BCA - Bachelor of Computer Application:

Specialization – Cloud Technology & Information Security (CTIS)

Program Educational Objectives (PEO)

PEO1	To prepare graduates as leading professionals in government, academia, and corporate along with entrepreneurial pursuits
PEO2	To prepare graduates with an ability to articulate and solve problems in the field of Computer Applications specifically in the field of Cloud Technology and Information Security.
PEO3	To prepare the graduates with strong learning quotients having adaptability to the constantly changing technological environment
PEO4	To prepare the graduates to lead and initiate ethically the professional and organizational goals in interdisciplinary team and obtain desired results.

Program Outcome:

On Successful completion of this program the graduates shall have:

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet t h e specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern Tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

After completion of the program, the students will:

PSO1	Be able to demonstrate the ability to solve complex problems of development in the field of Information Security, and the core issues of cloud computing such as security, privacy, and interoperability by analyzing, formulating sub-tasks, and proposing innovative solutions.
PSO2	Be able to work with various cloud services like SaaS, PaaS and IaaS and moreover they will also be able to provide the appropriate cloud computing solutions and make recommendations as per the use case on a particular cloud infrastructure level.
PSO3	Be able to apply creative and innovative techniques to identify the tools in Information Security that requires Cloud computing solutions.
PSO4	Be able to use modern tools for Information security like Cryptominer, NMap, Metasploit, Cainandable, Wireshark, JohnTheRipper, TCPDump, Hash Generator, KissMac, Nicto, Nexpose, BurpSuite.

B.C.A First Semester Syllabus

Teaching and Examination Scheme

Examination Scheme

S. No.	ERP CODE	Subject Code	Subject Name	Hours Per week			Credit	Examination Scheme				
				L	T	P	C	Theory Marks		Practical Marks		Total
								ESE	IA	ESE	IA	
1		**BCCT101CO**	Web Technology	03	-	-	03	70	30	-	-	100
2		**BCCT102CO**	Programming in C	03	-	-	03	70	30	-	-	100
3		**BCCT103CO**	Computer Architecture and Organization	03	1	-	04	70	30	-	-	100
4		**BCCT104CO**	Operating Systems	03		-	03	70	30	-	-	100
5		**BCCT105AC**	Effective Communication Skills	03	-	-	03	70	30	-	-	100
6		**BCCT106CO**	Theory of Mathematics	03	1	-	04	70	30	-	-	100
7		**BCCT107CO**	Web Technology Lab	-	-	02	01	-	-	35	15	50
8		**BCCT108CO**	Programming in C Lab	-	-	02	01	-	-	35	15	50
9		**BCCT109CO**	Operating Systems Lab	-	-	02	01	-	-	35	15	50
10		**BCCT110SC**	Office Automation Lab	-	-	02	01	-	-	35	15	50
Total Credit				**18**	**2**	**08**	**24**	**420**	**180**	**140**	**60**	**800**

*L- Lecture, P- Practical, C -Credit, IA-Internal Assessment, ESE- End Semester Examination

B.C.A Second Semester Syllabus

Teaching and Examination Scheme

S. No.	ERP CODE	Subject Code	Subject Name	Hours Per week			Credit	Examination Scheme				
				L	T	P	C	Theory Marks		Practical Marks		Total
								ESE	IA	ESE	IA	
1		BCCT201CO	Data Structures and Algorithms	3	1	-	04	70	30	-	-	100
2		BCCT202CO	Computer Networks	3	1	-	04	70	30	-	-	100
3		BCCT203CO	Introduction to Cloud Computing	3	-	-	03	70	30	-	-	100
4		BCCT204CO	Introduction to Information Security	3	-	-	03	70	30	-	-	100
5		BCCT205CO	Object Oriented Programming using Java	3	-	-	03	70	30	-	-	100
6		BCCT206AC	Environmental Studies	2	-	-	02	70	30	-	-	100
7		BCCT207SC	Personality Development	2	-	-	02	70	30	-	-	100
8		BCCT208CO	Data Structures and Algorithms Lab	-	-	02	01	-	-	35	15	50
9		BCCT209CO	Computer Networks Lab	-	-	02	01	-	-	35	15	50
10		BCCT210CO	Object Oriented Programming using Java Lab	-	-	02	01	-	-	35	15	50
Total Credit				**19**	**2**	**06**	**24**	**490**	**210**	**105**	**45**	**850**

*L- Lecture, P- Practical, C -Credit, IA-Internal Assessment, ESE- End Semester Examination

