School of Engineering & Technology

Department of CSE-Data Science

COURSE STRUCTURE & SYLLABUS (R25 Regulations)

Applicable from AY: 2025-26

Date: 08/09/2025

The Board of Studies (BoS) meeting of the *CSE-Data Science* was held on *08/09/2025* at *11:00 am (Online/Offline)* under the chairmanship of *Dr. Ch. Subbalakshmi, Professor & HoD*. The following members were present for the meeting.

S. No.	Name of the BoS Committee Member with Designation	BoS Committee Designation	Signature
1	Dr. CH. Subba Lakshmi, Professor & Head, GNITC, Hyderabad.	Chairman	
2	Dr. R. Sridevi, Professor & CSE, JNTUH UCESTH	JNTU Nominee	
3	Dr. Aruna Malapati, Professor, BITS Pilani, Hyderabad	ACM Nominee-1	
4	Dr. Naga Mani M, Associate Professor, University of Hyderabad	ACM Nominee-2	
5	Mrs. Chatti Saroja, Technology Architect, INFOSYS, Hyderabad	Industry Expert	
6	Mr. Ibrahim Raza, Alumni, GNITC	Alumni Member	
7	Dr. Rishi Sayal, Professor & Associate Director, GNITC, Hyderabad.	Member	
8	Dr. B. Srinivasa Rao, Assistant Professor, GNITC	Member	
9	Mr. CH. Upendar, Assistant Professor, GNITC	Member	
10	Mrs. G. Sushma, Assistant Professor, GNITC	Member	

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS
(AUTONOMOUS)
Ibrahimpatnam, R.R Dist – 501506
SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
(DATA SCIENCE)

BOARD OF STUDIES – MINUTES OF MEETING 04/2025

Name of the Board	: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)
Name of the Department	: COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)
Name of the BOS Chairman	: Dr. CH. SUBBA LAKSHMI
Date & Time of the Meeting	: 08.09.2025 11:00 AM (Online / Offline)

Members Present :

1	Dr. CH. Subba Lakshmi, Professor & Head, GNITC, Hyderabad.	Chairman
2	Dr. R. Sridevi, Professor & CSE, JNTUH UCESTH	JNTUH Nominee
3	Dr. Aruna Malapati, Professor, BITS Pilani, Hyderabad	Academic Council Nominee
4	Dr. Naga Mani M, Associate Professor, University of Hyderabad	Academic Council Nominee
5	Mrs. Chatti Saroja, Technology Architect, INFOSYS, Hyderabad	Industry Representative
6	Dr. Rishi Sayal, Professor & Associate Director, GNITC, Hyderabad.	Member
7	Dr. B. Srinivasa Rao, Assistant Professor, GNITC	Member
8	Mr. CH. Upendar, Assistant Professor, GNITC	Member
9	Mrs. G. Sushma, Assistant Professor, GNITC	Member
10	Mr. Ibrahim Raza, Alumni, GNITC	Member (Alumni)

Dr. Ch. Subba Lakshmi
Chairman-BOS

Dr. R. Sridevi
JNTUH Nominee

Dr. Aruna Malapati
Academic Council Nominee

Dr. Naga Mani M
Academic Council Nominee

Mrs. Chatti Saroja
Industry Representative

Dr. Rishi Sayal
Member, BOS

AGENDA:

1. Approval of the Course Structure and Detailed Syllabus for the First Year (Semesters I & II) of the B. Tech. Computer Science and Engineering (Data Science) Program under R25 Regulations (for the 2025-2026 admitted batch).
2. Approval of the Course Structure and Detailed Syllabus for the Second Year (Semesters I & II) of the B. Tech. Computer Science and Engineering (Data Science) Program under R25 Regulations (for the 2025-2026 admitted batch).
3. Approval of the Overall Course Structure for the Third and Fourth Years (Semesters I & II) of the B. Tech. Computer Science and Engineering (Data Science) Program under R25 Regulations (for the 2025-2026 admitted batch).
4. The Approval of the Substitute subjects under R25 for R18/R21/R22 re-admitted candidates in B. Tech I year II Semester, B. Tech II Year I Semester and B. Tech II Year II Semester Program.
5. Approval of the Additional Subjects for Credit Balance under R25 Regulations for R18/R21/R22 Re-Admitted candidates in B. Tech II Year (I & II Semesters).
6. Any additional points with the Chair's Permission

Agenda 1: Approval of the Course Structure and Detailed Syllabus for the First Year (Semesters I & II) of the B.Tech. Computer Science and Engineering (Data Science) Program under R25 Regulations (for the 2025-2026 admitted batch).

The BOS Chairman informed the members that the course structure and detailed syllabus for the I B. Tech. I and II semesters of the B. Tech. CSE (Data Science) program have been framed in accordance with AICTE and JNTUH regulations, following thorough discussions and approval in the Department Academic Committee meeting, for the 2025-2026 academic year under R25 regulations.

Dr. Ch. Subba Lakshmi
Chairman-BOS

Dr. R. Sridevi
JNTUH Nominee

Dr. Aruna Malapati
Academic Council Nominee

Dr. Naga Mani M
Academic Council Nominee

Mrs. Chatti Saroja
Industry Representative

Dr. Rishi Sayal
Member, BOS

It is resolved as under:

"The course structure for I B. Tech. I and II semesters of B. Tech. Computer Science and Engineering (Data Science) under R25 regulations for the 2025-2026 academic year has been approved for submission to and consideration by the Academic Council of Guru Nanak Institutions Technical Campus (Autonomous)".

Agenda 2: Approval of the Course Structure and Detailed Syllabus for the Second Year (Semesters I & II) of the B. Tech. Computer Science and Engineering (Data Science) Program under R25 Regulations (for the 2025-2026 admitted batch).

The BOS Chairman informed the members that the course structure and detailed syllabus for the II B. Tech. I and II semesters of the B. Tech. CSE (Data Science) program have been framed in accordance with AICTE and JNTUH regulations, following thorough discussions and approval in the Department Academic Committee meeting, for the 2025-2026 academic year under R25 regulations.

It is resolved as under:

"The course structure for II B. Tech. I and II semesters of B. Tech. Computer Science and Engineering (Data Science) under R25 regulations for the 2025-2026 academic year has been approved for submission to and consideration by the Academic Council of Guru Nanak Institutions Technical Campus (Autonomous)".

Dr. Ch. Subba Lakshmi
Chairman-BOS

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Agenda 3: Approval of the Overall Course Structure for the Third and Fourth Years (Semesters I & II) of the B. Tech. Computer Science and Engineering (Data Science) Program under R25 Regulations (for the 2025-2026 admitted batch).

The BOS Chairman informed the members that the course structure for the III Year & IV Year B. Tech. I and II semesters of the B. Tech. CSE (Data Science) program have been framed in accordance with AICTE and JNTUH regulations, following thorough discussions and approval in the Department Academic Committee meeting, for the 2025-2026 academic year under R25 regulations.

It is resolved as under:

"The course structure for III Year & IV Year B. Tech. I and II semesters of B. Tech. Computer Science and Engineering (Data Science) under R25 regulations for the 2025-2026 academic year has been approved for submission to and consideration by the Academic Council of Guru Nanak Institutions Technical Campus (Autonomous)".

