SAPTHAGIRI NPS UNIVERSITY
UNMATCHED EXCELLENCE, UNLIMITED POTENTIAL

SCHOOL OF APPLIED SCIENCE

BACHELOR OF COMPUTER APPLICATIONS
Specialization
in
Cloud Computing and Cyber Security

CURRICULUM

BATCH: 2024-2027

SAPTHAGIRI NPS UNIVERSITY
#14/5, Chikkasandra, Hesarghatta Main Road,Bangalore – 560057

About the University

Sapthagiri NPS University (SNPSU) stands at the forefront of multidisciplinary education, offering cutting-edge programs focused on instilling deep knowledge, problem-solving skills, leadership, and effective communication through innovative methods. The University is geared to scale and sustain the challenges of higher education in India. To impart quality and excellence in education under Medicine, Engineering, Applied Sciences, Business Studies, Management Studies etc. the University has world class state-of-the art infrastructure.

About the School of Applied Science

The School of Applied Science was established in 2024 stated with two programs, Bachelor of Computer Applications and Master of Computer applications with the specialization of Data Science, Artificial Intelligence and Machine learning, Cyber Security, Forensics, and Cloud Technology. The main objective is to produce high quality professionals to meet the demands of the emerging field of Applied Science and Computer Applications.

OUR VISION

Offer a transformative impact on society through unique learning experience in Engineering Technology, Medicine, Applied Sciences, Business Studies, Management Studies and other areas of scholarship to the stakeholders to an unparalleled educational journey to serve the world and betterment of mankind.

OUR MISSION

- To provide a student centric-learning environment focused on deep disciplinary knowledge, problem solving, leadership, communication, interpersonal skills through innovative pedagogy and education reforms.
- To generate outstanding leaders in the field of health sciences and to provide optimum human patient-centered health care of the highest quality.
- To create and sustain a community of lifelong learners in an environment that emphasizes literacy, critical and innovative thinking, humanity, scientific inquiry and to promote patriotism and moral values.
- To impact in a transformative way… regionally, nationally, and globally to face the economic, social and health related challenges for nation building.

- To accomplish quality assurance, enhancement and sustenance in academics and research for a fair and social justice by providing equal opportunity.

QUALITY POLICY

We at SNPSU strive to deliver continually enhanced, global quality in Medical, Technical, Applied Science, Business and Management education through an established Quality Management System complemented by the synergistic interaction of the stake holders concerned.

VISION OF THE SCHOOL

To envision developing internationally recognized school in academics, research activities and provide quality education for the students with good value system to serve the society and face challenges of the continuously changing world.

MISSION OF THE SCHOOL

1. To train effective professionals by innovative teaching methodologies, emphasizing on experiential learning, through industry integrated curriculum with state-of-the-art infrastructure.
2. To enhance and maintain the highest academic standard in teaching learning process and research.
3. To develop professionals through holistic education and inculcate ethics, discipline, integrity, and social responsibility.

Curriculum Course Credits Distribution

Sl. No	Types of Courses	No of Course	Total Credits
1.	Core Courses (CC)	16	54
2.	Program Core (PC)	7	26
3.	Ability Enhancement Compulsory Courses (AECC)	3	4
4.	Skill Enhancement Courses (SEC)	4	6
5.	Generic Elective (GE)	2	6
6.	Discipline Specific Elective (DSE)	3	9
7.	Project	1	11
8.	MOOC Courses	1	3
9.	Community Service Program (CSP)	1	1
10.	Non-Credit Courses (Value added Courses)	2	-
	TOTAL		**120**

SCHEME FOR 2024-2027 BATCH

SEMESTER- I

Sl. No	Course Code	Course Title	Course Type	L	T	P	C
1.	24BCACS101	Kali Kannada	AECC	1	0	0	1
2.	24BCACS102	Communicative English	CC	2	0	0	2
3.	24BCACS103	Mathematical Foundations for Computer Applications	CC	4	0	0	4
4.	24BCACS104	Introduction to C Programming	CC	3	0	2	4
5.	24BCACS105	Digital Computer Fundamentals	CC	3	0	0	3
6.	24BCACS106	Introduction to Soft Skills	SEC	2	0	0	2
7.	24BCACS107	Web Design and Development	CC	3	0	2	4
TOTAL				**18**	**0**	**4**	**20**

SEMESTER– II

Sl. No	Course Code	Course Title	Course Type	L	T	P	C
1.	24BCACS201	Discrete Mathematics	CC	3	0	0	3
2.	24BCACS202	Programming in Python	CC	3	0	2	4
3.	24BCACS203	Data Structures using C	CC	3	0	2	4
4.	24BCACS204	Database Management Systems	CC	2	0	2	3
5.	24BCACS205	Operating Systems with Unix	CC	3	0	0	3
6.	24BCACS206	Quantitative Aptitude and Logical Reasoning	AECC	2	0	0	2
7.	24BCACS207	Indian Constitution	SEC	1	0	0	1
TOTAL				**17**	**0**	**6**	**20**

SEMESTER – III

Sl. No	Course Code	Course Title	Course Type	L	T	P	C
1.	24BCACS301	Statistical Methods and Techniques	CC	3	0	0	3
2.	24BCACS302	Object Oriented Programming using Java	CC	3	0	2	4
3.	24BCACS303	Cloud Computing and Virtualization	PC	3	0	0	3
4.	24BCACS304	Design and Analysis of Algorithms	CC	2	0	2	3
5.	24BCACS305	Fundamentals of Information Security	PC	3	0	0	3
6.	24BCACS306	Environmental Studies	AECC	1	0	0	1
7.	24BCACSE1-	Elective – 1	GE	-	-	-	3
			TOTAL	**15**	**0**	**4**	**20**

SEMESTER – IV

Sl. No	Course Code	Course Title	Course Type	L	T	P	C
1.	24BCACS401	Multivariate Statistics	CC	2	0	2	3
2.	24BCACS402	Practical Approach to Cyber Security	PC	3	0	2	4
3.	24BCACS403	Cloud Computing Services	CC	2	0	2	3
4.	24BCACS404	Software Engineering	CC	3	0	0	3
5.	24BCACS405	Computer Networks	PC	3	0	0	3
6.	24BCACS406	Intellectual Property Rights-IPR	SEC	1	0	0	1
7.	24BCACSE2-	Elective-2	DSE	-	-	-	3
			TOTAL	**14**	**0**	**6**	**20**

SEMESTER- V

Sl. No	Course Code	Course Title	Course Type	L	T	P	C
1.	24BCACS501	Ethical Hacking and Penetration Testing	PC	3	0	2	4
2.	24BCACS502	Digital Forensics	PC	3	0	2	4
3.	24BCACS503	Project Phase -1	Project	0	0	6	3
4.	24BCACSE3-	Elective – 3	DSE	-	-	-	3
5.	24BCACSE4-	Elective – 4	DSE	-	-	-	3
6.	OE Code	Open Elective	GE	-	-	-	3
TOTAL				**6**	**0**	**10**	**20**

SEMESTER – VI

Sl. No	Course Code	Course Title	Course Type	L	T	P	C
1.	24BCACS601	IoT and Cloud Computing	PC	3	0	2	4
2.	24BCACS602	Data Analytics in Cloud Computing	PC	3	0	2	4
3.	24BCACS603	Internship/Swayam/MOOC*	MOOC	3	0	0	3
4.	24BCACS604	Project Phase-2	Project	0	0	16	8
5	24BCACS605	Out Reach Activity	CSP	0	0	0	1
TOTAL				**9**	**0**	**20**	**20**

TOTAL NO. OF CREDITS: 120

PROFESSIONAL/GENERAL ELECTIVES (PE/GE)

ELECTIVE – I

Sl. No	Course Code	Course Title	Category	L	T	P	C
1.	24BCACSE11	User Interface and User Experience Design	GE	2	0	2	3
2.	24BCACSE12	Web Content Management	GE	3	0	0	3
3.	24BCACSE13	E-Commerce Application Development	GE	3	0	0	3
4.	24BCACSE14	Accounting and Financial Management	GE	3	0	0	3
5.	24BCACSE15	Data Visualization using Tableau	GE	2	0	2	3

ELECTIVE – II

Sl. No	Course Code	Course Title	Category	L	T	P	C
1.	24BCACSE21	Block Chain Technologies	PE	3	0	0	3
2.	24BCACSE22	Security in Cloud Computing	PE	3	0	0	3
3.	24BCACSE23	Cryptography and Network Security	PE	3	0	0	3
4.	24BCACSE24	Malware Analysis and Reverse Engineering	PE	3	0	0	3
5.	24BCACSE25	Practical Approach to Cyber Security	PE	2	0	1	3

ELECTIVE – III

Sl. No	Course Code	Course Title	Category	L	T	P	C
1.	24BCACSE31	Introduction to Data Mining	PE	3	0	0	3
2.	24BCACSE32	Data Analytics in Cloud	PE	2	0	2	3
3.	24BCACSE33	Statistical Machine Learning Algorithms	PE	2	0	2	3
4.	24BCACSE34	Augmented and Virtual Reality	PE	3	0	0	3
5.	24BCACSE35	Go Programming	PE	3	0	0	3

ELECTIVE – IV

Sl. No	Course Code	Course Title	Category	L	T	P	C
1.	24BCACSE41	Reinforcement Learning	PE	3	0	0	3
2.	24BCACSE42	DevOps	PE	2	0	2	3
3.	24BCACSE43	Data Security and Privacy	PE	3	0	0	3
4.	24BCACSE44	Security in Distributed Computing	PE	3	0	0	3
5.	24BCACSE45	Edge Computing	PE	2	0	2	3

*** L: Lecture T: Tutorial P: Practical**

	Program	**Bachelor of Computer Applications (Cloud Computing and Cyber Security)**					Program Code	**24BCABCS**
	Course	**Kali Kannada**					Course Code	**24BCACS101**
	Semester	**I**	Credits	**1**	Theory **1**	Practical **-**	Total Hours	**15T**

	COURSE OBJECTIVES
1)	Develop vocabulary.
2)	Identify the basic Kannada language skill.
3)	Develop listening and speaking skill in Kannada language.
4)	Enrich language skill.
5)	Apply Kannada language skill for various purpose.

