Scheme & Syllabus of

Bachelor of Science in Cyber Security

(B. Sc. Cyber Security)

Batch 2021 onwards

By

Board of Study Computer Applications

Department of Academics

I K Gujral Punjab Technical University

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Bachelors of Science in Cyber Security (B.Sc. Cyber Security):
It is a Under Graduate (UG) Programme of 3 years duration (6 semesters)

PROGRAM OUTCOMES (POs)

Program: B Sc in Cyber Security

1. **Basic knowledge:** An ability to apply knowledge of basic mathematics, science and domain knowledge to solve the computational problems.

2. **Disciplineknowledge**:Anabilitytoapplydiscipline–specificknowledgeto solve core and/or applied computational problems.

3. **Experiments and practice:** An ability to plan and perform experiments and practices and to use the results to solve computational problems.

4. **Tools Usage**: Apply appropriate technologies and tools with an understanding of limitations.

5. **Profession and society**: Demonstrate knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional practice.

6. **Environment and sustainability**: Understand the impact of the computational solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

7. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the professiona lpractice.

8. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.

9. **Communication:** An ability to communicate effectively.

10. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the context of technological changes.

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

First Semester

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
UGCA1901	Core Theory	Mathematics	3	1	0	40	60	100	4
UGCA1902	Core Theory	Fundamentals of Computer and IT	3	1	0	40	60	100	4
UGCA1903	Core Theory	Problem Solving using C	3	1	0	40	60	100	4
UGCA1904	Practical/Laboratory	Workshop on Desktop Publishing	0	0	4	60	40	100	2
UGCA1905	Core Practical/Laboratory	Problem Solving using C Laboratory	0	0	4	60	40	100	2
UGCA1906	Core Practical/Laboratory	Fundamentals of Computer and IT Laboratory	0	0	4	60	40	100	2
BTHU103/18	Ability Enhancement Compulsory Course (AECC)-I	English	1	0	0	40	60	100	1
BTHU104/18	Ability Enhancement Compulsory Course (AECC)	English Practical/Laboratory	0	0	2	30	20	50	1
HVPE101-18	Ability Enhancement Compulsory Course (AECC)	Human Values, De-addiction and Traffic Rules	3	0	0	40	60	100	3
HVPE102-18	Ability Enhancement Compulsory Course (AECC)	Human Values, De-addiction and Traffic Rules (Lab/ Seminar)	0	0	1	25	--**	25	1
BMPD102-18		Mentoring and Professional Development	0	0	1	25	--**	25	1
	TOTAL		**13**	**3**	**16**	**460**	**440**	**900**	**25**

The Human Values, De-addiction and Traffic Rules (Lab/ Seminar) and Mentoring and Professional Development course will have internal evaluation only. **(See guidelines at the last page of this file)

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Second Semester

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
UGCA1923	Core Theory	Operating Systems	3	1	0	40	60	100	4
UGCA 1971	Core Theory	Fundamentals of Cyber Security	3	1	0	40	60	100	4
UGCA1909	Core Theory	Object Oriented Programming using C++	3	1	0	40	60	100	4
UGCA1910	Core Practical/Laboratory	Object Oriented Programming using C++ Laboratory	0	0	4	60	40	100	2
UGCA1926	Core Practical/Laboratory	Operating Systems Laboratory	0	0	4	60	40	100	2
UGCA 1972	Core Practical/ Laboratory	Fundamentals of Cyber Security Lab	0	0	4	60	40	100	2
EVS102-18	Ability Enhancement Compulsory Course (AECC) -III	Environmental Studies	2	0	0	40	60	100	2
BMPD202-18		Mentoring and Professional Development	0	0	1	25	--	25	1
	TOTAL		**11**	**3**	**13**	**365**	**360**	**725**	**21**

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Third Semester

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
UGCA1913	Core Theory	Computer Networks	3	1	0	40	60	100	4
UGCA1987	Core Theory	Mathematical Foundations for Cryptography	3	1	0	40	60	100	4
UGCA1915	Core Theory	Data Structures	3	1	0	40	60	100	4
UGCA1988	Core Theory	Ethical Hacking	3	0	0	40	60	100	3
UGCA1916	Core Practical/Laboratory	Computer Networks Laboratory	0	0	2	60	40	100	1
UGCA1918	Core Practical/Laboratory	Data Structures Laboratory	0	0	4	60	40	100	2
UGCA1914	Skill Enhancement Course-I	Programming in python	3	0	0	40	60	100	3
UGCA1917	Skill Enhancement Course-Laboratory	Programming in Python lab	0	0	2	30	20	50	1
BMPD302-18		Mentoring and Professional Development	0	0	1	25	--	25	1
	TOTAL		**15**	**3**	**9**	**375**	**400**	**775**	**23**

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Fourth Semester

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
UGCA1922	Core Theory	Database Management System	3	1	0	40	60	100	4
UGCA2001	Core Theory	Network Security	3	1	0	40	60	100	4
UGCA2002	Core Theory	Digital Forensics	3	1	0	40	60	100	4
UGCA1949	Core Theory	Cyber Laws and IPR	3	0	0	40	60	100	3
UGCA1925	Core Practical/Laboratory	Database Management System	0	0	4	60	40	100	2
UGCA2003	Core Practical/Laboratory	Network Security Lab	0	0	2	60	40	100	1
UGCA1927	Skill Enhancement Course-I	Web Technologies	3	0	0	40	60	100	3
UGCA1928	Skill Enhancement Course-Laboratory	Web Technologies Lab	0	0	2	30	20	50	1
BMPD402-18		Mentoring and Professional Development	0	0	1	25	--	25	1
	TOTAL		**15**	**3**	**9**	**375**	**400**	**775**	**23**
Students will undergo 4 weeks Institutional Summer Training* after 4th semester. Examination will be conducted along with 5th semester practical.									

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Fifth Semester

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
UGCA2019	Skill Enhancement Course-III	Advanced Web Technologies	3	0	0	40	60	100	3
UGCA2020	Skill Enhancement Course-Laboratory	Advanced Web Technologies Lab	0	0	2	30	20	50	1
	Open Elective-I		3	1	0	40	60	100	4
	Elective-I		3	1	0	40	60	100	4
	Elective-II		3	1	0	40	60	100	4
	Elective-I Laboratory		0	0	4	60	40	100	2
	Elective-II Laboratory		0	0	4	60	40	100	2
	Project	Minor Project	0	0	2	60	40	100	1
	Institutional Summer Training*		0	0	2	60	40	100	1
BMPD502-18		Mentoring and Professional Development	0	0	1	25	--	25	1
	TOTAL		**12**	**03**	**15**	**455**	**420**	**875**	**23**

Elective -I	
Course Code	Course Title
UGCA2021	Linux Operating System
UGCA2022	TCP/IP
UGCA2023	Wireless Communication

Elective -II	
Course Code	Course Title
UGCA1936	Cloud Computing
UGCA2027	Penetration Testing Using Open-Source Technologies
UGCA2028	Firewall & Intrusion detection

Elective-I Laboratory	
Course Code	Course Title
UGCA2024	Linux Operating System Lab
UGCA2025	TCP/IP Lab
UGCA2026	Wireless Communication Lab

Elective-II Laboratory	
Course Code	Course Title
UGCA1942	Cloud Computing Lab
UGCA2029	Penetration Testing Using Open-Source Technologies Lab
UGCA2030	Firewall & Intrusion detection Lab

Course Code: UGCA1901
Course Name: Mathematics

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Program: B. Sc. Cyber Security	**L:**3 **T:**1 **P:**0
Branch: Computer Applications	**Credits:** 4
Semester: 1st	**Contact hours:** 44 hours
Internal max. marks: 40	**Theory/Practical:** Theory
External max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status: core/elective:** Core

Prerequisite: Student must have the knowledge of Basic Mathematics.
Co requisite: NA.
Additional material required in ESE: Minimum two exercises of each concept will be recorded in the file and the file will be submitted in End Semester Examinations.
Course Outcomes: After studying this course, students will be able to:

CO#	Course Outcomes
CO1	Represent data using various mathematical notions.
CO2	Explain different terms used in basic mathematics.
CO3	Describe various operations and formulas used to solve mathematical problems.

Detailed contents	Contact hours
Unit-I Set Introduction, Objectives, Representation of Sets (Roster Method, Set BuilderMethod),TypesofSets(NullSet,SingletonSet,FiniteSet,InfiniteSet, Equal Set, Equivalent Set, Disjoint Set, Subset, Proper Subset, Power Set, Universal Set) and Operation with Sets (Union of Set, Intersection of Set, DifferenceofSet,SymmetricDifferenceofSet)UniversalSets,Complement of a Set.	12 hours
Unit-II Logic Statement, Connectives, Basic Logic Operations (Conjunction, Disjunction, Negation) Logical Equivalence/Equivalent Statements, Tautologies and Contradictions.	10 hours
Unit –III Matrices Introduction, Types of Matrix (Row Matrix, Column Matrix, Rectangular Matrix, Square Matrix, Diagonal Matrix, Scalar Matrix,Unit Matrix,NullMatrix,ComparableMatrix,EqualMatrix),ScalarMultiplication,	12 hours

Negative of Matrix, Addition of Matrix, Difference of two Matrix, Multiplication of Matrices, Transpose of a Matrix.	
Unit-IV Progressions Introduction, Arithmetic Progression, Sum of Finite number of quantitiesinA.P,ArithmeticMeans,GeometricProgression,GeometricMean.	10 hours

Text Books:

1. Discrete Mathematics and Its Applications by Kenneth H. Rosen, Mc Graw Hill, 6th Edition.
2. College Mathematics, Schaum's Series, TMH.

Reference Books:

1. Elementary Mathematics, Dr. RDSharma
2. Comprehensive Mathematics, ParmanandGupta
3. Elements of Mathematics, MLBhargava

E Books/ Online learning material

1. www.see.leeds.ac.uk/geo-maths/basic_maths.pdf
2. www.britannica.com/science/matrix-mathematics
3. www.pdfdrive.com/schaums-outline-of-discrete-mathematics-third-edition-schaums-e6841453.html

---

Course Code: UGCA1902
Course Name: Fundamentals of Computer and IT

Program: B. Sc. Cyber Security	**L**: 3 **T**: 1 **P**:0
Branch: Computer Applications	**Credits:** 4
Semester: 1st	**Contact hours:** 44 hours
Internal max. marks: 40	**Theory/Practical:** Theory
External max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: -NA-
Co requisite:-NA-
Additional material required in ESE: -NA-

CourseOutcomes:

CO#	Course outcomes

CO1	Understanding the concept of input and output devices of Computers
CO2	Learn the functional units and classify types of computers, how they process information and how individual computers interact with other computing systems and devices.
CO3	Understand an operating system and its working, and solve common problems related to operating systems
CO4	Learn basic word processing, Spreadsheet and Presentation Graphics Software skills.
CO5	Study to use the Internet safely, legally, and responsibly

Detailed Contents	Contact hours
Unit-I **Human Computer Interface** Concepts of Hardware and Software; Data and Information. **Functional Units of Computer System:** CPU, registers, system bus, main memory unit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors. **Devices:** Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter. **Memory:** Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks. **Data Representation:** Bit, Byte, Binary, Decimal, Hexadecimal, and Octal Systems, Conversions and Binary Arithmetic (Addition/ Subtraction/ Multiplication) Applications of IT.	12
Unit-II **Concept of Computing, Types of Languages:** Machine, assembly and High level Language; Operating system as user interface, utility programs. **Word processing:** Editing features, formatting features, saving, printing, table handling, page settings, spell-checking, macros, mail-merge, equation editors.	10
Unit-III **Spreadsheet:** Workbook, worksheets, data types, operators, cell formats, freeze panes, editing features, formatting features, creating formulas, using	10

formulas, cell references, replication, sorting, filtering, functions, Charts & Graphs. **Presentation Graphics Software:** Templates, views, formatting slide, slides with graphs, animation, using special features, presenting slide shows.	
Unit-IV **Electronic Payment System:** Secure Electronic Transaction, Types of Payment System: Digital Cash, Electronic Cheque, Smart Card, Credit/Debit Card E-Money, Bit Coins and Crypto currency, Electronic Fund Transfer (EFT),UnifiedPaymentInterface(UPI),ImmediatePaymentSystem(IMPS), Digital Signature and CertificationAuthority. Introduction to Bluetooth, Cloud Computing, Big Data, Data Mining, Mobile Computing and Embedded Systems and Internet of Things (IoT)	12

Text Books:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education
2. Computer Fundamentals, A. Goel, 2010, PearsonEducation.
3. Fundamentals of Computers, P. K.Sinha & P. Sinha, 2007, BPBPublishers.
4. IT Tools, R.K. Jain, Khanna PublishingHouse
5. "IntroductiontoInformationTechnology",SatishJain,AmbrishRai&ShashiSingh, Paperback Edition, BPB Publications,2014.

Reference Books:

1. "Introduction to Computers", Peter Norton
2. Computers Today, D. H. Sanders, McGrawHill.
3. "Computers", Larry long & Nancy long, Twelfth edition, PrenticeHall.
4. ProblemSolvingCasesinMicrosoftExcel,JosephBrady&EllenFMonk,Thomson Learning

E Books/ Online learning material

1. www.sakshat.ac.in
2. https://swayam.gov.in/course/4067-computer-fundamentals

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Course Code: UGCA1903

Course Name: Problem Solving using C

Program: B. Sc. Cyber Security	**L**: 3 **T**: 1 **P**:0
Branch: Computer Applications	**Credits:** 4
Semester: 1st	**Contact hours:** 44 hours
Internal max. marks: 40	**Theory/Practical:** Theory
External max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: -NA-

Co requisite:-NA-

Additional material required in ESE: -NA-

CourseOutcomes:

CO#	Course outcomes
CO1	Student should be able to understand the logic building used in Programming.
CO2	Students should be able to write algorithms for solving various real life problems.
CO3	To convert algorithms into programs using C .

Detailed Contents	Contact hours
Unit-I **LogicDevelopment:**DataRepresentation,Flowcharts,ProblemAnalysis, Decision Trees/Tables, Pseudo code and algorithms. Fundamentals: Characterset,IdentifiersandKeyWords,Datatypes,Constants,Variables, Expressions, Statements, SymbolicConstants. **Operations and Expressions:** Arithmetic operators, Unary operators, Relational Operators, Logical Operators, Assignment and Conditional Operators, Library functions.	11
Unit-II **Data Input and Output:** formatted & unformatted input output. **Control Statements:** While, Do–while and For statements, Nested loops, If–else, Switch, Break – Continue statements.	10
Unit-III	11

Functions: Brief overview, defining, accessing functions, passing arguments to function, specifying argument data types, function prototypes, recursion. **Arrays**: Defining, processing arrays, passing arrays to a function, multi–dimensional arrays. **Strings**: String declaration, string functions and string manipulation Program Structure Storage Class: Automatic, external and staticvariables.	
Unit-IV **Structures & Unions:** Defining and processing a structure, user defined data types, structures and pointers, passing structures to functions, unions. **Pointers:** Understanding Pointers, Accessing the Address of a Variable, Declaration and Initialization of Pointer Variables, Accessing a Variable through its Pointer, Pointers and Arrays **File Handling:** File Operations, Processing a Data File	12

Text Books:

1. Programming in ANSI C, E. Balagurusami, Fourth Edition, Tata McGrawHill.
2. Programming in C, Third Edition, Stephen G Kochan,Pearson.
3. The C Programming Language, Kernighan & Richie, Second Edition, PHI Publication.

Reference Books:

1. Object Oriented Programming, Lafore R, Third Edition, GalgotiaPublications
2. Let us C, Yashvant P Kanetkar, Seventh Edition, BPB Publications, NewDelhi.
3. Programming in C, Byron S. Gottfried, Second Edition, McGrawHills.
4. Problem Solving and Programming in C, R.S. Salaria, SecondEdition
5. Programming in C, AtulKahate.

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Course Code: UGCA1904
Course Name: Workshop on Desktop Publishing

Program: B. Sc. Cyber Security	**L**: 0 **T**: 0 **P**:4
Branch: Computer Applications	**Credits**: 2
Semester: 1st	**Contact hours**: 4 hours per week
Internal max. marks: 60	**Theory/Practical**: Practical
External max. marks: 40	**Duration of end semester examinations (ESE):** 3hrs
Total marks: 100	**Elective status**: Core

Prerequisite: Students must have basic understanding of designing/ Painting tools.
Co requisite: Printing & Publishing tools.
Additional material required in ESE: Softcopy & Hardcopy of the exercises are tobe maintained during the practical labs and to be submitted during the End Semester Examinations.