Agenda 4: The Approval of the Substitute subjects under R25 for R18/R21/R22 re-admitted candidates in B. Tech I year II Semester, B. Tech II Year I Semester and B. Tech II Year II Semester Program.

BOS Chairman explained the procedure adopted in preparing the substitute subjects and was discussed in the Department Academic Committee. Following substitute subjects are proposed for re-admitted students in I year II Semester.

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Chairman-BOS

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Substitute Subjects for the R18/R21students readmitted in I Year – II Semester

S. No	Name of Course	Regulation Change	Titles of the subjects with code already studied and repeated in the present semester	Suggested Subject with code by the HOD/BOS (Chairman)
1	B. Tech	GNITC R18/R21 to GNITC R25	1. Chemistry (21BS0CH01) (4 Credits) 2. Chemistry Lab (21BS0CH02) (1.5 Credits)	1. Advanced Engineering Physics (PH102BS) (3 Credits) 2. Advanced Engineering Physics Lab (PH106BS) (1 Credit)

It is resolved as under:

For GNITC R25 regulation readmitted students in I Year - II Semester, one subject and one lab are required to acquire the B. Tech degree under R18/R21 regulations. This Proposal is approved for submission to the Academic Council of Guru Nanak Institutions Technical Campus (Autonomous).

Substitute Subjects for the R22 students readmitted in I Year – II Semester

S. No	Name of Course	Regulation Change	Titles of the subjects with code already studied and repeated in the present semester	Suggested Subject with code by the HOD/BOS (Chairman)
1	B. Tech	GNITC R22 to GNITC R25	1. Engineering Chemistry (22BS0CH01) (4 Credits) 2. Engineering Chemistry Lab (22BS0CH02) (1 Credit)	1. Advanced Engineering Physics (PH102BS) (3 Credits) 2. Advanced Engineering Physics Lab (PH106BS) (1 Credit)

It is resolved as under:

For GNITC R25 regulation readmitted students in I Year - II Semester, one subject and one lab are required to acquire the B. Tech degree under R22 regulations. This Proposal is approved for submission to the Academic Council of Guru Nanak Institutions Technical Campus (Autonomous).

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Substitute Subjects for the R18/R21/R22 students readmitted in II Year I Semester

S. No	Name of Course	Regulation Change	Titles of the subjects with code already studied and repeated in the present semester	Suggested Subject with code by the HOD/BOS (Chairman)
1	B. Tech	GNITC R18/R21/R22 to GNITC R25	-	-

It is resolved as under:

For GNITC R25 regulation readmitted students in II Year - I Semester, no subjects required to acquire the B. Tech degree under R18/R21/R22 regulations. This Proposal is approved for submission to the Academic Council of Guru Nanak Institutions Technical Campus (Autonomous).

Substitute Subjects for the R18/R21/R22 students readmitted in II Year II Semester

S. No	Name of Course	Regulation Change	Titles of the subjects with code already studied and repeated in the present semester	Suggested Subject with code by the HOD/BOS (Chairman)
1	B. Tech	GNITC R18/R21/R22 to GNITC R25	-	-

It is resolved as under:

For GNITC R25 regulation readmitted students in II Year - II Semester, no subjects required to acquire the B. Tech degree under R18/R21/R22 regulations. This Proposal is approved for submission to the Academic Council of Guru Nanak Institutions Technical Campus (Autonomous).

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Agenda 5: Approval of Additional Subjects for Credit Balance under R25 Regulations for R18/R21/R22 Re-Admitted B. Tech II Year (I & II Semesters) Students.

BOS Chairman explained the procedure adopted in preparing the substitute subjects and was discussed in the Department Academic Committee. Following substitute subjects are proposed for re-admitted students in II year.

Adding Subjects for Balancing the Credit Score for the students readmitted in II Year I Semester

S. No	Name of Course	Regulation Change	Number of Credits Required for Balance in the Current Semester	Suggested Subject with code by the HOD/BOS (Chairman)
1	B. Tech	GNITC R18/R21 TO GNITC R25	2 Credits	1. Python Programming Lab (CS109ES) (1 Credit) 2. Data Structures Lab (CS207ES) (1 Credit)
2	B. Tech	GNITC R22 to R25	-	Nill

It is resolved as under:

GNITC R25 readmitted students in B. Tech II year I semester, previously under R18/R21 regulations, are required to complete two-credit subjects to obtain their degree and no subjects required to acquire under R22 regulation. This proposal is approved for submission to the Academic Council of Guru Nanak Institutions Technical Campus (Autonomous).

Dr. Ch. Subba Lakshmi
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Adding Subjects for Balancing the Credit Score for the students readmitted in II Year II Semester

S. No	Name of Course	Regulation Change	Number of Credits Required for Balance in the Current Semester	Suggested Subject with code by the HOD/BOS (Chairman)
1	B. Tech	GNITC R18/R21 to GNITC R25	1 Credit	1. Database Management System Lab (CS309PC) (1 Credit)
2	B. Tech	GNITC R22 to R25	-	Nill

It is resolved as under:

GNITC R25 readmitted students in B. Tech II year II semester, previously under R18/R21 regulations, are required to complete one-credit subjects to obtain their degree and no subjects required to acquire under R22 regulation. This proposal is approved for submission to the Academic Council of Guru Nanak Institutions Technical Campus (Autonomous).

There is no other matter to discuss and meeting concluded with a vote of thanks to the chair.

Dr. Ch. Subba Lakshmi
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Mr. Ibrahim Raza
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(An UGC Autonomous Institution - Affiliated to JNTUH)

Ibrahimpatnam, Ranga Reddy (District), Hyderabad - 501 506.

Department of Computer Science and Engineering (Data Science)

COURSE STRUCTURE & SYLLABUS (R25 Regulations)

Applicable from AY: 2025-26

II YEAR I- SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1.		Mathematical and Statistical Foundations	3	0	0	3
2.		Computer Organization and Architecture	3	0	0	3
3.		Object Oriented Programming through java	3	0	0	3
4.		Software Engineering	3	0	0	3
5.		Data base Management Systems	3	0	0	3
6.		Computational Mathematics Lab	0	0	2	1
7.		Object Oriented Programming through Java Lab	0	0	2	1
8.		Software Engineering Lab	0	0	2	1
9.		Database Management Systems Lab	0	0	2	1
10.		NodeJS/ ReactJS/ Django	0	0	2	1
4 Theory + 5 Lab + 1 MC		**Total Credits**	**15**	**0**	**10**	**20**

II YEAR II- SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Discrete Mathematics	3	0	0	3
2.		Operating Systems	3	0	0	3
3.		Algorithms Design and Analysis	3	0	0	3
4.		Computer Networks	3	0	0	3
5.		Machine Learning	3	0	0	3
6.		Innovation and Entrepreneurship	2	0	0	2
7.		Operating Systems Lab	0	0	2	1
8.		Computer Networks lab	0	0	2	1
9.		Machine Learning Lab	0	0	2	1
10.		Data Visualization – R Programming/ Power BI	0	0	2	1
11.		Indian Knowledge System	1	0	0	1
6 Theory + 4 Lab + 1 MC		**Total Credits**	**18**	**0**	**08**	**22**