B.C.A Third Semester Syllabus
Teaching and Examination Scheme

S. No.	ERP CODE	Subject Code	Subject Name	Hours Per week			Credit	Examination Scheme				
				L	T	P	C	Theory Marks		Practical Marks		Total
								ESE	IA	ESE	IA	
1		BCCT301CO	Software Engineering	3	-	-	03	70	30	-	-	100
2		BCCT302CO	Network Security	3	-	-	03	70	30	-	-	100
3		BCCT303CO	Database Management Systems	3	1	-	04	70	30	-	-	100
4		BCCT304CO	Python programming	3	-	-	03	70	30	-	-	100
5		BCCT305CO	Principles of Virtualization	3	-	-	03	70	30	-	-	100
6		BCCT306CO	Fundamentals of Storage and Data Centers	3	1	-	04	70	30	-	-	100
7		BCCT307AC	Business Communication and Presentation Skills	2	-	-	02	70	30	-	-	100
8		BCCT308SC	Inter Disciplinary Project –I	-	-	4	02	-	-	35	15	50
9		BCCT309CO	Network Security Lab	-	-	02	01	-	-	35	15	50
10		BCCT310CO	Database Management Systems Lab	-		02	01	-	-	35	15	50
11		BCCT311CO	Python programming Lab	-		02	01	-	-	35	15	50
12		BCCT312CO	Principles of Virtualization Lab	-	-	02	01	-	-	35	15	50
Total Credit				**20**	**02**	**12**	**28**	**490**	**210**	**175**	**75**	**950**

*L- Lecture, P- Practical, C -Credit, IA-Internal Assessment, ESE- End Semester Examination

B.C.A Fourth Semester Syllabus

Teaching and Examination Scheme

S. No.	ERP CODE	Subject Code	Subject Name	Hours Per week			Credit	Examination Scheme				
				L	T	P	C	Theory Marks		Practical Marks		Total
								ESE	IA	ESE	IA	
1		BCCT401CO	Windows Administration	3	-	-	03	70	30	-	-	100
2		BCCT402CO	Linux Administration	3	-	-	03	70	30	-	-	100
3		BCCT403CO	Ethical Hacking	3	1	-	04	70	30	-	-	100
4		BCCT404CO	Containerization using Docker	3	-	-	03	70	30	-	-	100
5		BCCT405DE	Elective-I (Specialization)	3	-	-	03	70	30	-	-	100
6		BCCT406CO	Logical Reasoning and Thinking	2	-		02	70	30	-	-	100
7		BCCT407SC	Inter Disciplinary Project – II	-	-	6	03	-	-	35	15	50
8		BCCT408CO	Windows Administration Lab	-	-	02	01	-	-	35	15	50
9		BCCT409CO	Linux Administration Lab	-	-	02	01	-	-	35	15	50
10		BCCT410CO	Ethical Hacking Lab	-		02	01	-	-	35	15	50
11		BCCT411CO	Containerization using Docker Lab	-		02	01	-	-	35	15	50
12		BCCT412CO	Elective-I Lab (Specialization)	-	-	02	01	-	-	35	15	50
Total Credit				**17**	**01**	**16**	**26**	**420**	**180**	**210**	**90**	**900**

Subject Code	**Subject :** Elective-I (Specialization)

BCCT405ADE	Database Security /
BCCT405BDE	Android Security

Subject Code	**Subject :** Elective-I Lab (Specialization)
BCCT412ADE	Database Security Lab
BCCT412BDE	Android Security Lab

B.C.A Fifth Semester Syllabus
Teaching and Examination Scheme

S. No.	ERP CODE	Subject Code	Subject Name	Hours Per week			Credit	Examination Scheme				
				L	T	P	C	Theory Marks		Practical Marks		Total
								ESE	IA	ESE	IA	
1		BCCT501CO	Cloud Infrastructure and Service Management	3	1	-	04	70	30	-	-	100
2		BCCT502CO	Defense in Depth (DiD)	3	-	-	03	70	30	-	-	100
3		BCCT503CO	Cloud Security	3	-	-	03	70	30	-	-	100
4		BCCT504DE	Elective-I **(**Specialization)	3	-	-	03	70	30	-	-	100
5		BCCT505GE	Elective-II (Generic/Open)	2	-	-	02	70	30	-	-	100
6		BCCT506SC	Working towards Placement	2	-	-	02	70	30	-	-	100
7		BCCT507SC	Industrial Training Evaluation	2	-	-	02	70	30	-	-	100
8		BCCT508SC	Project Work - I	-	-	6	03	-	-	35	15	50
9		BCCT509CO	Cloud Infrastructure and Service Management Lab	-	-	02	01	-	-	35	15	50
10		BCCT510CO	Defense in Depth (DiD) Lab	-		02	01	-	-	35	15	50
11		BCCT511CO	Cloud Security Lab	-		02	01	-	-	35	15	50
Total Credit				**18**	**01**	**16**	**25**	**490**	**210**	**140**	**60**	**900**

*L- Lecture, P- Practical, C -Credit, IA-Internal Assessment, ESE- End Semester Examination

Subject Code	**Subject :** Elective-I **(**Specialization)
BCCT504ADE	Exploring Software as a Services (SaaS)
BCCT504BDE	IT Governance, risk, compliance and Information Security Audit

Subject Code	**Subject :** Elective-II (Generic/Open)
BCCT505AGE	Internet of Things (IOT
BCCT505BGE	Data Science (DS)

