Scheme and Syllabi

For

BCA (Bachelor of Computer Applications)
(Four Year Degree Programme)
In line with NEP-2020

Committee:

Board of Studies

21/05/2024

20/5/2024

20/5/2024

20/05/2024

Approved By:

1. **Staff Council, Department of Computer Science and Engineering, CDLU, Sirsa**
2. **Board of Studies, Department of Computer Science and Engineering, CDLU, Sirsa**
3. **Faculty of Engineering & Technology, CDLU, Sirsa**
4. **Academic Council, CDLU, Sirsa**

(For Batch 2023-24 only)

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20/5/2024

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About the University

Established on 2nd April, 2003, CDLU, Sirsa is named after Jan Nayak Chaudhary Devi Lal, the former Deputy Prime Minister of India and the former Chief Minister of Haryana. This University, set up by the Government of Haryana under Act 9 of 2003 passed by the State Legislature, has a sprawling campus of 213 Acre, 4 Kanal, 12 Marla at Barnala Road, Sirsa.

The university has four Teaching Blocks, labs, Vivekananda Library, five hostels for boys and girls, Media Centre with a Community Radio Station, a Multi Purpose Hall and auditorium, Shopping complex, University Health Centre and the branch of a nationalized bank, Student Activity Centre, Guest House, Vice Chancellor's residence and 144 houses for the teaching and non-teaching staff. Fourth teaching block is near completion, besides extension of other buildings.

The university at present has (approx.) 62 colleges affiliated to it. The total enrolment of students in UTDs, University College and Affiliated Colleges crosses 42000. 24 Teaching Departments in the University offers 37 academic programmes under budgeted mode and Self Financing System and the University College offers five UG Programmes in the area of Technology, Management, Commerce, Law, Journalism and Mass Communication, Humanities, Social Sciences, Science and Education. Well-known, reputed and experienced academicians and professionals have been associated in preparing the academic curriculum of different programmes as per the guidelines of the UGC and other regulatory bodies. Teachers of the university have wide national and international exposure.

About the Department of CSE

The Department of Computer Science and Engineering was established in the year 2000 at the when the University used to be the Postgraduate Regional Centre of Kurukshetra University, Kurukshetra. The Department offers programmes in Doctor of Philosophy (PhD), Master of Technology in Computer Science and Engineering (Regular) Part-time, Master of Computer Applications, Master of Science in Computer science (Data Science and Artificial Intelligence), Bachelor of Technology in Computer Science and Engineering (Artificial Intelligence and Machine Learning), all the programmes are offered under NEP-2020

Various bodies governing the formulation of syllabus

Various bodies of the department/university which deal with formulation of syllabi are as under:

i. Syllabus committee
ii. Staff council of department of CSE
iii. Board of studies of department of CSE
iv. Faculty of Engineering and technology, CDLU
v. Academic council of CDLU

About institutions where BCA programme is offered

University School for Undergraduate Studies (USGS) in Teaching Block-IV (Dr. APJ Abdul Kalam Bhawan) and various university affiliated colleges where BCA programme is offered are listed as below:

Sr. No.	College Name	College Type	Address	Nature
1	University School for Undergraduate Studies (USGS)	Degree	Teaching Block-IV (Dr. APJ Abdul Kalam Bhawan) CDLU Sirsa	Government
2	Govt. College for Women	Degree	Barnala Road, Sirsa.	Government
3	Jan Nayak Ch. Devi Lal Memorial College	Degree	Barnala Road, Sirsa	Private
4	Shah Satnam Ji Boy's College	Degree	Begu Road, Sirsa	Private
5	Shah Satnam Ji Girl's College	Degree	Begu Road, Sirsa	Private
6	M.M.College	Degree	Sirsa Road, Fatehabad	Govt Aided
7	Mukhtiar Singh Memorial Degree College	Degree	Behbalpur, Fatehabad	Private
8	CMG Govt. , College for Women	Degree	Bhodia Khera, Fatehabad	Government
9	Shri Durga Mahila Mahavidyalaya	Degree	Tohana	Private
10	I.G. Government College	Degree	Tohana	Government