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II YEAR I- SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1.		Mathematical and Statistical Foundations	3	0	0	3
2.		Computer Organization and Architecture	3	0	0	3
3.		Object Oriented Programming through java	3	0	0	3
4.		Software Engineering	3	0	0	3
5.		Data base Management Systems	3	0	0	3
6.		Computational Mathematics Lab	0	0	2	1
7.		Object Oriented Programming through Java Lab	0	0	2	1
8.		Software Engineering Lab	0	0	2	1
9.		Database Management Systems Lab	0	0	2	1
10.		NodeJS/ ReactJS/ Django	0	0	2	1
4 Theory + 5 Lab + 1 MC		**Total Credits**	**15**	**0**	**10**	**20**

II YEAR II- SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Discrete Mathematics	3	0	0	3
2.		Operating Systems	3	0	0	3
3.		Algorithms Design and Analysis	3	0	0	3
4.		Computer Networks	3	0	0	3
5.		Machine Learning	3	0	0	3
6.		Innovation and Entrepreneurship	2	0	0	2
7.		Operating Systems Lab	0	0	2	1
8.		Computer Networks lab	0	0	2	1
9.		Machine Learning Lab	0	0	2	1
10.		Data Visualization – R Programming/ Power BI	0	0	2	1
11.		Indian Knowledge System	1	0	0	1
6 Theory + 4 Lab + 1 MC		**Total Credits**	**18**	**0**	**08**	**22**

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III YEAR I- SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1.		Predictive Analytics	3	0	0	3
2.		Data Mining	3	0	0	3
3.		Introduction to Data Science	3	0	0	3
4.		Professional Elective-I	2	0	0	2
5.		Open Elective-I	0	0	2	1
6.		Predictive Analytics Lab	0	0	2	1
7.		Data Mining Lab	0	0	2	1
8.		Data Science Lab	0	0	4	2
9.		Field Based Research Project	0	0	2	1
10.		UI Design–Flutter/ Android Studio	1	0	0	1
11.		Gender Sensitization*/Human Values and Professional Ethics*	**15**	**0**	**12**	**21**
5 Theory + 5 Lab + 1 MC		**Total Credits**				

III YEAR II- SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Data Stream Processing	3	0	0	3
2.		Big Data Technologies	3	0	0	3
3.		Business Economics and Financial Analysis	3	0	0	3
4.		Professional Elective-II	3	0	0	3
5.		Open Elective–II	2	0	0	2
6.		Data Stream Processing Lab	0	0	2	1
7.		Big Data Technologies Lab	0	0	2	1
8.		Exploratory Data Analysis Lab	0	0	2	1
9.		English for Employability Skills Lab	0	0	2	1
10.		Prompt Engineering	0	0	2	1
11.		Environmental Science	1	0	0	1
5 Theory + 5 Lab + 1 MC		**Total Credits**	**15**	**0**	**10**	**20**

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IV YEAR I- SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1.		Data Stream Mining	3	0	0	3
2.		Web and Social Media Analytics	3	0	0	3
3.		Fundamentals of Management for Engineers	3	0	0	3
4.		Professional Elective-III	3	0	0	3
5.		Professional Elective–IV	3	0	0	3
6.		Open Elective–III	2	0	0	2
7.		Data Stream Mining Lab	0	0	2	1
8.		Web and social media Analytics Lab	0	0	2	1
9.		Industry Oriented Mini Project/ Summer Internship	0	0	4	2
6 Theory + 3 Lab		**Total Credits**	**17**	**0**	**08**	**21**

IV YEAR II- SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1.		Professional Elective–V	3	0	0	3
2.		Professional Elective–VI	3	0	0	3
3.		Project Work	0	0	42	14
2 Theory + 1 Lab		**Total Credits**	**6**	**0**	**42**	**20**

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Professional Elective-I

S. No	Subject Code	Subject Name
1		Computer Graphics
2		Graph Theory
3		Software Testing Methodologies
4		Ad hoc and Sensor Networks
5		Web Programming
		Distributed Systems

Professional Elective-II

S. No	Subject Code	Subject Name
1		Image Processing
2		Block Chain Technology
3		Software Project Management
4		Mining Massive Datasets
5		Full Stack Development
		Artificial Intelligence

Professional Elective-III

S. No	Subject Code	Subject Name
1		Computer Vision
2		Vulnerability Assessment and Penetration Testing
3		Devops
4		Cryptography and Network Security
5		Cloud Computing
		Information Retrieval Systems

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Professional Elective-IV

S. No	Subject Code	Subject Name
1		Augmented Reality & Virtual Reality
2		Agile Methodology
3		Big Data Analytics
4		Quantum Computing
5		Robotic Process Automation
		Cyber Forensics

Professional Elective-V

S. No	Subject Code	Subject Name
1		Social Media Mining
2		Nature Inspired Computing
3		Internet of Things
4		Game Theory
5		Mobile Application Development
		Human Computer Interaction

Professional Elective-VI

S. No	Subject Code	Subject Name
1		High Performance Computing
2		Edge Computing
3		Generative AI
4		UI/UX design
5		Sustainable Engineering
		Distributed Databases

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OPEN ELECTIVES

Open Elective-I:

S. No	Subject Code	Subject Name
1		Fundamentals of AI
2		R Programming

Open Elective-II:

S. No	Subject Code	Subject Name
1		Introduction to Natural Language Processing
2		MERN Stack Development

Open Elective-III:

S. No	Subject Code	Subject Name
1		Chat Bots
2		Android Application Development

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Alumni

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

PROGRAMMING FOR PROBLEM SOLVING

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

Course Objectives:

1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To learn the syntax and semantics of the C programming language.
4. To learn the usage of structured programming approaches in solving problems.

Course Outcomes: The student will learn

1. To write algorithms and to draw flowcharts for solving problems.
2. To convert the algorithms/flowcharts to C programs.
3. To code and test a given logic in the C programming language.
4. To decompose a problem into functions and to develop modular reusable code.
5. To use arrays, pointers, strings and structures to write C programs.
6. Searching and sorting problems.

UNIT - I: Introduction to C: Phases of developing a running computer program in C, Variable Declarations and Data Types, Executable Statements, General Form of a C Program, Arithmetic Expressions, Formatting Numbers in Program Output.
Selection Structures: Control Structures, Conditions, if Statement, if Statements with Compound Statements, Decision Steps in Algorithms.
Repetition and Loop Statements: Repetition in Programs, Counting Loops and the while Statement, Computing a Sum or Product in a Loop, for Statement, Conditional Loops, Loop Design, Nested Loops, do-while Statement.

UNIT - II: Top-Down Design with Functions: Building Programs from Existing Information, Library Functions, Top-Down Design and Structure Charts, Functions without Arguments, Functions with Input Arguments.
Pointers and Modular Programming: Pointers and the Indirection Operator, Functions with Output Parameters, Multiple Calls to a Function with Input/ Output Parameters, Scope of Names, Formal Output Parameters as Actual Arguments.

UNIT - III: Arrays: Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Using Array Elements as Function Arguments, Array Arguments, Searching and Sorting an Array, Parallel Arrays and Enumerated Types, Multidimensional Arrays.
Strings: String Basics, String Library Functions: Assignment and Substrings, Longer Strings: Concatenation and Whole-Line Input, String Comparison, Arrays of Pointers.

