virtual Memory, Demand paging, Page fault, Handling of Page Fault, Page Replacement Techniques: Optimal, First in First Out (FIFO), and Least Recently used (LRU).

UNIT – V

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table).

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

TEXT BOOKS:

1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating System Concepts Essentials, 8th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.

REFERENCE BOOKS:

1. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

COURSE OUTCOMES:

By the end of the course, students will be able to:

CO 1: Describe the synchronous and asynchronous communication mechanisms in their respective operating systems

CO 2: Discuss the inter process communication in Unix/Linux

CO 3: Apply optimization techniques for the improvement of system performance

CO 4: Analyze turnaround time, waiting time, response time and throughput

CO 5: Compare the different operating system functionalities

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II Year B.Tech. Sem-II

L	T	P	C
0	0	4	2

OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB (18PC0CS07)

CO-REQUISITE:

1. A course on "Object Oriented Programming"

COURSE OBJECTIVE:

This lab course is introduced to create the Graphical User Interface using Applets, AWT Components & Swing Components

SOFTWARE REQUIREMENTS:

Java / Eclipse / Netbeans

SYLLABUS:

LIST OF PROGRAMS:

1. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box. [Use JOption Pane –Input dialog, Message dialog]
2. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
3. Write a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
4. Write a Java program that connects to a database using JDBC and does add, delete, modify and retrieve operations.

5. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in selected color. Initially, there is no message shown.
6. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero
7. a) Develop an applet in Java that displays a simple message.

b) Develop an applet in Java that receives an integer in one text field, and computes its factorial value and returns it in another text field, when the button named "Compute" is clicked.

8. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a Java program to display the table using Labels in Grid Layout.
9. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).
10. Implement the above program with the database instead of a text file.
11. Write a Java program that prints the meta-data of a given table.

TEXT BOOK:

1. Java Fundamentals – A comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH.

REFERENCE BOOKS:

1. Java for Programmers, P.J.Deitel and H.M.Deitel, Pearson education (OR) Java: How to Program, P.J.Deitel and H.M.Deitel, PHI.
2. Object Oriented Programming through Java, P. Radha Krishna, University Press.

COURSE OUTCOMES:

Upon successful completion of this Lab, students will be able to:

CO 1: Work with java compiler and eclipse platform to write and execute java programs
CO 2: Apply object oriented features in java programming for problem solving
CO 3: Access data from database with java programs
CO 4: Describe exception handling mechanism
CO 5: Develop applications using Console I/O and File I/O, GUI applications

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

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II Year B.Tech. Sem-II

L	T	P	C
0	0	4	2

DATA BASE MANAGEMENT SYSTEMS LAB (18PC0CS12)

CO-REQUISITE:

1. A course on "Data Base Management Systems"

COURSE OBJECTIVE:

This lab course is intended to describe the SQL basics for data definition, data manipulation and introduce ER data model, database design and normalization

SOFTWARE REQUIREMENTS:

Oracle / MySql

SYLLABUS:

LIST OF TASKS

1. Concept design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. Querying (using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.)
7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8. Triggers (Creation of insert trigger, delete trigger, update trigger)
9. Procedures
10. Usage of Cursors

TEXT BOOKS:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill, 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, 5th Edition.

REFERENCE BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
3. Introduction to Database Systems, C.J.Date Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah,PHI.

COURSE OUTCOMES:

Upon successful completion of this Lab, students will be able to:

CO 1: design database schema for a given application
CO 2: apply normalization
CO 3: acquire skills in using SQL commands for data definition and data manipulation
CO 4: develop solutions for database applications using procedures
CO 5: employ cursors and triggers

II Year B.Tech. Sem-II

L	T	P	C
0	0	3	1.5

OPERATING SYSTEMS LAB (18PC0CS13)

CO-REQUISITE:
1. A course on "Operating Systems"

COURSE OBJECTIVE:
This lab course is intended to perform different functionalities in Operating system Unix/Linux using commands

SOFTWARE REQUIREMENTS:
Turbo C / Unix / Linux

SYLLABUS:

LIST OF PROGRAMS:
1. Write a program to implement following process scheduling algorithms for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.
    i. First Come First Serve
    ii. Shortest Job First
    iii. Priority
    iv. Round Robin
2. Write a program to simulate the following memory management techniques:
    i. Variable Memory technique
    ii. Fixed Memory Technique
3. Write a program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention
4. Write a program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention
5. Write a program to simulate the following memory management techniques:
    i. Paging
    ii. Segmentation
6. Write a programs to simulate the following file organization Techniques:
    i. Single level
    ii. Two level
    iii. Hierarchical
    iv. DAG
7. Write a programs to simulate the following file allocation strategies:
    i. Sequential
    ii. Linked
    iii. Indexed

8. Write a programs to simulate the following Page Replacement Techniques:
    i. FIFO
    ii. LRU
    iii. Optimal
9. Write a program to simulate disk scheduling algorithms.