B.C.A Sixth Semester Syllabus
Teaching and Examination Scheme

S. No.	ERP CODE	Subject Code	Subject Name	Hours Per week			Credit	Examination Scheme				
				L	T	P	C	Theory Marks		Practical Marks		Total
								ESE	IA	ESE	IA	
1		BCCT601CO	Server-Side Scripting	3	-	-	03	70	30	-	-	100
2		BCCT602CO	Cyber Security Incident Response Management	3	-	-	03	70	30	-	-	100
3		BCCT603DE	Elective – I Digital Forensic Investigation / Cloud Web Services	3	-	-	03	70	30	-	-	100
4		BCCT604SC	Major Project / Internship	-	-	23	12	-	-	210	90	300
5		BCCT605CO	Server-Side Scripting Lab	-	-	2	01	-	-	35	15	50
6		BCCT606DE	Digital Forensic Investigation / Cloud Web Services Lab	-	-	2	01	-	-	35	15	50
Total Credit				**9**	**-**	**27**	**23**	**210**	**90**	**280**	**120**	**700**

Subject Code	**Subject :** Elective-I **(**Specialization)
BCCT603ADE	Digital Forensic Investigation
BCCT603BDE	Cloud Web Services

Subject Code	**Subject :** Elective-I Lab **(**Specialization)
BCCT606ADE	Digital Forensic Investigation
BCCT606BDE	Cloud Web Services

Total Credits:

Semester	Credit
I	24
II	24
III	28
IV	26
V	25
VI	23
Total	**150**

SUMMARY OF CREDIT SYSTEM

S.NO	SEMESTER	NO. OF CREDIT	CO	GE	SEC	DSE	AECC	ECA & GI
1	**I**							
2	**II**							
3	**III**							
4	**IV**							
5	**V**							
6	**VI**							
GRAND TOTAL=								

B.C.A First Semester Syllabus
Teaching and Examination Scheme
Examination Scheme

S. No.	ERP CODE	Subject Code	Subject Name	Hours Per week			Credit	Examination Scheme				
				L	T	P	C	Theory Marks		Practical Marks		Total
								ESE	IA	ESE	IA	
1		**BCCT101CO**	Web Technology	03	-	-	03	70	30	-	-	100
2		**BCCT102CO**	Programming in C	03	-	-	03	70	30	-	-	100
3		**BCCT103CO**	Computer Architecture and Organization	03	1	-	04	70	30	-	-	100
4		**BCCT104CO**	Operating Systems	03		-	03	70	30	-	-	100
5		**BCCT105SC**	Effective Communication Skills	03	-	-	03	70	30	-	-	100
6		**BCCT106CO**	Theory of Mathematics	03	1	-	04	70	30	-	-	100
7		**BCCT107CO**	Web Technology Lab	-	-	02	01	-	-	35	15	50
8		**BCCT108CO**	Programming in C Lab	-	-	02	01	-	-	35	15	50
9		**BCCT109CO**	Operating Systems Lab	-	-	02	01	-	-	35	15	50
10		**BCCT110AC**	Office Automation Lab	-	-	02	01	-	-	35	15	50
Total Credit				**18**	**2**	**08**	**24**	**420**	**180**	**140**	**60**	**800**

Name of the Programme/Semester: BCA- I	**Branch: CTIS**
Name of the Subject: Web Technology	**Subject Code: BCCT101CO**
Total Marks for Evaluation :70	**No. of Contact Hours: 45**

Course Objectives:

The objective of this course is to:

- Introduce students to web technologies such as HTML, CSS, XML, PHP
- Teach them to create static and simple dynamic web pages or applications using these technologies
- Understand web application deployment and software architectures
- Students will learn basic web application design, development and testing skills.

UNITWISE DETAILS	COURSE OUTCOME:	BLOOM TAXONOMY LEVEL	CONTACT HOURS
Module I: Introduction to the Internet and the World Wide Web Introduction, History of internet, Internet Design Principles, Internet Protocols - FTP, TCP/IP, SMTP, Telnet, etc., Client Server Communication, Web System architecture. Evolution of the Web, Web architectures, Web clients and servers, Static and Dynamic Web Applications, Front end and back end web development. HTML, CSS, JS, XML; HTTP, secure HTTP, etc; URL, Web Services – SOAP, REST.	CO1: Relate syntactically correct HTTP messages and describe the semantics of common HTTP methods and header fields	Knowledge Level	10
Module II: HTML and CSS More Html tags - Anchor tag, Image tag, Table tag, List tag, Frame tag, Div. tag; Html forms - Input type, Text area, Select , Button, Images. Introduction to CSS, Syntax, Selectors, Embedding CSS to Html, Formatting fonts, Text and background colour, Inline styles, External and Internal Style Sheets, Borders and boxing.	CO2:Describe differences between URIs, URNs, and URLs, and demonstrate a detailed understanding of http-scheme URLs, both relative and absolute	Comprehension level	9

Module III: XML and HTML5, CSS Introduction to XML, Difference b/w Html and XML, XML editors, XML Elements and Attributes XML DTD, XML Schema, XML Parser, Document Object Model (DOM), XML DOM. Introduction to HTML5, CSS3, New features, Local storage, Web Sockets, Server events, Canvas, Audio and Video, Geolocation, Microdata, Drag and Drop. Browser life cycle and browser rendering stages. Service workers.	CO3:Describe the actions, including those related to the cache, performed by a browser in the process of visiting a Web address	Comprehension level	9
Module IV: PHP Server side scripting Introduction to PHP, Basic Syntax, Variables, constants and operators, Loops, Arrays Strings, Environment and environment variables, responding to HTTP requests, Files, Cookies, Sessions, Examples.	CO4:Install a web server and experiment with basic administrative procedures, such as tuning communication parameters, denying access to certain domains, and interpreting an access log	Applying Level	8
Module V: Practical website development Commonly used Web Servers and browsers, setting up a server and domain name, website types and structures, Web authoring tools, Web hosting, website maintenance, generating traffic to your website.	CO5:Use CSS to implement a variety of presentation effects in HTML and XML documents, including explicit positioning of elements	Applying Level	9

Textbooks:

1. Practical Web Design for Absolute Beginners by Rumbaugh (Apress 2016)
2. Introducing Web Development By Jorg Krause, Apress 2017.