UNIT - IV: Recursion: The Nature of Recursion, Tracing a Recursive Function, Recursive Mathematical Functions, Recursive Functions with Array and String Parameters Structure and Union Types: User-Defined Structure Types, Structure Type Data as Input and Output Parameters, Functions with Structured Result Values, Union Types.

UNIT - V: Text and Binary File Pointers: Input/ Output Files - Review and Further Study, Binary Files, Searching a Database.
Searching and Sorting: Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms).

TEXT BOOKS:

1. Jeri R. Hanly and Elliot B. Koffman, Problem solving and Program Design in C 7th Edition, Pearson.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition).
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.

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1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill.
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB.
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.

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PROGRAMMING FOR PROBLEM SOLVING LAB

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

[Note:The programs may be executed using any available Open Source/ Freely available IDE
Some of the Tools available are:
CodeLite: https://codelite.org/
Code::Blocks: http://www.codeblocks.org/
DevCpp : http://www.bloodshed.net/devcpp.html
Eclipse: http://www.eclipse.org
This list is not exhaustive and is NOT in any order of preference

Course Objectives: The students will learn the following:

1. To work with an IDE to create, edit, compile, run and debug programs
2. To analyze the various steps in program development.
3. To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
4. To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
5. To Write programs using the Dynamic Memory Allocation concept.
6. To create, read from and write to text and binary files

Course Outcomes: The candidate is expected to be able to:

1. formulate the algorithms for simple problems
2. translate given algorithms to a working and correct program
3. correct syntax errors as reported by the compilers
4. identify and correct logical errors encountered during execution
5. represent and manipulate data with arrays, strings and structures
6. use pointers of different types
7. create, read and write to and from simple text and binary files
8. modularize the code with functions so that they can be reused

PRACTICE SESSIONS:

Simple numeric problems:

a) Write a program for finding the max and min from the three numbers.
b) Write the program for the simple, compound interest.
c) Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:

5 x 1 = 5
5 x 2 = 10
5 x 3 = 15

d) Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

a) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).
b) Write a program that finds if a given number is a prime number.

c) Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.

d) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

Arrays, Pointers and Functions:

a) Write a C program to find the minimum, maximum and average in an array of integers.

b) Write a C program that uses functions to perform the following:

I. Addition of Two Matrices

II. Multiplication of Two Matrices

c)Write a program for reading elements using a pointer into an array and display the values using the array.

c) Write a program for display values reverse order from an array using a pointer.

Storage Classes (auto, register, static, extern) :

a) Write a C program to demonstrate the use of a static variable in recursion.

b) Write a C program using two source files to demonstrate extern storage class.

c) Write a C program to demonstrate the lifetime of auto variables in nested loops.

d) Write a C program using a register variable to improve performance in searching.

Files:

a) Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.

b) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

Strings:

a) Write a C program that uses functions to perform the following operations:

I. To insert a sub-string into a given main string from a given position.

II. To delete n Characters from a given position in a given string

b) Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)

c) Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.

d) Write a C program to count the lines, words and characters in a given text.

Sorting and Searching:

a) Write a C program that uses non-recursive function to search for a Key value in a given list of integers using linear search method.

b) Write a C program that uses non-recursive function to search for a Key value in a given sorted list of integers using binary search method.

c) Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

d) Write a C program that sorts the given array of integers using selection sort in descending order

e) Write a C program that sorts the given array of integers using insertion sort in ascending order

f) Write a C program that sorts a given array of names.

TEXT BOOKS:

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson.
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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

IT WORKSHOP

B.Tech. I Year I Sem.

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Course Objectives: The IT Workshop for engineers is a training lab course spread over 60 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, PowerPoint and Publisher.

Course Outcomes:

- Perform Hardware troubleshooting
- Understand Hardware components and inter dependencies
- Safeguard computer systems from viruses/worms
- Document/ Presentation preparation
- Perform calculations using spreadsheets

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: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

Task1: 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.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and popup blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Task 3: 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 4: 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

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA - Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

PowerPoint

Task 1: Students will be working on basic power point utilities and tools which help them create basic PowerPoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

REFERENCE BOOKS:

1. Comdex Information Technology course tool kit Vikas Gupta, *WILEY Dreamtech*
2. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, *WILEY Dreamtech*
3. Introduction to Information Technology, ITL Education Solutions limited, *Pearson Education.*
4. PC Hardware - A Handbook – Kate J. Chase *PHI* (Microsoft)
5. LaTeX Companion – Leslie Lamport, *PHI/Pearson.*
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – *CISCO Press, Pearson Education.*
7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan – CISCO Press, *Pearson Education.*

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

DATA STRUCTURES

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

Prerequisites: A course on "Programming for Problem Solving

Course Objectives

- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
- Introduces sorting and pattern matching algorithms.

Course Outcomes

- Ability to select the data structures that efficiently model the information in a problem.
- Ability to assess efficiency trade-offs among different data structure implementations or combinations.
- Implement and know the application of algorithms for sorting and pattern matching.
- Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.

UNIT – I

Introduction to Data Structures: Basic Terminology, Classification of Data Structures, Operation on Data Structures, abstract data types, selecting a Data Structure,

Linear list – Introduction, singly linked list, Circular Linked Lists, Doubly Linked List, Stacks- Operations, Stack algorithm, Stack ADT, Stack applications, Queues- operations, Queue Algorithm, Queue ADT, Queue Applications.

UNIT - II

Trees: Introduction, Types of Trees, creating a Binary Tree from a General Tree, traversing a Binary Tree, Binary Search Trees (BST), BST Operations- Searching, Insertion and Deletion, BST ADT, BST Applications, Threaded Binary Trees, AVL Trees, Red –Black Trees, Splay Trees

UNIT – III

Multi way Search Trees: Introduction, B Trees, B Trees ADT, 2-3 Trees, 2-3- Tree, B* Tree, B+ Trees Heaps: Binary Heaps, Binomial heaps, Fibonacci heaps, Comparison of Various Heaps, **Applications Searching:** Introduction, Interpolation Search, Jump search

UNIT - IV

Graphs: Introduction, Directed Graphs, Bi connected Components, Representation of Graphs, Graph Traversal Algorithms, Graph ADT, Applications of Graphs Sorting: Radix Sort, Heap sort, Shell Sort, Tree Sort

UNIT – V

Hashing and Collision: Introduction, Hash Tables, Hash Functions, Different Hash Functions: Division Method, Multiplication Method, Mid-square Method, Folding Method;

collisions: Collision Resolution by Open Addressing, Collision Resolution by Chaining Files and their

Organization: Introduction, Data hierarchy, File Attributes, Text and Binary Files, Basic File Operations, File Organization, Indexing

TEXT BOOKS:

1. Data Structures: A Pseudocode Approach with C, 2 nd Edition, R. F. Gilberg and B.A.Forouzan, Cengage Learning
2. Data Structure using C– Reema Thareja, 3rd Edition, Oxford University Press.

REFERENCE:

1. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

DATA STRUCTURES LAB

B.Tech. I Year II Sem.

L T P C
0 0 2 1

Prerequisites: 1. A Course on "Programming for problem solving".

Course Objectives:

1. It covers various concepts of C programming language
2. It introduces searching and sorting algorithms
3. It provides an understanding of data structures such as stacks and queues.