Module	Topics	Hours
I	**(Parichaya) – Introduction** Kannada Bhashe about Kannada language – Kannada –Jnanpi Thawardees introduction to Kannada language – Karnataka state and Literature – Pedagogy/Course delivery tools: Chalk and talk – power point presentation.	3
II	**Kannada PadagaLumattuVakyagalu- Kannada Words and Sentences** Naamapadagalu – Sarvanaamapadagalu – (Nouns-Pronouns) and it's usage in Kannada – Kannada naama visheshanagalu - (Adjectives-Interrogatives) kriyapadagalu – kriya visheshanagalu- (verb-adverb) – Sambhashaneyalli Prashnartha kapadagalu–vaakyagalu mattu kriyapadagalu – visheshanagalu (Kannada- Interrogative words & Sentences and verb-adverb in Conversation)– Pedagogy/Course delivery tools: Chalk and Talk – power point presentation	3
III	**Kannada akshara male (Kannada alphabets and their practices with pronunciations)** Swaraksharangal – vyanjanaksharagalu – gunitaksharagalu – tantragnana mattu Aadalitapadagalu – Technical and administrative worlds in Kannada– Pedagogy/Course delivery tools: Chalk and Talk – power point presentation	3
IV	**Kannada padagalu (ekavachana – bahuvachanagalu – viruddhapadagalu dinanityadalli balasuvapadagalu mattu sankhyavyavaste**	3

	Sambhashanealli Eakavachana mattu Bahuvachana-(Singular and Plural nouns) Viruddhapadagalu / Virodarthakapadagalu (Antonyms) AsamanjasaUchcharane (Inappropriate Pronunciation) SankhyaVyavasthe (Numbers system) -Samaya / KalakkeSambhandhisidapadagalu (Words Relating to time) – Dikkugaligesambhadisidapadagalu (Words Relating to Directions) AaharakkesambandisidapadagaLu(Names connected with food) Manavanashareeradabhagagalu / angagalu (Parts of the Human body) ManavaSambhandhada da padagalu (Terms Relating to Human Relationship) ManavanaBhavanegaligesambandisidaPadagalu(Words Relating to Human's feelings and Emotions) VaasadastaLakkesambhandisidanthahapadhagalu(WordsRelatingtoplaceofleaving)– Pedagogy/Course Delivery Tools: Chalk and Talk – powerpoint Presentations	
V	**Kannada BhasheyalliSambhashanegalu-ConversationsinKannada** SamanyaSambhashaneyalliKannadadaPadagalumattuVakyagalu. (Kannada Words and Sentences in General Conversation with activities) (Conversation in Shop– Hostel – Market – Bus and Train) Shabdakosha:Vocabulary–chaTuvaTike:Exercises Vicharaneya / Bedikeyavakyagalu (Enquiry /Request sentences in Conversation) Shabdakosha – Vocabulary - Exercises to test their knowledge of understanding the Language– Pedagogy/Course Delivery Tools: Chalk and Talk – powerpoint Presentations	3

COURSE OUTCOMES

At the end of the course students will be,
CO1: Develop vocabulary.
CO2: Identify the basic Kannada language skill.
CO3: Develop listing & speaking skill in Kannada language.
CO4: Enrich language skill.
CO5: Apply Kannada language skill for various purpose.

Text Books

1. Dr.L.Thimmesh,Prof.Keshavamuurthy, "BaLakekannadaPrasarangaa", VTU, 2020

Reference Books

1. Smt.KanyaKumari S,"KannadaKali", 1st Edition, Kinnari Publications, 2022.
2. Lingadevaru Halemane, "Kannada Kali", 6thEdition, Prasaranga Kannada University Hampi, 2019.

E-Learning Sources

1. https://www.youtube.com/watch?v=0Sfi55ckrxw
2. https://nitc.ac.in/imgserver/uploads/attachments/Ed__5c3343c5-c3f9-468a-b114-_____8f33556810b4_.pdf

	Program	**Bachelor of Computer Applications (Cloud Computing and Cyber Security)**					Program Code	**24BCABCS**
	Course	**Communicative English**					Course Code	**24BCACS102**
	Semester	**I**	Credits	**2**	Theory **2**	Practical **-**	Total Hours	**30T**

	COURSE OBJECTIVES
1)	To know about fundamentals of communicative English and communication skills in general.
2)	To train to identify the nuances of self-management - interpersonal management skills.
3)	To impart basic English grammar and essentials of important language skills.
4)	To enhance with English vocabulary and language proficiency for better communication skills.
5)	To learn about techniques of information to face challenging situations through personal management presentation skills.

Module	Topics	Hours
I	**Introduction to English** Introduction to Communicative English: Fundamentals of communication – process of communication – styles and levels of communication – barriers to effective communicative English – personal management. interpersonal and intrapersonal communication.	6
II	**Poem** Daffodils by William Words Worth – Introduction to Phonetics: Phonetic transcription – pronunciation guidelines to consonants and vowels – sounds mispronounced – silent and non-silent letters – Introduction to vocabulary – all types of vocabulary – listening skills – active listening.	6
III	**Grammar** Basic grammar - Parts of speech – verbs in detail – phrases (verbal phrase and noun phrase) and clauses – word accent – intonation – spelling rules and words often misspelled. Common errors in pronunciation.	6
IV	**Short Story** Short story: Metamorphosis by Kafka – tenses (rules in use of tenses) and exercises on it. Employability skills – (GD–oral presentation – public speaking) resume writing and interview skills.	6
V	**Paragraph** Paragraph writing – essay writing – letter writing – report and project preparing skills – business reports and proposals – employability skills – self – management (self –stress management) importance of balancing personal life and professional life.	6

COURSE OUTCOMES

At the end of the course students will be,

CO1: Understand and apply the fundamentals of communication skills.

CO2: To impart basic English grammar and essentials of language skills as per present requirement.

CO3: Understand and use all types of English vocabulary and language proficiency.

CO4: Adopt the Techniques of Information Transfer through presentation.

CO5: Understand and apply the fundamentals of communication skills in their communication skills.

Text Books

1. Kumar and Pushp Lata, “Communication Skills”, Sanjay Oxford University Press India Pvt Ltd, 2019.
2. “A Textbook of English Language Communication Skills”, Infinite Learning Solutions, 2022.

Reference Books

1. Michael Swan, “Practical English Usage”, Oxford University Press, 2016.
2. N.P.Sudharshana and C.Savitha, “English for Engineers”, Cambridge University Press, 2018.
3. “English Language Communication Skills, Lab Manual cum Workbook”, Latest Revised Edition, Cengage learning India Pvt Limited, 2019. (ISBN-978-93-86668-45-5).
4. D Praveen Sam& KN Shoba, “A Course in Technical English”, Cambridge University Press, 2020.

E-Learning Sources

1. BBC Learning English
   https://www.bbc.co.uk › learningenglish
2. YOU TUBE
3. British Council | India
   https://www.britishcouncil.in

	Program	**Bachelor of Computer Applications (Cloud Computing and Cyber Security)**				Program Code	**24BCABCS**	
	Course	**Mathematical Foundations for Computer Applications**				Course Code	**24BCACS103**	
	Semester	**I**	Credits	**4**	Theory **4** / Practical **-**	Total Hours	**60T**	

	COURSE OBJECTIVES
1)	To study the addition and multiplication of objects in suitable categories.
2)	To find the solutions of the matrices and determinants.
3)	To solve the problems on derivatives.
4)	To solve the problems on integrals.
5)	To familiarize the importance of vector algebra.
	General Instructions for Teaching-Learning
1)	In addition to the traditional lecture method, different types of innovative teaching methods maybe adopted so that students will develop theoretical and applied mathematical skills.
2)	To support and guide the students for self-study.
3)	To state the need for mathematics with engineering studies and provide real-life examples.
4)	To encourage the students for group learning and to improve their creative and analytical skills.
5)	Responsible for assigning homework, grading assignments, and quizzes.