Course Outcomes: After studying this course, students will be able to:

CO#	Course outcomes
CO1	The students will gain professional skills of *Desk Top Publishing* Tools like designing, Printing & Publishing by using various tools.
CO2	Develop skills in printing jobs through basic understanding of a variety of designing tools.
CO3	Apply these concepts and knowledge in designing field including practice from text formatting to final publishing.
CO4	Workshops are included to enhance professional skills like Brochures, Flexes, Business Cards, Certificates and News Letter layouts etc.

Instructions: Instructor can increase/decrease the experiments as per the requirement.
Assignments:

1.	Design and print a *Title Page* of a Magazine/Book.
2.	Prepare multiple designs for a *Flex* by using different Tools.
3.	PrepareNSS*Certificates*forappreciationusinglogosofUniversity,College&NSS unit.
4.	Prepare 5 different Designing of *Business Cards*.
5.	Prepare *Envelops* displaying full address of the company by inserting graphical symbol/ logos of company.
6.	Design and Print *Invoices* for three companies.
7.	Prepare and print *News Letter Layouts*for anyfive activities of your college/ university.
8.	Prepare *Invitation Cards* for cultural meet held in your college.

9.	Design and print *Brochures* to advertise a "Blood Donation Camp" in your college.
10.	Design*Logos*ofyourcollege,University&Govt.ofPunjabalsodisplaytheselogos on black background as water mark.
11.	Design, Print and Publish 5 motivations Playcards.
12.	Design & Print assignment book of minimum 20 Pages an any Topic.
13.	Design & Print any five most important activities of your college in a collage.
14.	Design & Print Question Paper of any Subject.
15.	Assemble all the latest news cutting of your activities on a 10 X 8 size flex.

Reference Books:

1. DTP Course, by Shirish Chavan published byRapidex.
2. DTP Course Kit by Vikas Gupta published byComdex.
3. CorelDraw 9 by David Karlins published by Techmedia.
4. Adobe Illustrator CC by Brian Wood published by AdobePress.
5. Page Maker in Easy Steps - ScottBasham.

Software Tools:

1. Adobe Illustrator 14.
2. CorelDraw Graphics Suit.
3. GNU image manipulationprogram.
4. InkScape.
5. PhotoScapeSetup.

6.PM701.

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Course Code: UGCA1905

Course Name: Problem Solving using C Laboratory

Program: B. Sc. Cyber Security	**L**: 0 **T**: 0 **P**:4
Branch: Computer Applications	**Credits**: 2
Semester: 1st	**Contact hours:** 4 hours per week
Internal max. marks: 60	**Theory/Practical:** Practical
External max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
Total marks:100	**Elective status:** Core

Prerequisite: -NA-

Co requisite:-NA-

Additional material required in ESE: -NA-

CourseOutcomes:

CO#	Course Outcomes
CO1	Students should be able understand the logic building used in programming
CO2	Students should be able to write algorithms for solving various real-life problems
CO3	Students should be able to convert the algorithms into computer programs using C language.

Instructions: Develop all programs in C programming language.

Assignments:

1.	WRITEAPROGRAMtodisplayyourname.Writeanotherprogramtoprintmessage with inputted name.
2.	WRITE A PROGRAM to add two numbers.
3.	WRITE A PROGRAM to find the square of a given number.
4.	WRITE A PROGRAM to calculate the average of three real numbers.
5.	Write a program to Find ASCII Value of a Character
6.	WRITE A PROGRAM to Find the Size of int, float, double and char
7.	WRITE A PROGRAM to Compute Quotient and Remainder
8.	WRITE A PROGRAM to accept the values of two variables.
9.	WRITE A PROGRAM to find the simple interest, inputs are amount, period in years and rate of interest.
10.	Basic salary of an employee is input through the keyboard. The DA is 25% of the basic salary while the HRA is 15% of the basic salary. Provident Fund is deducted at the rate of 10% of the gross salary(BS+DA+HRA). WRITE A PROGRAM to calculate the net salary
11.	WRITE A PROGRAM to find area of a circle using PI as constant
12.	WRITE A PROGRAM to find volume of a cube using side as input from user
13.	WRITE A PROGRAM using various unformatted Input Functions

14.	WRITEAPROGRAMtofindareaofrectangleandprinttheresultusingunformatted output Functions
15.	WRITE A PROGRAM to find the larger of two numbers.
16.	WRITE A PROGRAM to find greater of three numbers using Nested If.
17.	WRITE A PROGRAM to find whether the given number is even or odd.
18.	WRITE A PROGRAM to Generate Multiplication Table Using for loop
19.	WRITE A PROGRAM to Generate Multiplication Table Using while loop
20.	WRITE A PROGRAM to Make a Simple Calculator Using switch...case
21.	WRITE A PROGRAM to find whether the given number is a prime number.
22.	WRITE A PROGRAM using function to find the largest of three numbers
23.	WRITE A PROGRAM using function to print first 20 numbers and its squares.
24.	WRITE A PROGRAM to find the factorial of a given number.
25.	WRITE A PROGRAM to print the sum of two matrices
26.	WRITE A PROGRAM to Find the Length of a String
27.	WRITE A PROGRAM to Copy String using strcpy()
28.	WRITE A PROGRAM to compare a string
29.	WRITE A PROGRAM to reverse a string
30.	WRITE A PROGRAM to reverse a string
31.	WRITE A PROGRAM to multiply two numbers using pointers.
32.	WRITE A PROGRAM to display address of variable using pointers
33.	WRITE A PROGRAM to show the memory occupied by Structure and Union
34.	WRITE A PROGRAM to create Student I-Card using a Structure
35.	WRITE A PROGRAM to read data from a file from a file
36.	WRITE A PROGRAM to save Employee details in a file using File Handling

---

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Course Code: UGCA1906

Course Name: Fundamentals of Computer and IT Laboratory

Program: B. Sc. Cyber Security	**L**: 0 **T**: 0 **P**:4
Branch: Computer Applications	**Credits:** 2
Semester: 1st	**Contact hours:** 4 hours per week
Internal max. marks: 60	**Theory/Practical:** Practical
External max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: -NA-

Co requisite:-NA-

Additional material required in ESE: - NA-

CourseOutcomes:

CO#	Course outcomes
CO1	FamiliarizingwithOpenOffice(Wordprocessing,SpreadsheetsandPresentation).
CO2	To acquire knowledge on editor, spread sheet and presentation software.
CO3	The students will be able to perform documentation and accounting operations.
CO4	Students can learn how to perform presentation skills.

Instructions:

Word Orientation: The instructor needs to give an overview of word processor. Details of the four tasks and features that would be covered Using word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.	
1.	Using word to create Resume Featurestobecovered:-FormattingFontsinword,DropCapinword,Applying Texteffects,UsingCharacterSpacing,BordersandColors,InsertingHeaderand Footer, Using Date and Time option inWord.
2.	Creating an Assignment Features to be covered: - Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
3.	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 and Paragraphs
4.	Creating a Feedback form Features to be covered :- Forms, Text Fields, Inserting objects, Mail Merge in Word.
Excel Orientation:	

The instructor needs to tell the importance of Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered Excel – Accessing, overview of toolbars, saving excel files,	
1.	Creating a Scheduler Features to be covered :- Gridlines, Format Cells, Summation, auto fill, Formatting Text
2.	Calculations Features to be covered :- Cell Referencing, Formulae in excel – average, std.deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP
3.	Performance Analysis Features to be covered :- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting
4.	Game (like Cricket, badminton) Score Card Features to be covered :- Pivot Tables, Interactive Buttons, Importing Data, Data Protection, Data Validation
Presentation Orientation:	
1.	Studentswillbeworkingonbasicpowerpointutilitiesandtoolswhichhelpthem create basic power point presentation. Topic covered includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows
2.	This session helps students in making their presentations interactive. Topicscoveredincludes:Hyperlinks,Inserting–Images,ClipArt,Audio,Video, Objects, Tables andCharts
3.	Concentrating on the in and out of Microsoft power point. Helps them learn best practices in designing and preparing power point presentation. Topics covered includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures,DesignTemplates,Hiddenslides.Autocontentwizard,SlideTransition, Custom Animation, Auto Rehearsing
4.	Power point test would be conducted. Students will be given model power point presentation which needs to be replicated
Internet and its Applications The instructor needs to tell the how to configure Web Browser and to use search engines by defining search criteria using Search Engines	
1.	To learn to setup an e-mail account and send and receive e-mails
2.	Tolearntosubscribe/postonablogandtousetorrentsforacceleratedownloads
3.	Hands on experience in online banking and Making an online payment for any domestic bill

Reference Books:

1. IT Tools, R.K. Jain, Khanna PublishingHouse.

2. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
3. Introduction to information technology, Turban, Rainer and Potter, John Wiley and Sons.
4. ProblemSolvingCasesinMicrosoftExcel,JosephBrady&EllenFMonk,Thomson Learning.

AECC (For UGC courses)
BTHU103-18 English:

Course Outcomes:

- The objective of this course is to introduce students to the theory, fundamentals and tools ofcommunication.
- To help the students become the independent users of Englishlanguage.
- To develop in them vital communication skills which are integral to their personal, social and professionalinteractions.
- ThesyllabusshalladdresstheissuesrelatingtotheLanguageofcommunication.
- Students will become proficient in professional communication such as interviews, group discussions, office environments, important reading skills as well as writing skills such as report writing, note takingetc.

The recommended readings given at the end are only suggestive; the students and teachershavethefreedomtoconsultothermaterialsonvariousunits/topicsgivenbelow.
Similarly, the questions in the examination will be aimed towards assessing the skills learnt by the students rather than the textual content of the recommendedbooks.

Detailed Contents:

Unit1- 1 (Introduction)

- Theory ofCommunication
- Types and modes ofCommunication

Unit- 2 (Language of Communication)

- Verbal and Non-verbal
- (Spoken andWritten)
- Personal, Social andBusiness
- Barriers andStrategies
- Intra-personal, Inter-personal and Groupcommunication

Unit-3 (Reading and Understanding)

- CloseReading
- Comprehension
- SummaryParaphrasing

- Analysis andInterpretation
- Translation(from Hindi/Punjabi to English and vice-versa)
  OR
  Precis writing /Paraphrasing (for International Students)
- Literary/KnowledgeTexts

Unit-4 (Writing Skills)

- Documenting
- ReportWriting
- Makingnotes
- Letterwriting

Recommended Readings:

1. *Fluency in English* - Part II, Oxford University Press,2006.
2. *Business English,* Pearson,2008.
3. *Language, Literature and Creativity*, Orient Blackswan,2013.
4. *Language through Literature* (forthcoming) ed. Dr. Gauri Mishra, Dr RanjanaKaul, Dr BratiBiswas
5. *On Writing Well*. William Zinsser. Harper Resource Book.2001
6. *Study Writing.* Liz Hamp-Lyons and Ben Heasly. Cambridge University Press.2006.

AECC
BTHU104/18 English Practical/Laboratory
: 0L 0T 2P 1 Credit

Course Outcomes:

- The objective of this course is to introduce students to the theory, fundamentals and tools ofcommunication.
- To help the students become the independent users of Englishlanguage.
- To develop in them vital communication skills which are integral to personal, social and professionalinteractions.
- ThesyllabusshalladdresstheissuesrelatingtotheLanguageofcommunication.
- Students will become proficient in professional communication such as interviews, group discussions and business office environments, important reading skills as well as writing skills such as report writing, note takingetc.

The recommended readings given at the end are only suggestive; the students and teachershavethefreedomtoconsultothermaterialsonvariousunits/topicsgivenbelow.
Similarly, the questions in the examination will be aimed towards assessing the skills learnt by the students rather than the textual content of the recommendedbooks.

Interactive practice sessions in Language Lab on Oral Communication

- ListeningComprehension
- Self Introduction, Group Discussion and RolePlay
- Common Everyday Situations: Conversations andDialogues
- Communication atWorkplace
- Interviews
- FormalPresentations
- Monologue
- Effective Communication/ Mis-Communication
- PublicSpeaking

Recommended Readings:

1. *Fluency in English* - Part II, Oxford University Press,2006.
2. *Business English*, Pearson,2008.
3. Practical English Usage. Michael Swan. OUP.1995.
4. *Communication Skills*. Sanjay Kumar and Pushp Lata. Oxford University Press.2011.
5. *Exercises in Spoken English*. Parts. I-III. CIEFL, Hyderabad. Oxford UniversityPress

---

Course Code:HVPE101-18
Course Name: Human Values, De-addiction and Traffic Rules

Program: B. Sc. Cyber Security	**L**: 3 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits:** 3
Semester: 1st	**Contact hours:** 33 hours
Internal max. marks: 40	**Theory/Practical:** Theory
External max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Ability Enhancement

Prerequisite: -NA-
Co requisite:-NA-
Additional material required in ESE: -NA-

CourseOutcomes:

CO#	Course outcomes
CO1	To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the coreaspirations of all human beings.

CO2	To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Value based living in a natural way.
CO3	To highlight plausible implications of such a Holistic understanding in terms ofethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction withNature.

Note: This course is intended to provide a much needed orientational input in Value Education to the young enquiring minds.

Detailed Contents	Contact hours
Unit-I **Course Introduction - Need, Basic Guidelines, Content and Process for Value Education** 1. Understanding the need, basic guidelines, content and process for ValueEducation 2. Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration 3. Continuous Happiness and Prosperity- A look at basic HumanAspirations 4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correctpriority 5. UnderstandingHappinessandProsperitycorrectly-Acriticalappraisal of the currentscenario 6. Method to fulfill the above human aspirations: understanding and living in harmony at variouslevels	8
Unit-II **Understanding Harmony in the Human Being - Harmony in Myself!** 1. Understanding human being as a co-existence of the sentient 'I' and the material'Body' 2. Understanding the needs of Self ('I') and 'Body' - *Sukh* and*Suvidha* 3. Understanding the Body as an instrument of 'I' (I being the doer, seer andenjoyer) 4. Understanding the characteristics and activities of 'I' and harmonyin 'I'	8

5. UnderstandingtheharmonyofIwiththe Body:*Sanyam*and*Swasthya*; correct appraisal of Physical needs, meaning of Prosperity indetail 6. Programs to ensure *Sanyam* and*Swasthya* - Practice Exercises and Case Studies will be taken up in Practice Sessions.	
Unit-III **UnderstandingHarmonyintheFamilyandSociety-HarmonyinHuman-HumanRelationship** 1. Understanding harmony in the Family- the basic unit of human interaction 2. Understandingvaluesinhuman-humanrelationship;meaningof *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship 3. Understanding the meaning of *Vishwas*; Difference between intention andcompetence 4. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values inrelationship 5. Understanding the harmony in the society (society being an extension offamily):*Samadhan,Samridhi,Abhay,Sah-astitva*ascomprehensive HumanGoals 6. Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj),* Universal Order (*Sarvabhaum Vyawastha)*-from family to worldfamily! - Practice Exercises and Case Studies will be taken up in Practice Sessions.	6
Unit-IV **Understanding Harmony in the Nature and Existence - Whole existence as Co-existence** *1.* Understanding the harmony in theNature *2.* Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation innature *3.* Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasivespace *4.* Holistic perception of harmony at all levels ofexistence - Practice Exercises and Case Studies will be taken up in Practice Sessions.	5
Unit-V	6

Implications of the above Holistic Understanding of Harmony on Professional Ethics 1. Natural acceptance of humanvalues 2. Definitiveness of Ethical HumanConduct 3. Basis for Humanistic Education, Humanistic Constitution and Humanistic UniversalOrder 4. Competence in professionalethics: a) Ability to utilize the professional competence for augmenting universal humanorder, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, c) Abilitytoidentifyanddevelopappropriatetechnologiesand management patterns for above productionsystems. 5. Case studies of typical holistic technologies, management models and productionsystems 6. Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists andmanagers b) Atthelevelofsociety:asmutuallyenrichinginstitutionsand organizations.	