Reference Books:

1. HTML and CSS: The Complete Reference by Thomas Powell, McGraw Hill, Fifth Edition, 2010.
2. Creating a Website: The Missing Manual,by Mathew Macdonald. O'Reilly, 3rd Edition.

E-Resources:

1. Web Technology Fundamentals: http://webappsuccess.com/web-technology-fundamentals.html.
2. Web Technology Tutorials: https://www.tutorialspoint.com/web_development_tutorials.htm.
3. Web Technology tutorials: https://nptel.ac.in/courses/106/105/106105084/.
4. Complete Web Technology: https://lecturenotes.in/subject/503/web-technologies-wt.

Name of the Programme/Semester: BCA- I	**Branch: CTIS**
Name of the Subject: Programming in C	**Subject Code: BCCT102CO**
Total Marks for Evaluation :70	**No. of Contact Hours: 45**

Course Objective: This course focuses on all the basic concepts, syntax and constructs of the C language. For students, who are new to programming, this unit can be considered as the starting point before taking up any other programming oriented units.

UNITWISE DETAILS	COURSE OUTCOME:	BLOOM TAXONOMY LEVEL	CONTACT HOURS
Unit I: **Overview of Programming**: Introduction to computer based problem solving, Program design and implementation issues- Flowcharts & Algorithms, Top down design & stepwise refinement, Programming environment – Machine language, assembly language, high level languages, Assemblers, Compilers, Interpreters .	CO1: **Define** the basic concepts of Computer components	Knowledge Level	10
Unit II **Fundamentals of C programming**: Overview of C, Data Types, Constants & Variables, Operators & Expressions, Control constructs-if then, for, while, Arrays- single & multidimensional arrays, Functions-fundamentals general form, function arguments, return value, Basic I/O-formatted and Unformatted I/O, Advanced features- Type modifiers and storage class specifies for data types, Bit operators, ? operator, and operator, * operator, Type casting, type conversion.	CO2: **Describe** the fundamental structure of programs in C	Knowledge Level	10

Unit III Advanced programming techniques: Control constructs- Do while, Switch statement, break and continue, exit() function, go to and label, Scope rules- Local & global variables, scope rules of functions, Functions-parameter passing, call by value and call by reference, calling functions with arrays, argc and argv, recursion- basic concepts, ex-towers of Hanoi	CO3: **Compute** the several of the differentiations methods and rules of differentiations	Application Level	9
Unit IV Dynamic data structures in C:Pointers- The & and * operator, pointer expression, assignments, arithmetic, comparison, malloc vs calloc, arrays of pointers, pointers to pointers, initializing pointers, pointers to functions, function retuning pointers, Structures- Basics, declaring, referencing structure elements, array of structures, passing structures to functions, structure pointers, arrays and structures within structures, Unions – Declaration, uses, enumerated data-types, typedef	CO4: **Explain** pointers and arrays, perform pointer arithmetic	Comprehension Level	8
Unit V Additional features:File Handling – The file pointer, file accessing functions, fopen, fclose, puc, getc, fprintf, C Preprocessor- #define, #include, #undef, Conditional compilation directives, C standard library and header files: Header files, string functions, mathematical functions, Date and Time functions	CO5: **Show** the file concept of the C program	Application Level	8

Text Book:

1. Let us C by Yashwant Kanetka, 6th Edition, PBP Publication

Reference Books:

1. The C programming Language by Richie and Kenninghan, 2004, BPB Publication
2. Programming in ANSI C by Balaguruswamy, 3rd Edition, 2005, Tata McGraw Hil

Name of the Programme/Semester: BCA- I	**Branch: CTIS**
Name of the Subject: Computer Architecture and Organization	**Subject Code: BCCT103CO**
Total Marks for Evaluation :70	**No. of Contact Hours: 60**

Course Objectives:

The objective of this course is to:

- Understand the basic structure and operation of digital computer.
- Familiarize the students with implementation of fixed point and floating-point arithmetic operations.
- Analyse the design of data path unit and control unit for processor.
- Understand the concept of various memories and interfacing.
- Introduce the parallel processing technique.