TEXT BOOKS:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the Unix environment, W.R.Stevens, Pearson education.

REFERENCE BOOKS:

1. Operating Systems – Internals and Design Principles Stallings, Fifth Edition–2005, Pearson Education/PHI
2. Operating System A Design Approach-Crowley,TMH.
3. Modern Operating Systems, Andrew S Tanenbaum 2nd edition, Pearson/PHI
4. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
5. Unix Internals The New Frontiers, U.Vahalia, Pearson Education

COURSE OUTCOMES:

Upon successful completion of this Lab, students will be able to:

CO 1: Describe the operating systems concepts in Unix/Linux
CO 2: Illustrate various concepts in operating systems through implementation
CO 3: Solve the real-time problems like deadlock by providing suitable solutions
CO 4: Analyze the different operating system functionalities
CO 5: Simulate the page replacement algorithms

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

(AUTONOMOUS)

II Year B.Tech. Sem-II

L	T	P	C
0	0	2	1

R PROGRAMMING LAB (18PC0CS30)

COURSE OBJECTIVE:
This lab course is intended to learn syntax and semantics and build web services and introduction to network and database programming in R programming.

SOFTWARE REQUIREMENTS:
R Studio

SYLLABUS:

LIST OF PROGRAMS

Overview of R, R data types and objects, reading and writing data
1. Write an R-Program to print Hello World
2. Write an R-Program to take input from user.
3. Write an R-Program to demonstrate working with operators (Arithmetic, Relational, Logical, Assignment operators).

Control structures, functions, scoping rules, dates and times…
4. Write an R Program to Check if a Number is Odd or Even
5. Write an R Program to check if the given Number is a Prime Number
6. Write an R Program to Find the Factorial of a Number

Control structures, functions, scoping rules, dates and times
7. Write an R Program to Find the Fibonacci sequence Using Recursive Function
8. Write an R Program to Make a Simple Calculator
9. Write a R program to create the system's idea of the current date with and without time

Vectors and working on data sets (Reading and Writing different Types of Datasets (.txt, .csv))
10. Write an R Program to create a Vector and to access elements in a Vector
11. Write a R program, Reading data from files and working with datasets
(i) Reading data from csv files, inspection of data. (ii) Reading data from Excel files.

Matrices, Arrays and Lists
12. Write an R Program to create a Matrix and access rows and columns using functions colnames() and rownames() .
13. Write an R Program to create a Matrix using cbind() and rbind() functions.

14. Write an R Program to create a Matrix from a Vector using dim() function.
15. Write an R Program to create a List and modify its components.

Data Frames
16. Write an R Program to create a Data Frame.
17. Write an R Program to access a Data Frame like a List.
18. Write an R Program to access a Data Frame like a Matrix.
19. Write an R Program to create a Factor.
20. Write an R Program to Access and Modify Components of a Factor.

Data Visualization
21. Write a R program to implement Graphs
(i) Basic high-level plots
(ii) Modifications of scatter plots
(iii) Modifications of histograms, parallel box plots.

OOP- S3 Classes – S4 Classes and Networking, web services and data base application
22. Write an R Program to create an S3 Class and S3 Objects.
23. Write an R Program to write a own generic function in S3 Class.
24. Write an R Program to create an S4 Class and S4 Objects.
25. Write an R Program to write a own generic function in S4 Class.
26. Write an R Program to create Reference Class and modify its Methods.
27. Wrie an R program to create simple web application.

TEXT BOOKS:
1. Norman Matloff , "The Art of R Programming: A Tour of Statistical Software Design", No Starch Press, 2011
2 Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics", Addison-Wesley Data & Analytics Series, 2013.

REFERENCE BOOKS:
1. Mark Gardener, " Beginning R – The Statistical Programming Language", Wiley, 2013
2. Robert Knell, "Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R", Amazon Digital South Asia Services Inc, 2013.

COURSE OUTCOMES:

Upon successful completion of this Lab, students will be able to:

CO 1: Examine R syntax and semantics and be fluent in the use of R flow control and functions.
CO 2: Demonstrate proficiency in handling Strings and File Systems.
CO 3: Create, run and manipulate R Programs using core data structures like Lists, Data frames, matrices and use Regular Expressions.
CO 4: Interpret the concepts of Object-Oriented Programming as used in R.
CO 5: Implement exemplary applications related to Network Programming, Web Services and Databases in R.