Text Book

1. R R Gaur, R Sangal, G P Bagaria, 2009, *A Foundation Course in Value Education*.

Reference Books

1. Ivan Illich, 1974, *Energy & Equity,* The Trinity Press, Worcester, and Harper Collins, USA.
2. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs,Britain.
3. A Nagraj, 1998, *Jeevan Vidya ek Parichay,* Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How *the Other Half Dies,* Penguin Press. Reprinted 1986, 1991.
5. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Common wealthPublishers.
6. A.N. Tripathy, 2003, *Human Values*, New Age InternationalPublishers.
7. Subhas Palekar, 2000, *How to practice Natural Farming,* Pracheen (Vaidik) Krishi Tantra Shodh,Amravati.
8. DonellaH.Meadows,DennisL.Meadows,JorgenRanders,WilliamW.Behrens III, 1972, *Limits to Growth – Club of Rome's report,* UniverseBooks.
9. E G Seebauer & Robert L. Berry, 2000, *Fundamentals of Ethics for Scientists & Engineers,* Oxford UniversityPress

10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, *Engineering Ethics (includingHumanValues)*,EasternEconomyEdition,PrenticeHallofIndiaLtd.
11. B P Banerjee, 2005, *Foundations of Ethics and Management*, Excel Books.
12. BLBajpai,2004,*IndianEthosandModernManagement*,NewRoyalBookCo., Lucknow. Reprinted2008.

Relevant CDs, Movies, Documentaries & Other Literature:

1. Value Education website,http://uhv.ac.in
2. Story of Stuff,http://www.storyofstuff.com
3. Al Gore, An Inconvenient Truth, Paramount Classics,USA
4. Charlie Chaplin, Modern Times, United Artists,USA
5. IIT Delhi, Modern Technology – the Untold Story

Course Code: HVPE102-18
Course Name: Human Values, De-addiction and Traffic Rules (Lab/ Seminar)

Program: B. Sc. Cyber Security	**L**: 0 **T**: 0 **P**:1
Branch: Computer Applications	**Credits:** 1
Semester: 1st	**Contact hours:** 1 hour per week
Internal max. marks: 25	**Theory/Practical:** Practical
External max. marks: 0	**Duration of end semester exam (ESE):** 3hrs
Total marks: 25	**Elective status:** Ability Enhancement

One each seminar will be organized on Drug De-addiction and Traffic Rules. Eminent scholar and experts of the subject will be called for the Seminar at least once during the semester. It will be binding for all the students to attend the seminar.

Course Code: UGCA1923
Course Name: Operating Systems

Program: B Sc	**L**:3 **T**:1 **P**:0
Branch: Cyber Security	**Credits**: 4
Semester: 4th	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems:** 15%
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Core
Total marks: 100	

Prerequisite: Basic understanding of computer system.

Co requisite: -NA-
Additional material required in ESE: -NA-
Course Outcomes: Students will be able to:

CO#	Course outcomes
CO1	Discuss the evaluation of operating systems.
CO2	Explain different resource managements performed by operating system.
CO3	Describe the architecture in terms of functions performed by different types of operating systems.
CO4	Analyze the performance of different algorithms used in design of operating system components.

Detailed contents	Contact hours
Unit-I **Fundamentals of Operating system**: Introduction to Operating system, Functions of an operating system. Operating system as a resource manager. Structure of operating system (Role of kernel and Shell). Views of operating system. Evolution and types of operating systems. **Process & Thread Management**: Program vs. Process; PCB, State transition diagram, Scheduling Queues, Types of schedulers, Concept of Thread, Benefits, Types of threads, Process synchronization. **CPU Scheduling**: Need of CPU scheduling, CPU I/O Burst Cycle, Preemptive vs. Non-pre-emptive scheduling, Different scheduling criteria's, scheduling algorithms (FCSC, SJF, Round-Robin, Multilevel Queue).	12

Unit-II **Memory Management**: Introduction, address binding, relocation, loading, linking, memory sharing and protection; Paging and segmentation; Virtual memory: basic concepts of demand paging, page replacement algorithms.	12
Unit-III **I/O Device Management**: I/O devices and controllers, device drivers; disk storage. **File Management**: Basic concepts, file operations, access methods, directory structures and management, remote file systems; file protection.	08
Unit-IV **Advanced Operating systems:** Introduction to Distributed Operating system, Characteristics, architecture, Issues, Communication & Synchronization; Introduction Multiprocessor Operating system, Architecture, Structure, Synchronization & Scheduling; Introduction to Real-Time Operating System, Characteristics, Structure & Scheduling. Case study of Linux operating system	12

Text Books:

1. Operating System Principles by Abraham Silberschatz and Peter Baer Galvin, Seventh Edition, Published byWiley-India.
2. Principals of Operating System by Naresh Chauhan, Published by OXFORD University Press,India.

Reference Books:

1. Operating Systems by Sibsankar Haldar and Alex A. Aravind, Published by PearsonEducation.
2. Operating system by Stalling, W., Sixth Edition, Published by Prentice Hall (India)

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Course Code: UGCA1971
Course Name: Fundamentals of Cyber Security

Program: B. Sc. Cyber Security	**L**: 3 **T**: 1 **P**:0
Branch: Computer Applications	**Credits:** 4
Semester: 4th	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems:** --
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Core
Total marks: 100	

Prerequisite: -NA-

Co requisite: -NA-

Additional material required in ESE: -NA-

Course Outcomes: Students will be able to

CO#	Course outcomes
CO1	Define key knowledge areas of cyber security
CO2	Justify the need of various measures to protect cyber space
CO3	Identify various threads to cyber security

Detailed contents	Contact hours
Unit-I **IntroductiontoCyberSpace:**HistoryofInternet,CyberCrime,Information Security, Computer Ethics and Security Policies, **Choosing the Best Browser according to the requirement and email security,** Guidelines to choose web browsers, Securing web browser, Antivirus ,Email. **Guidelines for secure password and wi-fi security:** Guidelines for setting up a Secure password, Two-steps Password management, Wi-Fi Security. **Guidelines for social media and basic Windows security:** Guidelines for social media.	12
Unit-II **Smartphone security guidelines:** Introduction to mobile phones, Smartphone Security ,AndroidSecurity, IOS Security. **Cyber Security Initiatives in India:** Counter Cyber Security Initiatives in India, Cyber Security Exercise, Cyber Security Incident Handling.	10
Unit-III **Online Banking, Credit Card and UPI Security: Overview of** Online Banking Security, Mobile Banking Security, Security of Debit and Credit Card, UPISecurity.	12

Unit-IV **Cyber Security Threat Landscape and Techniques:** Cyber Security Threat Landscape, Emerging Cyber Securitythreats , Cyber Security Techniques, Firewall. **IT Security Act and Misc. Topics:** IT Act ,Hackers-Attacker-Countermeasures ,WebApplicationSecurity ,Digital Infrastructure Security, DefensiveProgramming.	10

Text Books:

1. Introduction to Cyber Security available athttp://uou.ac.in/foundation-course
2. Fundamentals of Information Security http://uou.ac.in/progdetail?pid=CEGCS-17
3. Cyber Security Techniqueshttp://uou.ac.in/progdetail?pid=CEGCS-17
4. Cyber Attacks and Counter Measures: User Perspective http://uou.ac.in/progdetail?pid=CEGCS-17
5. Information System http://uou.ac.in/progdetail?pid=CEGCS-17

ReferenceBooks:
Introduction to Cyber Security: Jatindra Pandey.

Course Code: UGCA1909
Course Name: Object Oriented Programming using C++

Program: B. Sc. Cyber Security	**L**: 3 **T**: 1 **P**: 0
Branch: Computer Applications	**Credits:** 4
Semester: 2nd	**Contact hours:** 44 hours
Internal max. marks: 40	**Theory/Practical:** Theory
External max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: -NA-
Co requisite:-NA-
Additional material required in ESE: -NA-

CourseOutcomes:

CO#	Course outcomes
CO1	To learn programming from real world examples.

CO2	To understand Object oriented approach for finding Solutions to various problems with the help of C++ language.
CO3	To create computer based solutions to various real-world problems using C++
CO4	To learn various concepts of object oriented approach towards problem solving

Detailed Contents	Contact hours
Unit-I **Principles of object oriented programming** Introduction to OOP and its basic features, Basic components of a C++, Program and program structure, Compiling and Executing C++ Program. Difference between Procedure Oriented Language(C) and Object Oriented Language	12
Unit-II **Classes & Objects and Concept of Constructors** Defining classes, Defining member functions, Declaration of objects to class, Access to member variables from objects, Different forms of member functions, Access specifiers (Private, public, protected), Array of objects. Introduction to constructors, Parameterized constructors, Copy Constructor, Multiple constructors in class, Dynamic initialization of objects, Destructors.	10
Unit-III **Inheritance and Operator overloading** IntroductiontoInheritance,Typesofinheritance:-Singleinheritance,Multiple inheritance, Multilevel inheritance, Hierarchical inheritance, Hybrid inheritance, Defining operator overloading, Overloading of Unary and Binary operators, Rules for overloadingoperators	12
Unit-IV **Polymorphism and File Handling** EarlyBinding,LateBinding,VirtualFunctions,purevirtualfunctions,Abstract Classes. Opening and Closing File, Reading and Writing a file.	10

Text Books:

1. Object Oriented Programming with C++, E. Balagurusami, Fourth Edition, Tata Mc-GrawHill.
2. Object Oriented Programming in Turbo C++, Robert Lafore, Fourth Edition GalgotiaPublications.
3. The C++ Programming Language, Bjarna Stroustrup, Third Edition, Addison-Wesley PublishingCompany.
4. ObjectOrientedProgrammingUsingC++,Salaria,R.S,FourthEdition,Khanna Book Publishing.

Course Code: UGCA1910
Course Name: Object Oriented Programming using C++ Laboratory

Program: B. Sc. Cyber Security	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits:** 2
Semester: 2nd	**Contact hours:** 4 hours per week
Internal max. marks: 60	**Theory/Practical:** Practical
External max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite: -NA-
Co requisite:-NA-
Additional material required in ESE: -NA-

CourseOutcomes:

CO#	Course outcomes
CO1	To learn programming from real world examples.
CO2	To understand Object oriented approach for finding Solutions to various problems with the help of C++ language.
CO3	To create computer based solutions to various real-world problems using C++
CO4	To learn various concepts of object oriented approach towards problem solving

Instructions: Develop all program in C++
Assignments:

1.	Writeaprogramtoentermarkof6differentsubjectsandfindoutthetotalmark(Using cin and cout statement)
2.	Write a function using reference variables as arguments to swap the values of pair of integers.
3.	Write a function to find largest of three numbers.
4.	Write a program to find the factorial of a number.

5.	Define a class to represent a bank account which includes the following members as Data members: a) Name of the depositor b) Account Number c) Withdrawal amount d) Balance amount in the account Member Functions: a) To assign initial values b)To deposit an amount c) To withdraw an amount after checking the balance d) To display name and balance.
6.	Write the above program for handling n number of account holders using array of objects.
7.	Write a C++ program to compute area of right angle triangle, equilateral triangle, isosceles triangle using function overloading concept.
8.	Consider a publishing company that markets both book and audio cassette version to itsworks.CreateaclassPublicationthatstoresthetitle(astring)andprice(typefloat) of a publication. Derive the following two classes from the above Publication class: Book which adds a page count (int) and Tape which adds a playing time in minutes(float).Eachclassshouldhaveget_data()functiontogetitsdatafromtheuser at the keyboard. Write the main() function to test the Book and Tape classes by creatinginstancesofthemaskingtheusertofillindatawithget_data()andthen displaying it using put_data().
9.	Consideranexampleofdeclaringtheexaminationresult.Designthreeclassesstudent, exam and result. The student has data members such as rollno, name. Create the lass exam by inheriting the student class. The exam class adds data members representing the marks scored in 5 subjects. Derive the result from exam-class and it has owndata members like total, avg.
10.	Write a program for overloading of Unary ++ operator.
11.	Write a program for overloading of Binary + operator.
12.	Write a program of Virtual Functions.
13.	Write a program of Abstract Classes.
14.	Write a program to read and write from file.

Reference Books:

1. Object Oriented Programming with C++, E. Balagurusami, Fourth Edition, Tata Mc-GrawHill.
2. Object Oriented Programming in Turbo C++, Robert Lafore, Fourth Edition GalgotiaPublications.
3. The C++ Programming Language, Bjarna Stroustrup, Third Edition, Addison-Wesley PublishingCompany.
4. ObjectOrientedProgrammingUsingC++,Salaria,R.S,FourthEdition,Khanna Book Publishing.

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Course Code: UGCA1926
Course Name: Operating Systems Laboratory

Program: B Sc	**L**:0 **T**:0 **P**:4
Branch: Cyber Security	**Credits**: 2
Semester: 4th	**Contact hours**: 4 hours per week
Theory/Practical: Practical	**Percentage of numerical/design problems:** 100
Internal max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 40	**Elective status:** Core
Total marks: 100	

Prerequisite: -
NA- Co
requisite: -NA-
Additional material required in ESE: -NA-

Course Outcomes: After going through the practical, student will be able to:

CO#	Course outcomes
CO1	Install & configure different operating systems.
CO2	Write programs/ scripts for different scheduling algorithms.

Instructions:

1	Installation of windows OS.
2	Installation of Linux OS.
3	Dual boot installation of Operating systems.
4	Implementation of FCFS Scheduling algorithm
5	Implementation of SJF Scheduling algorithm
6	Implementation of Round-Robin Scheduling algorithm
7	Vi Editor & its commands
8	Shell Commands
9	Shell Scripting- Using variables
10	Shell Scripting- Input & Output
11	Shell Scripting- Data types
12	Shell Scripting- Use of arithmetic operators
13	Shell Scripting- if control statement programs
14	Shell Scripting- while control statement
15	Shell Scripting- for control statement

Reference Books:

i. Linux: The complete reference by Richard Petersen, Published

by Tata McGraw- HillPublication.

ii. Operating System Principles by Abraham Silberschatz and Peter Baer Galvin, Seventh Edition, Published byWiley-India.

Course Code: UGCA1972
Course Name: Fundamentals of Cyber Security Lab

Program: B. Sc. Cyber Security	**L**: 0 **T**: 0 **P**:4
Branch: Computer Applications	**Credits:** 2
Semester: 4th	**Contact hours:** 4 hours per week
Theory/Practical: Practical	**Percentage of numerical/design problems:** 100%
Internal max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 40	**Elective status:** Core
Total marks: 100	

Prerequisite: -NA-
Co requisite:-NA-
Additional material required in ESE: -NA-

CourseOutcomes:

CO#	Course outcomes
CO1	Implement various security policies.
CO2	Set various networking parameters
CO3	Choose best security options for antiviruses.

Experiments:

1. WriteaprograminC/Javatoperformencryptionanddecryptionusingthe followingalgorithms
   a) CeaserCipher
   b) SubstitutionCipher
2. Demonstrate creation of Digital signatures usingGNUPG.
3. Demonstrate the concept offirewalls.
4. Install Wireshark and different filters for networkmonitoring.
5. Install the keyloggers to understand theirworking.

Ability Enhancement Compulsory Course
EVS102-18 Environmental Studies

Course Outcomes:

1. Students will enable to understand environmental problems at local and national level through literature and general awareness.

2. The students will gain practical knowledge by visiting wildlife areas, environmentalinstitutesandvariouspersonalitieswhohavedonepracticalworkon various environmentalIssues.

3. The students will apply interdisciplinary approach to understand key environmental issues and critically analyze them to explore the possibilities to mitigate theseproblems.

4. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world

UNIT-1: Introduction to Environmental Studies
Multidisciplinary nature of Environmental Studies: Scope & Importance
Need for Public Awareness

UNIT-2: Ecosystems
ConceptofanEcosystem:Structure&functionsofanecosystem(Producers,Consumers &Decomposers)
Energy Flow in an ecosystem: Food Chain, Food web and Ecological Pyramids
Characteristic features, structure & functions of following Ecosystems:

- ForestEcosystem
- Aquatic Ecosystem (Ponds, Lakes, River &Ocean)

UNIT-3: Natural Resources
Renewable & Non-renewable resources
Forest Resources: Their uses, functions & values (Biodiversity conservation, role in climate change, medicines) & threats (Overexploitation, Deforestation, Timber extraction, Agriculture Pressure), Forest Conservation Act
Water Resources: Their uses (Agriculture, Domestic & Industrial), functions & values, Overexploitation and Pollution of Ground & Surface water resources (Case study of Punjab), Water Conservation, Rainwater Harvesting,

Land Resources: Land as a resource; Land degradation, soil erosion and desertification

Energy Resources: Renewable & non-renewable energy resources, use of alternate energy resources (Solar, Wind, Biomass, Thermal), Urban problems related to Energy

UNIT-4: Biodiversity & its conservation
Types of Biodiversity: Species, Genetic & Ecosystem
India as a mega biodiversity nation, Biodiversity hot spots and biogeographic regions of India
Examples of Endangered & Endemic species of India, Red data book

UNIT-5: Environmental Pollution & Social Issues
Types, Causes, Effects & Control of Air, Water, Soil & Noise Pollution
Nuclear hazards and accidents & Health risks

Global Climate Change: Global warming, Ozone depletion, Acid rain, Melting of Glaciers & Ice caps, Rising sea levels
Environmental disasters: Earthquakes, Floods, Cyclones, Landslides

UNIT-6: Field Work
Visit to a National Park, Biosphere Reserve, Wildlife Sanctuary
Documentation & preparation of a Biodiversity (flora & fauna) register of campus/river/forest
Visit to a local polluted site: Urban/Rural/Industrial/Agricultural
Identification & Photography of resident or migratory birds, insects (butterflies)
Public hearing on environmental issues in a village

Suggested Books:

1. Bharucha, E. Text Book for Environmental Studies. University Grants Commission, NewDelhi.
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd.Bikaner.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.480p
5. Clark R.S., Marine Pollution, Clanderson Press Oxford(TB)
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai,1196p
7. De A.K., Environmental Chemistry, Wiley EasternLtd.
8. Down to Earth, Centre for Science and Environment(R)
9. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
10. Hawkins R.E., Encyclopedia of Indian Natural History, BombayNatural History Society, Bombay(R)
11. Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press1140p.
12. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p.
13. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems &Solutions, Web enhanced edition.639p.
14. Mhaskar A.K., Matter Hazardous, Techno-Science Publication(TB)
15. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co.(TB)
16. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA,574p
17. Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBHPubl. Co. Pvt. Ltd. 345p.
18. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House,Meerut
19. Survey of the Environment, The Hindu(M)
20. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)

21. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication(TB)
22. Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA499p

CourseCode:UGCA1913
CourseName:ComputerNetworks

Program:B.Sc.Cyber Security	**L:**3 **T:**1 **P:**0
Branch: ComputerApplications	**Credits:**4
Semester:3rd	**Contacthours:**44hours
Internalmax.marks:40	**Theory/Practical:**Theory
Externalmax.marks:60	**Durationofendsemesterexam (ESE):** 3hrs
Totalmarks: 100	**Electivestatus: core/elective:**Core

Prerequisite: InformationTechnology
Corequisite:-NA-
Additional material required in ESE: -NA-

CourseOutcomes: Studentswill beable to

CO#	Courseoutcomes
CO1	Highlightthecharacteristicsofvariousprotocols.
CO2	Definedifferentnetworktechnologiesandtheir application.
CO3	IdentifyHardwareand softwarecomponents fordesigningnetwork.
CO4	Comparetheperformance ofdifferentnetworkmedia
CO5	Implementvariousconfigurationsettings

DetailedContents	Contacthours

Unit-I **Data communications concepts:** Digital and analog transmissions-Modem,parallelandserialtransmission,synchronousandasynchronouscommunication. Modes of communication: Simplex, half duplex, full duplex.[CO1] **Typesof Networks:** LAN,MAN,WAN **NetworkTopologies:** Bus,Star,Ring,Mesh,Tree,Hybrid **Communication Channels: Wired transmissions:** Telephone lines, leasedlines,switchline,coaxialcables-baseband,broadband,opticalfibertransmission.**[**CO3] **CommunicationSwitchingTechniques**:CircuitSwitching,MessageSwitching, Packet Switching.[CO1]	12
Unit-II **NetworkReferenceModels**:OSIReferenceModel,TCP/IPReferenceModel,Comparisonof OSIandTCP/IP ReferenceModels. Transmission impairments – Attenuation, Distortion, Noise. Multiplexing – Frequencydivision, Time division, Wavelength division. [CO2] **Data Link Layer Design Issues**: Services provided to the Network Layer,Framing, Error Control (error detection and correction code), Flow Control,Data LinkLayerin theInternet(SLIP, PPP)[CO2]	10
Unit-III **MACsublayer:**CSMA/CD/CA,IEEEstandards(IEEE802.3Ethernet,GigabitEthernet,IEEE802.4 TokenBus,IEEE802.5TokenRing) [CO1] **Network Layer:** Design Issues, Routing Algorithms: Optimality Principle,Shortest Path Routing, Congestion Control Policies, Leaky bucket and tokenbucketalgorithm, Concept ofInternetworking.[CO1]	12

Unit-IV **TransportLayer**:Designissues,Elementsoftransportprotocols–Addressing,Connectionestablishmentandrelease,Flowcontrolandbuffering,Introductionto TCP/UDP protocols.[CO4] **Session,PresentationandApplicationLayers**:SessionLayer–Design issues,remoteprocedurecall.PresentationLayer–Designissues,Datacompressiontechniques,Cryptography.ApplicationLayer–Distributed application(client/server,peertopeer,cloudetc.),WorldWideWeb(WWW), DomainNameSystem(DNS),E-mail,FileTransferProtocol(FTP),HTTPasanapplication layer protocol.[CO5]	10

TextBooks:

1.ComputerNetworks,Tanenbaum,Andrew,FifthEdition,PHI.
2. DataCommunicationandNetworking,Behrouz A.Forouzan,FourthEdition.
3. ComputerToday,S.K.Basandra, FirstEdition,Galgotia.

ReferenceBooks:

1.DataCommunicationSystem,Black,Ulysse,ThirdEdition,PHI.
2.DataandComputerCommunications,Stalling,NinthEdition,PHI.
3.JamesF.KuroseandKeithW.Ross,"ComputerNetworking",PearsonEducation.
4.DouglasE.Comer,"InternetworkingwithTCP/IP",Volume-I,PrenticeHall,India.

Course Code: UGCA1987

Course Name: **Mathematical Foundations for Cryptography**

Program: **B Sc Cyber Security**	L:**3** T: 1 P:0
Branch: **Computer Applications**	Credits: **4**
Semester: **3rd**	Contact hours: **44**
Theory/Laboratory: **Theory**	Status (Elective/Core): **Core**
Internal max. marks: **40**	External max. marks: **60**
Total marks: **100**	

Course Outcomes:

CO#	Course outcomes
CO1	Apply different algorithms in number theory.
CO2	Apply finite fields in context to cryptography.
CO3	Implement random number generation.
CO4	Discuss overview of cryptography fundamentals.

Detailed contents	Contact hours

Unit 1: **Introduction to Number Theory :**Divisibility, TheDivisionAlgorithm, TheEuclideanAlgorithm, GreatestCommonDivisor, FindingtheGreatestCommonDivisor, ModularArithmetic, TheModulus, Linear Congruence, Properties of Congruences,Modular Arithmetic Operations, Modular Inverses,PropertiesofModularArithmetic , EuclideanAlgorithmRevisited, TheExtendedEuclideanAlgorithm, PrimeNumbers, Fermat's Theorem,Euler'sTotientFunction, Euler'sTheorem, TestingforPrimality, Miller–RabinAlgorithm, ADeterministicPrimalityAlgorithm, DistributionofPrimes, TheChineseRemainderTheorem, DiscreteLogarithms, ThePowersofanInteger,Modulo*n* Logarithms for Modular Arithmetic,CalculationofDiscreteLogarithms [CO1]	12
Unit 2: **Finite Fields :** Algebraic Structures**,** Groups, Abelian Group, CyclicGroup, Rings Fields, FiniteFieldsoftheFormGF(*p*), FiniteFieldsofOrder*p*, FindingtheMultiplicativeInverseinGF(*p*), OrdinaryPolynomialArithmetic, PolynomialArithmeticwithCoefficientsinZ_p , Finding the Greatest Common Divisor, FiniteFieldsoftheform**GF(2^n)**, Modular Polynomial Arithmetic,FindingtheMultiplicativeInverse, Computational ConsiderationsUsingaGenerator CO2]	12
Unit 3: **Random Number Generation and Bitwise Operations:** PrinciplesofPseudorandomNumberGeneration, PseudorandomNumberGenerators, True NumberGenerators, Binary Arithmetic, Bitwise AND, Bitwise OR, Bitwise XOR, Bitwise complement, Shift left, Shift right. [CO3]	10
Unit 4: **Overview of Cryptography:** Security terminology including Cryptology, Cryptography, Cryptanalysis, Confidentiality, Privacy, Threat, Attack, Incident, Intrusion, Malware, Countermeasure, Asset, Vulnerability, Risk, Mitigation of Risk, Cipher, Key, Symmetric Encryption, Asymmetric Encryption, Substitution and Transposition Ciphers, Block and Stream Ciphers. [C04]	10

Reference Books:

1. Cryptography & Network Security by Atul Kahate, Mc Graw Hill.
2. An introduction to mathematical Cryptography, Jeffrey Hoffstein, Jill Pipher, Joseph H., Springer.
3. Modern Cryptography: Applied Mathematics for Encryption and Information Security, William Easttom, Springer.

Course Code: UGCA1915
CourseName:DataStructures

Program:B.Sc.Cyber Security	**L**: 3 **T**: 1 **P**:0
Branch:ComputerApplications	**Credits**:4
Semester:3rd	**Contacthours:**44hours

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Theory/Practical: Theory	**Percentageofnumerical/designproblems:**--
Internalmax.marks: 40	**Durationof endsemesterexam(ESE):** 3hrs
External max. marks:60	**Electivestatus:**Core
Totalmarks:100	

Prerequisite:-NA-Corequisite:-NA-
Additional material required in ESE: -NA-

CourseOutcomes: Studentswill beableto

CO#	Courseoutcomes
CO1	ApplyappropriateconstructsofProgramminglanguage,codingstandardsforapplication development
CO2	Selectappropriatedatastructuresforproblemsolvingandprogramming
CO3	Illustratetheoutcomeof variousoperationsondatastructures.
CO4	Identifyappropriatesearchingand/orsortingtechniquesforwiderangeofproblemsand datatypes.
CO5	Differentiatebetweenvarioustypesofdatastructures

DetailedContents	Contacthours
Unit-I **IntroductiontoDataStructures:** Algorithms and Flowcharts, Basics Analysis on Algorithm, Complexity ofAlgorithm, Introduction and Definition of Data Structure, Classification ofData, Arrays, Various types of Data Structure, Static and Dynamic MemoryAllocation,Function, Recursion.[CO5] **Arrays, PointersandStrings:** IntroductiontoArrays,Definition,OneDimensionalArrayandMulti-Dimensional Arrays, Pointer, Pointer to Structure, various Programs for Arrayand Pointer. Strings.Introduction to Strings, Definition, Library Functions ofStrings.[CO1]	10
Unit-II **StacksandQueue** Introduction to Stack, Definition, Stack Implementation, Operations of Stack,Applications of Stack and Multiple Stacks. Implementation of Multiple StackQueues,IntroductiontoQueue,Definition,QueueImplementation,Operatio nsofQueue, CircularQueue, De-queueand PriorityQueue.[CO2]	8

Unit-III **LinkedListsandTrees** Introduction, Representation and Operations of Linked Lists, Singly LinkedList, Doubly Linked List, Circular Linked List, And Circular Doubly LinkedList.[CO3] **Trees** Introduction to Tree, Tree Terminology Binary Tree, Binary Search Tree,Strictly Binary Tree, Complete Binary Tree, Tree Traversal, Threaded BinaryTree,AVLTreeBTree,B+Tree.[CO3]	14
Unit-IV **Graphs,Searching,SortingandHashing** **Graphs:**Introduction,RepresentationtoGraphs,GraphTraversalsShortestPathAlgorithms.[CO3] **SearchingandSorting:**Searching,TypesofSearching,Sorting,Typesofsortinglikequick sort, bubble sort, mergesort, selectionsort.[CO4] **Hashing:**HashFunction,TypesofHashFunctions,Collision,Collision ResolutionTechnique(CRT),Perfect Hashing[CO4]	12

TextBooks

1. BrijeshBakariya.DataStructuresandAlgorithmsImplementationthroughC,BPBPublications.
2. KruseR.L.DataStructures andProgramDesignin C;PHI
3. AhoAlfredV.,HopperoftJohnE.,UIlmanJeffreyD.,"DataStructuresandAlgorithms",AddisonWesley

Referencebooks

1. Horowitz&Sawhaney: FundamentalsofDataStructures,GalgotiaPublishers.
2. YashwantKanetkar,UnderstandingPointersin C,BPBPublications.
3. Horowitz,S.Sahni,andS.Rajasekaran,ComputerAlgorithms,GalgotiaPub.Pvt.Ltd.,1998.

Course Code: UGCA1988
CourseName:Ethical Hacking

Program:B.Sc.Cyber Security	**L**: 3 **T**: 0 **P**:0
Branch:ComputerApplications	**Credits**:3
Semester:3rd	**Contacthours:**44hours

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Theory/Practical: Theory	**Percentageofnumerical/designproblems:**--
Internalmax.marks: 40	**Durationof endsemesterexam(ESE):** 3hrs
External max. marks:60	**Electivestatus:**Core
Totalmarks:100	

Prerequisite:-NA-Corequisite:-NA-
Additional material required in ESE: -NA-

CourseOutcomes: Studentswill beableto

CO#	Courseoutcomes
CO1	Discuss the need of Ethical Hacking
CO2	Explain the concept of foot printing.
CO3	Apply the process of scanning on target systems.
CO4	Implement system hacking.
CO5	Explain the concepts related to hacking over wireless system.

DetailedContents	Contacthours
Unit-I Introduction: Understanding the importance of security, Concept of ethical hacking and essential Terminologies-Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit. Phases involved in hacking. [CO1]	7
Unit-II Foot printing: Authoritative, Non -Auth reply by DNS, Introduction to foot printing, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase. [CO2]	8
Unit-III Scanning: Detecting live systems on the target network, Discovering services running /listening on target systems, Understanding port scanning techniques, Identifying TCP and UDP services running on the target network, Understanding active and passive fingerprinting. [C03]	8

Unit-IV System Hacking: Aspect of remote password guessing, Role of eavesdropping ,Various methods of password cracking, Keystroke Loggers, Understanding Sniffers ,Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing. [CO4][Hacking Wireless Networks: Introduction to 802.11,Role of WEP, Cracking WEP Keys, Sniffing Traffic, Securing Wireless Networks. [CO5]	10

TextBooks

1. Network Security and Ethical Hacking, Rajat Khare , Luniver Press
2. Ethical Hacking, Thomas Mathew, OSB Publisher
3. Hacking Exposed: Network Security Secrets & Solutions, Stuart McClure, Joel Scambray and George Kurtz, McGraw-Hill

---

CourseCode:UGCA1916
CourseName:ComputerNetworksLaboratory

Program:B.Sc.Cyber Security	**L**: 0 **T**: 0 **P**:2
Branch: ComputerApplications	**Credits:**1
Semester:3rd	**Contacthours:**4hoursperweek
Theory/Practical: Practical	**Percentageofnumerical/designproblems:**--
Internalmax.marks: 60	**Durationof endsemesterexam(ESE):** 3hrs
External max. marks:40	**Electivestatus:**Core
Totalmarks:100	

Prerequisite:-NA-Corequisite:-NA-
Additional material required in ESE: -NA-

CourseOutcomes:

CO#	Courseoutcomes
CO1	Outlinethe keyfeaturesofvarious protocols
CO2	Implementnetworkconfigurationsettingsforanoperatingsystem
CO3	Preparedifferenttypesof cablesfornetwroking.
CO4	Designnetworkmodel usingnetworksimulation tool
CO5	Implementvarious settingonFTP,Proxyand otherservers.

Listofassignments:

1.	Familiarizationwithnetworkingcomponentsand devices: LANAdapters,Hubs, Switches,Routersetc
2.	Familiarizationwithtransmissionmediaandtools:Coaxialcable,UTPcable, Crimpingtool,Connectorsetc
3.	Preparingstraightand crosscables
4.	StudyofvariousLANtopologiesandtheircreationusingnetworkdevices,cables Andcomputers
5.	ConfigurationofTCP/IP ProtocolsinWindowsand Linux
6.	Implementationofresourcesharing(file,printer etc.)
7.	DesigningandimplementingclassA,BandCnetworks
8.	Subnetplanninganditsimplementation
9.	Toconfiguredynamic IPaddressforacomputerconnectedtoaLAN
10.	Useofcommandslikeping,ipconfigfortroubleshootingnetworkrelated Problems
11.	DevelopaprogramtocomputetheHammingDistancebetweenanytwocode Words
12.	Installationof FTPserverandclient
13.	To configureproxyserver
14.	Familiarizationwithnetworksimulationtools.

ReferenceBooks:

1. DataCommunicationandNetworking,Behrouz A.Forouzan,FourthEdition.
2. DouglasE.Comer,"InternetworkingwithTCP/IP",Volume-I,PrenticeHall, India.