5. National Education Policy -2020

National Education Policy (NEP) -2020 has provided an impetus to the changing horizons of Higher Education. The University has established University School for Undergraduate Studies (USGS) in Teaching Block-IV (Dr. APJ Abdul Kalam Bhawan) to start new programmes for tuning ourselves to the latest state-of-the-art in Higher Education. UCGS will focus on Four Year Degree Programmes (FYDP) to strengthen the graduate studies especially on designing, developing, execution of market and industry-oriented demand. To benefit students, society and faculty, the USGS is destined to start undergraduate programmes based on Learning Outcomes Curriculum Framework and as per NEP-2020 such as: (i) B.Com. Banking & Insurance, (ii) B.Com. Fintech & Financial Markets, (iii) B.Com. Derivatives & Risk Management, (iv) B.Sc. Data Science, (v) B.Sc. Mathematics, (vi) B.Sc. Physics, (vii) B.A. Economics & Finance. In addition, there is a 1-year programme namely (viii) Bachelor of Library & Information Science (B.LIS).

5.1 Objectives of the Programme

The primary objective of this program is to provide a foundation of computing principles and business practices for effectively using/managing information systems and enterprise software. It helps students analyse the requirements for system development and exposes students to business software and information systems. This programme provides students with options to specialize in legacy application software, system software or mobile applications. Following tangible objectives are expected from the programme:

1. To produce outstanding IT professionals who can apply the theoretical knowledge into practice in the real world and develop standalone live projects themselves
2. To provide opportunity for the study of modern methods of information processing and its applications.
3. To develop among students the programming techniques and the problem- solving skills through programming
4. To prepare students who wish to go on to further studies in computer science and related subjects.
5. To acquaint students to Work effectively with a range of current, standard, Office Productivity software applications

5.2 Programme Outcomes (POs)

At the time of completion, the BCA graduates are expected to possess the following generic graduate attribute:

1. **Discipline knowledge:** Acquiring knowledge on basics of Computer Science and ability to apply to design principles in the development of solutions for problems of varyingcomplexity
2. **Problem Solving:** Improved reasoning with strong mathematical ability to Identify, formulate and analyze problems related to computer science and exhibiting a sound knowledge on data structures and algorithms.
3. **Design and Development of Solutions:** Ability to design and development of algorithmic solutions to real world problems and acquiring a minimum knowledge on statistics and optimization problems. Establishing excellent skills in applying various design strategies for solving complex problems.
4. **Programming a computer:** Exhibiting strong skills required to program a computer for various issues and problems of day-to-day applications with thorough knowledge on programming languages of various levels.
5. **Application Systems Knowledge**: Possessing a sound knowledge on computer application software and ability to design and develop app for applicative problems.
6. **Modern Tool Usage:** Identify, select and use a modern scientific and IT tool or technique for modeling, prediction, data analysis and solving problems in the area of Computer Science and making them mobile based application software.
7. **Communication:** Must have a reasonably good communication knowledge both in oral and writing.
8. **Project Management:** Practicing of existing projects and becoming independent to launch own project by identifying a gap in solutions.
9. **Ethics on Profession, Environment and Society:** Exhibiting professional ethics to maintain the integrity in a working environment and also have concern on societal impacts due to computer-based solutions for problems.
10. **Lifelong Learning:** Should become an independent learner. So, learn to learn ability.
11. **Motivation to take up Higher Studies:** Inspiration to continue educations towards advanced studies on Computer Science.

5.3 Programme Specific Outcomes (PSOs)

The fresh graduates of the BCA programme will have the following discipline-specific graduate attributes:

1. Apply standard Software Engineering practices and strategies in real -time software project development
2. Design and develop computer programs/computer -based systems in the areas related to AI, algorithms, networking, web design, cloud computing, IoT and data analytics.
3. Acquaint with the contemporary trends in industrial/research settings and thereby innovatenovel solutions to existing problems.
4. The ability to apply the knowledge and understanding noted above to the analysis of a giveninformation handling problem.
5. The ability to work independently on a substantial software project and as an effective team member.