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)
SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)
COURSE STRUCTURE
(Applicable for the Batch admitted from 2020-2021)

V SEMESTER (THIRD YEAR)

S. No.	Subject Code	Group	Subject	L	T	P	Credits
1	18PC0DS01	PCC	Design and Analysis of Algorithms	3	0	0	3
2	18PC0DS02	PCC	Foundations of Data Science	3	0	0	3
3	18PC0DS03	PCC	Data Mining and Data warehousing	3	0	0	3
4		PEC	Professional Elective - I	3	0	0	3
5		OE	Open Elective – I	3	0	0	3
6		HSMC	Effective Technical Communication	3	0	0	3
7	18PC0DS04	PCC	Foundations of Data Science Lab	0	0	3	1.5
8	18PC0DS05	PCC	Data Mining and Data warehousing Lab	0	0	3	1.5
9	18MC0DS01	MC	Environmental Science	3	0	0	0
6 Theory + 2 Lab + 1 MC			**Total Credits**	**21**	**0**	**06**	**21**

L – Lecture **T** – Tutorial **P** – Practical

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

(AUTONOMOUS)

III Year B.Tech. Sem-I

L	T	P	C
3	0	0	3

DESIGN AND ANALYSIS OF ALGORITHMS (18PC0DS01)

PRE-REQUISITES:

1. A course on "Programming for problem solving"
2. A course on "Data Structures"

COURSE OBJECTIVE:

The objective of the course is to solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking and branch and bound

SYLLABUS:

UNIT – I

Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average, and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

UNIT – II

Fundamental Algorithmic Strategies: Brute-Force, Greedy, Dynamic Programming, Branch-and-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving, Bin Packing, Knap Sack TSP. Heuristics – characteristics and their application domains.

UNIT – III

Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth-First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

UNIT – IV

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.

UNIT – V

Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – PSPACE

TEXTBOOKS:

1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MITPress/McGraw-Hill.
2. Fundamentals of Algorithms – E. Horowitz et al.

REFERENCE BOOKS:

1. Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos,Pearson.
2. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia,Wiley.
3. Algorithms – A Creative Approach, 3rd Edition, UdiManber, Addison-Wesley

COURSE OUTCOMES:

By the end of the course, students will be able to:

CO 1: Describe algorithms dealing with various techniques along with the efficiency of algorithms

CO 2: Select the data structures and algorithm design methods that impact the performance of programs

CO 3: Identify the various searching and graph traversal techniques

CO 4: Distinguish designing methods for the development of algorithms to realistic problems, such as divide and conquer, greed and etc.

CO 5: Estimate the performance of algorithms.

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

(AUTONOMOUS)

III Year B. Tech. Sem-I

L	T	P	C
3	0	0	3

DATA SCIENCE (18PC0DS02)

PRE-REQUISITE:
A Course on "Data Base Management Systems"

CO-REQUISITE:
A Course on "Data Warehousing and Data Mining"

COURSE OBJECTIVE:
The objective of this course is to introduce the basic concepts of data science, probability and statistical analysis on data, preprocessing and processing of data

SYLLABUS:

UNIT - I
Introduction: The Ascendance of Data, Data Science, Motivating Hypothetical: Data Sciencester
Visualizing Data: Matplotlib, Bar Charts, Line Charts, Scatterplots,
Linear Algebra: Vectors, Matrices.

UNIT - II
Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Some Other Correlational Caveats, Correlation and Causation,
Probability: Dependence and Independence, Conditional Probability, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem, **Hypothesis and Inference:** Statistical Hypothesis Testing, p-Values, Confidence Intervals, p-Hacking, Bayesian Inference.

UNIT - III
Gradient Descent: The Idea Behind Gradient Descent, Estimating the Gradient, Using the Gradient, Choosing the Right Step Size, Using Gradient Descent to Fit Models, Minibatch and Stochastic Gradient Descent.
Getting Data: stdin and stdout, Reading Files, Scraping the Web, Using APIs, Using the Twitter APIs.
Working with Data: Exploring Your Data, Using NamedTuples, Dalaclasses, Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.
Machine Learning: Modeling, Machine Learning, Over fitting and Under fitting, Correctness, The Bias-Variance Tradeoff, Feature Extraction and Selection.

UNIT - IV

Natural Language Processing: Word Clouds, n-Gram Language Models, Grammars, An Aside: Gibbs Sampling, Topic Modeling, Word Vectors.

Network Analysis: Betweenness Centrality, Eigenvector Centrality, Matrix Multiplication, Centrality, Directed Graphs and Page Rank.

UNIT - V

Recommender Systems: Manual Curation, Recommending What's Popular, User-Based Collaborative Filtering, Item-Based Collaborative Filtering, Matrix Factorization.

Map Reduce: Example: Word Count, Why Map Reduce?, Map Reduce More Generally, Example: Analyzing Status Updates, Example: Matrix Multiplication

Data Ethics: Necessity of Data Ethics, Care about Data Ethics, Building Bad Data Products, Trading Off Accuracy and Fairness, Collaboration, Interpretability, Recommendations, Biased Data, Data Protection.

TEXTBOOK:

1. Joel Grus, "Data Science from Scratch - First Principles With Python", O'Reilly Publication, 2nd Edition, 2019.

REFERENCE BOOKS:

1. Sinan Ozdemir, Sunil Kakade, "Principles of Data Science", Packt Publication, Second Edition, 2018.
2. Alberto Boschetti, Luca Massaron, "Python Data Science Essentials", Packt Publication, Third Edition, 2018.