Module	Topics	Module
I	**Number Theory** Basic properties of integers- Properties of integers- Division theorem (statement only)- Greatest common divisor and its basic properties- Euclidean Algorithm- least common multiple- Congruence relation and their corresponding problems.	I
II	**Matrices and Determinants** Matrices: Definition – types of matrices – addition – subtraction – scalar multiplication and multiplication of matrices – adjoint of a matrix – inverse of a matrix – rank of a matrix – Eigen value of a matrix – Caley Hamilton theorem (without proof) - problems – Determinants: Definition – minors – cofactors – Cramer's rule - problems.	II
III	**Differentiation** Derivative – definition – derivatives of sum – differences – product – and quotient – chain rule – derivatives of composite functions – logarithmic differentiation – indeterminant forms – L- Hospitals rule – problems.	III
IV	**Integration** Definition and basic formulas– methods of integration- integration by substitution – integration by partial fractions – integration by parts - problems.	IV
V	**Vector Algebra** Definition of vectors and scalars – scalar product – vector product – scalar triple product – vector triple product – applications of scalar triple product and vector triple product on areas and volumes - problems.	V

COURSE OUTCOMES

At the end of the course students will be,
CO1: Understand the basic concepts of number theory and apply them to create and solve

application problems.

CO2: Define matrices, solution to linear equations and determinants.

CO3: Find derivatives and to calculate chain rule, composite functions and L-Hospital rules.

CO4: Solve the problems on integrals.

CO5**:** Define the concepts on dot and cross product in vector algebra.

Text books

1) J.P. Chauhan, “BCA Mathematics Volume -1”, Krishna Publications.
2) G. K. Ranganath and B. Suryanarayana, “BCA Mathematics Volume -II”, S. Chand and Company Ltd., 2001.
3) C. M. Chikkodi, “Business Mathematics”, Himalaya Publications, latest edition, 2019.

Reference books

1) B. S. Grewal, “Elementary Engineering Mathematics”, 34th edition, 1998.
2) H. K. Dass, “Advanced Engineering Mathematics”, S. Chand & Company.
3) Shanti Narayan, “Integral Calculus”, S. Chand & Company, 1999.
4) Charles G Cullen, “Matrices and Linear Transformation”, 2nd edition, Dover Publications, 1990.

	Program	**Bachelor of Computer Applications (Cloud Computing and Cyber Security)**					Program Code	**24BCABCS**
	Course	**Introduction to C Programming**					Course Code	**24BCACS104**
	Semester	**I**	Credits	**4**	Theory **3**	Practical **2**	Total Hours	**45T 30P**

	COURSE OBJECTIVES
1)	Provides knowledge on problem solving technique, flowchart, algorithm, and basic programming language.
2)	Provides knowledge on looping and control statements along with IO operations.
3)	Learning the modular programming, arrays, and strings.
4)	Understanding the memory management, pointers, and file handling operations.
5)	Learning the basic programming constructs which helps to switch over to any other language in future.
	General Instructions for Teaching-Learning Process
1)	Analyze the problem, Input/ Output requirements, and procedure to solve problem before implementation.
2)	Open source software has to be used for practical implementation.
3)	Student should carry separate observation book for every lab which contains algorithm / flowchart and code.
4)	Refer related concepts and tutorials from web resources.

Module	Topics	Hours
I	**Fundamentals of Computer, Data Types and Operators** Fundamentals of Computer: Concept of problem solving – problem definition – program design – Techniques of problem solving: Flowcharting – algorithms – pseudo code – decision table – structured programming concepts – programming methodologies viz. top-down and bottom-up programming. Characteristics of a good programming language – Data Types: Character set – C tokens – keywords & identifiers – structure of C program – executing a C program. Constants – variables – data types – declaration of variables – declaration of storage classes – assigning values to variables defining symbolic constants – declaring a variable as constant – Operators and Expressions: Arithmetic – relational – logical – assignment – increment and decrement – conditional – bitwise – comma – special operators – arithmetic expressions – evaluation of expressions – precedence of arithmetic operators – type conversions in expressions – operator precedence and associativity.	9
II	**IO Operations and Control structures** Managing Input and Output Operations: The scanf() and printf() functions – reading a character – writing a character – (the getchar() and putchar() functions() – the address operator(&) – formatted input and output using format specifiers – writing simple complete C programs – Decision Making and Branching: Decision making with if statement – simple if – if..else – nesting of if..else – the else..if ladder – the switch – the ?: operator – the goto statement – the break statement – programming examples – Decision Making and Looping: The while – the do..while statements – the for statement – nested loops – jumps in loops – the continue – programming examples.	9
III	**Introduction to Arrays and Strings** Arrays: The meaning of an array – one dimensional and two dimensional	8

	arrays – declaration and initialization of arrays – reading – writing and manipulation of above types of arrays – dynamic arrays – programming examples – Strings: Declaring and initializing string variables – reading string from terminal – writing string to screen – arithmetic operations on characters – putting strings together – comparison of two strings – string Handling functions – table of strings – programming examples.	
IV	**Functions and Structures** User Defined Functions: Need for user defined functions – a multi-function program – elements of user defined functions – defining functions – return values and their types – function calls – function declaration – category of functions – nesting of functions – recursion – passing arrays to functions – programming examples – Structures: Defining a structure – declaring structure variables – accessing structure members – structure initialization – copying and comparing structure variables – operations on individual members – array of structures – structures within structures – programming examples.	8
V	**Pointers – Memory Allocation and File management** Pointers and Dynamic Memory Allocation: Understanding pointers – accessing the address space of a variable – declaring and initialization pointer variables – accessing a variable through its pointer – pointer expressions – pointers and arrays – pointer and character strings – array of pointers – pointer as function arguments – functions returning pointers – pointers and structures – programming examples – Dynamic memory allocation: Allocating a block of memory: *Malloc*– al locating multiple blocks of memory: *Calloc* – releasing the used space: *Free* – altering the size of a block: *Realloc.* File Management in C: Defining and opening file – closing file – input/output operations on files – command line arguments – programming examples.	11

COURSE OUTCOMES

At the end of the course students will be,
CO1: Understand the basic problem-solving techniques.
CO2: Develop programs using looping, branching and I/O concepts.
CO3: Apply the concepts of arrays and strings by implementing modular programming.
CO4: Understand the dynamics of memory, using pointers and structures.
CO5: Demonstrate memory management concepts and file handling techniques.

Text books

1. Gottfried, Byron S, “Programming with C”, 4th Edition, Tata McGraw Hill, 2018.
2. Balagurusamy .E,”Programming in ANSI C”, 8E, Tata McGraw-Hill, 2019.

Reference books

1. Jeri R. Hanly& Elliot P. Koffman,” Problem Solving and Program Design in C”, 8th Edition, Addison Wesley, 2015.
2. YashwantKanetker,” Let us C”, 19th Edition, BPB publisher, 2016.
3. V.Rajaraman, “Computer Programming in C’, 2nd Edition, Prentice Hall of India Pvt. Ltd, 2019.

INTRODUCTION TO C PROGRAMMING LAB		
S.NO.	**PROGRAM LISTS**	**HOURS**
1	a. Write a program to perform the operations, namely, addition, subtraction, multiplication, division and square of a number. b. Write a program to convert Fahrenheit to Celsius.	2
2	a. Write a program to find the sum of individual digits of a given number. b. Write a program to calculate simple and compound interest.	2
3	a. Write a program to check whether the given number is a Prime number or not. b. Write a program to generate the Fibonacci series.	2
4	a. Write a program to print all the Armstrong numbers between any 2 given limits. b. Write a program to check whether given string is palindrome.	2
5	Write a program to count the number of words, character and lines in a sentence	2
6	Write a program for string concatenation, comparison and the length of the given strings.	2
7	Write a program to sort the given numbers	
8	Write a program to perform matrix multiplication	2
9	Write a recursive program to find the factorial of a number.	2
10	Write a program to find the roots of a quadratic equation.	2
11	Write to program to calculate the mean of given numbers using functions	2
12	Write a function to swap two numbers using pointers	2
13	Write a program to prepare student marks list using structures	2
14	Write a program to prepare employee payroll using files	2
15	Write a C program to illustrate command line arguments.	2

	Program	**Bachelor of Computer Applications (Cloud Computing and Cyber Security)**					Program Code	**24BCABCS**
	Course	**Digital Computer Fundamentals**					Course Code	**24BCACS105**
	Semester	**I**	Credits	**3**	Theory **3**	Practical **-**	Total Hours	**45T**

	COURSE OBJECTIVES
1)	Understand the number system and their conversion.
2)	Gain the knowledge of the working with logic gates, flip-flops, and latches.
3)	Perform a comparative analysis of the components of different memory units.
4)	Understand the use of Boolean algebra and Karnaugh Map in digital circuits.
5)	Equip students to design and develop simple combinational and sequential circuits.
	General Instructions for Teaching-Learning Process
1)	Appropriate power point presentation, problem solving techniques shall be analyzed, to enhance teaching and learning process.
2)	Appreciate the importance of transducers and communication system.
3)	Student should design a circuit using basic gates.
4)	Refer tutorials, concepts from web resources.