Course Outcomes:

1. Ability to develop C programs for computing and real-life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists.
2. Ability to Implement searching and sorting algorithms

List of Experiments

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) ADT

5. Write a program that implement Queue (its operations) using
   i) Arrays ii) ADT

6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
   i) Radix Sort, ii) Heap sort, iii) Shell Sort, iv) Tree Sort

7. Write a program to implement the tree traversal methods (Recursive and Non-Recursive).

8. Write a program to implement
   i) Binary Search tree ii) B Trees iii) B+ Trees iv) AVL trees v) Red - Black trees

9. Write a program to implement the graph traversal methods.

10. Write a program to implement the following Hash Functions:
    i) Division Method, ii) Multiplication Method, iii) Mid-square Method, iv) Folding Method

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 BOOK:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning.

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

PYTHON PROGRAMMING LAB

B.Tech. I Year II Sem.

L T P C
0 0 2 1

Course Objectives:

- To install and run the Python interpreter
- To learn control structures
- To Understand Lists, Dictionaries in python
- To Handle Strings and Files in Python

Course Outcomes: After completion of the course, the student should be able to

- Develop the application specific codes using python.
- Understand Strings, Lists, Tuples and Dictionaries in Python
- Verify programs using modular approach, file I/O, Python standard library
- Implement Digital Systems using Python

Note: The lab experiments will be like the following experiment examples.

List of Experiments:

1.

I. Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.

II. Start the Python interpreter and type help() to start the online help utility.

III. Start a Python interpreter and use it as a Calculator.

2. Write a program to calculate compound interest when principal, rate and number of periods are given.

3. Read the name, address, email and phone number of a person through the keyboard and print the details.

4. Print the below triangle using for loop.

5

4 4

3 3 3

2 2 2 2

1 1 1 1 1

5. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character(use 'if-else-if' ladder)

6. Python program to print all prime numbers in a given interval (use break)

7. Write a program to convert a list and tuple into arrays.

8. Write a program to find common values between two arrays.

9. Write a function called palindrome that takes a string argument and returnsTrue if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

10. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.

11. Write a function called has_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.

12. Write a function called remove_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.

13. The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.

14. Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.

15. Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'

16. Remove the given word in all the places in a string?

17. Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?

18. Writes a recursive function that generates all binary strings of n-bit length

19. Write a python program that defines a matrix and prints

20. Write a python program to perform multiplication of two square matrices

21. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.

22. Use the structure of exception handling all general-purpose exceptions.

23. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.

24. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.

25. Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.

26. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw_circle that draws circles on the canvas.

27. Write a python code to read a phone number and email-id from the user and validate it for correctness.

28. Write a Python code to merge two given file contents into a third file.

29. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.

30. Write a Python code to Read text from a text file, find the word with most number of Occurrences.

31. Write a function that reads a file file1and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.

32. Import numpy, Plotpy and Scipy and explore their functionalities.

33. Install NumPypackage with pip and explore it.

34. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR

35. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

36. Write a Python program using **Flask** to create a simple web application that accepts sensor values (temperature, humidity) from the user through a form and displays them back on a webpage.

37. Write a Python program to fetch and display real-time weather data using a **public API** (like OpenWeatherMap).

38. Write a Python program using **pandas** to read a CSV file of student marks (Name, Subject, Marks).

- Display the dataset as a table.
- Calculate and print the average marks of all students.
- Find and display the highest mark in the dataset along with the student's name.

39. Write a Python program using **Django** to build a simple web page that displays a list of IoT devices (Light, Fan, AC) with their ON/OFF status. Allow the user to change device states through the web interface.

TEXT BOOKS:

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)
COMPUTER ORGANIZATION AND ARCHITECTURE

B.Tech. II Year I Sem.

L	T	P	C
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Prerequisites: No prerequisites.
Co-requisite: A Course on "Digital Electronics".
Course Objectives:

- The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
- It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
- Topics include computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

Course Outcomes:

- Understand the basics of instruction sets and their impact on processor design.
- Demonstrate an understanding of the design of the functional units of a digital computer system.
- Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
- Design a pipeline for consistent execution of instructions with minimum hazards.
- Recognize and manipulate representations of numbers stored in digital computers

UNIT - I:
Boolean Algebra and Logic Gates: Binary codes, Binary Storage and Registers, Binary logic. **Digital logic gates. Data Representation**: Data types, Complements, Fixed Point Representation, Floating Point Representation
Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

UNIT - II:
Combinational Logic: Combinational Circuits, Analysis procedure Design procedure, Binary Adder- Subtractor Decimal Adder, Binary multiplier, magnitude comparator, Decoders, Encoders, Multiplexers, HDL for combinational circuits.
Sequential Logic: Sequential circuits, latches, Flip-Flops Analysis of clocked sequential circuits, state Reduction and Assignment, Design Procedure. Registers, shift Registers, Ripple counters, synchronous counters, other counters.

UNIT III
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.

UNIT - IV

Microprogrammed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.**Computer Arithmetic:** Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT - V

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

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

TEXT BOOKS:

1. Digital Design – M. Morris Mano, Third Edition, Pearson/PHI.
2. Computer System Architecture – M. Morris Mano. Third Edition, Pearson/PHI.

REFERENCE BOOKS:

1. Switching and Finite Automata Theory, ZVI. Kohavi, Tata Mc Graw Hill.
2. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, 5th Edition, McGraw Hill.
3. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
4. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

B.Tech. II Year I Sem.

L	T	P	C
3	0	0	3

Prerequisites: A course on "Programming for Problem Solving".

Course Objectives:

1. To Understand the basic object-oriented programming concepts and apply them in problem solving.
2. To Illustrate inheritance concepts for reusing the program.
3. To Demonstrate multitasking by using multiple threads and event handling
4. To Develop data-centric applications using JDBC.
5. To Understand the basics of java console and GUI based programming

Course Outcomes:

1. Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
2. Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords
3. Use multithreading concepts to develop inter process communication.
4. Understand the process of graphical user interface design and implementation using AWT or swings.
5. Develop applets that interact abundantly with the client environment and deploy on the server.

UNIT - I

Object oriented thinking and Java Basics- Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. History of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, nested and inner classes, exploring String class.

UNIT - II

Inheritance, Packages and Interfaces — Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super keyword uses, using final keyword with inheritance

polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

UNIT - III

Exception handling and Multithreading– Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception subclasses. Differences between multithreading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads.

UNIT - IV

Exploring String class- Object class, Exploring java.util package, Exploring java.io package

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. graphics, layout manager – layout manager types — border, grid, flow, card and grid bag.

UNIT - V

Swing — Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JFrame and JComponent, JLabel, ImageIcon, JTextField, JButton, JCheckBox, JRadioButton, JList, JComboBox, Tabbed Panes, Scroll Panes, Trees, and Tables. Menu Basics **Menu related classes -** JMenuBar, JMenu, JMenuItem, JCheckBox MenuItem, JRadioButton MenuItem, JSeperator. creating a popup menu.

TEXT BOOKS:

1. Java the complete reference, 13th edition, Herbert schildt, Dr. Denny Coward, Mc Graw Hill.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson education.

REFERENCE BOOKS:

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John Wiley & sons.
2. An Introduction to OOP, third edition, T. Budd, Pearson education.
3. Introduction to Java programming, Y. Daniel Liang, Pearson education.
4. An introduction to Java programming and object-oriented application development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education
7. Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu, TMH.
8. Java and Object Orientation, an introduction, John Hunt, second edition, Springer.
9. Maurach's Beginning Java2 JDK 5, SPD.