COURSE OUTCOMES:

By the end of the course, students would be able to:

CO 1: comprehend the fundamental concepts of data science and visualization
CO 2: apply probability and statistical techniques on data
CO 3: choose appropriate pre-processing techniques on data
CO 4: apply natural language processing techniques on the selected data
CO 5: discuss on recommender systems and data ethics

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

(AUTONOMOUS)

III Year B.Tech. Sem-I

L	T	P	C
3	0	0	3

DATA WAREHOUSING AND DATAMINING (18PC0DS03)

PRE-REQUISITE:

1. A Course on "Database Management Systems"

COURSE OBJECTIVE:

The course aims at providing the student with the concepts related to data warehousing, online analytical processing (OLAP) and various techniques used for the functionalities of data mining

SYLLABUS:

UNIT-I

Data Warehousing and Online Analytical Processing: Data Warehouse-Basic Concepts, **Data Warehouse Modeling:** Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction.

UNIT-II

Data Mining: Introduction, Why Data Mining, What is Data Mining, What kinds of Data can be mined, What kind of patterns can be mined, Which Technologies Are Used, Which Kinds of Applications are Targeted, Major issues in data mining.

Getting to Know Your Data: Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity.

UNIT-III

Data Preprocessing: Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Frequent Item set Mining Methods, Pattern Evaluation Methods.

UNIT-IV

Classification: Basic concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy.

Cluster Analysis: Basic concepts, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering.

UNIT-V

Outlier Detection: Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches, Proximity-Based Approaches, Clustering-Based Approaches, Classification-Based Approaches.

Data Mining Trends and Research Frontiers: Mining Complex Data Types, Data Mining Applications, Data Mining and Society, Data Mining Trends.

TEXT BOOK:

1. "Data Mining – Concepts and Techniques", Jiawei Han & Micheline Kamber, Elsevier, Third Edition, 2014.

REFERENCE BOOKS:

1. "Data Warehousing, Data Mining &OLAP", Alex Berson and Stephen J. Smith, TataMcGraw-Hill, Tenth reprint,2007.
2. "Building the Data Warehouse", W. H. Inmon, Wiley Dreamtech India Pvt.Ltd., Fourth Edition, 2008.
3. "Data Mining Techniques", Arun K Pujari, Universities Press (India) Private Limited, Eighth Impression, 2005.

COURSE OUTCOMES:

By the end of the course, students will be able to

CO 1: analyze the data through multi-dimensional data warehouse model

CO 2: define the types of the data to be mined and apply appropriate data mining techniques

CO 3: discuss preprocessing statistical methods for any given raw data

CO 4: evaluate the accuracy of supervised and unsupervised models and algorithms

CO 5: produce interesting patterns from large amounts of data that can be used for further analysis

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

(AUTONOMOUS)

III Year B.Tech. Sem-I

L	T	P	C
0	0	3	1.5

DATA SCIENCE LAB (18PC0DS04)

CO-REQUISITE:
A Course on "Data Science"

COURSE OBJECTIVE:
This lab course is introduced to have a hands-on experience by working on data of various data science applications

RECOMMENDED SOFTWARE:
Python

SYLLABUS:

LIST OF EXPERIMENTS

Week 1: Overview of Python, PANDAS and NUMPY

Week 2: Working with CSV files, XML files, Web Data, JSON files, Databases, Excel files

Week 3: Data Collection and Descriptive Statistics

Week 4: Data Visualization using MatPlotLib and Seaborn Packages
(Basic Plots: Scatter, Bar, Line, Box, Histograms, Correlation Maps ...)

Week 5: Data Analysis I (Data Pre-Processing)

- Handling Missing Data
- Dimensionality Reduction

Week 6: Data Analysis I (Performing Train-Test Split, Feature Selection) and Working with ScikitLearn

Week 7: Data Analysis II (Classification Techniques)

Week 8: Data Analysis II (Regression Techniques)

Week 9: Case Studies:

1. Health Care Datasets
2. Ecommerce Applications

Week 10: Case Studies

1. Covid-19 Datasets
2. Agricultural Datasets

TEXT BOOKS:

1. Alberto Boschetti, Luca Massaron, "Python Data Science Essentials", Packt Publication, Third Edition, 2018.
2. Joel Grus, "Data Science from Scratch - First Principles With Python", O'Reilly Publication, 2nd Edition, 2019.