UNITWISE DETAILS	COURSE OUTCOME:	BLOOM TAXONOMY LEVEL	CONTACT HOURS
Unit I: Register Transfer and Micro-operation Register Transfer Language, Register Transfer, Bus and Memory Transfer: Three state bus buffers, Memory Transfer. Arithmetic Micro-operations: Binary Adder, Binary Adder-Subtractor, Binary Incrementor, Logic Micro-operations: List of Logic micro operations, Shift Micro-operations (excluding H/W implementation), Arithmetic Logic Shift Unit.	CO1: Describe basic organization of computer and the architecture of 8086 microprocessor.	Comprehension Level	8
Unit II: Basic Computer Organization Instruction Codes, Computer Registers: Common bus system, Computer Instructions: Instruction formats, Instruction Cycle: Fetch and Decode, Flowchart for Instruction cycle, Register reference instructions.	Build assembly language program for given task for 8086 microprocessors.	Application Level	10

Unit III: Micro Programmed Control Unit Control Memory, Address Sequencing, Conditional branching, Mapping of instruction, Subroutines, Design of Control Unit, Central Processing Unit: Introduction, General Register Organization, Stack Organization: Register stack, Memory stack; Instruction Formats, Addressing Modes.	Demonstrate control unit operations and conceptualize instruction level parallelism.	Comprehension Level	10
Unit IV: Computer Arithmetic Introduction, Addition and Subtraction, Multiplication Algorithms (Booth algorithm), Division Algorithms, Input – Output Organization: Peripheral devices, Input – Output interface, Introduction of Multiprocessors: Characteristics of multi-processors.	Demonstrate and perform computer arithmetic operations on integer and real numbers.	Comprehension Level	9
Unit V: Modes of Data Transfer and Memory Organization Modes of Data Transfer: Priority Interrupt, Direct Memory Access, Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.	Identify and compare different methods for computer I/O mechanisms.	Application Level	8

Textbooks:

1. Computer System Architecture by Morris Mano, PHI.
2. Computer Organization and Architecture by William Stallings, PHI.

Reference Books:

1. Digital Computer Electronics: An Introduction to Microcomputers by Malvino, TMH.
2. PC Hardware in a Nutshell by Barbara Fritchman Thompson, Robert Bruce Thompson, O'Reilly, 2nd Edition, 2010.
3. Fundamentals of Computer Organization and Architecture by Mostafa AB-EL-BARR and Hesham EL-REWNI, John Wiley and Sons.

Name of the Programme/Semester: BCA- I	**Branch: CTIS**
Name of the Subject: Operating Systems	**Subject Code: BCCT104CO**
Total Marks for Evaluation :70	**No. of Contact Hours: 45**

Course Objective: The operating system is the most important program that runs on a computer. Every general- purpose computer must have an operating system to run other programs.

UNITWISE DETAILS	COURSE OUTCOME:	BLOOM TAXONOMY LEVEL	CONTACT HOURS
Unit I: Introduction to Operating System Introduction, Objectives and Functions of OS, Evolution of OS, OS Structures, OS Components, OS Services, System calls, System programs, Virtual Machines. History of UNIX, Features & Benefits, Versions of UNIX, Features of UNIX File System,, Commonly Used Commands and getting Started (Login/Logout) . Creating and viewing files using cat, file comparisons, View files, disk related commands, checking disk free spaces.	CO1: **Describe** the general architecture of computers	Knowledge Level	8
Unit II : Process Management – Processes and Threads Processes: Process concept, Process scheduling, Co-operating processes, Inter process Communication Threads: Introduction to Threads, Single and Multi-threaded processes CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling. **UNIX Process Management** The Structure of Processes: Process States and Transitions - Layout of system memory - Context of a process. Process Control: Process Creation – Signals – Process Termination – Invoking other programs – PID & PPID – Shell on a Shell.	CO2: **Explain** the implementation of: processes, resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files	Comprehension Level	10

Unit III : Process Management – Synchronization and Deadlocks Process Synchronization: Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical Regions, Monitors, OS Synchronization, Atomic Transactions. Deadlocks: System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.	CO3 **Illustrate** the memory, virtual memory in detail.	Application Level	10
Unit IV : Storage Management Memory Management: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. Virtual Memory Management: Demand paging, Process creation, Page Replacement Algorithms, Allocation of Frames, Thrashing, File-System Interface: File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics.	CO4: **Illustrate** the file system with management	Application Level	9
Unit V : Protection and Security Protection: Goals of Protection, Domain of Protection, Security: Security Problem, User Authentication, One – Time Password, Program Threats, System Threats,	CO5: Design and construct the following OS components: System calls, Schedulers, Memory management systems, Virtual Memory and Paging systems	Creating	8

Textbooks:

1. Milan Milonkovic, Operating System Concepts and design, II Edition, McGraw Hill 1992.
2. Tanenbaum, Operation System Concepts, 2nd Edition, Pearson Education.