CourseCode:UGCA1918
CourseName:DataStructuresLaboratory

Program:B.Sc.Cyber Security	**L**: 0 **T**: 0 **P**:4
Branch:ComputerApplications	**Credits**:2
Semester:3rd	**Contacthours:**4hoursperweek
Theory/Practical: Practical	**Percentageofnumerical/designproblems:**--
Internalmax.marks: 60	**Durationof endsemesterexam(ESE):** 3hrs
External max. marks:40	**Electivestatus:**Core
Totalmarks:100	

Prerequisite:-NA-Corequisite:-NA-
Additional material required in ESE: - NA-

CourseOutcomes: Student willbeable to

CO#	Courseoutcomes
CO1	ImplementDynamicmemoryallocation.
CO2	CreatedifferentdatastructuresinC/C++
CO3	Implementvariousoperationsofalldatastructures

CO4	Illustratetheoutcomeofvariousoperationswiththehelpofexamples.
CO5	Writeprogramstoimplementvarioustypes ofsearchingandsortingalgorithms

Instructions: ProgramsmaybedevelopedinC/C++/Python/Javalanguage.

Listofassignments:

1	ProgramforusingDynamicFunctions (malloc(),calloc(),realloc()andfree())functions.
2	Programtoinsert,delete andtraverseanelementfroman array
3	Programtomergeonedimensionalarrays
4	Programforaddition and subtraction oftwomatrices.
5	Programforimplementingmultiplicationoftwomatrices
6	Implementlinearsearch usingoneandtwodimensionalarray.
7	Programforimplementingselectionsort.
8	Program forimplementinginsertionsort.
9	Programforimplementingquicksort.
10	Programforimplementingmergesort.
11	Programtocalculatelengthofthe stringusinguser definedfunction.
12	Programtoconcatenate andcomparetwo stringsusinguserdefinedfunction.
13	Programforusingtheconceptof pointertostring.
14	Programto reverseasentencebyrecursion.
15	Programtodeleteallrepeatedwordsinstring.
16	Programtofindthenumberofvowels,consonants, digitsandwhitespaceinastring.
17	Programtofindthelengthofthelongestrepeatingsequenceinastring.
18	Programtofindhighestandlowestfrequencycharacterinastring.
19	ProgramforimplementingStackusingarray.
20	ProgramforimplementingStackusingpointer.
21	Programforimplementingmultiplestack.
22	Programforconvertinginfixtopostfixform.
23	ProgramforimplementingQueueusingarray.
24	Programfordynamicimplementationofqueue.
25	Programforimplementingcircularqueue.
26	Programforimplementingdequeue.
27	Program forimplementingpriorityqueue.
28	ProgramforimplementingSinglyLinkedlist.
29	ProgramforimplementingDoublyLinked list.
30	ProgramforimplementingBinarySearchTree.
31	ProgramforBreadthFirstSearch(BFS)forgraphtraversal.
32	ProgramforDepthFirst Search(DFS)forgraphtraversal.

ReferenceBooks:

1. BrijeshBakariya.DataStructuresandAlgorithmsImplementationthroughC,BPBPublications.

2. AhoAlfredV.,HopperoftJohnE.,UIlmanJeffreyD.,"DataStructuresandAlgorithms",AddisonWesley
3. Horowitz&Sawhaney: Fundamentalsof DataStructures,GalgotiaPublishers.

Course Code: UGCA1914
Course Name: Programming in Python

Program: BCA	**L**:3 **T**:1 **P**:0
Branch: Computer Applications	**Credits**: 4
Semester: 3rd	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: 40%
Internal max. marks: 40	**Duration of end semester exam (ESE):**3hrs
External max. marks: 60	**Elective status:** Core
Total marks: 100	

Prerequisite: -NA-
Co requisite: **-NA-**
Additional material required in ESE:-NA-
Course Outcomes: Students will be able to:

CO#	Course Outcomes
CO1	Explain environment, data types, operators used in Python.
CO2	Compare Python with other programming languages.
CO3	Outline the use of control structures and numerous native data types with their methods.
CO4	Design user defined functions, modules, files, and packages and exception handling methods.
CO5	Write solutions for Object Oriented Programming Concepts.

Detailed Contents	Contact hours
Unit-I **Introduction to Python Programming Language:** Programming Language, History and Origin of Python Language, Features of Python, Limitations, Major Applications of Python, Getting, Installing Python, Setting up Path and Environment Variables, Running Python, First Python Program, Python Interactive Help Feature, Python differences from other languages. [CO1] [CO2] **Python Data Types & Input/Output:** Keywords, Identifiers, Python Statement, Indentation, Documentation, Variables, Multiple Assignment, Understanding Data Type, Data Type Conversion, Python Input and Output Functions, Import command. [CO1] **Operators and Expressions:** Operators in Python, Expressions, Precedence, Associativity of Operators, Non Associative Operators. [CO1]	12

Unit-II **Control Structures:** Decision making statements, Python loops, Python control statements. **Python Native Data Types:** Numbers, Lists, Tuples, Sets, Dictionary, Functions & Methods of Dictionary, Strings (in detail with their methods and operations).[CO3]	10
Unit-III **Python Functions:** Functions, Advantages of Functions, Built-in Functions, User defined functions, Anonymous functions, Pass by value Vs. Pass by Reference, Recursion, Scope and Lifetime of Variables. [CO3] **Python Modules:** Module definition, Need of modules, Creating a module, Importing module, Path Searching of a Module, Module Reloading, Standard Modules, Python Packages. [CO3]	12
Unit-IV **Exception Handling:** Exceptions, Built-in exceptions, Exception handling, User defined exceptions in Python. **File Management in Python:** Operations on files (opening, modes, attributes, encoding, closing), read() & write() methods, tell() & seek() methods, renaming & deleting files in Python, directories in Python. [CO4] **Classes and Objects:** The concept of OOPS in Python, Designing classes, Creating objects, Accessing attributes, Editing class attributes, Built-in class attributes, Garbage collection, Destroying objects. [CO5]	10

Text Books:

1. Programming in Python, Pooja Sharma, BPB Publications, 2017.
2. Core Python Programming, R. Nageswara Rao, 2nd Edition, Dreamtech.

Reference Books:

1. Python, The complete Reference, Martin C. Brown, Mc Graw Hill Education.
2. Python in a Nutshell, A. Martelli, A. Ravenscroft, S. Holden, OREILLY.

Course Code: UGCA1917
Course Name: Programming in Python Laboratory

Program: BCA	**L**: 0 **T**: 0 **P**:4
Branch: Computer Applications	**Credits**: 2

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Semester: 3rd	**Contacthours**: 4 hours per week
Theory/Practical: Practical	**Percentage of numerical/design problems**: 90%
Internal max. marks: 60	**Duration of end semester exam (ESE)**: 3hrs
External max. marks:40	**Elective Status :** Core
Total marks: 100	

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: - Maintain practical note book as per the instructions given by the instructor.
Course Outcomes: Students will be able to :

CO#	Course outcomes
CO1	Outline various programming constructs like data types and control structures of Python.
CO2	Implement different data structures.
CO3	Implement modules and functions.
CO4	Illustrate concept of object oriented programming.
CO5	Implement file handling.

List of assignments:

1.	Compute sum, subtraction, multiplication, division and exponent of given variables input by the user.
2.	Compute area of following shapes: circle, rectangle, triangle, square, trapezoid and parallelogram.
3.	Compute volume of following 3D shapes: cube, cylinder, cone and sphere.
4.	Compute and print roots of quadratic equation $ax^2+bx+c=0$, where the values of a, b, and c are input by the user.
5.	Print numbers up to N which are not divisible by 3, 6, 9,, e.g., 1, 2, 4, 5, 7,….
6.	Write a program to determine whether a triangle is isosceles or not?
7.	Print multiplication table of a number input by the user.
8.	Compute sum of natural numbers from one to n number.
9.	Print Fibonacci series up to n numbers e.g. 0 1 1 2 3 5 8 13…..n
10.	Compute factorial of a given number.
11.	Count occurrence of a digit 5 in a given integer number input by the user.
12.	Print Geometric and Harmonic means of a series input by the user.
13.	Evaluate the following expressions: a. $x-x^2/2!+x^3/3!- x^4/4!+\ldots x^n/n!$ b. $x-x^3/3!+x^5/5!- x^7/7!+\ldots x^n/n!$
14.	Print all possible combinations of 4, 5, and 6.
15.	Determine prime numbers within a specific range.
16.	Count number of persons of age above 60 and below 90.
17.	Compute transpose of a matrix.
18.	Perform following operations on two matrices. 1) Addition 2) Subtraction 3) Multiplication
19.	Count occurrence of vowels.
20.	Count total number of vowels in a word.

21.	Determine whether a string is palindrome or not.
22.	Perform following operations on a list of numbers: 1) Insert an element 2) delete an element 3) sort the list 4) delete entire list
23.	Display word after Sorting in alphabetical order.
24.	Perform sequential search on a list of given numbers.
25.	Perform sequential search on ordered list of given numbers.
26.	Maintain practical note book as per their serial numbers in library using Python dictionary.
27.	Perform following operations on dictionary 1) Insert 2) delete 3) change
28.	Check whether a number is in a given range using functions.
29.	Write a Python function that accepts a string and calculates number of upper case letters and lower case letters available in that string.
30.	To find the Max of three numbers using functions.
31.	Multiply all the numbers in a list using functions.
32.	Solve the Fibonacci sequence using recursion.
33.	Get the factorial of a non-negative integer using recursion.
34.	Write a program to create a module of factorial in Python.
35.	Design a Python class named *Rectangle*, constructed by a length & width, also design a method which will compute the area of a rectangle.
36.	Design a Python class named *Circle* constructed by a radius and two methods which will compute the area and the perimeter of a circle.
37.	Design a Python class to reverse a string 'word by word'.
38.	Write a Python program to read an entire *text file*.
39.	Design a Python program to read first n lines of a *text file.*
40.	Construct a Python program to write and append text to a file and display the text.

Text Books:

1. Programming in Python, Pooja Sharma, BPB Publications, 2017.
2. Core Python Programming, R. Nageswara Rao, 2nd Ediiton, Dreamtech.

Reference Books:

1. Python, The complete Reference, Martin C. Brown, Mc Graw Hill Education.
2. Python in a Nutshell, A. Martelli, A. Ravenscroft, S. Holden, OREILLY.

GuidelinesregardingMentoringandProfessionalDevelopment

Theobjectiveof mentoringwill be development of:

- OverallPersonality
- Aptitude(TechnicalandGeneral)

- GeneralAwareness (CurrentAffairs andGK)
- CommunicationSkills
- PresentationSkills

The course shall be split in two sections i.e. outdoor activities and class activities.Forachievingtheabove,suggestivelist ofactivities tobeconducted are:

Part – A(ClassActivities)

1. Expertandvideolectures
2. AptitudeTest
3. GroupDiscussion
4. Quiz(General/Technical)
5. Presentationsbythestudents
6. TeambuildingExercises

Part – B(OutdoorActivities)

1. Sports/NSS/NCC
2. SocietyActivitiesofvariousstudentschapteri.e.ISTE,SCIE,SAE,CSI,CulturalClub, etc.

Evaluationshall bebasedonrubrics forPart–A&B
Mentors/Faculty incharges shall maintain proper record student wise of each activityconductedand thesame shall besubmittedto the department.

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Course Code: UGCA1922
Course Name: Database Management System

Program: B. Sc Cyber Security	**L**: 3 **T**: 1 **P**: 0
Branch: Computer Applications	**Credits:** 4
Semester: 4th	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems: --**
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Core
Total marks: 100	

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-
Course Outcomes: Students will be able to

CO#	Course outcomes
CO1	Define the basic concepts of DBMS.
CO2	Design SQL queries.
CO3	Illustrate the concept of data normalization with the help of real life examples.
CO4	Explain the concept of transaction management.
CO5	Outline features of advanced database management systems.

Detailed contents	Contact hours
Unit-I Introduction of DBMS, Data Modeling for a Database, Three level Architecture of DBMS, Components of a DBMS. Introduction to Data Models, Hierarchical, Network and Relational Model, Comparison of Network, Hierarchical and Relational Model, Entity Relationship Model. [CO1]	10
Unit-II Relational Database, Relational Algebra and Calculus, SQL Fundamentals, DDL, DML, DCL, PL/SQL Concepts, Cursors, Stored Procedures, Stored Functions, Database Triggers. [CO2]	12
Unit-III Introduction to Normalization, First, Second, Third Normal Forms, Dependency Preservation, Boyce-Codd Normal Form, Multi-valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Domain-key normal form (DKNF). [CO3]	12
Unit-IV Database Recovery, Concurrency Management, Database Security, Integrity and Control. Structure of a Distributed Database, Design of Distributed Databases. [CO4] [CO5]	10

Text Books:

1. "An Introduction to Database System", Bipin C. Desai, Galgotia Publications Pvt Ltd-New Delhi, Revised Edition, (2012).
2. "Database System Concepts", Abraham Silberschatz, Henry F. Korth, S. Sudharshan, Tata McGraw Hill, 6th Edition, (2013).

Reference Books:

1. "SQL, PL/SQL The Programming Language of Oracle", Ivan Bayross, BPB Publications, 4th Revised Edition (2009)
2. "An Introduction to Database Systems", C. J. Date, A. Kannan, S. Swamynathan, 8th Edition, Pearson Education, (2006).
3. Database Management Systems, Raghu Ramakrishnan, McGraw-Hill, Third Edition, 2014.

Course Code: UGCA2001
Course Name: Network Security

Program: B. Sc Cyber Security	**L**: 3 **T**: 1 **P**: 0
Branch: Computer Applications	**Credits:** 4
Semester: 4th	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems: --**
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Core
Total marks: 100	

Prerequisite: Computer Networks
Co requisite: -NA-
Additional material required in ESE: -NA-
Course Outcomes: Students will be able to

CO#	Course outcomes
CO1	Understand real time systems for identifying security threats.
CO2	Compare public and private cryptographic algorithms and make use of the same for encryption and decryption of messages.
CO3	Apply both cryptography and hashing to create digital signatures and certificates for achieving integrity.
CO4	Understand application of cryptosystems in design of, IPSec, Firewall

Detailed contents	Contact hours
Unit-I Network Security Terminology: Identification, Confidentiality, Authentication, Authorization, Access Control, Integrity, Non-Repudiation, Freshness, and Availability, Network Threats and Types of attacks, Introduction to malwares. [CO 1]	10
Unit-II Cryptography Symmetric Cipher Model, Classical Cryptographic Algorithms: Monoalphabetic Substitutions such as Caesar Cipher, Cryptanalysis of Monoalphabetic ciphers; Transposition Cipher. Stream and Block Ciphers,	12

Block cipher: principles, Data Encryption Standard (DES), Concept of Asymmetric Cryptography, Rivets-Shamir-Adleman (RSA) Key Generation, Encryption and Decryption Algorithm. Key Management Protocols: Solving Symmetric Key Distribution Problem, Diffie-Hellman Algorithm, Key Exchange with Public Key Cryptography or Asymmetric Cryptography, Digital Envelope, Public Key Certificate Structure, Certificate Authority [CO 2] [CO	
Unit-III Hash Algorithms & Digital Signature Hash concept, Hash Function Requirements, Popular Message Digest and Hash Algorithms: Overview of SHA1, SHA2, MD4, MD5, Digital Signature. Authentication Protocols Basic authentication protocols, concept of Key distribution centre (KDC), Needham-Schroeder Authentication Protocol. [CO 2,3]	12
Unit-IV SSL and TLS, Overview of IP Security, Introduction to Firewalls and IDS.[CO 4]	**10**

Text Books:

1. Principles of Cryptography, 4th Edition by William Stallings, Pearson Education.
2. Security in Computing, 2nd Edition by Charles P.Pfleeger, Prentice Hall International.
3. Cryptography & Network Security, 2nd Edition by Atul Kahate, TMH.
4. Applied Cryptography: Protocols, Algorithms, and Source Code in C, 2nd Edition by Bruce Schneier, John Wiley and Sons.
5. Firewalls and Internet Security, 2nd Edition by Bill Cheswick and Steve Bellovin, AddisonWesley.
6. Security Technologies for the world wide web, 2nd Edition by Rolf Oppliger, Artech House, Inc.