Module	Topics	Hours
I	**NUMBER SYSTEM AND CODES** Decimal Numbers – binary numbers – decimal to binary conversions – binary arithmetic – 1's and 2's complements of binary numbers – signed numbers – arithmetic operations with signed numbers – hexadecimal numbers – octal numbers – digital codes – error detection codes.	6
II	**LOGIC GATES** The Inverter – the AND gate – the OR gate – the NAND gate – NOR gate – the exclusive – OR gate and exclusive-NOR gate; Boolean algebra and logic simplification - Boolean operations and expressions – laws and rules – De Morgan's theorems – Boolean expressions and truth tables – the Karnaugh map – SOP minimizations.	11
III	**COMBINATIONAL LOGIC ANALYSIS** Basic combinational logic circuits – implementing combinational logic – the universal property of NAND and NOR gates – Functions of combinational logic: Basic adder – parallel binary adders – comparators – decoders – encoders – code converters – multiplexers – parity generator/checkers.	10
IV	**LATCHES AND FLIP-FLOPS** Latches – edge triggered flip-flops – flip-flop operating characteristics – flip-flop applications – registers – counters.	9
V	**MEMORY AND STORAGE** Memory Basics: The RAM – the ROM – programmable ROMs – the flash memory – memory expansion – special types of memories – magnetic and optical storage.	9

COURSE OUTCOMES

At the end of the course students will be,
CO1: Understand the principles of number system and their conversion and Karnaugh map.
CO2: Design basic electronic circuits using logic gates.
CO3: Able to perform a comparative analysis of the components of different memory units.
CO4: Analyze combinational logic in terms of adder, subtractor and multiplexer circuits.
CO5: Comprehend the knowledge in terms of latches and flip-flops.

Text Books
1. M. Morris Mano and Michael D. Ciletti, “Digital Design”, 6th Edition, Pearson Education, 2018. 2. Floyd, Thomas L, “Digital Computer Fundamentals”, 11th Edition, University Book Stall, 2017.
Reference books
1. Malvino, Paul Albert and Leach, Donald P, “Digital Principles and Applications”, 8th Edition McGraw Hill Education, 2014. 2. Bartee, Thomas C, “Digital Computer Fundamentals”, 6th Edition, McGraw Hill Education,1995. 3. S.Salivahanan and S.Arivazhagan ,”Digital Circuits and Design”, 5th Edition, Vikas publishing House Pvt Ltd, 2018. 4. Anil K.Maini,” Digital Electronics Principles, Devices, Applications”,1st Edition, Wiley publications, 2007.

	Program	**Bachelor of Computer Applications (Cloud Computing and Cyber Security)**					Program Code	**24BCABCS**
	Course	**Introduction to Soft Skills**					Course Code	**24BCACS106**
	Semester	**I**	Credits	**2**	Theory **2**	Practical **-**	Total Hours	**30T**

	COURSE OBJECTIVES
1)	To know about progression and promotion soft skills and communication skills in general
2)	To train to identify the nuances of self-management- interpersonal management skills.
3)	To impart basic English grammar and essentials of important language skills.
4)	To learn about techniques of information to face challenging situations through personal management.
5)	To learn about Techniques of information to face challenging situations through personal management presentation skills.

Module	Topics	Hours
I	**Introduction to Soft Skills** Introduction to Soft Skills: What are soft skills need for soft skills – practical lessons – communication skills – body language and etiquette – group discussion skills – interview skills – presentation skills – and emotional intelligence – time management skills – preparation of CV and life skills.	6
II	**Personality Development** Personality development: What is personality – types of personality – personality development – elements of personality development – SWOT analysis goal setting creativity and human values.	6
III	**Grammar** Basic grammar– parts of speech-- verbs in detail– phrases (verbal phrase and noun phrase) and clauses– Word accent – intonation– spelling rules and words often misspelled– common errors in pronunciation.	6
IV	**Management skills** Self management and people management skills – body language & etiquettes – group discussion – emotional intelligence skills – what is stress recognizing stress acknowledging stress common signs of stress tackling the problem.	6
V	**Behavioral skills** Team building introduction importance of human relations – understanding behavior – comfort zones stepping stones to assertiveness getting to win/win assertiveness – approaches to leadership task – team and individual functions – functions and responsibilities of leadership styles of leadership.	6
	COURSE OUTCOMES	

At the end of the course students will be,

CO1: Understand and apply the fundamentals of communication skills.

CO2: To impart basic English grammar and essentials of language skills as per present requirement.

CO3: Understand and use all types of English vocabulary and language proficiency.

CO4: Adopt the techniques of information transfer through presentation.

CO5: Understand and apply the fundamentals of communication skills in their communication skills.

Text Books

1) Bandi .S. Herold, “Managerial Communication and Soft Skills”, Walnut publication, 2018.
2) Cynthia Menezes Prabhu, “Managerial Skills”, 8th Edition, Pen to Print publishing, 2015.

Reference Books

1. Shilpi Saxena, ”Learning Soft Skills”,1st Edition, Adhyaan books, 2024. ISBN 9789358472240.
2. N.P.Sudharshana and C.Savitha,”English for Engineers”,1st Edition, Cambridge University press, 2018.
3. Meenakshi Raman And ShaliniUpadyaya,”Soft Skills”, Latest Revised Edition, Cengage learning India Pvt Limited, 2019. ISBN-978-93-86668-45-5
4. D Praveen Sam and KN Shoba, “A Course in Technical English”, Cambridge University press, 2020.

E-Learning Sources

1. BBC Learning English
https://www.bbc.co.uk › learningenglish
2.YOUTUBE
3. British Council | India
https://www.britishcouncil.in

	Program	**Bachelor of Computer Applications (Cloud Computing and Cyber Security)**					Program Code	**24BCABCS**
	Course	**Web Design and Development**					Course Code	**24BCACS107**
	Semester	**I**	Credits	**4**	Theory **3**	Practical **2**	Total Hours	**45T 30P**

	COURSE OBJECTIVES
1)	To acquire the knowledge of the fundamentals of Internet, browsing techniques and the principles of web design.
2)	Learn how to create and maintain quality web pages using HTML tabs and elements.
3)	Simple and impressive design techniques, from basics to advance to focus on goal oriented and user centric designs.
4)	To build dynamic web pages with validation using JavaScript objects and by applying different event handling mechanisms.
5)	To develop and deploy excellent websites for business, clients on the internet.

	General Instructions for Teaching-Learning Process
1)	Analyze the problem, Input/ Output requirements, and procedure to solve problem before implementation.
2)	Open source software has to be used for practical implementation.
3)	Student should carry separate observation book for every lab which contains algorithm / flowchart and code.
4)	Refer related concepts and tutorials from web resources.

Module	Topics	Hours
I	**Web Basics** WWW – sticking with the standards – the internet versus the web – the anatomy of a web page – creating web content – understanding web content delivery – selecting a web hosting provider – testing with multiple web browsers – the request/response procedure – content strategy – testing web content **–** responsive web design.	6
II	**HTML 5** Creating a Simple page – HTML document structure – marking up text – paragraphs – headings – thematic breaks – lists – organizing page content – adding links – adding images – table markup – forms – working with fonts – text blocks – and lists – using tables to display information – using external and internal links – working with colors – images – and multimedia.	10
III	**Cascading Style Sheets** Introduction: The benefits of CSS – internal style sheets and inline style sheets – more CSS techniques – styling forms – styling tables – image replacement techniques – formatting text – colors and backgrounds – placing list item indicators – creating image maps with list items – the CSS box model – margin – border – padding – creating vertical navigation with CSS – creating horizontal navigation with CSS.	9
IV	**JavaScript Basics** Understanding JavaScript – exploring JavaScript's capabilities – using variables – understanding expressions and operators – data types – converting between data types – using string objects – working with substrings – using numeric arrays and string arrays – sorting a numeric	10

	array – using functions – using objects to simplify scripting – controlling flow with conditions and loops.	
V	**JavaScript DOM and Event Handling** Understanding the document object model (DOM) – using window objects – working with the document object – accessing browser history – working with the location object – more about the DOM structure – working with DOM nodes – creating position able elements – hiding and showing objects – modifying text within a page – adding text to a page – responding to events – cookies – validating user input with JavaScript regular expressions.	10

COURSE OUTCOMES

At the end of the course students will be,

CO1: To learn the concepts of World Wide Web and the requirements of effective web design.