REFERENCE BOOK:

3. Sinan Ozdemir, Sunil Kakade, "Principles of Data Science", Packt Publication, Second Edition, 2018.

COURSE OUTCOMES:

Upon successful completion of this lab, students will be able to

CO 1: Program in Python and use its packages for effective data analysis
CO 2: Choose appropriate statistical and visualization techniques for data collection
CO 3: Select appropriate data pre-processing techniques
CO 4: Apply various supervised and unsupervised data analysis techniques
CO 5: Describe a variety of data science concepts in solving real-world problems

III Year B.Tech. Sem-I

L	T	P	C
0	0	3	1.5

DATA WAREHOUSING AND DATA MINING LAB (18PC0DS05)

CO-REQUISITE:

1. A course on " Data Warehousing and Data Mining"

COURSE OBJECTIVE:

This lab course is intended to provide a hands-on experience on data warehousing and data mining, which gives a practical exposure of the concepts involved in data mining algorithms

LIST OF EXPERIMENTS:

1. Perform the statistical analysis of data using WEKA Tool.
2. Demonstrate the preprocessing techniques that can be applied on an ARFF file.
3. List all the categorical (or nominal) attributes and the real valued attributes separately.
4. What attributes do you think might be crucial in making the credit assessment? Come up with some simple rules in plain English using your selected attributes.
5. One type of model that you can create is a Decision tree . train a Decision tree using the complete data set as the training data. Report the model obtained after training.
6. Suppose you use your above model trained on the complete dataset, and classify credit good/bad for each of the examples in the dataset. What % of examples can you classify correctly? (This is also called testing on the training set) why do you think cannot get 100% training accuracy?
7. Is testing on the training set as you did above a good idea? Why or why not?
8. One approach for solving the problem encountered in the previous question is using cross-validation? Describe what is cross validation briefly. Train decision tree again using cross validation and report your results. Does accuracy increase/decrease? Why?
9. Check to see if the data shows a bias against "foreign workers" or "personal status". One way to do this is to remove these attributes from the data set and see if the decision tree created in those cases is significantly different from the full dataset case which you have already done. Did removing these attributes have any significantly effect? Discuss.
10. Another question might be, do you really need to input so many attributes to get good results? May be only a few would do. For example, you could try just having attributes 2,3,5,7,10,17 and 21. Try out some combinations. (You had removed two attributes in problem 7. Remember to reload the arff data file to get all the attributes initially before you start selecting the ones you want.)
11. Sometimes, The cost of rejecting an applicant who actually has good credit might be higher than accepting an applicant who has bad credit. Instead of counting the misclassification equally in both cases, give a higher cost to the first case (say cost 5) and lower cost to the

second case. By using a cost matrix in weka, train your decision tree and report the Tree and cross validation results. Are they significantly different results obtained in problem 6.

12. Do you think it is a good idea to prefect simple decision trees instead of having long complex decision tress? How does the complexity of a Decision Tree relate to the bias of the model?
13. You can make your Decision Trees simpler by pruning the nodes. One approach is to use Reduced Error Pruning. Explain this idea briefly. Try reduced error pruning for training your Decision Trees using cross validation and report the Decision Trees you obtain? Also Report your accuracy using the pruned model does your Accuracy increase?
14. How can you convert a Decision Tree into "if-then-else rules". Make up your own small Decision Tree consisting 2-3 levels and convert into a set of rules. There also exist different classifiers that output the model in the form of rules. One such classifier in weka is rules. PART, train this model and report the set of rules obtained. Sometimes just one attribute can be good enough in making the decision, yes, just one! Can you predict what attribute that might be in this data set? One R classifier uses a single attribute to make decisions (it chooses the attribute based on minimum error). Report the rule obtained by training a one R classifier. Rank the performance of j48, PART, one R.
15. Perform association rule mining on german credit data set using FP growth algorithm and compare the rules with that of apriority algorithm.
16. Perform cluster analysis on German credit data set using k-means partitional clustering algorithm.

TEXT BOOK:

1. "Data Mining – Concepts and Techniques", Jiawei Han & Micheline Kamber, Elsevier, Third Edition, 2014.

REFERENCE BOOKS:

1. "Data Warehousing, Data Mining &OLAP", Alex Berson and Stephen J. Smith, Tata McGraw-Hill, Tenth reprint,2007.
2. "Building the Data Warehouse", W. H. Inmon, Wiley Dreamtech India Pvt.Ltd., Fourth Edition, 2008.
3. "Data Mining Techniques", Arun K Pujari, Universities Press (India) Private Limited, Eighth Impression, 2005.

COURSE OUTCOMES:

Upon successful completion of this lab, students will be able to

CO 1: Apply preprocessing statistical methods on the data sets

CO 2: Select the appropriate algorithm useful for the application

CO 3: Analyze the interesting patterns obtained by the application of various algorithms

CO 4: Evaluate the accuracy of supervised and unsupervised models

COURSE STRUCTURE

(Applicable for the Batch admitted from 2020-2021)

VI SEMESTER (THIRD YEAR)

S. No.	Subject Code	Group	Subject	L	T	P	Credits
1	18PC0DS06	PCC	Machine Learning	3	0	0	3
2	18PC0DS07	PCC	Computer Networks	3	0	0	3
3		PEC	Professional Elective – II	3	0	0	3
4	18PC0DS08	PCC	Natural Language Processing	3	0	0	3
5		PEC	Professional Elective – III	3	0	0	3
6		OE	Open Elective-II	3	0	0	3
7	18PC0DS09	PCC	Machine Learning Lab	0	0	3	1.5
8	18PC0DS10	PCC	Computer Networks Lab	0	0	3	1.5
9	18MC0DS02	MC	Fundamentals of Cyber Security	3	0	0	0
6 Theory + 2 Lab + 1 MC			**Total Credits**	**21**	**00**	**06**	**21**

L – Lecture **T** – Tutorial **P** – Practical

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

(AUTONOMOUS)

III Year B.Tech. Sem-II

L	T	P	C
3	0	0	3

MACHINE LEARNING (18PC0DS06)

PRE-REQUISITES:

1.Courses on "Operating Systems, Design and Analysis of Algorithms".