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)
SOFTWARE ENGINEERING

B.Tech. II Year I Sem.

L	T	P	C
3	0	0	3

Prerequisites: A course on "Programming for Problem Solving".

Course Objectives

- The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
- Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

Course Outcomes

- Ability to translate end-user requirements into system and software requirements, using e.g.
- UML, and structure the requirements in a Software Requirements Document (SRD).
- Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
- Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

UNIT - I

Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths. A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI).

Process models: The waterfall model, Spiral model, Incremental Process Models, Concurrent Models, Component based development and Agile Development.

UNIT - II

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.

Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

UNIT - III

Design Engineering: Design process and design quality, design concepts, the design model.

Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, use case diagrams, class diagrams, sequence diagrams, collaboration diagrams, activity diagrams and component diagrams.

UNIT - IV

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

Metrics for Process and Products: Software measurement, metrics for software quality.

UNIT - V

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM. Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide, Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.

REFERENCE BOOKS:

1. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
2. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.
3. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.
4. Fundamentals of Software Engineering-Rajib Mall, PHI.

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

DATABASE MANAGEMENT SYSTEMS

B.Tech. II Year I Sem.

L	T	P	C
3	0	0	3

Prerequisites: A course on "Data Structures".

Course Objectives:

1. To understand the basic concepts and the applications of database systems.
2. To master the basics of SQL and construct queries using SQL.
3. Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

Course Outcomes:

1. Gain knowledge of fundamentals of DBMS, database design and normal forms
2. Master the basics of SQL for retrieval and management of data.
3. Be acquainted with the basics of transaction processing and concurrency control.
4. Familiarity with database storage structures and access techniques

UNIT - I

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

UNIT - II

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views.

Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT - III

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active databases.

Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multivalued dependencies, FOURTH normal form, FIFTH normal form.

UNIT - IV

Transaction Management: 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.

UNIT - V

File Organization and Index Structures: Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations,

Indexes- Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM),

B+ Trees: A Dynamic Index Structure.

TEXT BOOKS:

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

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.

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

B.Tech. II Year I Sem.

L	T	P	C
0	0	2	1

Prerequisites: A course on "Programming for Problem Solving".

Course Objectives:

1. To write programs using abstract classes.
2. To write programs for solving real world problems using the java collection framework.
3. To write multithreaded programs.
4. To write GUI programs using swing controls in Java.
5. To introduce java compiler and eclipse platform.
6. To impart hands-on experience with java programming.

Course Outcomes:

1. Able to write programs for solving real world problems using the java collection framework.
2. Able to write programs using abstract classes.
3. Able to write multithreaded programs.
4. Able to write GUI programs using swing controls in Java.

Note:

1. Use LINUX and MySQL for the Lab Experiments. Though not mandatory, encourage the use of the Eclipse platform.
2. The list suggests the minimum program set. Hence, the concerned staff is requested to add more problems to the list as needed.

List of Experiments:

1. Use Eclipse or Net bean platform and acquaint yourself with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2. 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 divided by zero.
3. 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.

4. 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 Num 2 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.
5. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.
6. Write a Java program for the following:

   Create a doubly linked list of elements.

   Delete a given element from the above list.

   Display the contents of the list after deletion.
7. 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 the selected color. Initially, there is no message shown.
8. 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.
9. 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.
10. Write a java program to display the table using Labels in Grid Layout.
11. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).
12. 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).
13. Write a Java program that correctly implements the producer – consumer problem using the concept of inter thread communication.

14. Write a Java program to list all the files in a directory including the files present in all its subdirectories.

TEXT BOOKS:

1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.

REFERENCE BOOKS

1. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.
2. Core Java, Volume 1, 9th edition, Cay S. Horstmann and G Cornell, Pearson.

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)
SOFTWARE ENGINEERING LAB

B.Tech. II Year I Sem.

L	T	P	C
0	0	2	1

Prerequisites: A course on "Programming for Problem Solving".
Co-requisite: A Course on "Software Engineering".
Course Objectives:

- To have hands-on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

Course Outcomes:

- Ability to translate end-user requirements into system and software requirements
- Ability to generate a high-level design of the system from the software requirements
- Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

List of Experiments

Do the following seven exercises for any two projects given in the list of sample projects or any other Projects:

1. Development of problem statements.
2. Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents.
3. Preparation of Software Configuration Management and Risk Management related documents.
4. Study and usage of any Design phase CASE tool
5. Performing the Design by using any Design phase CASE tools.
6. Develop test cases for unit testing and integration testing
7. Develop test cases for various white box and black box testing techniques.

Sample Projects:

1. Passport automation System
2. Online Exam Registration
3. Stock Maintenance System
4. E-ticketing
5. Software Personnel Management System
6. Credit Card Processing
7. E-book management System.
8. Recruitment system
9. Movie Recommendation System
10. Health care Analytics

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

REFERENCE BOOKS:

1. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
2. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)
DATABASE MANAGEMENT SYSTEMS LAB

B.Tech. II Year I Sem.

L	T	P	C
0	0	2	1

Co-requisites: "Database Management Systems"

Course Objectives:

- Introduce ER data model, database design and normalization
- Learn SQL basics for data definition and data manipulation

Course Outcomes:

- Design database schema for a given application and apply normalization
- Acquire skills in using SQL commands for data definition and data manipulation.
- Develop solutions for database applications using procedures, cursors and triggers

List of Experiments:

1. Concept design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. A) Querying (using ANY, ALL, UNION, INTERSECT, JOIN, Constraints etc.) B) Nested, Correlated subqueries
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, McGraw Hill, V edition.

REFERENCES 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.

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

NODE JS/ REACT JS/ DJANGO

B.Tech. II Year I Sem.

L	T	P	C
0	0	2	1

Prerequisites: Object Oriented Programming through Java, HTML Basics.

Course Objectives:

1. To implement the static web pages using HTML and do client-side validation using JavaScript.
2. To design and work with databases using Java
3. To develop an end to end application using java full stack.
4. To introduce Node JS implementation for server-side programming.
5. To experiment with single page application development using React.

Course Outcomes: At the end of the course, the student will be able to,

1. Build a custom website with HTML, CSS, and Bootstrap and little JavaScript.
2. Demonstrate Advanced features of JavaScript and learn about JDBC
3. Develop Server – side implementation using Java technologies like
4. Develop the server – side implementation using Node JS.
5. Design a Single Page Application using React.

Exercises:

1. Build a responsive web application for shopping cart with registration, login, catalog and cart pages using CSS3 features, flex and grid.
2. Make the above web application responsive web application using Bootstrap framework.
3. Use JavaScript for doing client – side validation of the pages implemented in experiment 1 and experiment 2.
4. Explore the features of ES6 like arrow functions, callbacks, promises, async/await. Implement an application for reading the weather information from openweathermap.org and display the information in the form of a graph on the web page.
5. Develop a java stand alone application that connects with the database (Oracle / mySql) and perform the CRUD operation on the database tables.
6. Create an xml for the bookstore. Validate the same using both DTD and XSD.
7. Design a controller with servlet that provides the interaction with application developed in experiment 1 and the database created in experiment 5.
8. Maintaining the transactional history of any user is very important. Explore the various session tracking mechanism (Cookies, HTTP Session)
9. Create a custom server using http module and explore the other modules of Node JS like OS, path, event.
10. Develop an express web application that can interact with REST API to perform CRUD operations on student data. (Use Postman)

11. For the above application create authorized end points using JWT (JSON Web Token).
12. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.
13. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation using chart.js
14. Create a TODO application in react with necessary components and deploy it into GitHub.