CO2: To design web pages using the HTML and CSS features with different layouts.

CO3: Develop and implement websites with good aesthetic sense using java script and event handling.

CO4: Ability to develop server - side scripting, to generate the dynamic web pages.

CO5: Analyze a web page and identify its elements and attributes, ability to develop user friendly and commercial websites.

Text Books

1. Julie Meloni, Jennifer Kyrnin, “HTML, CSS, and JavaScript All in One: Covering HTML5, CSS3and ES6”, 3rd Edition, Pearson Education, 2019.
2. Jennifer Niederst Robbins, “Learning Web Design: A Beginner`s Guide To HTML, CSS, JavaScript and Web Graphics”, 5th Edition, O’Reilly publication, 2018.

Reference Books

1 Luke Welling Laura Thomson, “PHP and MySQL Web Development”, 5th Edition, Addison-Wesley Professional, 2018.

2. KOGENT Learning Solutions Inc.,”HTML5 BLACK BOOK”, 2nd Edition, Dream tech Press, 2016

3. Robert W. Sebesta, “Programming the World Wide Web”, 7th Edition, Pearson Education, 2013.

4. BOOTSTRAP Responsive Web Development by Tutorials Point.

WEB DESIGN AND DEVELOPMENT LAB		
S.NO.	**PROGRAM LISTS**	**HOURS**
1	Acquaintance with elements, tags and basic structure of HTML files.	2
2	Write a HTML program for basic and advanced text formatting.	2
3	Write a HTML code for the use of multimedia components (Image, video and audio) in HTML document.	2
4	Write a HTML program for designing of webpage – Working with Lists	2
5	Write a HTML program for designing of webpage – Working with Tables	2
6	Write a HTML program for designing of webpage – Working with Hyperlinks	2
7	Write a HTML program for designing of webpage – Working with Frames	2
8	Write a HTML code to work with HTML elements Box properties in CSS(Cascading Style Sheets)	2
9	Write a HTML code to work with HTML elements Block properties in CSS(Cascading Style Sheets)	2
10	Write a JavaScript program to perform four arithmetic operations: addition, subtraction, multiplication, and division on two numbers.	2
11	Write a program using JavaScript to display the multiplication table for the given number.	2
12	Write a JavaScript program to create dialogue boxes using alert, confirm and prompt.	2
13	Write a JavaScript program on Form Validation.	2
14	Create a commercial website for a departmental store.	2
15	Create a website of our university.	2

	Program	**Bachelor of Computer Applications (Cloud Computing and Cyber Security)**					Program Code	**24BCABCS**
	Course	**Discrete Mathematics**					Course Code	**24BCACS201**
	Semester	**II**	Credits	**3**	Theory **3**	Practical **-**	Total Hours	**45T**

	COURSE OBJECTIVES
1)	To understand and use the notations of mathematical logic.
2)	To understand the statement of two common forms of mathematical induction and able to identify the combinatorics.
3)	To understand the concept of logarithms and its rules.
4)	To achieve the command of the fundamental definitions and concept of graph theory.
5)	To identify the vector fields from the given equation.
	General Instructions for Teaching-Learning
1)	In addition to the traditional lecture method, different types of innovative teaching methods maybe adopted so that students will develop theoretical and applied mathematical skills.
2)	To support and guide the students for self-study.
3)	To state the need for mathematics with engineering studies and provide real-life examples.
4)	To encourage the students for group learning and to improve their creative and analytical skills.
5)	Responsible for assigning homework, grading assignments and quizzes.

Module	Topics	Module
I	**Set Theory and Logic** Fundamentals of set theory – Relations and Functions – Types of Functions- Inverse functions and Problems – Fundamentals of Logic – Propositional Logic – Logical connectives and Truth tables – Logical equivalence – Predicates and Quantifiers – Problems.	I
II	**Mathematical Induction and Combinatorics** Mathematical Induction: Introduction and its principles – problems – Combinatorics: Definitions – properties and problems on permutation and combinations – Pigeonhole principle – Fibonacci series – Problems.	II
III	**Logarithmic and their Applications** Introduction – laws of logarithms – simple interest – compound interest – annuities – percentage – problems.	III
IV	**Graph Theory** Introduction about graphs – terminologies – types of graphs – simple graph – multigraph – weighted graph – paths and circuits – connectivity – Hamilton and Eulerian graphs – Kruskal's algorithm.	IV
V	**Vector Calculus** Basic concepts of vectors – scalar and vector point functions – directional derivatives – gradient – divergence – curl of a vector – solenoidal vector – irrotational vector – problems.	V

COURSE OUTCOMES

At the end of the course students will be able to,
CO1: Explain and apply basic notions of symbolic logic.

CO2: Understand and prove the principles of mathematical induction and combinatorics.
CO3: Understand and prove logarithmic statements and apply the concept of simple interest and compound interest bills in day-to-day life.
CO4: Understand the basics of graph theory and their various properties.
CO5: Illustrate the concepts of gradient, divergence and curl.

Text books

1. J K. Sharma, “Discrete Mathematics”, Macmillan Publications, 3rd Edition, 2007.
2. Kennath H Rosen, “Discrete Mathematics and its Applications”, McGraw-Hill Publications, 7th Edition, 2012.
3. Narsingh Deo, “Graph Theory with Applications to Engineering and Computer Science” Courier Dover Publications, latest edition, 2017.

Reference books

1. Ralph P. Grimaldi, “Discrete and Combinatorial Mathematics”, 5th Edition, Pearson Education, 2006.
2. Ralph P. Grimaldi and B. V. Ramana, “Discrete and Combinatorial Mathematics - An applied Introduction”, 5th Edition, 2007, Pearson Education.
3. D. S. Chandrasekharaiah, “Discrete Mathematics Structures”, 6th Edition, PRISM Book Pvt. Ltd, 2019.
4. J. P. Trembley and R. Manohar, “Discrete Mathematics Structures with Application to Computer Science”,1st Edition, Tata McGraw Hill Education, 2017.
5. G. K. Ranganath and B. Suryanarayana, “BCA Mathematics Volume -II”, S. Chand and Company Ltd, 2001.

	Program	**Bachelor of Computer Applications (Cloud Computing and Cyber Security)**					Program Code	**24BCABCS**
	Course	**Programming in Python**					Course Code	**24BCACS202**
	Semester	**II**	Credits	**4**	Theory **3**	Practical **2**	Total Hours	**45T 30P**

	COURSE OBJECTIVES:
1)	To learn how to design and develop basic Python programs, and to apply the methods to create and manipulate the data structures such as strings, lists, tuples, dictionaries, and arrays.
2)	Develop modular programs using functions.
3)	Demonstrate object- oriented concepts and understand the regular expressions.
4)	To implement how to use exception handling in Python applications for error handling and file processing.
5)	Acquire the knowledge about Django architecture with Python.
	General Instructions for Teaching-Learning Process
1)	Analyze the problem, Input/Output requirements and procedure to solve problem before implementation.
2)	Open source software has to be used for practical implementation.
3)	Student should carry separate observation book for every lab which contains algorithm / flowchart and code.
4)	Refer related concepts and tutorials from web resources.

Module	Topics	Hours
I	**Introduction to Python** Python Basics: Data Types – operators – input/output statements – creating python programs – Python Flow Control Statements: Decision making statements – indentation – conditionals – loops – break – continue – and pass statements – Core Data Structures: Strings– lists – tuples – and dictionaries.	10
II	**Functions and Functional Programming** Python Functions: Defining functions – DOC strings – Function parameters: Default – keyword required and variable length arguments – keyword only parameters – local and global variables – pass by reference versus value – recursion – Functional Programming: Mapping– filtering and reduction – lambda functions – list comprehensions.	9
III	**OOPs and Regular Expressions** Object Oriented Programming: Definition and defining a class – constructor – destructor – self and del keywords – access to attributes and methods – getattr – setattr and hasattr attributes – data attributes and class attributes – data hiding – inheritance – static members. Regular Expressions: Defining regular expressions and string processing.	8
IV	**Arrays – File and Exceptions** Working with Arrays: Arrays – NumPy – File I/O: File object attributes read and write into the file – rename and delete a file – Exceptions Handling: Handling exceptions – built-in exceptions and user defined exceptions.	8
	Working with Django	10

V	Rendering templates into HTML and other formats – understanding models – views – and templates – separating the layers (MVC) models – views – templates – overall Django architecture – defining and using models – templates and form processing – setting up the database – using a database server – using SQLite – creating the tables.	

COURSE OUTCOMES

At the end of the course students will be,

CO1: Develop proficiency in creating applications using the python programming language.

CO2: Describe various data structures available in python programming language and apply them in solving computational problems.

CO3: Implement modular programming using functions for various applications.

CO4: To develop and implement object-oriented programming concepts for python program applications, exception handling and file processing.

CO5: Implement the acquired knowledge of Django architecture for python applications.