3. Silberschatz / Galvin / Gagne, Operating System,6th Edition, WSE (WILEY Publication)

Reference Books:

1. William Stallings, Operating System, 4th Edition, Pearson Education.
2. H.M.Deitel, Operating systems, 2nd Edition ,Pearson Education
3. Nutt: Operating Systems, 3/e Pearson Education 2004
4. Operating System by H.M.Deitel , 2nd Edition, Pearson Education
5. Operating System by Abraham Silberschatz and peter Baer Galvin, 8th Edition, Pearson Education 1989 (Chapter 1,3.1,3.2,3.3,3.4,3.6,4,5,6 (Except 6.8,6.9), 7, 8,9,10,11,13, (Except 13.6) 19 (Except 19.6),20(Except 20.8, 20.9), 22,23).
6. Operating Systems by Nutt, 3/e Pearson Education 2004

E-Resources:

1. http://it.bmc.uu.se/andlov/dev/books/OperatingSystemConceptsed.pdf
2. https://repository.dinus.ac.id/docs/ajar/Operating_System.pdf

Name of the Programme/Semester: BCA- I	**Branch: CTIS**
Name of the Subject: Effective Communication skills	**Subject Code: BCCT105SC**
Total Marks for Evaluation :70	**No. of Contact Hours: 45**

Course Objective: To train students in how to be effective communicators by practicing various skills and also help those in becoming well groomed individuals in terms of both verbal and non- verbal communication

UNITWISE DETAILS	COURSE OUTCOME:	BLOOM TAXONOMY LEVEL	CONTACT HOURS
Unit I: Communication Process What is communication? The communication model, elements of communication, Importance of effective communication skills in the business world, Components of Communication Process, practicing effective communication, good communication Vs effective communication, styles of communication, intercultural communication skills- need for attitude change and benefits	CO1: Describe effectiveness of communication 1.	Knowledge Level	8
Unit II Types of Communication & Barriers to communication Verbal Communication, Non Verbal Communication, Written Communication, Do's and don'ts of each type, barriers to effective communication and how to overcome them, interaction of verbal and non-verbal communication, talents of a corporate communicator, silence- merits and limitations of each type	CO2: Illustrate type of communication	Application Level	10
Unit III Listening Skills & Reading Skills What is listening, various types of listening – Active, passive, selective, listening and note taking, listening and comprehending, listening to speak,	CO3 Show the reading and writing skill	Application Level	10

principles of good listening Techniques to develop effective listening skills, Reading Skills- skimming, scanning and inferring- common reading techniques, practicing smart reading.			
Unit IV Conversation Skills Importance of conversation skills, features of a good conversation, Tips to improve Conversation skills, importance of questioning skills, techniques to ask right questions- role play situations to practice the same, discussing issues (social, political and cultural), formal and informal conversation	CO4: Discover formal and informal issues	Application Level	9
Unit V Telephone Etiquette Basic rules of telephone etiquette- formal vs. informal; tone, pitch and vocabulary related to formal ways of speaking over the phone, leaving voice messages; practice sessions (role plays) **Persuasive communication** What is persuasive communication, different techniques of persuasive communication, How to negotiate using persuasive communication, the act of negotiation, negotiation style and their contexts, fundamentals of negotiation, common hurdles in negotiation and how to overcome them	CO5:Express different etiquete	Comprehension Level	8

Text Books:

1. "Active Listening 101: How to Turn Down Your Volume to Turn Up Your Communication Skills, by Emilia Hardman, 2012
2. The Power of Communication: Skills to Build Trust, Inspire Loyalty, and Lead Effectively, by Helio Fred Garcia, 2012

Reference Books:

1. Power Listening: Mastering the Most Critical Business Skill of All, by Bernard T. Ferrari, 2012
2. Fitly Spoken: Developing Effective Communication and Social Skills, by Greg S. Baker, 2011

The Secrets of Successful Communication: A Simple Guide to Effective Encounters in Business (Big Brain vs. Little Brain Communication), by

Name of the Programme/Semester: BCA- I	**Branch: CTIS**
Name of the Subject: Theory of Mathematics	**Subject Code: BCCT106CO**
Total Marks for Evaluation :70	**No. of Contact Hours: 60**

Course Objectives:

- Work with matrices and determine if a given square matrix is invertible.
- Learn to solve systems of linear equations and application problems requiring them.
- Learn to compute determinants and know their properties.
- Learn to find and use eigen values and eigenvectors of a matrix.
- Learn about and work with vector spaces and subspaces.

UNITWISE DETAILS	COURSE OUTCOME:	BLOOM TAXONOMY LEVEL	CONTACT HOURS
Unit I: Set theory and Relations Introduction theorems on sets, sets and elements, Venn diagrams, set operations, algebra of sets, duality, classes of sets, power sets, real vector spaces and subspaces null spaces, dimension of vector spaces, column spaces, geometrical vectors in a plane, vectors in a Cartesian plane, scalar multiplications, Euclidean inner product of two vectors, application of dot and scalar multiplications, vectors in three dimensional spaces, cross product in three dimension, relations and its properties, order relations, Hasse diagrams.	CO1: Justify simple mathematical proofs and possess the ability to verify them	Comprehension Level	13
Unit II : Functions and Algorithms Introduction to functions and algorithms, functions and types of functions, interjections and surjections, bijections and inverse functions, One-to-One, Onto, invertible functions, mathematical, exponential and logarithmic functions, sequences and indexed classes of sets, recursively defined functions, cardinality, data base: functional dependence and normal forms,	CO2: Elaborate formal logical arguments and expression of mathematical properties formally via the formal language of propositional logic and predicate logic	Knowledge Level	13