6. Programme Structure

BCA - four-year (8-semester) graduate programme shall comprise of Discipline Specific Courses (DSC), Minor Courses (MIC), Multidisciplinary Courses (MDC), Skill Enhancement Courses (SEC), Ability Enhancement Courses (AEC), and Value Added Courses (VAC).

7. Detailed Syllabus

Scheme and syllabi of 1st and 2nd semester is already approved. Scheme and syllabi of 3rd and 4th semester is placed for approval.

Course Category	Course Code	Course Title	Level	Credits			Marks		
				L	P	Total	Int	Ext	Total
Semester-III									
DSC	BCA/SM/3/DSC/109	Digital Electronics	200	2	-	2	15	35	50
	BCA/SM/3/DSC/110	Java Programming	200	2		2	15	35	50
	BCA/SM/3/DSC/111	Software Lab I based on DSC/109	200	-	2	2	-	50	50
	BCA/SM/3/DSC/112	Software Lab II based on DSC/110	200	-	2	2	-	50	50
MIC	BCA/SM/1/MIC/105	Desktop and Hardware Troubleshooting	200	2		2	15	35	50
	BCA/SM/1/MIC/106	Software Lab III based on MIC/105	200		2	2		50	50
MDC		To be opted by the student from the pool of MDC	200			3			75
AEC		To be opted by the student from the pool of AEC	200			2			50
SEC		To be opted by the student from the pool of SEC	200			3			75
VAC		To be opted by the student from the pool of VAC	200			2			50
	Total					22			550
Semester-IV									
DSC	BCA/SM/4/DSC/113	Operating System	200	4	-	4	30	70	100
	BCA/SM/4/DSC/114	Computer Network	200	4		4	30	70	100
	BCA/SM/4/DSC/115	Web Development	200	4		4	30	70	100
	BCA/SM/4/DSC/116	Software Lab I based on DSC/114	200	-	2	2	-	50	50
	BCA/SM/4/DSC/117	Software Lab I based on DSC/115	200	-	2	2	-	50	50
MIC	BCA/SM/4/MIC/107	Multimedia Tools	200	2		2	15	35	50
	BCA/SM/4/MIC/108	Software Lab III based on MIC/107	200		2	2		50	50
AEC		To be opted by the student from the pool of AEC	200			2			50
VAC		To be opted by the student from the pool of VAC	200			2			50
	Total					24			600

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Course Category	Course Code	Course Title	Level	Credits			Marks		
				L	P	Total	Int	Ext	Total
Semester-V									
DSC	BCA/SM/5/DSC/118	Artificial Network	300	4	-	4	30	70	100
	BCA/SM/5/DSC/119	Data Mining	300	4	-	4	30	70	100
	BCA/SM/5/DSC/120	Computer Graphics	300	4	-	4	30	70	100
	BCA/SM/5/DSC/121	Software Lab I based on DSC/119	300	-	2	2	-	50	50
	BCA/SM/5/DSC/122	Software Lab II based on DSC/120	300	-	2	2	-	50	50
MIC	BCA/SM/5/MIC/109	Linux	300	2		2	15	35	50
	BCA/SM/5/MIC/110	Software Lab III based on MIC/109	300		2	2		50	50
SEC		Internship	300			4			100
	Total					24			600
Semester-VI									
DSC	BCA/SM/6/DSC/123	TOC	300	4	-	4	30	70	100
	BCA/SM/6/DSC/124	Cloud Computing	300	4		4	30	70	100
	BCA/SM/6DSC/125	Python	300	2		2	15	35	50
	BCA/SM/6/DSC/126	Android Development	300	2		2	15	35	50
	BCA/SM/6/DSC/127	Software Lab I based on DSC/125	300	-	2	2	-	50	50
	BCA/SM/6/DSC/128	Software Lab I based on DSC/126	300	-	2	2	-	50	50
MIC	BCA/SM/6/MIC/111	Generative AI	300	2		2	15	35	50
	BCA/SM/6/MIC/112	Software Lab III based on MIC/111	300		2	2		50	50
SEC		To be opted by the student from the pool of SEC	300			2			50
Total						22			550