COURSE OBJECTIVE:

This course is intended to learn the basic concepts and techniques of machine learning, understand supervised and unsupervised learning techniques and to study the various probability-based learning techniques along with graphical models of machine learning algorithms

SYLLABUS:

UNIT-I

Introduction :Learning –Types of Machine Learning –Supervised Learning –The Brain and the Neuron –Design a Learning System –Perspectives and Issues in Machine Learning –Concept Learning Task –Concept Learning as Search –Finding a Maximally Specific Hypothesis –Version Spaces and the Candidate Elimination Algorithm –Linear Discriminants –Perceptron –Linear Separability –Linear Regression.

UNIT-II

Linear Models : Multi-layer Perceptron –Going Forwards –Going Backwards: Back Propagation Error –Multi-layer Perceptron in Practice –Examples of using the MLP –Overview –Deriving Back-Propagation –Radial Basis Functions and Splines –Concepts –RBF Network –Curse of Dimensionality –Interpolations and Basis Functions –Support Vector Machines.

UNIT-III

Tree and Probabilistic Models :Learning with Trees –Decision Trees –Constructing Decision Trees –Classification and Regression Trees –Ensemble Learning –Boosting –Bagging –Different ways to Combine Classifiers –Probability and Learning –Data into Probabilities –Basic Statistics –Gaussian Mixture Models –Nearest Neighbor Methods –Unsupervised Learning –K means Algorithms –Vector Quantization –Self Organizing Feature Map.

UNIT-IV

Dimensionality Reduction and Evolutionary Models :Dimensionality Reduction –Linear Discriminant Analysis –Principal Component Analysis –Factor Analysis –Independent Component Analysis –Locally Linear Embedding –Isomap –Least Squares Optimization –Evolutionary Learning –Genetic algorithms –Genetic Offspring: -Genetic Operators –Using Genetic Algorithms –Reinforcement Learning –Overview –Getting Lost Example –Markov Decision Process.

UNIT-V

Graphical Models :Markov Chain Monte Carlo Methods –Sampling –Proposal Distribution –Markov Chain Monte Carlo –Graphical Models –Bayesian Networks –Markov Random Fields –Hidden Markov Models –Tracking Methods.

TEXT BOOKS:

1. Stephen Marsland, "Machine Learning –An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
2. Tom M Mitchell, "Machine Learning", First Edition, McGraw Hill Education, 2013.

REFERENCE BOOKS:

1. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", First Edition, Cambridge University Press, 2012.
2. Jason Bell, "Machine learning –Hands on for Developers and Technical Professionals", First Edition, Wiley, 2014.
3. EthemAlpaydin, "Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)", Third Edition, MIT Press, 2014.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO 1: distinguish supervised, unsupervised and semi-supervised learning
CO 2: apply appropriate machine learning strategy for any given problem
CO 3: describe probabilistic models for classification and regression
CO 4: apply evolutionary models to improve classification efficiency
CO 5: design systems that uses the appropriate graphical models of machine learning

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

(AUTONOMOUS)

III Year B.Tech. Sem-II

L	T	P	C
3	0	0	3

COMPUTER NETWORKS (18PC0DS07)

PRE-REQUISITES:

1. A course on "Computer Programming and Data Structures"
2. A course on "Design and Analysis of Algorithms"

COURSE OBJECTIVE:

This course is intended to equip the students with an overview of the fundamental concepts of computer networks and the protocols of the various layers

SYLLABUS:

UNIT – I

Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: Internet, ARPANET. Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, Power lines, fiber optics. Wireless transmission: Electromagnetic spectrum, Radio transmission, Microwave transmission, Infrared transmission, and Light transmission.

UNIT – II

Data link layer: Design issues, framing, Error detection and correction: Hamming codes, Parity, Checksum, and Cyclic Redundancy Check. Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel. Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat.

Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols.

UNIT – III

Network Layer: Design issues, Routing algorithms: the optimality principle, shortest path algorithm, Flooding, distance vector routing, Hierarchical routing, Broadcast Routing, Multicast Routing. Congestion Control Algorithms, Quality of Service, Internetworking, the Network layer in the internet: IPv4 Protocol, IP Address, IPv6.

UNIT – IV

Transport Layer: Transport Service, Elements of Transport protocols: Addressing, Connection Establishment, Connection Release. Connection management. The Internet Transport Protocols: Introduction to UDP, Remote Procedure calls, Introduction to TCP, The TCP Service Model, The TCP Protocol, and The TCP Segment Header, The TCP Connection Establishment, TCP Connection Release.