Course Code: UGCA2002
Course Name: Digital Forensics

Program: B.Sc Cyber Security	**L**: 3 **T**: 1 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 2nd	**Contact hours:** 44 hours
Internal max. marks: 30	**Theory/Practical:** Theory
External max. marks: 70	**Duration of end semester exam (ESE):** 3hrs
Total marks: 100	**Elective status:** Core

Prerequisite:
Cyber Security
Co requisite: -NA-
Additional material required in ESE: -NA-

Course Outcomes:

CO#	Course outcomes
CO1	Understand relevant legislation and codes of ethics
CO2	Computer forensics and digital detective and various processes, policies and procedures
CO3	E-discovery, guidelines and standards, E-evidence, tools and environment.
CO4	Email and web forensics and network forensics

Detailed contents	Contact hours
Unit 1 **Digital Forensics Science:** Forensics science, computer forensics, and digital forensics. **Computer Crime:** Criminalistics as it relates to the investigative process, analysis of cyber-criminalistics area, holistic approach to cyber-forensics.[CO1]	10 hours
UNIT 2 **Cyber Crime Scene Analysis:** Discussion on court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation. **Evidence Management & Presentation:** Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.[CO2,3]	12 hours

UNIT 3 **Computer Forensics:** Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case, **Network Forensics:** open-source security tools for network forensic analysis, requirements for preservation of network data.[CO4]	12 hours
UNIT 4 **Mobile Forensics:** mobile forensics techniques, mobile forensics tools. Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008. Recent trends in mobile forensic technique and methods to search and seizure electronic evidence[CO4]	10 hours

Text Books:

1. John Sammons, The Basics of Digital Forensics, Elsevier
2. John Vacca, Computer Forensics: Computer Crime Scene Investigation, Laxmi Publications

Course Code: UGCA1949
Course Name: Cyber Laws and IPR

Program: B.Sc Cyber Security	**L**: 3 **T**: 1 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 6th	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems:** --
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Elective
Total marks: 100	

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-
Course Outcomes:

CO#	Course outcomes
CO1	Identify statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.
CO2	Categorize case law and common law to current legal dilemmas in the technology field.
CO3	Outline the primary forms of intellectual property rights.
CO4	Compare the different forms of intellectual property protection in terms of their key differences and similarities.

CO5	Analyze the effects of intellectual property rights on society as a whole.

Detailed Contents	Contact hours
Unit-I **Introduction** Overview of Computer and Web Technology, Need for Cyber Law, Cyber Jurisprudence at International and Indian Level, Jurisdictional Aspects in Cyber Law Issues of jurisdiction in cyberspace, Types of jurisdiction, Minimum Contacts Theory, Sliding Scale Theory, Effects Test and International targeting, Jurisdiction under IT Act, 2000. [CO1]	12
Unit-II **Cyber Crimes& Legal Framework** Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Ethics and Etiquettes of Cyber World, Cyber Pornography, Identity Theft & Fraud, Cyber Terrorism, Cyber Defamation, Right to Privacy and Data Protection on Internet, Concept of privacy, Threat to privacy on internet, Self-regulation approach to privacy.[CO2]	12
Unit-III **Overview of Intellectual Property** introduction and the need for intellectual property right (IPR), IPR in India – Genesis and Development IPR in abroad, Data Protection, Open Source Software, Macro economic impact of the patent system, Patent and kind of inventions protected by a patent, Patent document How to protect your inventions?, Granting of patent, Rights of a patent.[CO3]	10
Unit-IV **Copyright, Related Rights and Trademarks** What is copyright? Latest editions of Designs, what is covered by copyright? How long does copyright last? Why protect copyright? What are related rights?, Distinction between related rights and copyright?, What is a trademark? Rights of trademark?, What kind of signs can be used as trademarks?, types of trademark, function does a trademark perform, How is a trademark protected?, How is a trademark registered?[CO4][CO5]	10

Text Books

1. Anirudh Rastogi. Cyber Law, LexisNexis.
2. Vakul Sharma. Information Technology Law and Practice Cyber Laws and Laws Relating to E-Commerce, Universal Law Publishing.
3. Pankaj Sharma. Information Security and Cyber Laws, Kataria, S. K., & Sons.
4. Navneet Nagpal. Intellectual Property Right, Ebooks2go Inc.
5. Dr. S.K. singh. Intellectual Property Rights, Central Law Agency.

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Course Code: UGCA1925
Course Name: Database Management Systems Laboratory

Program: B.Sc Cyber Security	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits:** 2
Semester: 4th	**Contact hours:** 4 hours per week
Theory/Practical: Practical	**Percentage of numerical/design problems:** 100%
Internal max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 40	**Elective status:** Core
Total marks: 100	

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-
Course Outcomes:

CO#	Course outcomes
CO1	Differentiate between DDL, DML and DCL commands
CO2	Implement DDL, DML and DCL commands
CO3	Write integrity constraints on a database
CO4	Design Databases and Tables in relational model for some project related to society welfare
CO5	Implement PL/SQL.

Instructions:

1.	Used of CREATE, ALTER, RENAME and DROP statement in the database tables (relations)
2.	Used of INSERT INTO, DELETE and UPDATE statement in the database tables (relations)
3.	Use of simple select statement.
4.	Use of select query on two relations
5.	Use of nesting of queries.
6.	Use of aggregate functions.
7.	Use of substring comparison.
8.	Use of order by statement.
9.	Consider the following schema for a Library Database: BOOK (*Book_id, Title, Publisher_Name, Pub_Year*) BOOK_AUTHORS (Book_id, Author_*Name*) PUBLISHER (*Name, Address, Phone*) BOOK_COPIES (*Book_id, Branch_id, No-of_Copies*) BOOK_LENDING (*Book_id, Branch_id, Card_No, Date_Out, Due_Date*) LIBRARY_BRANCH (*Branch_id, Branch_Name, Address*) Write SQL queries to 1. Retrieve details of all books in the library_id, title, name of publisher, authors, number of copies in each branch, etc.

	2. Get the particulars of borrowers who have borrowed more than 3 books between Jan 2018 to Jun 2018 3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation. 4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query. 5. Create a view of all books and its number of copies that are currently available in the Library.
10.	Consider the following schema for Order Database: SALESMAN (*Salesman_id, Name, City, Commission*) CUSTOMER (*Customer_id, Cust_Name, City, Grade, Salesman_id*) ORDERS (*Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id*) Write SQL queries to 1. Count the customers with grades above Amritsar's average. 2. Find the name and numbers of all salesmen who had more than one customer. 3. List all salesmen and indicate those who have and don't have customers in their cities (Use UNION operation.) 4. Create a view that finds the salesman who has the customer with the highest order of a day. 5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.
11.	Write a PL/SQL code to add two numbers and display the result. Read the numbers during run time.
12.	Write a PL/SQL code to find sum of first 10 natural numbers using while and for loop.
13.	Write a program to create a trigger which will convert the name of a student to upper case before inserting or updating the name column of student table.
14.	Write a PL/SQL block to count the number of rows affected by an update statement using SQL%ROWCOUNT
15.	Write a PL/SQL block to increase the salary of all doctors by 1000.

Reference Books:

1. "SQL, PL/SQL The Programming Language of Oracle", 4th Revised Edition, Ivan Bayross (2009).
"Oracle PL/SQL Programming", 5th Edition, Steven Feuerstein and Bill Pribyl

Course Code: UGCA2003
Course Name: Network Security Laboratory

Program: B.Sc Cyber Security	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits**: 2
Semester: 4th	**Contact hours:** 4 hours per week
Theory/Practical: Practical	**Percentage of numerical/design problems:** 80%
Internal max. marks: 30	**Duration of End Semester Exam (ESE):** 3hrs
External max. marks: 20	**Elective status:** Core
Total marks: 50	

Prerequisite: NA
Co requisite: NA
Additional material required in ESE:NA
Course Outcomes: After studying this course, students will be able to:

CO#	Course Outcomes
CO1	Understand real time systems for identifying security threats.
CO2	Compare public and private cryptographic algorithms and make use of the same for encryption and decryption of messages.
CO3	Design confidential systems with minimum possible threats

Instructions: Instructor can increase/decrease the experiments as per the requirement.

1.	Explain packet sniffer. Discuss its need. Explore from the Internet some popular packet sniffers. Wireshark is one such sniffer. Install Wireshark on your system. Explore its features and sniff various packets from your machine and enter into your machine. Identify the type of protocols of these packets. Connect to the PTU's website and find HTTP, TCP, IP and data link layer headers. Take snapshot of header fields, values and payloads of the packets being exchanged between your machine and PTU's website. (CO 1)
2.	Implement DES algorithm. Display all substitution and transposition outputs. (CO 2)
3.	Implement concept of digital envelop using socket programming. (CO 2)
4.	Write a program to implement RSA algorithm. (CO 2)
5.	Explore various hash functions. Use these hash functions to generate digital signatures on different length messages. (CO 3)
6.	Install packet sniffer on your machine. Visit any https website. Take snapshots of TCP headers of all phases of SSL/TLS protocol. Demonstrate and explain working of SSL/TLS protocol with the help of snapshots. (CO 1)

Text Books:

1. Principles of Cryptography, 4th Edition by William Stallings, Pearson Education.
2. Security in Computing, 2nd Edition by Charles P.Pfleeger, Prentice Hall International.
3. Cryptography & Network Security, 2nd Edition by Atul Kahate, TMH.

Course Code: UGCA1927
Course Name: Web Technology

Program: B.Sc Cyber Security	**L**: 3 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 3
Semester: 4th	**Contact hours:** 33 hours
Theory/Practical: Theory	**Percentage of numerical/design problems:** 80%
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Skill Enhancement
Total marks: 100	

Prerequisite: Student must have the basic knowledge of any text editor like notepad, notepad++ and Edit plus etc.
Co requisite: Student must know the background of Markup Language.
Additional material required in ESE:

- Demonstration of the website of college/ specific department/specific cells etc. will be presented by the students during the final practical.
- Developed Website/s must be made online by the student/s.
- Printouts of the Main Page of the website must be arranged on Practical file during daily lab work and must be submitted in the final examinations.

Course Outcomes: The students will be able to:

CO#	Course Outcomes
CO1	Create pages with simple tags in HTML
CO2	Design webpages with multiple sections or frames
CO3	Explain how to link webpages through hypertext or images a links
CO4	Outline the key web designing concepts using java script
CO5	Design forms with special controls using HTML

Detailed Contents	Contact hours
Unit-I **Internet Basics** Basic concepts, communicating on the internet, internet domains, internet server identities, establishing connectivity on the internet client IP address. **Introduction To HTML** Information Files Creation, Web Server, Web Client/Browser, Hyper Text Markup Language (HTML Tags, Paired Tags, Singular Tags), Commonly Used Html Commands (Document Head, Document Body), Title and Footer, Text Formatting (Paragraph Breaks, Line Breaks), Emphasizing Material in a Web Page (Heading Styles, Drawing Lines). Basic Formatting Tags HTML Basic Tags, Text Formatting (Paragraph Breaks, Line Breaks), Emphasizing Material in a Web Page (Heading Styles, Drawing Lines), Text Styles (Bold, Italics, Underline), Other Text Effects (Centering (Text, Images etc.), Spacing (Indenting Text), HTML Color Coding. [CO1]	8
Unit-II **Lists** Type of Lists (Unordered List (Bullets), Ordered Lists (Numbering), Definition Lists. **Adding Graphics To Html Documents** Using The Border Attribute, Using The Width And Height Attribute, Using The Align Attribute, Using The Alt Attribute. [CO2] **Tables** Introduction (Header, Data rows, The Caption Tag), Using the Width and Border Attribute, Using the Cell padding Attribute, Using the Cell spacing Attribute,	9

Using the BGCOLOR Attribute, Using the COLSPAN and ROWSPAN Attributes [CO2] **Linking Documents** Links (External Document References, Internal Document References), Image As Hyperlinks. [CO3] **Frames** Introduction to Frames: The<FRAMESET> tag, The <FRAME> tag, Targeting Named Frames. DHTML: Cascading Style Sheets, Style Tag. [CO2]	
Unit-III **Forms Used by a Web Site** The Form Object, The Form Object's Methods (The Text Element, The Password Element, The Button Element, The Submit (Button) Element, The Reset (Button) Element, The Checkbox Element, The Radio Element, The Text Area Element, The Select and Option Element, The Multi Choice Select Lists Element). [CO4]	8
Unit 4 **Introduction to JavaScript** JS Introduction, Where To, Output, Statements, Syntax, Comments, Variables, Operators, Arithmetic, Assignment, Data Types, Functions, Objects, Events, Strings, String Methods, Numbers, Number Methods, Arrays, Array Methods, Array Sort, Array Iteration, Dates, Date Formats, Date Get Methods, Date Set Methods, Math, Random, Booleans, Comparisons, Conditions, Switch, Loop For, Loop While, Break, Type Conversion, Bitwise, RegExp, Errors, Scope, Hoisting, Strict Mode, JSON, Forms, Forms API [CO5] JS Functions, Function Definitions, Function Parameters, Function Invocation, Function Call, Function Apply, Function Closures [CO5]	8

Text Books/Reference Books:

1. Internet for EveryOne: Alexis Leon, 1st Edition, Leon Techworld, Publication, 2009.
2. Greenlaw R; Heppe, "Fundamentals of Internet and WWW", 2nd Edition, Tata McGraw-Hill, 2007.
3. Raj Kamal, "Internet& Web Technologies", edition Tata McGraw-Hill Education.2009.

E-Books/ Online learning material:

1. BayrossIvan, "HTML, DHTML, JavaScript, PERL, CGI", 3rd Edition, BPB Publication,2009.
2. Chris Payne, "Asp in 21 Days", 2nd Edition, Sams Publishing, 2003 PDCA.
3. A Beginner's Guide To Html Http://www.Ncsa.Nine.Edit/General/Internet/w ww/Html.Prmter
4. https://www.tutorialspoint.com/html/html_tutorial.pdf
5. https://www.w3schools.com/js/
6. https://www.w3schools.com/html/
7. https://www.cs.uct.ac.za/mit_notes/web_programming.html
8. http://www.pagetutor.com/table_tutor/index.html

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Course Code: UGCA1928
Course Name: Web Technology Laboratory

Program: B.Sc Cyber Security	**L**: 0 **T**: 0 **P**: 2
Branch: Computer Applications	**Credits**: 1
Semester: 4th	**Contact hours:** 2 hours per week
Theory/Practical: Practical	**Percentage of numerical/design problems:** 80%
Internal max. marks: 30	**Duration of End Semester Exam (ESE):** 3hrs
External max. marks: 20	**Elective status:** Skill Enhancement
Total marks: 50	

Prerequisite: Students must have the knowledge of editors like Notepad etc.
Co requisite: Knowledge of Networking, Internet, Client Server concepts, Static & Dynamic environment of the websites etc.
Additional material required in ESE:

- Demonstration of the website of college/ specific department/specific cells etc. will be presented by the students during the final practical.
- Developed Website/s must be made online by the student/s.
- Printouts of the Main Page of the website must be arranged on Practical file during daily lab work and must be submitted in the final examinations.

Course Outcomes: After studying this course, students will be able to:

CO#	Course Outcomes
CO1	Design pages with simple tags in HTML
CO2	Create web pages with Auido and Video content in it.
CO3	Illustrate the movement from one web page to another
CO4	Implement advanced web designing concepts using java script
CO5	Execute a small web pased project for the benefit of scoiety

Instructions: Instructor can increase/decrease the experiments as per the requirement.

7.	Create a simple HTML page to demonstrate the use of different tags.
8.	Design index page of a book on web designing.
9.	Display Letter Head of your college on a web page.
10.	Create a Hyperlink to move around within a single page rather than to load another page.
11.	Display letter using different Text formatting Tags.
12.	Design Time Table of your department and highlights of most important periods.
13.	Use Tables to provide layout to your web page.
14.	Embed Audio and Video into your web page.
15.	Divide a web page vertically and horizontally and display logo of your college in left pane and logo of university in right pane.
16.	Create a student Bio- Data.
17.	Design front page of hospital with different style sheets.

18.	Design a web page and display two different pages at a time.
19.	Write a program to create a login form. On submitting the form, the user should get navigated to a profile page using JavaScript.
20.	Write a code to create a Registration Form. On submitting the form, the user should be asked to login with the new credentials using JavaScript.
21.	Write an HTML code to create your Institute website/Department website/ Tutorial website for specific subject. Also use Java Script for validation.

Reference Books:

1. Greenlaw R; Hepp E, "Fundamentals of Internet and www", 2nd Edition, Tata. McGraw-Hill, 2007.
2. A Beginner's Guide to HTML
   http://www.Ncsa.Nine.Edit/General/Internet/www/
   a. html.prmter.