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Course Category	Course Code	Course Title	Level	Credits			Marks		
				L	P	Total	Int	Ext	Total
		Semester-VII (Honours)							
DSC	BCA/SM/7/DSC/129	Machine Learning	400	4	-	4	30	70	100
	BCA/SM/7/DSC/130	Wireless Network	400	4	-	4	30	70	100
	BCA/SM/7/DSC/131	Compiler Design	400	4	-	4	30	70	100
	BCA/SM/7/DSC/132	IoT	400	2		2	15	35	50
	BCA/SM/7/DSC/133	R	400	2		2	15	35	50
	BCA/SM/7/DSC/134	Software Lab I based on DSC/132	400	-	2	2	-	50	50
	BCA/SM/7/DSC/135	Software Lab II based on DSC/133	400	-	2	2	-	50	50
MIC	BCA/SM/7/MIC/113	Statistical Techniques	400	2		2	15	35	50
	BCA/SM/7/MIC/114	Software Lab III based on MIC/113	400		2	2		50	50
	Total					24			600
		Semester-VIII (Honours)							
DSC	BCA/SM/8/DSC/136	Research Methodology	400	4	-	4	30	70	100
	BCA/SM/8/DSC/137	Deep Learning	400	4		4	30	70	100
	BCA/SM/8/DSC/138	Soft Computing	400	4		4	30	70	100
	BCA/SM/8/DSC/139	Data Analytics with R	400	2		2	15	35	50
	BCA/SM/8/DSC/140	Matlab	400	2		2	15	35	50
	BCA/SM/8/DSC/141	Software Lab I based on DSC/139	400	-	2	2	-	50	50
	BCA/SM/8/DSC/142	Software Lab II based on DSC/140	400	-	2	2	-	50	50
MIC	BCA/SM/8/MIC/115	IT based Research Tools	400	2		2	15	35	50
	BCA/SM/8/MIC/116	Software Lab III based on MIC/115	400		2	2		50	50
		OR (Honours with Research)							
DSC	BCA/SM/8/DSC/136	Research Methodology	400	4	-	4	30	70	100
	BCA/SM/8/DSC/137	Data Analytics with R	400	2		2	15	35	50
	BCA/SM/8/DSC/138	Software Lab I based on DSC/137	400	-	2	2	-	50	50
MIC	BCA/SM/8/MIC/115	IT based Research Tools	400	2		2	15	35	50
	BCA/SM/8/MIC/116	Software Lab III based on MIC/115	400		2	2		50	50
	Research Project / Dissertation			12					300
	Total					24			600

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SEMESTER - III

BCA/SM/3/DSC/109: Digital Electronics								
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Core Theory	02	02	Lecture	35	15		2 Hrs	TEE/MTE/ Assignment/ Attendance
					10	3 2		

Note for the Paper Setter: *The question paper will consist of* ***five*** *questions in all. The first question will be compulsory and will consist of* ***seven*** *short questions of* ***1*** *mark each covering the whole syllabus. In addition,* ***four*** *more questions of* ***14 marks each*** *will be set unit-wise comprising of* ***two*** *questions from each of the* ***two*** *units. The candidates are required to attempt* ***one compulsory question*** *and* ***two more questions*** *selecting at least one question from each unit.*

Course Objectives	This course aims to equip students with a comprehensive understanding of numerical representations and operations within different number systems. Additionally, students will learn to simplify Boolean expressions through both algebraic techniques and Karnaugh Maps (K-Maps), enhancing their ability to analyse and manipulate logical statements effectively.
Course Outcomes	After completion of the course, student will be able to
CO1	define: number system, code, gates and circuit.
CO2	perform: binary arithmetic operations on different number system.
CO3	understand: the significance of fixed-point and floating-point representations.
CO4	apply: various character codes for data exchange.
CO5	choose: Boolean expressions using algebraic techniques and K-Maps.
CO6	explain: the sequential and combinational circuits.