algorithms and functions, complexity of algorithms.			
Unit III Counting Techniques Introduction to counting, basics of counting, pigeonhole principles, permutations and combinations, generalized permutations and combinations, generating permutations and combinations, basics of discrete probability theory, recurrence relations, solving recurrence relations, divide and conquer relations, generating functions, inclusion and exclusion, application of inclusion and exclusion.	CO3: Formulate computer programs (e.g. recursive functions) using mathematical principle	Knowledge Level	12
Unit IV Graph Theory Introduction to graphs, varieties of graphs and graph models, graph operations, special graph and graph family, representation and computations, attributes of graph models, directed graph: path, cycles and connectedness, orientations, acyclic graphs, distance, connectivity and traversability, graph invariance and isomorphism types, graph and map coloring, planer drawings, enumerating graphs, algebraic graph theory, analytic graph theory, hyper graphs, application of graph theory, rooted trees, sorting, searching strategies, weighted graphs.	CO4: **Demonstrate** the knowledge of the graph theory.	Application Level	11
Unit V Trees Introduction to trees, characterization and types of trees, properties of tree, roots and orderings, tree traversal, infinite trees, spanning trees, Depth-first and breadth-first spanning trees, enumeration of spanning trees, enumerating trees: counting generic trees, counting trees in computer science.	CO5: Elaborate formal logical arguments and expression of mathematical properties formally via the formal language of propositional logic and predicate logic	Knowledge Level	11

Textbooks:

1. Discrete Mathematics for New Technology, Second Edition - Rowan Garnier, John Taylor, Institute of Physics Publishing Bristol and Philadelphia
2. Theory and Problems of Discrete Mathematics, Third Edition - Seymour Lipschutz, Marc Lars Lipson, Schaum's Outline Series, McGRAW-HILL

Reference Books:

1. Hand book of Discrete and Combinatorial Mathematics - Kenneth H. Rosen, John G. Michaels, Jonathan L. Gross, Jerrold W. Grossman, Douglas R Shier, Crc Press
2. Linear Algebra and Matrix Analysis for Statistics – Sudipto Banerjee, Anindya Roy, CRC Press
3. Linear Algebra concepts and methods – Martin Anthony, Michele Harvey, Cambridge University Press

Name of the Programme/Semester: BCA-I	**Branch: BCA(CTIS)**
Subject Name: Web Technology Lab	**Subject Code: BCCT107CO**
Total Marks for End Semester Exam :35	**No. of Contact Hours: 30**

Course Objectives:

The objective of this course is to:

- Understand web application deployment and software architectures
- Students will learn basic web application design, development and testing skills.

UNITWISE DETAILS	COURSE OUTCOME:	BLOOM TAXONOMY LEVEL	CONTACT HOURS
1. Design a simple web page with head, body and footer, with heading tags, image tag. 2. Design a web site for book information, home page should contain books list, when particular book is clicked, information of the books should display in the next page.	CO1: Relate syntactically correct HTTP messages and describe the semantics of common HTTP methods and header fields	Knowledge Level	6
1. Design a page to display the product information such as name, brand, price and etc with table tag. 2. Design a web site for book information using frames, home page should contain two parts, left part should contain books list, and right part should contain book information.	CO2: Describe the actions, including those related to the cache, performed by a browser in the process of visiting a Web address	Comprehension Level	6

1. Design a web page to capture the user information such as name, gender, mobile number, mail id, city, state, and country using form elements. 2. Design a web page with nice formatting like background image, text colors and border for text using external CSS.	Install a web server and experiment with basic administrative procedures, such as tuning communication parameters, denying access to certain domains, and interpreting an access log	Applying Level	6
1. Design a web page to perform mathematical calculations such as addition, subtraction, multiplication, and division. 2. Design a web page to read data from an XML file and display the data in tabular format, take the data as employee information.	Use CSS to implement a variety of presentation effects in HTML and XML documents, including explicit positioning of elements	Applying Level	6
1. Design a web site for online purchase using CSS, JS and XML, web site should contain the following web pages. 2. Create Home page, Login page and a page contains products of a store using where user can view the stored and bought product in kart HTML and CSS.	Demonstrate techniques for improving the accessibility of an HTML document.	Comprehension Level	6

Name of the Programme/Semester: BCA-I	**Branch: BCA(CTIS)**
Subject Name: Programming in C Lab	**Subject Code: BCCT108CO**
Total Marks for End Semester Exam :35	**No. of Contact Hours: 30**

EXPERIMENTWISE DETAILS	COURSE OUTCOME:	BLOOM TAXONOMY LEVEL	CONTACT HOURS
1. Printing the reverse of an integer.	CO1:Discuss the practical aspect of loop	Knowledge Level	2
2. Printing the odd and even series of N numbers.	CO2:Show the practical aspect of linear series	Application Level	1
3. Get a string and convert the lowercase to uppercase and vice--versa using getchar() and putchar().	CO3:Discover the practical aspect of string	Comprehension Level	1
4. Input a string and find the number of each of the vowels appear in the string.			2
5. Accept N words and make it as a sentence by inserting blank spaces and a full stop at the end.			2
6. Printing the reverse of a string.			2
7. Searching an element in an array using pointers.	CO4:Discuss the practical aspect of Array	Knowledge Level	1
8. Checking whether the given matrix is an identity matrix or not.			1
9. Finding the first N terms of Fibonacci series.			1