Online Experiment material:

1. https://www.w3schools.com/html/html_examples.asp
2. https://www.cs.uct.ac.za/mit_notes/web_programming.html

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Program: B. Sc Cyber Security	**L**: 3 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 3
Semester: 5th	**Contact hours:** 33 hours
Theory/Practical: Theory	**Percentage of numerical/design problems:** 80%
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Skill Enhancement
Total marks: 100	

Prerequisite: - basic Web Programming
Co requisite: -NA-
Additional material required in ESE: -NA-
Course Outcomes: Students will be able to:

CO#	Course outcomes
CO1	Learn to represent web data and XML document handling.
CO2	Understand AJAX and relevance.
CO3	Able to learn how to perform basic CRUD database operations in a Dynamic Website.
CO4	Learn about web services and their development.

Detailed contents	Contact hours
Part A **PHP**: Server-side web scripting, Installing PHP, Adding PHP to HTML, Syntax and Variables, Passing information between pages, Strings, Arrays and Array Functions, Numbers, Basic PHP errors/ problems. **Advanced PHP and MySQL**: PHP/MySQL Functions, Displaying queries in tables, Introduction to PHP OOPs concepts, Building Forms from queries, String and Regular Expressions, Sessions, Cookies and HTTP, Type and Type Conversions, E-Mail **Introduction to Web Services:** Use of Web Services, Types of Web Services, Introduction to Content Management System CMS (Types, Usages, Benefits).	22 Hours
Part B **XML**: Introduction to XML, XML Basics, XML Syntax and Editors, documents, Elements, Attributes. Creating XML documents. **Ajax** : Introduction and Use of Ajax in Website. **jQuery** : Introduction, jQuery UI: Date picker, auto complete, tooltip, accordion, retrieving page content, manipulating page content, working with events. **Introduction to Bootstrap :** Components of Bootstrap **Introduction to Node.js**: Node Package Manager (NPM), Node.js Webserver – Server and Clients.	22 Hours

React: Introduction to ReactJS, Environment Setup, JSX, Components, State, Props, Validating Props, Component API, Component Life Cycle, Forms, Events	

Text Books:

1. Steven Holzner, "PHP: The Complete Reference", TATA McGraw Hill, 2015.
2. Roger S Pressman, David Lowe, "Web Engineering: A Practitioner's Approach", TMH.
3. W. Jason Gilmore,"Beginning PHP and MySQL: From Novice to Professional", Apress.
4. "Learning PHP, MySQL, JavaScript, CSS and HTML 5", Robin Nixon, O'Reilly publication
5. Web Technologies, Black Book, dreamtech Press
6. Alex Young, "Node.js in Action", 2ed, Bradley Meck

Reference Books:

1. Jesus Caspagnetto, "Professional PHP Programming", Wrox Publication.
2. P.J. Deitel & H.M. Deitel, "Internet and World Wide Web How to program", Pearson
3. Harwani, "Developing Web Applications in PHP and AJAX", McGrawHill
4. Ralph Moseley and M. T. Savaliya, "Developing Web Applications", Wiley-India
5. HTML 5, Black Book, Dreamtech Press

Course Code: UGCA2020
Course Name: Advanced Web Technology Laboratory

Program: B.Sc Cyber Security	**L**: 0 **T**: 0 **P**: 2
Branch: Computer Applications	**Credits**: 1
Semester: 5th	**Contact hours:** 2 hours per week
Theory/Practical: Practical	**Percentage of numerical/design problems:** 100%
Internal max. marks: 30	**Duration of End Semester Exam (ESE):**
External max. marks: 20	**Elective status:** Skill Enhancement
Total marks: 50	

Course Outcomes: After studying this course, students will be able to:

CO#	Course Outcomes
CO1	Understand the advance concepts of website development.
CO2	Provide skills to design and develop dynamic web sites.
CO3	Work independently for database programming for web applications
CO4	Understand concepts of jQuery methods, AJAX, Bootstrap and REACT
CO5	Connect Website with an Database Server and perform basic CRUD operations.
CO6	Develop market ready website, to be used by clients.

Instructions: Instructor can increase/decrease the experiments as per the requirement.
Assignments: All the Practical Assignments need to be carried on specific applications. (Example: Inventory Management System, Bus/Airline/Railway Reservation System, Student Management System etc.)

Practice Programs with PHP	
1.	PHP Code to display today's date in dd-mm-yyyy format.

2.	PHP Code to check if number is prime or not.
3.	PHP Code to print first 10 Fibonacci Numbers.
4.	PHP Code to read data from txt file and display it in html table (the file contains info in format Name: Password: Email)
5.	PHP Script for login authentication. Design an HTML form which takes username and password from user and validate against stored username and password in file.
6.	PHP Script for storing and retrieving user information from MySql table. • Design A HTML page which takes Name, Address, Email and Mobile No. From user (register.php) • Store this data in MySql database / text file. • Next page display all user in html table using PHP (display.php)
7.	PHP Script for user authentication using PHP-MYSQL. Use session for storing username.
Implement the following with specific web applications	
8.	Create HTML page for chosen application that contain textbox, submit / reset button. Write php program to display this information and also store into text file.
9.	Create XML documents for chosen application and validate using DTD and schema. Also render the content of XML document using XSL. Scenarios include • XML document must have attributes and elements so that they can be validated against DTD/Schema. • Check the data types of variables declared in XML document using Schema. • Display the details of data contained in XML document in a table using XSL.
10.	Embed the JQuery features for the application chosen. Perform the Scenarios using JQUERY ready function • In login form, define username and password constraints and ensure that the credentials follow them. • In registration form, username must be of atleast 6 characters. Password must be of atleast 8 characters and follow password constraints. Password and confirm password fields must match with each other. E-mail id must be of the form "yourname@domain.com". Mobile number must be of 10 digits only and starting digit must be any number from 6-9 etc… • Use the get and post methods for server side communication.
11.	Modify the specific web applications to use AJAX to show the result on the same page.
12.	Enhance functionality of the specific web applications using BOOTSTRAP
13.	Create a responsive Photo Gallery in BOOTSTRAP
14.	Suppose you have a list of Students having Student's Name, Roll Number, Marks in five subjects, Show this list in a responsive table in BOOTSTRAP
15.	Modify your answer for above question with PHP and MYSQL database and Perform CRUD operations with AJAX
16.	Build a Password Strength Check App with JQuery. You can use AJAX for form validation and add an alert when the user enters a weak password.
17.	Build a Registration Form and Validate it with JQuery. Registration Form must have at least 10 elements.

18.	Design a Sign In, Sign Up and Forgot Password Page with BOOTSTRAP. Use PHP and MYSQL to store Sign Up data in Database.
19.	Create a Star Rating System in JQuery.
20.	Create a simple To-do list Application with REACT
21.	Create a Calculator with REACT
22.	Create a Photo Gallery with REACT. Also implement search operation
23.	How can you create a Portfolio App with Node.js?
24.	Create a simple Shopping Cart with REACT and Node.js
25.	Modify your Shipping Cart with JQuery, JSON and AJAX functionality.

Reference Books:

1. Roger S Pressman, David Lowe, "Web Engineering: A Practitioner's Approach", TMH.
2. Steven Holzner, "PHP: The Complete Reference", TATA McGraw Hill, 2015.
3. W. Jason Gilmore,"Beginning PHP and MySQL: From Novice to Professional", Apress.
4. Learning PHP, MySQL, JavaScript, CSS and HTML 5, Robin Nixon, O'Reilly publication

Elective -I

Course Code: UGCA2021
Course Name: Linux Operating System

Program: B. Sc Cyber Security	**L**: 3 **T**: 1 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 5th	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems:** 60%
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Elective
Total marks: 100	

P**rerequisite**: Operating System
Co requisite: -NA-
Additional material required in ESE: -NA-
Course Outcomes: After completing this course, students will be able to:

CO#	Course outcomes
CO1	Discuss the evolution of Open Source operating systems.
CO2	Prepare environment for working on open source operating system like Linux.
CO3	Perform resource management in Linux
CO4	Write scripts in Linux.
CO5	Execute user level privileges

Detailed contents	Contact hours
Unit-I **Introduction to Linux**	12

History of Linux & Unix, Overview of Linux Operating System, structure of Linux Operating system, Installation. [CO1] Desktops (The X window System, GNOME, KDE), desktop operations. Different types of editors, vi editor and its command.	
Unit-II **Shells and Utilities** Role of shells in the Linux environment, Different types of shells in Linux Operating system, Shell configuration: Shell initialization & configuration directories & file, Aliases, Filename expansion, Standard Input/ Output & Redirection, Pipes, Managing Jobs.[CO3] **Shell Scripting:** Different types of statements in shell script, variables in shell, assign values to shell variables, Default shell variables value, Rules for Naming variables, Display the value of shell variables Getting User writing simple shell scripts to accept input from the user and display a message on screen, Shell scripts to implement various control statements. [CO4]	12
Unit-III **Files Systems & Linux Software** Linux Files, File structure, commands for managing files & directories with other commonly used commands, Software Management, Office and Database Applications, Graphics Tools and Multimedia, Internet & Network services, Web, FTP & java Clients. [CO3]	10
Unit-IV **Linux Administration** Managing users, Superuser Control, System Run levels, Managing File Systems, [CO3] **Kernel Administration**: Linux kernel sources, rebuilding kernel, installing kernel, Virtualization, backup management. [CO5]	10

Text Books:

1. Linux: The complete reference by Richard Petersen, Published by Tata McGraw- Hill Publication.
2. Linux in a Nutshell: A Desktop Quick Reference, 6th Edition by Stephen Figgins, Arnold Robbins, Ellen Siever & Robert Love Published by O'Reilly Media.
3. Linux Administration: A Beginner's Guide by Steve Shah & Wale Soyinka, Published by McGraw-Hill Education
4. Unix Shell Programming by Yashavant P. Kanetkar, Published by BPB Publishers.

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Course Code: UGCA2022
Course Name: TCP/IP Protocols

Program: B. Sc Cyber Security	**L: 3 T: 1 P: 0**
Branch: Computer Applications	**Credits:** 3
Semester: 5th	**Contact hours:** 44
Theory/Laboratory: Theory	**Status (Elective/Core):** Elective
Internal max. marks: 40	**External max. marks:** 60
Total marks: 100	

Course Outcomes:

CO#	Course outcomes
CO1	Demonstrate an understanding of the TCP/IP layers, components and functions
CO2	Identify the services that TCP/IP applications provide
CO3	Identify the protocols used to transport data over the Internet
CO4	Utilize a variety of tools to navigate and search the Internet
CO5	Install, maintain and troubleshoot a TCP/IP Network

Detailed contents	**Contact hours**
Unit 1: INTRODUCTION TO TCP/IP, Origin of TCP/IP and Internet, A Brief History of the Internet, Architecture of the Internet, TCP/IP Layer and Protocols, Network Access Layer, Internet Layer, Need for IP Address.	11
Unit 2: INTERNET PROTOCOL: Overview of Internet Protocol, IP Header, IP Address, IP Address Classes, Subnet Masks and CIDR Networks (Classless IP Addresses), Internet-Legal Versus Private Addressing, IP Routing, Routing Protocol, Routing Algorithms	11
Unit 3: TRANSPORT LAYER PROTOCOLS: Overview of TCP, Transmission Control Protocol (TCP), TCP Header, TCP Connection Establishment and Termination, TCP Connection Establishment, TCP Connection Termination, User Datagram Protocol (UDP)	11
Unit 4: APPLICATION LAYER PROTCOLS: Domain Name System (DNS), Hierarchical Name Space, Domain Servers, Working of DNS Work in Internet, Domain Name Resolution, Messages Used in DNS, Dynamic DNS (DDNS). Overview of Electronic Mail, Simple Mail Transfer Protocol (SMTP), Message Transfer Agent, User Agent, Post Office Protocol (POP), Internet Mail Access Protocol (IMAP),Multipurpose Internet Mail Extension (MIME), Telnet , File Transfer Protocol (FTP)	11

Text Books:

1. Kurose and Ross , Computer Networking: A Top-Down Approach , 6th ed., 2012, Morgan Kaufmann

2. Douglas E.Comer – "Internetworking with TCP/IP Principles, Protocols and Architecture", Vol. 1 & 2 fourth edition, Pearson Education Asia, 2003
(Unit I in Comer Vol. I, Units II, IV & V – Comer Vol. II)

Reference Books:

1. Michael J. Donahoo and Kenneth L. Calvert , TCP/IP Sockets in Java , 2nd ed., 2011
2. TCP/IP protocol suite, Forouzan, 2nd edition, TMH, 2003
3. W.Richard Stevens "TCP/IP illustrated" Volume 2 Pearson Education 2003.

Course Code: UGCA2023
Course Name: Wireless Communication

Program: **B. Sc Cyber Security**	L: **3** T: 1 P: 0
Branch: **Computer Applications**	Credits: **4**
Semester: **4th**	Contact hours: **44**
Theory/Laboratory: **Theory**	Status (Elective/Core): **Core**
Internal max. marks: **40**	External max. marks: **60**
Total marks: **100**	

Course Outcomes:

CO#	Course outcomes
CO1	Understand the fundamentals of wireless communication systems
CO2	Analyze wireless channel models and design wireless communication systems
CO3	Evaluate different modulation techniques and multiple access techniques
CO4	Apply coding techniques to wireless communication systems
CO5	Understand the architecture of different wireless networks
CO6	Analyze advanced topics related to wireless communication systems.

Detailed contents	Contact hours
Unit 1: **Introduction to Wireless Communication** Overview and Preliminaries, Introduction to Wireless Communication, Wireless Channel Models, Communication Link Budget, Antenna Fundamentals, Wireless System Design Considerations, and Standards.	9
Unit 2: **Signal Propagation and Modulation Techniques** Radio Wave Propagation, Small Scale Fading, Large Scale Fading, Modulation Techniques, Spread Spectrum Techniques, MIMO Techniques. **Multiple Access Techniques and Coding** FDMA, TDMA, CDMA, OFDMA, Channel Coding Techniques, Error Control Coding, ARQ Techniques.	13

Unit 3: **Wireless Network Architecture** Wireless LANs, Cellular Networks, Wireless Sensor Networks, Ad hoc Networks, Wireless Personal Area Networks, Cognitive Radio Networks.	11
Unit 4: **Advanced Topics in Wireless Communication** Wireless Security: Security threats and mechanisms in wireless communication systems. Localization: Techniques for estimating the location of wireless devices. Mobile IP: Concepts and protocols for mobility management in wireless networks. Wireless Mesh Networks: Architecture, routing protocols, and applications of wireless mesh networks. Wireless Multimedia: Techniques for streaming audio and video over wireless networks. Future Wireless Communication Systems: Emerging technologies and standards in wireless communication, including 5G and beyond.	11

Text Books:

1. Wireless Communications and Networking,Vijay Garg, Elsevier
2. Wireless Communications-T.L.Singh-TMH
3. Adhoc Mobile Wireless network, C.K.Toh Pearson.

Reference Books:

1. T.S. Rappaport, Wireless Communications: Principles and Practice, 2nd Edition, Pearson Education Asia, 2010.
2. William C Y Lee, Mobile Cellular Telecommunications, 2nd Edition, MGH, 2004.
3. Raj Pandya, ―Mobile and Personal Communication systems and services‖, Prentice Hall of India, 2001.
4. Wireless and Digital Communications; Dr. Kamilo Feher (PHI), 1998.

Course Code: UGCA2024
Course Name: Linux Operating System Laboratory

Program: B.Sc Cyber Security	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits**: 2
Semester: 5th	**Contact hours:** 4 hours per week
Theory/Practical: Practical	**Percentage of numerical/design problems:** 100
Internal max. marks: 60	**Duration of end semester exam (ESE):**
External max. marks: 40	**Elective status:** Core
Total marks: 100	

Prerequisite: Operating system
Co requisite: -NA-
Additional material required in ESE: -NA-
Course Outcomes:

CO#	Course outcomes
CO1	Prepare the environment for installation and use of Linux operating system

CO2	Write Shell Scripts
CO3	Implement C programs using gcc compiler
CO4	Impelment virtualization
CO5	Execute commands related to grantinf and revoking user priviledges.

Instructions:

1	Installation of Linux OS.
2	Writing advanced shell programs
3	Installation and management of printers
4	Using gcc compiler to write c programs
5	Configuring mail server
6	Configuring FTP server
7	Connecting to internet
8	Implementing different commands to manage file system
9	Implementation of virtualization
10	Becoming super user and implementing configuration commands
11	Implementing commands to manage users

- Instructor can select the commands, utilities and services to be managed on their own.