Unit 1

Information Representation: Number-Systems and its complements, Binary-Arithmetic, Fixed-point and Floating point representation of numbers, BCD Codes, EBCDIC, ASCII, UNICODE, Gray Code, Excess-3 Code, Self Complementing codes, Weighted Codes

Binary Logic: Boolean algebra, Boolean Theorems, Boolean Functions and Truth Tables, Canonical and Standard forms of Boolean functions, Simplification of Boolean Functions - using Boolean postulates and K- Map,

Unit 2

Digital Logic: Basic Gates - AND, OR, NOT, Universal Gates - NAND, NOR, Other Gates - XOR, XNOR etc, AND-OR-INVERT and OR-AND-INVERT implementations of digital circuits.

Combinational Circuits: Half-Adder, Full-Adder, Half-Subtractor, Full-Subtractor

Introduction to Sequential Circuits: Flip-flops, SR Flip flop, JK Flip flop, D-Flip flop, T-Flip flop

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Recommended Books:

1. P.K. Sinha & Priti Sinha, Computer Fundamentals, BPB
2. Nasib Singh Gill & J.B Dixit, Digital Design and Computer Organisation, University Science Press 2008
3. M. Morris Mano, Digital Logic and Computer Design, Prentice Hall of India Pvt. Ltd.
4. V. Rajaraman, T. Radha krishnan, An Introduction to Digital Computer Design, Prentice Hall of India Pvt. Ltd.

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BCA/SM/3/DSC/110: Java Programming - Major								
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Core Theory	02	02	Lecture	35	15		2 Hrs.	TEE/MTE/ Assignment/ Attendance
					10	3 2		

Note for the Paper Setter: *The question paper will consist of* ***five*** *questions in all. The first question will be compulsory and will consist of* ***seven*** *short questions of* ***1*** *mark each covering the whole syllabus. In addition,* ***four*** *more questions of* ***14 marks each*** *will be set unit-wise comprising of* ***two*** *questions from each of the* ***two*** *units. The candidates are required to attempt* ***one compulsory question*** *and* ***two more questions*** *selecting at least one question from each unit.*

Course Objectives	The objective of this course is to get the basic concepts and building blocks of Core Java programming languages using the modular approach which emphasizes on small programs. Learn how to write moderately complex programs efficiently. Learn making GUI-based applications in Core Java.
Course Outcomes	By the end of this course, the student will able to:
CO1	outline: programming environment, data types, control constructs, loops, arrays, programming approaches, threads in programming, file system for data storing, data structure library, graphical user interface concepts.
CO2	summarize: programming fundamentals, programming approaches, multithreaded programming, data storing using file system, data structure library, GUI concepts.
CO3	apply: basic programming concepts: to solve basic mathematical operations, data structure operations, concurrent execution of threads, user friendly interfaced programs.
CO4	elaborate the concepts of pointer, inheritance and polymorphism
CO5	choose: programming approaches, branching and iteration methods, serial or concurrent programming, multi-threading and package.
CO6	develop: programs using basic, Object Oriented based concepts. Package, context switching, thread, GUI in Java

Unit 1

Java: Introduction of java, data types, reference types, operators and its types, control statements (sequential, selection and looping), array, string, functions, boxing & unboxing, scope of variables.

OOPS concepts in Java: Encapsulation, class, object, constructors, destructors, polymorphism: function overloading and operator overloading in java, inheritance, interface, abstract class, packages, exception handling.

Unit 2

Multithreading in Java: Thread model, multithreading supporting classes and methods, creating single and multiple threaded programs, context switching,

Working with GUI in Java: Containers and components. I/O streams in Java, file handling operations.