Text Books

1. Timothy A. Budd, “Exploring Python”, Indian Edition, Tata McGraw-Hill, 2011.
2. Ascher and Mark Lutz, “Learning Python”, 5th Edition, O'Reilly, 2013.

Reference Books

1. Jeff Forcier, Paul Bissex, Wesley Chun, “Python Web Development with Django”, 1st Edition, Addison-Wesley, 2008.
2. Wesley J Chun, “Core Python Applications Programming”, 3rd Edition, Pearson Education, 2015.
3. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, ”How to Think Like a Computer Scientist: Learning with Python 3”, 3rd Edition, Green Tea Press, 2020.
4. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist”, 2nd Edition, O'Reilly Media, 2015.
5. Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014, 2015.

PROGRAMMING IN PYTHON LAB		
S.NO.	**PROGRAM LISTS**	**HOURS**
1	Exercise programs on basic control structures & loops. a) Write a program for checking the given number is even or odd. b) Using a for loop, write a program that prints the decimal equivalents of 1/2, 1/3, 1/4 ,..... 1/10 c) Write a program for displaying reversal of a number.	2
2	Exercise programs on basic control structures & loops. a) Write a program for finding biggest number among 3 numbers. b) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.	2
3	Exercise programs on operators & I/O operations. a) Write a program that takes 2 numbers as command line arguments and prints its sum. b) Implement python script to show the usage of various operators available in python language.	2
4	Exercise programs on operators & I/O operations. a) Implement python script to read person's age from keyboard and display whether he is eligible for voting or not. b) Implement python script to check the given year is leap year or not.	2
5	Exercise programs on Python Script. a) Implement Python Script to generate first N natural numbers. b) Implement Python Script to check given number is palindrome or not. c) Implement Python script to print factorial of a number.	2
6	Exercise programs on Python Script. a) Implement Python Script to print sum of N natural numbers. b) Implement Python Script to check given number is Armstrong or not. c) Implement Python Script to generate prime numbers series up to n	2
7	Exercise programs on Lists. a) Finding the sum and average of given numbers using lists. b) To display elements of list in reverse order. c) Finding the minimum and maximum elements in the lists.	2
8	Exercise programs on Strings. a) Implement Python Script to perform various operations on string using string libraries. b) Implement Python Script to check given string is palindrome or not. c) Implement python script to accept line of text and find the number of characters, number of vowels and number of blank spaces in it.	2
9	Exercise programs on functions. a) Define a function max_of_three() that takes three numbers as arguments and returns the largest of them. b) Write a program which makes use of function to display all such numbers which are divisible by 7 but are not a multiple of 5, between 1000 and 2000.	2
10	Exercise programs on recursion & parameter passing techniques. a) Define a function which generates Fibonacci series up to n numbers.	2

	b) Define a function that checks whether the given number is Armstrong	
11	Exercise programs on recursion & parameter passing techniques. a) Implement a python script for Call-by-value and Call-by-reference b) Implement a python script for factorial of number by using recursion.	2
12	Exercise programs on Tuples. a) Write a program which accepts a sequence of comma-separated numbers from console and generate a list and a tuple which contains every number. Suppose the following input is supplied to the program: 34, 67, 55, 33, 12, 98. Then, the output should be: ['34', '67', '55', '33', '12', '98'] ('34',67', '55', '33', '12', '98'). b) With a given tuple (1, 2, 3, 4, 5, 6, 7, 8, 9, 10), write a program to print the first half values in one line and the last half values in one line.	2
13	Exercise programs on files. a) Write Python script to display file contents. b) Write Python script to copy file contents from one file to another.	2
14	Exercise programs on searching & sorting Techniques. a) Implement a python script to check the element is in the list or not by using Linear search & Binary search. b) Implement a python script to arrange the elements in sorted order using Bubble, Selection, Insertion and Merge sorting techniques.	2
15	Exercise programs on Exception handling concepts. a) Write a python program by using exception handling mechanism. b) Write a python program to perform various database operations (create, insert, delete, update).	2

	Program	**Bachelor of Computer Applications (Cloud Computing and Cyber Security)**					Program Code	**24BCABCS**
	Course	**Data Structures using C**					Course Code	**24BCACS203**
	Semester	**II**	Credits	**4**	Theory **3**	Practical **2**	Total Hours	**45T 30P**

	COURSE OBJECTIVES
1)	Understand the concept of ADT, recursion, and linear data structure such as stack, and implement it into real world scenarios.
2)	Apply the knowledge of the queue and list concepts for real time applications, select specific data structures and apply to a particular problem definition.
3)	To exhibit the usage and operation of trees and binary search trees.
4)	To build and perform operations on AVL and heap trees.
5)	To implement the multi way tree and traversal of graphs

	General Instructions for Teaching-Learning Process
1)	Analyze the problem, Input/Output requirements and procedure to solve problem before implementation.
2)	Open source software has to be used for practical implementation.
3)	Student should carry separate observation book for every lab which contains algorithm / flowchart and code.
4)	Refer related concepts and tutorials from web resources.

Module	Topics	Hours
I	**Introduction to Data Structures – Recursion and Stack** Introduction to Data Structures: Definition – abstract data type – model for an ADT – ADT implementations and example – Recursion: Recursive definition and designing recursive algorithms – example on recursion: GCD – Fibonacci numbers – Towers Of Hanoi problem – Stack and its applications: Definition and examples – representing stacks – example – infix – prefix and postfix.	9
II	**Queues and Lists** Queues: Queue operations– queue ADT– queue applications – Lists: Basic operations – implementation – List ADT – applications – complex implementations.	8
III	**Trees and Binary Search Tree** Trees: Basic concepts – binary trees and its properties – operations on binary trees – binary tree traversals – expression tree – General trees: Insertions – deletions – changing a general tree to a binary tree – Binary Search Tree: Binary Search tree – basic concepts and its operations – threaded trees.	9
IV	**Advanced concepts in Trees** AVL Search trees: Basic concepts – implementations – Heaps: Basic concepts– implementation.	9
V	**Multiway Trees and Graphs** Multiway Trees: M-way search trees – B-trees: Basic concepts – implementations – simplified B-Trees: 2-3 tree – 2-3-4 tree – Graphs: Basic concepts – operations – storage structures – graph algorithms.	10

COURSE OUTCOMES
At the end of the course students will be, CO1: Analyze and implement the concept of ADT, recursion and linear data structure such as stack, and implement it into real world scenarios. CO2: Implement linear data structure such queues, linked lists and their applications. CO3: Implement basic operations and usage on trees and binary search trees. CO4: Design AVL tree, Heap tree and apply various operations on them. CO5: Demonstrate the representation of multiway tree and traversal of graphs with their Applications.
Text Books
1. Richard F Gilberg and Behrouz A Forouzan, "Data Structures - A Pseudocode Approach with C", 6th Indian Reprint, Cengage Learning, 2009. 2. Yedidyah Langsam, Moshe J. Augenstein and Aaron M Tenenbaum, "Data Structures using C and C++", 2nd Edition, Pearson Education Asia, 2002.
Reference Books
1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education Asia, 1997. 2. Robert Kruse, C L Tondo and Bruce Leung, "Data Structures and Programming Design in C", 2ndEdition, Pearson Education, 2007. 3. Horowitz, Sahani, Anderson and Freed, "Fundamentals of Data Structures in C", Second edition, Universities Press, 2014. 4. Reema Thareja, "Data Structures Using C" , 2nd Edition, Oxford University Press, 2018.

FUNDAMENTALS OF DATA STRUCTURES LAB		
S.NO.	**PROGRAM LISTS**	**HOURS**
1	Demonstrate Tower of Hanoi program using Recursive programming	2
2	Write a program that implement Stack (its operations) using Arrays	2
3	Write a program that implement Stack (its operations) using Pointers	2
4	Write a program that implement Queue (its operations) using Arrays	2
5	Write a program that implement Queue (its operations) using Pointers	2
6	Write a C program that uses functions to perform the following on Singly Linked List: a. Creation b. Insertion c. Deletion d. Traversal	2
7	Write a program that uses functions to perform the following operations on Doubly Linked List.: a. Creation b. Insertion c. Deletion d. Traversal	2
8	Write a program that uses functions to perform the following operations on Circular Linked List.: a. Creation b. Insertion c. Deletion d. Traversal	2
9	Write a program that implements Bubble Sort Method to sort a given list of integers in ascending order.	2
10	Write a program that implements Selection Sort Method to sort a given list of integers in ascending order.	2
11	Write a program that implements Insertion Sort Method to sort a given list of integers in ascending order.	2
12	Write a program that use both recursive and non recursive functions to perform Linear search operations for a Key value in a given list of integers.	2
13	Write a program that use both recursive and non recursive functions to perform Binary search operations for a Key value in a given list of integers	2
14	Write a program to implement the tree traversal methods.	2
15	a. Write a program to implement Depth First Search (DFS) graph traversal methods. b. Write a program to implement Breadth First Search (BFS) graph traversal methods.	2

	Program	**Bachelor of Computer Applications (Cloud Computing and Cyber Security)**					Program Code	**24BCABCS**
	Course	**Database Management System**					Course Code	**24BCACS204**
	Semester	**II**	Credits	**3**	Theory **2**	Practical **2**	Total Hours	**30T 30P**

	COURSE OBJECTIVES
1)	To understand the fundamental elements of relational database approach, using schema to design databases.
2)	To acquire the knowledge about relational operations, join and division, relational algebra from set theory.
3)	To interpret SQL interface of a RDBMS package to create, secure, maintain and query a database.
4)	Apply design principles using ER models, convert the ER model to relational tables and perform normalization approach.
5)	To perform transaction management queries, concurrency control, backup and recovery control

	General Instructions for Teaching-Learning Process
1)	Analyze the problem, Input/Output requirements, procedure and draw ER diagrams to solve a given problem before implementation.
2)	Open source software has to be used for practical implementation.
3)	Student should carry separate observation book for every lab which contains algorithm / flowchart and code to design and develop design schema of the given problem.
4)	Refer related concepts and tutorials from web resources.