UNIT – V

Application Layer –Domain name system: The DNS Name Space, Domain Resource Records, Name Servers, Electronic Mail: Architecture Services, SMTP, the World Wide Web: Architectural Overview, HTTP, Streaming audio and video: digital audio, digtal video, streaming stored media, streaming live media, real time conferencing.

TEXT BOOK:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5thEdition.

   Pearson Education/PHI

REFERENCE BOOKS:

1.An Engineering Approach to Computer Networks-S. Keshav, 2ndEdition,

Pearson Education

2.Data Communications and Networking – Behrouz A. Forouzan. 3rdEditionTMH.

COURSE OUTCOMES:

By the end of the course, students will be able to:

CO 1: Describe the basic computer network technology

CO 2: Express the functions of each layer in the OSI and TCP/IP reference

CO 3: Apply the skills of subnet and routing mechanisms

CO 4: Examine the protocols of computer networks

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

(AUTONOMOUS)

III Year B.Tech. Sem-II

L	T	P	C
3	0	0	3

NATURAL LANGUAGE PROCESSING (18PC0DS08)

PRE-REQUISITE:
1. Courses on "Data Warehousing and Data Mining on Finite Languages & Automata Theory"

COURSE OBJECTIVE:
This course is introduced to study the problems and solutions of NLP and their relation to linguistics and Statistics.

SYLLABUS:

UNIT-I
Finding the Structure of Words: Words and Their Components, Issues, and Challenges, Morphological Models
Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the approaches.

UNIT-II
Syntax: Parsing Natural Language, Tree banks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues.

UNIT-III
Semantic Parsing: Introduction, Semantic Interpretation, Predicate Argument Structure, Meaning Representation Systems, Discourse Context and World Knowledge.

UNIT-IV
Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross lingual Language Modeling.

UNIT-V
Recognizing Textual Entailment: Introduction, The Recognizing Textual Entailment Task, A Framework for Recognizing Textual Entailment, Case Studies
Multilingual Sentiment and Subjectivity Analysis: Introduction, Definitions, Sentiment and Subjectivity Analysis on English, Word- and Phrase-Level Annotations, Sentence-Level Annotations, Document-Level Annotations

TEXT BOOK:

1. Multilingual Natural Language Processing Applications: From Theory to Practice, Daniel M. Bikel and ImedZitouni, Pearson Publication.

REFERENCE BOOKS:

1. Speech and Natural Language Processing, Daniel Jurafsky& James H Martin, Pearson Publications.
2. Natural Language Processing and Information Retrieval, Tanvier Siddiqui, U.S.Tiwary.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO 1: Illustrate sensitivity to linguistic phenomena to model with formal grammars
CO 2: Identify proper experimental methodology for evaluating empirical NLP systems
CO 3: Estimate parameters using supervised and unsupervised training methods
CO 4: Analyze natural language processing algorithms
CO 5: Design different language modeling techniques

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

(AUTONOMOUS)

III Year B.Tech. Sem-II

L	T	P	C
0	0	3	1.5

MACHINE LEARNING LAB (18PC0DS09)

CO-REQUISITE:

1. A course on "Machine Learning"

COURSE OBJECTIVE:

This lab course is intended to provide a hands-on experience using machine learning concepts, which gives a practical exposure of machine learning algorithms.

SOFTWARE REQUIRED:

Python

SYLLABUS:

LIST OF PROGRAMS

1. Extract the data from database using python
2. Implement k-nearest neighbours classification using python
3. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of kmeans clustering with 3 means (i.e., 3 centroids)

VAR1	VAR2	CLASS
1.713	1.586	0
0.18	1.786	1
0.353	1.24	1
0.94	1.566	0
1.486	0.759	1
1.266	1.106	0
1.54	0.419	1
0.459	1.799	1
0.773	0.186	1

4. The following training examples map descriptions of individuals onto high, medium and low credit-worthiness.

medium skiing design single twenties no	→	highRisk
high golf trading married forties yes	→	lowRisk
low speedway transport married thirties yes	→	medRisk
medium football banking single thirties yes	→	lowRisk
high flying media married fifties yes	→	highRisk
low football security single twenties no	→	medRisk

medium golf media single thirties yes → medRisk
medium golf transport married forties yes → lowRisk
high skiing banking single thirties yes → highRisk
low golf unemployed married forties yes → highRisk

Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `med Risk' in the dataset?

5. Implement linear regression using python
6. Implement Naïve Bayes theorem to classify the English text
7. Implement an algorithm to demonstrate the significance of genetic algorithm
8. Implement the finite words classification system using Back-propagation algorithm

TEXT BOOKS:

1. Stephen Marsland, "Machine Learning –An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
2. Tom M Mitchell, "Machine Learning", First Edition, McGraw Hill Education, 2013.