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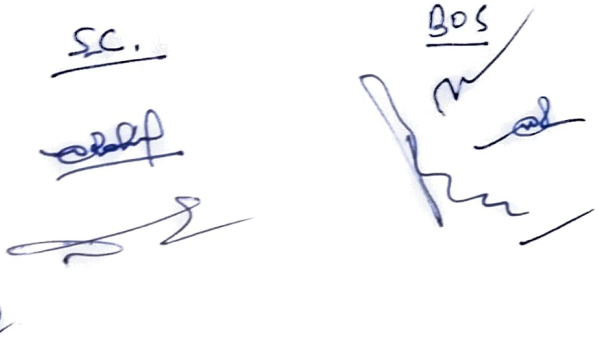
Recommended Books:

1. E. Balagurusamy, Programming with Java, 6th Edition, Tata McGraw Hill.
2. Darrel Ince & Adam Freeman, Programming the Internet with Java, 2nd Edition, Addison Wesley.

Recommended E-content:

1. https://www.w3schools.com/java/default.asp



BCA/SM/3/DSC/111: Digital Electronics (Lab-Work based on DSC/109)							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Core Practical	02	04	Practical	50	-	3 Hours	Practical/ Viva-voce

Instructions to paper setter for Term-End Examination: The Term-End examination shall be conducted by a panel of one external and one internal examiner. The question paper for practical examination shall be set on the spot.

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BCA/SM/3/DSC/112: Java Programming (Lab-Work based on DSC/110)							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Core Practical	02	04	Practical	50	-	3 Hours	Practical/ Viva-voce

Instructions to paper setter for Term-End Examination: The Term-End examination shall be conducted by a panel of one external and one internal examiner. The question paper for practical examination shall be set on the spot.

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BCA/SM/3/MIC/105: Desktop and Hardware Troubleshooting							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Core Theory	02	02	Lecture	35	15 (10 / 3 / 2)	2 Hrs.	TEE/MTE/ Assignment/ Attendance

Note for the Paper Setter: *The question paper will consist of* ***five*** *questions in all. The first question will be compulsory and will consist of* ***seven*** *short questions of* ***1*** *mark each covering the whole syllabus. In addition,* ***four*** *more questions of* ***14 marks each*** *will be set unit-wise comprising of* ***two*** *questions from each of the* ***two*** *units. The candidates are required to attempt* ***one compulsory question*** *and* ***two more questions*** *selecting at least one question from each unit.*

Course Objectives	Objective of this course is to make the students familiar with the functioning of the computer hardware, installations of Operating systems (Window/MAC/Linux) and troubleshooting with computer and its components. Students will learn Computer Networks installation.
Course Outcomes	By the end of this course, the student will able to:
CO1	define: understand the main components of Computer Hardware
CO2	understand: the Installations of operating systems and service packs
CO3	perform: various types of computer maintenance tasks, ensuring systems are running efficiently
CO4	diagnose: common hardware issues, using troubleshooting techniques to resolve problems
CO5	defend: troubleshoot CPU, motherboard, and storage device issues, including data recovery and backup strategies
CO6	explain: networking infrastructures, identify network troubleshooting tools, and address storage issues

Unit 1

Inside the PC: Motherboard-CPU, memory, chipset, Flash ROM, CMOS Battery, BIOS, I/O Connectors; SMPS and power supply connectors; Storage devices- Hard drive, SSD, CD-ROM, memory sticks, Assembly kit-Mounting of Motherboard & Processor- Connecting the different Ports & Connectors of SDD & IDE-Inserting different I/O cards on the Motherboard, Connecting SMPS to the Motherboard; Connecting RAM and other devices; Disassembly of PC.

System Installation: CMOS Setup; identification of HDD-Master-Slave, Operating System introduction and installation (Windows, Linux & MAC), Configuration of HDD-logical & physical sections of HDD;, Driver Installation-Multimedia, Printer, Modem, NIC & other Devices, Installation of Application software - MS-Office & other Windows/Linux Application Software; Installation of Anti-virus. Data compression, backup & Archiving, Data Crash & Recovery and recovery tools

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Unit 2

Introduction to Computer Networks: Understanding Network Hardware and Software, LAN setup (wired & wireless), Types of Networks-LAN, MAN, WAN, PAN, SAN, CAN, Body area network, VLAN and VPN, Intranet, Internet; Broadband, DHCP, DNS. Types of Connectivity- wired, wireless; Network Operating System: server-client operating systems.