REFERENCE BOOKS:

1. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wrox Publications, 2010.
2. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2nd Edition, 2008.
3. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node ,2nd Edition, APress.

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

DISCRETE MATHEMATICS

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

Prerequisites: An understanding of Mathematics in general is sufficient

Course Objectives:

1. Introduces elementary discrete mathematics for computer science and engineering.
2. Topics include formal logic notation, methods of proof, induction, sets, relations, algebraic structures, elementary graph theory, permutations and combinations, counting principles; recurrence relations and generating functions.

Course Outcomes:

1. Understand and construct precise mathematical proofs
2. Apply logic and set theory to formulate precise statements
3. Analyze and solve counting problems on finite and discrete structures
4. Describe and manipulate sequences
5. Apply graph theory in solving computing problems

UNIT - I

Mathematical logic: Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

UNIT - II

Set theory: Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions.

UNIT - III

Algebraic Structures: Introduction, Algebraic Systems, Semi groups and Monoids, Lattices as Partially Ordered Sets, Boolean Algebra.

UNIT - IV

Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutation with Constrained Repetitions, Binomial Coefficient, The Binomial and Multinomial Theorems, The Principle of Exclusion.

UNIT - V

Graph Theory: Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-Hill, 1st ed.

2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott, Abraham Kandel, Teodore P. Baker, Prentis Hall of India, 2nd ed.

REFERENCE BOOKS:

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph. P. Grimald, Pearson education, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill Publishing co.

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)
OPERATING SYSTEMS

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

Prerequisites:
1. A course on "Computer Programming and Data Structures".
2. A course on "Computer Organization and Architecture".

Course Objectives:
1. Introduce operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
2. Introduce the issues to be considered in the design and development of operating system
3. Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

Course Outcomes:
1. Will be able to control access to a computer and the files that may be shared
2. Demonstrate the knowledge of the components of computers and their respective roles in computing.
3. Ability to recognize and resolve user problems with standard operating environments.
4. Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.

UNIT - I

Operating System - Introduction, Structures - Simple Batch, Multiprogrammed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls

Process - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

UNIT - II

CPU Scheduling - Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec

Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

UNIT - III

Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors

Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT - IV

Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

UNIT - V

File System Interface and Operations -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl system calls.

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, William 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.

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

ALGORITHMS DESIGN AND ANALYSIS

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

Prerequisites: Programming for problem solving and Data Structures

Course Objectives

1. Develop proficiency in evaluating algorithms using asymptotic notations, including best-, average-, and worst-case time/space complexities, and solving related recurrence relations.
2. Master various algorithmic strategies—divide-and-conquer, greedy, dynamic programming, backtracking, and branch-and-bound—identifying suitable use cases and demonstrating their application.
3. Critically assess and contrast different algorithms in terms of efficiency, scalability, and correctness through rigorous analytical reasoning and empirical evaluation.
4. Differentiate between tractable (polynomial-time) and intractable (super-polynomial or exponential-time) problems;
5. **Identify and classify** problems as P, NP, NP-hard, or NP-complete, and **assess** their relationships through polynomial-time reductions and Cook's theorem.

Course Outcomes

1. Able to Apply space and time complexity analysis using asymptotic notations.
2. Able to Design divide-and-conquer algorithms and critically assess their runtime and space trade-offs.
3. Able to Device backtracking and dynamic programming solutions.
4. Able to Apply greedy methods and graph traversal algorithms
5. Able to Analyse and Design branch-and-bound algorithms for NP-hard problems

UNIT - I

Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation, and Little oh notation.
Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

UNIT - II

Disjoint Sets: Disjoint set operations, union and find algorithms, Priority Queue- Heaps, Heapsort
Backtracking: General method, applications, n-queens problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

UNIT - III

Dynamic Programming: General method, applications- Optimal binary search tree, 0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design

UNIT - IV

Greedy method: General method, applications- Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.
Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for Graphs, Connected components, Biconnected components.

UNIT - V

Branch and Bound: General method, applications - Travelling salesperson problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

TEXT BOOK:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni, and Rajasekaran, University Press.

REFERENCE BOOKS:

1. Design and Analysis of algorithms, Aho, Ullman, and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C.Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and Sons.

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

COMPUTER NETWORKS

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

Prerequisites

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

Course Objectives

- The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
- Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

Course Outcomes

- Gain the knowledge of the basic computer network technology.
- Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
- Obtain the skills of subnetting and routing mechanisms.
- Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.

UNIT – I

Introduction: Introduction to Computer Networks, Uses of Computer Networks, Network Hardware, Network Software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.

Physical Layer: Guided Transmission media - Twisted Pairs, Coaxial Cable, Fiber Optics, Wireless Transmission.

Data Link Layer: Design Issues, Framing, Error Detection and Correction.

UNIT – II

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, Example Data Link Protocols.

Medium Access Control Sublayer: The channel allocation problem, Multiple access protocols - ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols. Wireless LAN Protocols.

UNIT – III

Network Layer - Network Layer Design Issues, Routing Algorithms - Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network Layer in the Internet.

UNIT - IV

Transport Layer: The Transport Services, Elements of Transport protocols, Congestion Control, The Internet Transport Protocols.

UNIT - V

Application Layer: Domain Name System, SNMP, Electronic Mail, The World Wide WEB, HTTP, Streaming Audio and Video.

TEXT BOOK:

1. Computer Networks - Andrew S Tanenbaum, David. j. Wetherall, Fifth Edition. Pearson Education/PHI
2.Computer Networking: A Top-Down Approach – James F. Kurose, Keith W. Ross, Pearson

REFERENCE BOOKS:

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

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

MACHINE LEARNING

B.Tech. II Year II Sem.

L T P C
3 0 0 3

Prerequisites : 1. Data Structures
2. Knowledge on statistical methods

Course Objectives:

1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To have a thorough understanding of the Supervised and Unsupervised learning techniques
3. To study the various probability-based learning techniques

Course Outcomes:

1. Distinguish between, supervised, unsupervised and semi-supervised learning.
2. Understand algorithms for building classifiers applied on datasets of non-linearly separable classes
3. Design an ensemble model to increase the classification accuracy
4. Understand the principles of RL evolutionary computing algorithms

UNIT - I

Introduction to Machine Learning: Types of Human learning, machine learning process, Well-posed learning problem, Types of machine learning and comparison, applications of machine learning. Model Preparation, Evaluation and feature engineering: Machine learning activities, Types of data in machine learning, dataset understanding, plotting and exploration, checking data quality, remediation, data pre-processing, selecting a model, predictive and descriptive models, supervised learning model training, cross-validation and boot strapping, lazy vs eager learner, interpreting the model- underfitting, overfitting, bias-variance trade-off. Parameter for evaluating performance of classification, regression, and clustering model. Improving performance of a model.

UNIT - II

Feature Engineering: Feature transformation - feature construction, feature extraction by PCA, SVD, LDA. Feature subset selection — feature relevancy and redundancy measures. Feature selection process and approaches.