10. Declare 3 pointer variables to store a character, a character string and an integer respectively. Input values into these variables. Display the address and the contents of each variable.			2
11. Define a structure with three members and display the same.	CO5:Show the practical aspect of linear series	Application Level	2
12. Declare a union with three members of type integer, char, string and illustrate the use of union.			2
13. Recursive program to find the factorial of an integer. 14. Finding the maximum of 4 numbers by defining a macro for the maximum of two numbers. Arranging N numbers in ascending and in descending order using bubble sort. 15.Addition and subtraction of two matrices. 16.Multiplication of two matrices.			5
17.Converting a hexadecimal number into its binary equivalent. 18.Check whether the given string is a palindrome or not. 19.Demonstration of bitwise operations. 20.Applying binary search to a set of N numbers by using a function. 21.Create a sequential file with three fields: empno, empname, empbasic. Print all the details in a neat format by adding 500 to their basic salary.			6

Name of the Programme/Semester: BCA-I	**Branch: BCA(CTIS)**
Subject Name: Operating System Lab	**Subject Code: BCCT109CO**
Total Marks for End Semester Exam :35	**No. of Contact Hours: 30**

EXPERIMENTWISE DETAILS	COURSE OUTCOME:	BLOOM TAXONOMY LEVEL	CONTACT HOURS
1 Execute 25 basic commands of UNIX 2 Basics of functionality and modes of VI Editor.	CO1: Identify the need to create the special purpose operating system	Knowledge Level	4
3. WAP that accepts user name and reports if user is logged in. 4. WAP which displays the following menu and executes the option selected by user: ls 2. Pwd 3. ls –l 4. ps –fe 5. WAP to print 10 9 8 7 6 5 4 3 2 1 .	CO2: Identify the basic commands to understand the OS.	Application Level	5
6. WAP that replaces all "*.txt" file names with "*.txt.old" in the current 7. WAP that echoes itself to stdout, but backwards.	CO3: Identify use and evaluate the storage management policies with respect to different storage management.	Comprehension Level	5
8. WAP that takes a filename as input and checks if it is executable, if not make it executable. 9. WAP to take string as			5

command line argument and reverse it.			
10. Create a data file called employee in the format given below: a. EmpCode Character b. EmpName Character c. Grade Character d. Years of experience Numeric e. Basic Pay Numeric $vi employee A001 ARJUN E1 01 12000.00 A006 Anand E1 01 12450.00 A010 Rajesh E2 03 14500.00 A002 Mohan E2 02 13000.00 A005 John E2 01 14500.00 A009 Denial Smith E2 04 17500.00 A004 Williams E1 01 12000.00			4
Perform the following functions on the file:			12

a. Sort the file on EmpCode. b.Sort the file on (i) Decreasing order of basic pay (ii) Increasing order of years of experience. c. Display the number of employees whose details are included in the file. d. Display all records with 'smith' a part of employee name. e. Display all records with EmpName starting with 'B'. f. Display the records on Employees whose grade is E2 and have work experience of 2 to 5 years. g.Store in 'file 1' the names of all employees whose basic pay is between 10000 and 15000. h.Display records of all employees who are not in grade E2			

Name of the Programme/Semester: BCA-I	Branch: BCA(CTIS)
Subject Name: Office Automation Lab	**Subject Code: BCCT110AC**
Total Marks for End Semester Exam :35	**No. of Contact Hours: 30**

Course Objectives:

The objective of this course is to:

- Understand computers are essential components in business, education and society.
- Introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking and mobile computing.
- Provide hands-on use of Microsoft Office applications Word, Excel, Access and PowerPoint. Completion of the assignments will result in MS Office applications knowledge and skills.

EXPERIMENTWISE DETAILS	COURSE OUTCOME:	BLOOM TAXONOMY LEVEL	CONTACT HOURS
1. Text Manipulation using MS-WORD. 2. Usage of Bullets and Numbering, Header and Footer using MS-WORD.	CO1: Describe the usage of computers and why computers are essential components in business and society.	Comprehension Level	3
3. Usage of Spell check Find and Replace using MS-WORD.	CO2: Use the Internet Web resources and evaluate on-line e-business system.	Application Level	
4. Table Manipulation using MS-WORD. 5. Picture Insertion and Alignment using MS-WORD. 6. Creation of documents using templates using MS-WORD.	CO3: Solve common business problems using appropriate Information Technology applications and systems	Analysis Level	4

7. Cell Editing using MS-EXCEL. 8. Data Sorting using MS-EXCEL. 9. Usage of Formulas and Built In Functions using MS-EXCEL.	CO4: Identify categories of programs, system software and applications. Organize and work with files and folders.	Comprehension Level	3
10. Worksheet Preparation using MS-EXCEL. 11. Drawing Graphs using MS-EXCEL.			3
12. Inserting ClipArt's and Pictures using MS-EXCEL. 13. Slide Transitions and Animation using MS-POWER POINT.	CO5: Describe various types of networks network standards and communication software.	Comprehension Level	2
14. Organization Chart using MS-POWER POINT.			2