REFERENCE BOOKS:

1. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", First Edition, Cambridge University Press, 2012.
2. Jason Bell, "Machine learning–Hands on for Developers and Technical Professionals", First Edition, Wiley, 2014
3. EthemAlpaydin, "Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)", Third Edition, MIT Press, 2014

COURSE OUTCOMES:

After completion of the course, students will be able to:

CO1: Understand the implementation procedure of all machine learning Algorithms.
CO2: Apply appropriate data sets to the Machine Learning algorithms.
CO3: Apply machine learning algorithms for classification
CO4: Design and develop machine learning algorithms for patterns analysis
CO5: Understand the implementation procedures for the machine Learning algorithms.

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

(AUTONOMOUS)

III Year B.Tech. Sem-II

L	T	P	C
0	0	2	1

COMPUTER NETWORKS LAB (18PC0DS10)

CO-REQUISITE:

1. A course on "Computer Networks"

COURSE OBJECTIVE:

This lab course is intended to provide practical exposure of the concepts, designing, modeling and evaluation in computer networks.

LIST OF PROGRAMS:

1. Implement the data link layer framing method "character-stuffing"
2. Implement the data link layer framing method "bit stuffing"
3. Write a program to compute CRC code for the polynomial "CRC-12"
4. Write a program to compute CRC code for the polynomial "CRC-16"
5. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-Nmechanism
6. Implement Dijkstra's algorithm to compute the shortest path through a network
7. Write a program to implement congestion control in network layer using leaky bucket algorithm
8. Take an example subnet of hosts and obtain a broadcast tree for the subnet
9. Implement distance vector routing algorithm for obtaining routing tables at each node

TEXT BOOK:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks-S.Keshav,2nd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

COURSE OUTCOMES:

Upon successful completion of this Lab, students will be able to:

CO 1: describe data link layer framing methods

CO 2: classify error correction and detection techniques and design data link layer protocols

CO 3: employ routing and congestion algorithms and also generate encryption algorithms

CO 4: test the network scenario

CO 5: study the performance of computer networks and protocols

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

(AUTONOMOUS)

III Year B.Tech. Sem-II

L	T	P	C
3	0	0	0

FUNDAMENTALS OF CYBER SECURITY (18MC0DS02)

PRE-REQUISITES: NIL

COURSE OBJECTIVE:

This course is introduced to familiarize the need for cyber security, various threats, countermeasures and cyber laws.

SYLLABUS:

UNIT-I

Introduction to Cyber Security: Basic cyber security concepts, motive of attackers, active attacks, passive attacks, cybercrime and information security, computer criminals, classification of cybercrimes: E-Mail spoofing, spamming, cyber defamation, internet time threat, salami attack, data diddling, forgery, web jacking, newsgroup spam, industrial espionage, hacking, online frauds, software piracy, computer sabotage, email bombing, use net newsgroup as the source of cybercrimes, computer network intrusions, password sniffing, identity theft, cyber threats-cyber warfare, CIA triad.

UNIT-II

Cybercrime: Mobile and Wireless Devices: Introduction, proliferation of mobile and wireless devices, trends in mobility, credit card frauds in mobile and wireless computing era, security challenges posed by mobile devices, authentication service security, attacks on mobile/cell phones. Tools and methods used in cybercrime: phishing, password cracking.

UNIT-III

Cyber Law – The Legal Perspectives: Introduction, Cybercrime and the Legal Landscape around the World, Why do we need cyber laws: the Indian context, the Indian IT act.

Cyber Forensics: Introduction, historical background of cyber forensics, digital forensics science, the need for computer forensics, cyber forensics and digital evidence, digital forensics lifecycle, challenges in computer forensics.

UNIT-IV

Cyber Security - Organizational implications: Introduction, cost of cyber crimes and IPR issues, web threats for organizations, security and privacy implications from cloud computing, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes, the psychology, mindset and skills of hackers and other cyber criminals.

UNIT-V

Cyber Crime Examples: Introduction, Real-life Examples: Official website of Maharashtra Government hacked, E-Mail spoofing instances, Indian banks lose millions of rupees, Parliament attack, Pune city police bust Nigerian racket.

Mini-Cases: The Indian case of online gambling, an Indian case of intellectual property crime, illustrations of financial frauds in cyber domain.

TEXT BOOKS:

1. Nina Godbole and SunitBelpure, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley.
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, "Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives", CRC Press.

REFERENCE BOOKS:

1. James Graham, Richard Howard and Ryan Otson, "Cyber Security Essentials", CRC Press.
2. Chwan-Hwa(john) Wu, J. David Irwin, "Introduction to Cyber Security", CRC Press.

COURSE OUTCOMES:

By the end of the course, students will be able to

CO 1: comprehend the basics of cyber security
CO 2: acquire knowledge on security for mobile and wireless devices
CO 3: realize the Indian and Global Act concerning cyber crimes
CO 4: identify the cyber etiquette and correlate to the organization
CO 5: employ security and privacy methods in the development of modern applications