Reference Books:

1. Linux: The complete reference by Richard Petersen, Published by Tata McGraw- Hill Publication.
2. Linux in a Nutshell: A Desktop Quick Reference, 6th Edition by Stephen Figgins, Arnold Robbins, Ellen Siever & Robert Love Published by O'Reilly Media.
3. Unix Shell Programming by Yashavant P. Kanetkar, Published by BPB Publishers.

Course Code: UGCA2025
Course Name: TCP/IP Laboratory

Program: B.Sc Cyber Security	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits**: 2
Semester: 5th	**Contact hours:** 4 hours per week
Theory/Practical: Practical	**Percentage of numerical/design problems:** 100
Internal max. marks: 60	**Duration of end semester exam (ESE):**
External max. marks: 40	**Elective status:** Elective
Total marks: 100	

Detailed Contents:

1. Configuring Internet IP address.
2. Assigning IP Address using CIDR.
3. Creating an echo client server.
4. Building client for TIME protocol.

5. Decode header fields of IP datagram.
6. Decode header fields of TCP header.
7. Designing an Internet server with web hosting facility.
8. To implement TCP/IP Socket communication
9. Extract data from TCP stream.
10. Configure and run RIP software.

Course Code: UGCA2026
Course Name: Wireless Communication Laboratory

Program: B. Sc Cyber Security	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits**: 2
Semester: 5th	**Contact hours:** 4 hours per week
Theory/Practical: Practical	**Percentage of numerical/design problems:** 100
Internal max. marks: 60	**Duration of end semester exam (ESE):**
External max. marks: 40	**Elective status:** Elective
Total marks: 100	

Course Description: This lab course provides hands-on experience in wireless communication systems. The course covers topics related to signal propagation, modulation techniques, multiple access techniques, coding, and wireless network architecture.
List of Experiments:

1. Study of Wireless Communication Systems and Terminologies
2. Simulating Wireless Communication Systems using MATLAB.
3. Design and Implementation of Frequency Modulation (FM) System.
4. Design and Implementation of Amplitude Modulation (AM) System.
5. Design and Implementation of Phase Modulation (PM) System.
6. Study and Implementation of Spread Spectrum Techniques.
7. Design and Implementation of Error Control Coding Techniques.
8. Implementation of Wireless Local Area Network (WLAN) using IEEE 802.11 standard.
9. Implementation of Wireless Sensor Network (WSN) using Zigbee standard.
10. Implementation of Cognitive Radio Network using GNU Radio.
11. Design and Implementation of Wireless Communication System using Software-Defined Radio (SDR).
12. Implementation of Mobile Ad hoc Network (MANET) using AODV protocol.

Lab Outcomes:
Upon completion of this lab course, students will be able to:

1. Understand the fundamentals of wireless communication systems.
2. Simulate and analyze wireless communication systems using MATLAB.
3. Design and implement different modulation techniques and multiple access techniques.
4. Apply coding techniques to wireless communication systems.
5. Understand the architecture of different wireless networks.
6. Implement wireless communication systems using different standards.

Reference Books:

1. "Wireless Communications: Principles and Practice" by Theodore S. Rappaport
2. "Introduction to Wireless Systems" by Bruce A. Black
3. "Wireless Communications and Networks" by William Stallings.

Elective-II

Course Code: UGCA1936
Course Name: Cloud Computing

Program: B.Sc Cyber Security	**L**: 3 **T**: 1 **P**:0
Branch: Computer Applications	**Credits:** 4
Semester: 5th	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems: --**
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Elective
Total marks: 100	

Prerequisite: -NA-
Co requisite: -NA-
Additional material required in ESE: -NA-
Course Outcomes:

CO#	Course outcomes
CO1	Define the concept of cloud computing.
CO2	Outline the benefits if migrating to a cloud solution for different applications.
CO3	Compare different virtualization technologies.
CO4	Identify various resources needed to build cloud.
CO5	Explain various security threats to cloud.

Detailed contents	Contact hours
Unit-I **Overview of Computing Paradigm:** Recent trends in Computing -Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing. [CO1] **Introduction to Cloud Computing:** Vision of Cloud Computing, Defining a Cloud, Cloud delivery Model, Deployment Model, Characteristics, Benefits of Cloud Computing, Challenges ahead. Cloud computing vs. Cluster computing vs. Grid computing.[CO1] **Migrating into a Cloud:** Introduction, Broad approaches to Migrating into the Cloud, The Seven-Step Model of Migration Into a Cloud. [CO2]	12

Unit-II **Virtualization:** Introduction, Characteristics of Virtualized environment, Taxonomy of Virtualization techniques, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Hypervisor Technology Examples- Xen, VMware, Microsoft Hyper-V. [CO3] **Capacity Planning:** Elasticity vs Scalability, Introduction, Defining Baseline and Metrics-Baseline Measurements, System Metrics, Load Testing, Resource Ceilings, Server and Instance types; Network Capacity, Scaling. [C04]	12
Unit-III **SLA Management in Cloud Computing:** Inspiration, Traditional Approaches to SLO Management, Types of SLA, Life Cycle of SLA, SLA management in Cloud. Automated Policy-based management.[CO4] **Securing Cloud services:** Cloud Security, Securing Data- Brokered Cloud Storage Access, Storage location and tenancy, Encryption, Auditing and compliance. Steps to ensure security over cloud.[CO5]	10
Unit-IV **Cloud Platforms in Industry:** Amazon Web Services-Compute Services, Storage Services, Communication Services, Additional Services. Google AppEngine-Architecture and Core Concepts, Application Life Cycle. Cost Model. Microsoft Azure-Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance. [CO4]	10

Text Books:

1. 1.Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, Tata McGraw Hill, ISBN-13: 978-1-25-902995-0, New Delhi, India, Feb 2013.
2. Cloud Computing Bible, Barrie Sosinsky, Wiley India Pvt. Ltd, ISBN-13: 978-81-265-2980-3, New Delhi, India, 2011.
3. Cloud Computing: Principles and paradigms, Raj Kumar Buyya, James Broberg, Andrezei M. Goscinski, Wiley India Pvt. Ltd, ISBN-13: 978-81-265-4125-6, New Delhi, India, 2011

Reference Books:

1. 1.Cloud Computing for Dummies, Fern Halper, Hurwitz, Robin Bloor, Marcia Kaufman, Wiley India Pvt. Ltd, ISBN-13: 978-0-47-0597422, New Delhi, India, 2011.
2. Dr. Saurabh Kumar, Cloud Computing: Insights into New-Era Infrastructure, Wiley India Pvt. Ltd, ISBN-13: 978-8-12-6528837, New Delhi, India, 2011.

E Books/ Online learning material

1. P.D. Kaur, I. Chana, Unfolding the distributed computing paradigm, in: Proceedings of the IEEE International Conference on Advances in Computer Engineering, ACE, Bangalore, Karnataka, India, 2010, pp. 339–342.

2. P. Mell and T. Grance, "The NIST definition of cloud computing (draft), NIST Spec. Publ. 800 (2011) 7.

Course Code: UGCA2027
Course Name: Penetration Testing Using Open Source Technologies

Program: B. Sc Cyber Security	**L: 3 T: 1 P: 0**
Branch: Computer Applications	**Credits:** 4
Semester: 5th	**Percentage of numerical/design problems:-**
Theory/Laboratory: Theory	**Duration of end semester exam (ESE):-**
Internal max. marks: 40	**External max. marks:** 60
Total marks: 100	**Status (Elective/Core):** Elective

Course Outcomes: Student will be able to

CO#	Course outcomes
CO1	Identify the need of ethical Hacking
CO2	Discuss various OS vulnerabilities.
CO3	Explain the need of Penetration testing
CO4	Explore various penetration testing tools

Detailed contents	Contact hours
INTRODUCTION TO HACKING: Introduction to Hacking — Importance of Security — Elements of Security — Phases of an Attack — Types of Hacker Attacks — Vulnerability Research —Introduction to Footprinting — Information Gathering Methodology.	11
OS VULNERABILITIES: Windows OS Vulnerabilities — Tools for Identifying Vulnerabilities —Countermeasures — Linux OS Vulnerabilities — Tools for Identifying Vulnerabilities — Countermeasures	11

INTRODUTION TO PENETRATION TESTING: Introduction — Security Assessments — Types of Penetration Testing-Phases of Penetration Testing— Tools —	11
PENETRATION TESTING TOOLS: Choosing Different Types of Pen-Test Tools — Penetration Testing Tools, Information Gathering Tools, Vulnerability Analyses Tools.Tools for Wireless Attacks, Tools for Website Penetration Testing, Exploitation Tools. Tools Password Cracking Tools, Maintaining Access Tools.	11

1. Penetration Testing with Kali Linux: Learn Hands-on Penetration Testing Using a Process-Driven Framework,30 July 2021, Pranav Joshi Deepayan Chanda (Author), BPB Publications , ISBN-10 : 939068479X ,ISBN-13 : 978-9390684793

Course Code: UGCA2028

Course Name: Firewall & Intrusion Detection

Program: B. Sc Cyber Security	**L: 3 T: 1 P: 0**
Branch: Computer Applications	**Credits:** 4
Semester: 5th	**Percentage of numerical/design problems:-**
Theory/Laboratory: Theory	**Duration of end semester exam (ESE):-**
Internal max. marks: 40	**External max. marks:** 60
Total marks: 100	**Status (Elective/Core):** Elective

Course Outcomes:

CO#	Course outcomes
CO1	Identify risks related to Computer Security and information hazard in various situations.
CO2	Apply user identification and authentication methods.
CO3	Apply measures to prevent attacks on network using firewall.
CO4	Apply Cryptographic algorithms and protocols to maintain Computer Security

Detailed contents	Contact hours
Unit 1: Introduction to Computer and Information Security Security Basics : Confidentiality, Integrity, Availability, Accountability, Non-Repudiation, Reliability; Threat to Security : Viruses, Worms, Tojan Horse, Intruders; Risk and Threat Analysis. Types of Attacks : Active and Passive attacks, Denial of Service, DDOS, Backdoors and Trapdoors, Sniffing, Spoofing, TCP/IP Hacking. Information Security : Need and importance of information, Criteria for Information	9

Classification, Principles of Information Classification.	
Unit 2: User Authentication and Access Control User Authentication: Password and Certificate based. Biometric Authentication : Finger/Hand prints, Retina, Patterns, Signature and writing patterns. Access Controls : Authentication Mechanism, Principle Authentication, Authorization, Audit and Policies.	8
Unit 3: Firewall and Intrusion Detection Firewall : Types of Firewalls, Policies, Configuration limitations. Intrusion Detection System : Vulnerability Assessment, Misuse Detection, Anomaly Detection, Network Based IDS, Host Based IDS, Honeypots	8
Unit 4: Cryptography, Cyber Laws and Compliance Standards Cryptography : Introduction to Plan & Cipher Text, Cryptography, Cryptanalysis, Cryptology, Encryption, Decryption, RSA Algorithm IP Security : Overview, Protocols, Modes. Email Security : AMTP, PEM, PGP. Public Key Infrastructure : Certificate and Registration Authority. Cyber Crime : Hacking, Digital Forgery, Identity Theft and Fraud. Cyber Laws : Need, Crime Against Individual, Government and Property. Compliance Standards : Implementing and Information Security Management	8

Text Books:

1. Atul Kahate, “Cryptography & Network Security”, Mc Graw Hill
2. Harish Chander, “Cyber Laws and IT Protection”, PHI
3. William Stalling, “Cryptography & Network Security”, PHI
4. Forouzan “Cryptography & Network Security”, PHI

Reference Books:

5. Dieter Gollmann, “Computer Security”, Wiley Publication
6. Wenbo Mao."Modern Cryptography, Theory & Practice", Pearson Education.
7. C. Boyd, A. Mathuria "Protocols for Authentication and Key Establishment", Springer.

Course Code: UGCA1942
Course Name: Cloud Computing Laboratory

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)

Program: B.Sc Cyber Security	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits:** 2
Semester: 5th	**Contact hours:** 4 hours per week
Theory/Practical: Practical	**Percentage of numerical/design problems:** --
Internal max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 40	**Elective status:** Elective
Total marks: 100	

Prerequisite: Working Knowledge of Linux Operating system
Co requisite: -NA-
Additional material required in ESE: -NA-
Course Outcomes:

CO#	Course outcomes
CO1	Identify major commercial projects in the field of cloud computing
CO2	Design basic cloud applications
CO3	Execute basic functionalities of open source tools like Open Stack.
CO4	Implement virtualization
CO5	Define major services provided by cloud service provider.

Detailed contents	
1.	Enlist various companies in cloud business and the corresponding services provided by them and tag them under SaaS , PaaS & IaaS.
2.	Create a warehouse application using tools supplied by any SaaS provider.
3.	Implementation of Para-Virtualization using VM Ware‘s Workstation/ Oracle‘s Virtual Box and Guest O.S. Learn creation, migration, cloning and managing of virtual machines.
4.	Using public cloud service providers tools for exploring the usage of IaaS, PaaS and SaaS cloud services.
5.	Setting up a private cloud using open source tools (Eucalyptus/Open Stack etc.).

Course Code: UGCA2029
Couse Name: Penetration Testing Using Open Source Technologies Lab

Program: **B.Sc Cyber Security**	L: 0 T: 0 P: **4**
Branch: **Computer Applications**	Credits: **2**
Semester: **5th**	Percentage of numerical/design problems:-
Theory/Laboratory: **Theory**	Duration of end semester exam (ESE):-
Internal max. marks: **30**	External max. marks: **20**
Total marks: **50**	Status (Elective/Core): Elective

Course Outcomes:

CO#	Course outcomes

CO1	To Install and configure Kalli Linux
CO2	To Implement penetration testing
CO3	To identify various attacks and vulnerabilities.

Detailed contents

1. Kali Linux - Installation and Configuration.
2. Kali Linux – Information Gathering Tools.
    1. NMAP and ZenMAP.
    2. Stealth Scan.
    3. Searchsploit.
    4. DNS Tools.
    (i) dnsenum.pl.
    (ii) DNSMAP.
    iii) dnstracer.
    5. LBD (Load Balancing Detector) Tools.
    6. Hping3.
3. Kali Linux - Vulnerability Analyses Tools.
    1. Cisco Tools.
    2. Cisco Auditing Tool.
    3. Cisco Global Exploiter.
    4. BED.
4. Kali Linux - Wireless Attacks.
    1. Fern Wifi Cracker.
    2.Kismet.
    3. GISKismet.
5. Kali Linux - Website Penetration Testing.
    Vega Usage.
6. Kali Linux - Exploitation Tools.
    1. Metasploit.
    2. Armitage.
7. Kali Linux - Password Cracking Tools.
    1. Hydra.
    2. Johnny.
    3. John.
    4. SQLdict.
8. Kali Linux - Maintaining Access.
    1. Powersploit
    2. Sbd
    3. Webshells

1. Penetration Testing with Kali Linux: Learn Hands-on Penetration Testing Using a Process-Driven Framework,30 July 2021, Pranav Joshi Deepayan Chanda (Author), BPB Publications , ISBN-10 : 939068479X ,ISBN-13 : 978-9390684793

Course Code: UGCA2030

I. K. Gujral Punjab Technical University
Bachelor of Science in Cyber Security (B Sc. Cyber Security)
Couse Name: Firewall and Intrusion detection Lab

Program: **B.Sc Cyber Security**	L: 0 T: 0 P: **4**
Branch: **Computer Applications**	Credits: **2**
Semester: **5th**	Percentage of numerical/design problems:-
Theory/Laboratory: **Theory**	Duration of end semester exam (ESE):-
Internal max. marks: **30**	External max. marks: **20**
Total marks: **50**	Status (Elective/Core): Elective

Course Outcomes:

The aim of this course is to build further on the grounding of principles in the earlier security courses, and to apply those principles to currently popular technologies such as firewalls and intrusion detection systems, widely sold as commercial solutions. Students will construct and adapt firewalls and intrusion detectors and analyze their architectures.

Detailed contents:

1. Threats to security from the network
2. Security strategies and policies
3. Firewall architecture
4. Intrusion-detection systems (snort)
5. Pattern matching and artificial intelligence versus computer immunology
6. Reading and analyzing log files and audits (Perimeter logs)
7. IP-spoofing and sequence guessing
8. Malicious ICMP activity and router/switch poisoning
9. Use of TCPdump for protocol analysis
10. Denial of Service attacks, structure, detecting and preventing
11. IPSec filters, Windows filtering, IP filters in Linux and BSD.
12. Anomaly detection: research directions.
13. IETF XML standard for exchange of intrusion information.