Module	Topics	Hours
I	**Introduction to Database Management System** Implication and scope of database concepts and its importance in economic growth of nation – impact of the course on societal problems / sustainable solutions / national economy – career perspective – overview of the course in current innovations and research trends – Characteristics of database approach: Actors on the scene – workers behind the scene – advantages of using DBMS approach – data models – schemas and instances – three – schema architecture and data independence – Entity-Relationship Model: Conceptual database using high level conceptual data models for database design – a sample database application – entity types – entity sets attributes and keys relationship types – relationship sets – roles and structural constraints weak entity types.	6
II	**Relational Model** Relational Model and Relational Algebra: Relational model concepts – relational model constraints and relational database schema update operations – transactions and dealing with constraint violations – unary relational operations – relational algebra operations from set theory – binary relational operations – JOIN and DIVISION – additional relational operations – examples of queries in relational algebra relational database design using ER-to-relational mapping.	6
III	**Introduction to SQL**	7

	Overview of the SQL Query language – SQL data definition – basic structure of SQL queries – additional basic operations – null values – aggregate functions – modification of the database – join expressions – views – transactions – integrity constraints – SQL data types and schemas – authorization – database programming issues and techniques – embedded SQL.	
IV	**Database Design**	6
	Informal design guidelines for relation schemas – functional dependencies – normal forms based on primary keys – general definitions of 2nd and 3rd normal forms – Boyce-Codd normal forms – stored procedures and functions – triggers – views.	
V	**Transaction Management**	5
	Transaction concept – a simple transaction model – desirable properties of transaction – Concurrency control: Lock based protocols – Recovery techniques: Recovery concepts – recovery in multi-database systems – database backup and recovery from catastrophic failures.	

COURSE OUTCOMES

At the end of the course students will be,

CO1: To acquire the knowledge about the fundamental elements of relational database approaches and schema design.

CO2: Ability to perform the relational operations, join and division, relational algebra from set theory.

CO3: To develop relational databases, interface to create, secure, maintain and query a database.

CO4: Apply normalization techniques to improve database design.

CO5: To design transaction management queries, concurrency control, backup and recovery control.

Text Books

1. Elmasri and Navathe, “Fundamentals of Database Systems”, 5th Edition, Addison-Wesley, 2011.
2. C.J. Date, A. Kannan, S. Swaminathan, “An Introduction to Database Systems”, 8th Edition, Pearson education, 2009.

Reference Books

1. Raghu Ramakrishnan and Johannes Gehrke, “Database Management Systems”, 3rd Edition, McGraw-Hill, 2003.
2. Silberschatz, Korth and Sudharshan, “Data base System Concepts”, 7th Edition, Tata McGraw Hill, 2021.
3. S. K. Singh, “Database Systems: Concepts, Design and Application”, 2nd Edition, Pearson Education, 2011. ISBN 978-81-317-6092-5.

DATABASE MANAGEMENT SYSTEMLAB		
S.NO.	**PROGRAM LISTS**	**HOURS**
1	Create the following table and retrieving records from the table. EMPLOYEES (Employee_Id, First_Name, Last_Name, Email, Phone_Number, Hire_Date, Job_Id, Salary, Commission_Pct, Manager_Id, Department_Id) (a) Find out the employee id, names, salaries of all the employees (b) List out the employees who works under manager 100 (c) Find the names of the employees who have a salary greater than or equal to 4800 (d) List out the employees whose last name is 'AUSTIN' (e) Find the names of the employees who works in departments 60,70 and 80 (f) Display the unique Manager_Id.	2
2	Create the following table and Update records from the table. Create Client_master with the following fields(ClientNO, Name, Address, City, State, bal_due) (a) Insert five records (b) Find the names of clients whose bal_due> 5000 . (c) Change the bal_due of ClientNO " C123" to Rs. 5100 (d) Change the name of Client_master to Client12 . (e) Display the bal_due heading as "BALANCE"	2
3	Demonstrate the following commands Rollback and Commit commands Create Teacher table with the following fields(Name, DeptNo, Date of joining, DeptName, Location, Salary) (a) Insert five records (b) Give Increment of 25% salary for Mathematics Department . (c) Perform Rollback command (d) Give Increment of 15% salary for Commerce Department (e) Perform commit command	2
4	Demonstrate the on order by and group by clauses Create Sales table with the following fields(Sales No, Salesname, Branch, Salesamount, DOB) (a) Insert five records (b) Calculate total salesamount in each branch (c) Calculate average salesamount in each branch . (d) Display all the salesmen, DOB who are born in the month of December as day in character format i.e. 21-Dec-09 (e) Display the name and DOB of salesman in alphabetical order of the month.	2
5	Create an Emp table with the following fields and retrieve the data from the table (EmpNo, EmpName, Job,Basic, DA, HRA,PF, GrossPay, NetPay)	

	(Calculate DA as 30% of Basic and HRA as 40% of Basic) (a) Insert Five Records and calculate GrossPay and NetPay. (b) Display the employees whose Basic is lowest in each department . (c) If NetPay is less than <Rs. 10,000 add Rs. 1200 as special allowances . (d) Display the employees whose GrossPay lies between 10,000 & 20,000 (e) Display all the employees who earn maximum salary .	2
6	Consider the Insurance database given below. PERSON(driver_ID, name, address) CAR(regno, model,year) ACCIDENT(report_number,accd_date,location) OWNS(driver_id,regno) PARTICIPATED(driver_id,regno,report_number,damage_amount)i. a) Specify the primary keys and foreign keys and enter at least five tuples for each relation. b) Update the damage amount for the car with specific regno in the accident with report number 1025 c) Add a new accident to the database d) Find the total number of people who owned cars that were involved in accidents in the year 2018. e) Find the number of accidents in which cars belonging Wagon R were involved	2
7	Employee Database An Enterprise wishes to maintain a database to automate its operations. Enterprise is divided into certain departments and each department consists of employees. The following two tables describes the automation schemas Dept (deptno, dname, loc) Emp (empno, ename, job, mgr, hiredate, sal, comm, deptno) a) Update the employee salary by 15%, whose experience is greater than 10 years. b) Delete the employees, who completed 30 years of service. c) Display the manager who is having maximum number of employees working under him? d) Create a view, which contain employee names and their manager	2
8	Using Employee Database in question no 6 perform the following queries a) Determine the names of employee, who earn more than their managers. b) Determine the names of employees, who take highest salary in their departments. c) Determine the employees, who are located at the same place. d) Determine the employees, whose total salary is like the minimum Salary of any department. e) Determine the department which does not contain any employees.	2

9	Consider the following tables namely “DEPARTMENTS” and “EMPLOYEES” Their schemas are as follows, Departments (dept _no , dept_ name , dept_location); Employees (emp_id , emp_name , emp_salary,dept_no); a) Develop a query to grant all privileges of employees table into departments table b) Develop a query to grant some privileges of employees table into departments table c) Develop a query to revoke all privileges of employees table from departments table d) Develop a query to revoke some privileges of employees table from departments table e) Write a query to implement the save point.	2
10	Using the tables “DEPARTMENTS” and “EMPLOYEES” perform the following queries a) Display the employee details, departments that the departments are same in both the emp and dept. b) Display the employee name and Department name by implementing a left outer join. c) Display the employee name and Department name by implementing a right outer join. d) Display the details of those who draw the salary greater than the average salary.	2
11	Write a PL/SQL program to demonstrate the control structures.	2
12	Write a PL/SQL program to demonstrate Exceptions.	2
13	Write a PL/SQL program to demonstrate Cursors.	2
14	Write a PL/SQL program to demonstrate Functions and Procedure	2
15	Write a PL/SQL program to demonstrate Packages and Triggers.	2

	Program	**Bachelor of Computer Applications (Cloud Computing and Cyber Security)**					Program Code	**24BCABCS**
	Course	**Operating Systems with Unix**					Course Code	**24BCACS205**
	Semester	**II**	Credits	**3**	Theory **3**	Practical **-**	Total Hours	**45T**

	COURSE OBJECTIVES
1)	Understand functions, services, and structure of operating systems.
2)	Acquire the knowledge about the processes, threads, schedulers, and explanation of CPU scheduling.
3)	Comprehend issues related to process synchronization and focus on principles of deadlock and its related problems.
4)	Analyse the mechanisms used in memory management and virtual memory.
5)	Grasp the concepts of file system, secondary storage management and disk scheduling.