Review of Probability concepts: joint probability, conditional probability, bayes rule, Common discrete and continuous distributions, dealing with multiple random variables, central limit theorem. Bayes classifier, Multi-class Classification, Naïve Bayes classifier, Bayesian belief network.

UNIT - III

Supervised Learning - Introduction to supervised learning,

Regression: Introduction of regression, Regression algorithms: Simple linear regression, Multiple linear regression, Polynomial regression model, Logistic regression, Maximum likelihood estimation.

Classification: Classification model and learning steps, Classification algorithms: Naïve Bayes classifier, Distance measures, k-Nearest Neighbor (kNN), Decision tree, Support vector machines, Kernel trick, Random Forest.

UNIT - IV

Unsupervised Learning: Introduction to unsupervised learning, Unsupervised vs supervised learning, Application of unsupervised learning, Clustering and its types, Partitioning method: k-Means and K-Medoids, Hierarchical clustering, Density-based methods – DBSCAN.

UNIT - V

Artificial Neural Network: Biological neuron, Artificial neuron, Activation functions, neural network architecture, perceptron, learning process in ANN, Back propagation.
Introduction to deep learning, overview of reinforcement learning, Representation learning, Evolutionary learning. Case-study of ML applications: Image recognition, Email spam filtering, Online fraud detection.

TEXT BOOKS:

1. Saikat Dutt, S. Chjandramouli, Das – Machine Learning, Frist Edition, Pearson
2. M N Murty, Anathanarayana V S – Machine Learning, First Edition, University Press
3. Tom M Mitchell, —Machine Learning, First Edition, McGraw Hill Education, 2013.

REFERENCE BOOKS:

1. Stephen Marsland, —Machine Learning – An Algorithmic Perspective, Second Edition,
2. Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

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Alumni

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)
OPERATING SYSTEMS LAB

B.Tech. II Year II Sem.

L	T	P	C
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Prerequisites:

- A course on "Programming for Problem Solving".
- A course on "Computer Organization and Architecture".

Co-requisite: A course on "Operating Systems".

Course Objectives:

1. To provide an understanding of the design aspects of operating system concepts through simulation.
2. Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix.

Course Outcomes:

1. Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.
2. Able to implement C programs using Unix system calls.

List of Experiments:

1. Write C programs to simulate the following CPU Scheduling algorithms a) FCFS b) SJF c) Round Robin d) priority
2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close, lseek, stat, fork, exit)
3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.
4. Write a C program to implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls.
5. Write C programs to illustrate the following IPC mechanisms a) Pipes b) FIFOs c) Message Queues d) Shared Memory
6. Write C programs to simulate the following memory management techniques a) Paging b) Segmentation
7. Write C programs to simulate Page replacement policies a) FCFS b) LRU c) Optimal

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, William 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.

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

COMPUTER NETWORKS LAB

B.Tech. II Year II Sem.

L	T	P	C
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Prerequisites 1. A course on "Programming for problem solving"
2. A course on "Data Structures"

Course Objectives:

- To understand the working principle of various communication protocols.
- To understand the network simulator environment and visualize a network topology and observe its performance
- To analyze the traffic flow and the contents of protocol frames

Course Outcomes:

- Implement data link layer farming methods
- Analyze error detection and error correction codes.
- Implement and analyze routing and congestion issues in network design.
- Implement Encoding and Decoding techniques used in presentation layer
- To be able to work with different network tools

List of Experiments

1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijkstra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting techniques used in buffers.
10. **Wireshark**
    i. Starting Wire shark
    ii. Packet Capture Using Wire shark
    iii. Viewing Captured Traffic
    iv. Analysis and Statistics & Filters.
11. How to run Nmap Scan
12. Operating System Detection Using Nmap
13. Do the Following Using NS2 Simulator:
    i. NS2 Simulator-Introduction
    ii. Simulate to Find the Number of Packets Dropped
    iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
    iv. Simulate to Find the Number of Packets Dropped due to Congestion
    v. Simulate to Compare Data Rate & Throughput.
    vi. Simulate to Plot Congestion for Different Source/Destination
    vii. Simulate to Determine the Performance with respect to Transmission of Packets

TEXT BOOK:

1. Computer Networks, Andrew S Tanenbaum, David. j. Wetherall, Fifth Edition. Pearson Education/PHI
2. Computer Networking: A Top-Down Approach – James F. Kurose, Keith W. Ross, Pearson

REFERENCES:

1. An Engineering Approach to Computer Networks, S. Keshav, Second Edition, Pearson Education
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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)
MACHINE LEARNING LAB

B.Tech. II Year II Sem.

L	T	P	C
0	0	2	1

Prerequisites: 1. Data Structures
2. Knowledge on statistical methods

Course Objective:

- The objective of this lab is to get an overview of the various machine learning techniques and can demonstrate them using python.

Course Outcomes:

- Understand modern notions in predictive data analysis
- Select data, model selection, model complexity and identify the trends
- Understand a range of machine learning algorithms along with their strengths and weaknesses
- Build predictive models from data and analyze their performance

List of Experiments:

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode, Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering
10. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

TEXT BOOK:

1. Machine Learning – Tom M. Mitchell, - MGH.

REFERENCE BOOK:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis.

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GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)
DATA VISUALIZATION - R PROGRAMMING/ POWER BI

B.Tech. II Year II Sem.

L	T	P	C
0	0	2	1

Prerequisites: 1. A course on "Database Management Systems".

Course Objectives:

- Effective use of Business Intelligence (BI) technology (Tableau) to apply data visualization
- To discern patterns and relationships in the data.
- To build Dashboard applications.
- To communicate the results clearly and concisely.
- To be able to work with different formats of data sets.

Course Outcomes: At the end of the course a student should be able to

- Understand How to import data into Tableau.
- Understand Tableau concepts of Dimensions and Measures.
- Develop Programs and understand how to map Visual Layouts and Graphical Properties.
- Create a Dashboard that links multiple visualizations.
- Use graphical user interfaces to create Frames for providing solutions to real world problems.

Lab Problems:

1. Understanding Data, What is data, where to find data, Foundations for building Data Visualizations, Creating Your First visualization?
2. Getting started with Tableau Software using Data file formats, connecting your Data to Tableau, creating basic charts(line, bar charts, Tree maps),Using the Show me panel.
3. Tableau Calculations, Overview of SUM, AVR, and Aggregate features, Creating custom calculations and fields.
4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Tools and Menus, Formatting specific parts of the view.
5. Editing and Formatting Axes, Manipulating Data in Tableau data, Pivoting Tableau data.
6. Structuring your data, Sorting and filtering Tableau data, Pivoting Tableau data.
7. Advanced Visualization Tools: Using Filters, Using the Detail panel, using the Size panels, customizing filters, Using and Customizing tooltips, Formatting your data with colors.
8. Creating Dashboards & Storytelling, creating your first dashboard and Story, Design for different displays, adding interactivity to your Dashboard, Distributing & Publishing your Visualization.
9. Tableau file types, publishing to Tableau Online, Sharing your visualizations, printing, and Exporting.
10. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.

REFERENCES:

1. Microsoft Power BI cookbook, Brett Powell, 2nd edition.
2. R Programming for Data Science by Roger D. Peng (References)
3. The Art of R Programming by Norman Matloff Cengage Learning India.

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