	General Instructions for Teaching-Learning Process
1)	Appropriate power point presentation, problem solving techniques shall be analyzed before implementation, to enhance teaching and learning process.
2)	Open source software is used for practical implementation.
3)	Student should perform file handling operations.
4)	Refer tutorials and concepts from web resources.

Module	Topics	Hours
I	**Introduction to Operating Systems** Introduction to operating systems: System structure what operating systems do – operating system operations – operating system services – system calls – types of system calls.	8
II	**Process Management** Process concept – scheduling criteria – scheduling algorithms. Process synchronization: The critical section problem – semaphores – readers-writers problem – dining philosopher's problem using semaphores.	9
III	**Deadlocks** System model – deadlock characterization – methods for handling deadlocks – deadlock prevention – deadlock avoidance – deadlock detection and recovery from deadlock**.**	8
IV	**Memory Management** Memory management strategies – basic hardware – swapping – contiguous memory allocation – paging – segmentation. Virtual memory: Demand paging – page replacement.	11
V	**File System** File system implementation – file concepts – access methods – directory overview – allocation methods – free space management – secondary storage structures magnetic disks – disk management – disk scheduling – swap space management. **NOTE:** Unix commands will be demonstrated in the lab.	9

COURSE OUTCOMES

At the end of the course students will be,

CO1: To get an idea about the basic concepts of operating system, services, and their structures.

CO2: Understand the concept of the processes, threads, and CPU scheduling.

CO3:Classify the various issues related to inter process communication like process scheduling, resource management and deadlocks.
CO4: Interpret the issues and challenges of memory management.
CO5: Synthesize the concepts of I/O management, file system implementation and problems related to disk space management

Text Books

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne,"Operating Systems Principles", 8th Edition, Wiley India, 2017.
2. D M Dhamdhere, "Operating Systems – A Concept Based Approach", 2nd Edition, Tata McGraw Hill, 2006.
3. Behrouz A Forouzan and Richard F Gilberg, "LINUX and Shell Programming", 1st Edition, Edition, 2005, Thomson Course Technology, 2005.

Reference Books

1. William Stalling, "Operating System-Internals and Design System", 9th Edition, Pearson Education, 2017.
2. Andrew S. Tanenbaum, "Modern Operating Systems", 5th Edition, Prentice Hall of India, 2022.
3. Deitel & Deitel , "Operating systems", 3rd Edition, Pearson Education, 2008.
4. Robert Love, "Linux Kernel Development", 3rd Edition, Pearson Education, 2010.

	Program	**Bachelor of Computer Applications (Cloud Computing and Cyber Security)**					Program Code	**24BCABCS**
	Course	**Quantitative Aptitude and Logical Reasoning**					Course Code	**24BCACS206**
	Semester	**II**	Credits	**2**	Theory **2**	Practical **-**	Total Hours	**30T**

	COURSE OBJECTIVES:
1)	To develop the skill to meet the competitive examinations for better job opportunity.
2)	Effort has been made to accommodate fundamental, mathematical aspects to instill confidence among students.
3)	To understand the concept of logarithms and its rules.
4)	To enrich and develop their knowledge in logical reasoning and thinking ability.
5)	To enhance their language skills in the area of grammar and pronunciation.

	General Instructions for Teaching-Learning:
1)	In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that students will develop theoretical and applied mathematical skills.
2)	To support and guide the students for self-study.
3)	To encourage the students for group learning and to improve their creative and analytical skills.
4)	Responsible for assigning homework, grading assignments, and quizzes.
5)	Get familiarized with English vocabulary and language proficiency

Module	Topics	Hours
I	**Quantitative Aptitude I** Number system – HCF – LCM – decimal fractions – ratio and proportions – averages – ages – percentage – profit and loss- problems.	6
II	**Quantitative Aptitude II** Time and work – time and distance – time and speed – heights and distances – problems related to calendar – clock and trains.	6
III	**General Mental Ability** Coding and decoding – classification – blood relation – analogy – number puzzles – direction sense test – logical venn diagram – alphabetic test – number series – problems.	6
IV	**Logical Reasoning (Verbal)** Decision making – mathematical operations – logical sequence of words – assertion and reason – sequential output tracing – statement (arguments – assumptions – force of action and conclusion).	6
V	**English Language and Comprehension Solving** Vocabulary – English grammar – verbal ability – sentence structures – spot the error – fill in the blanks – idioms and phrases – cloze passages and comprehension passages.	6

COURSE OUTCOMES:

At the end of the course students will be,

CO1: Able to develop critical thinking, numerical reasoning, and logical problem-solving skills.

CO2: Able to solve the problems easily by using short-cut method with time management and to clear the competitive exams for better job opportunities.

CO3: Able to analyze the problems logically and approach in a different manner.

CO4: Able to use appropriate techniques in a given context.
CO5: Able to identify the language structure.

Text books

1. R. S. Aggarwal, “Quantitative Aptitude”, Latest Edition, S.Chand & Company, 2023.
2. R. S. Aggarwal, “A Modern Approach to Verbal and non-Verbal Reasoning”, S.Chand and Company, 2017.

Reference books

1. Kiran Prakashan and R. S. Aggarwal, “Objective Arithmetic”, S.Chand & Company New Delhi, 2012.
2. B.S. Sijiwal, “Analytical and Logical Reasoning”, Arihant publications, 2015.
3. Govind Prasad Singh and Rakesh Kumar, “Textbook of Quickest Mathematics (for all Competitive Examinations)”, 1st Edition, Kiran Prakashan, 2021.
4. Abhijit Guha, “Quantitative Aptitude for Competitive Examination”, 6th Edition, McGraw Hill Education, 2016.

	Program	**Bachelor of Computer Applications (Cloud Computing and Cyber Security)**					Program Code	**24BCABCS**
	Course	**Indian Constitution**					Course Code	**24BCACS207**
	Semester	**II**	Credits	**1**	Theory	Practical	Total Hours	**15T**
					1	**-**		

COURSE OBJECTIVES

1) To know about the basic structure of Indian constitution.
2) To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
3) To know about our union government, political structure & codes, procedures.
4) To know the state executive & elections system of India.
5) To learn the amendments and emergency provisions, other important provisions given by the constitution.

Module	Topics	Hours
I	Indian Constitution: Necessity of the constitution – societies before and after the constitution adoption – Introduction to the Indian constitution – making of the constitution – role of the constituent assembly.	3
II	Salient features of India Constitution – Preamble of Indian Constitution & Key concepts of the Preamble – Fundamental Rights (FR's) and its restriction and limitations in different Complex Situations.	3
III	Directive Principles of State Policy (DPSPs) and its present relevance in Indian society – Fundamental duties and its scope and significance in nation – Union Executive: Parliamentary system – union executive – president – prime minister – union cabinet.	3
IV	Parliament – LS and RS – Parliamentary committees – important parliamentary terminologies – Judicial system of India: Supreme court of India and other courts – judicial reviews and judicial activism.	3
V	State Executive and Governor – CM – state cabinet – legislature -VS and VP – election commission – elections & electoral process. Amendment to constitution and important constitutional amendments till today. Emergency provisions.	3

COURSE OUTCOMES

At the end of the course students will be,

CO1: To analyze the basic structure of Indian constitution.

CO2: Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.

CO3: To know about our union government, political structure & codes, procedures.

CO4: Understand our state executive & elections system of India.

CO5: Remember the amendments and emergency provisions, other important provisions given by the constitution.

Text Books

1. Dr.J.N.Pandey, “Constitution Law of India, Central Law Agency”, 2020 Edition.
2. "Constitution of India (for Competitive Exams)”, Naidhruva Edutech Learning Solutions, Bengaluru, 2022.
3. Durga Das Basu, "Introduction to the Constitution of India", Students Edition, Prentice Hall, 2008.

Reference Books

1. Charles E. Haries, "Constitution of India, Professional Ethics and Human Rights", Latest Edition, Cengage Learning India, 2019.
2. Merunandan KB, “The Constitution of India", Latest Edition, Merugu Publication, Bengaluru, 2019.
3. Justice H N Nagamohan Das, Sahayana, kerekon, “Samvidhana Odu for Students & Youths”.

E-Learning Sources

https://successesacademy
https://lddashboard.legislative.gov.in/sites/default/files/COI...pdf
https://www.udemy.com/course/constitution-of-india