Network Hardware: Introduction; Ethernet technology; FDDI; NIC, Repeaters, Transceivers, Hubs, Bridges/Switches, Routers; Making Cables, installing Connectors and Structured Cabling; working with network hardware tools, cable Color Coding. Firewalls & Proxy servers (Forward & Reverse)

Recommended Books:

1. RON GILSTER, PC Hardware: A Beginner's Guide, McGraw-Hill Education-16 May 2001
2. John Rourke, PC Hardware: The Complete Reference, McGraw Hill Education- First Edition (1 July 2017) (India) Private Limited, B-4, Sector-63, Dist. Gautam Budh Nagar, Noida
3. Dr. Ajit Mittal, and Dr. Ajay Rana Mastering Pc Hardware And Networking, Khanna Book Publishing Company 1 January 2014;

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BCA/SM/3/MIC/106: Desktop and Hardware Troubleshooting (Lab-Work based on MIC/105)							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Core Practical	02	04	Practical	50	-	3 Hours	Practical/ Viva-voce

Instructions to paper setter for Term-End Examination: The Term-End examination shall be conducted by a panel of one external and one internal examiner. The question paper for practical examination shall be set on the spot.

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SEMESTER - IV

BCA/SM/4/DSC/113: Operating System

Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Core Theory	04	04	Lecture	70	30		4 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Term-End Examination: *The Term-End examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting SEVEN short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.*

Course Objectives	The objective of this course is to get the students familiar with fundamental concepts of operating systems, namely, types of operating systems, functions of memory management module, process management module, deadlock management and file protection, etc.
Course Outcomes	At the end of this course, the student will be able to:
CO1	outline and define: the goals, functions and types of operating system, inter process communication, deadlock; identify the techniques of allocation of memory, processor, and disk space.
CO2	describe and discuss: the goals, functions and types of operating system, inter process communication, deadlock management, techniques of allocation of memory, processor, and disk space.
CO3	illustrate: the concepts of operating system like process scheduling, memory management, virtual memory, directory structure, disk space allocation, and process deadlocks.
CO4	classify: operating systems, deadlock management approaches, process scheduling algorithms, disk scheduling algorithms, page replacement algorithms, directory structure, disk space allocation methods.
CO5	select: various techniques and algorithms and memory managements in Operating system.
CO6	design: Various operating system algorithms help students in OS designing.

Unit 1

Operating Systems Overview: Introduction, OS Architecture, Operations of operating system (Process management, File management, Memory management, Storage management, Protection and security), Types of operating system (Batch Processing, Multi-programming, Multi processing, Multi-tasking, Time Sharing, Distributed, Real time).
Operating Systems Structures: Operating system services, systems calls and types of system calls.

Unit 2

Process Management: Process concepts, process states, operations on process, inter-process communication, process scheduling criteria and categories (preemptive, non-preemptive),

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Process scheduling algorithms (FCFS, SJF, RR, Shortest remaining time first, Priority Scheduling).

Unit 3

Deadlocks: System model, deadlock prevention, detection and avoidance, recovery from deadlock banker's algorithm.

File System: Concept of a file, access methods, directory and disk structure, file system structure, file system implementation, directory implementation, allocation methods, free-space management.

Unit 4

Memory Management: Swapping, fragmentation, paging, structure of the page table, segmentation, virtual memory, demand paging, thrashing.

Secondary-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Scheduling Algorithms (FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK), Disk Management.

Recommended **Books:**

1. Silberschatz A., Galvin P. B., Gagne G., Operating System Concepts, 9th Edison, 2018 Wiley India Pvt. Ltd.
2. ChauhanNaresh, Principles of Operating Systems, Oxford University Press.
3. Tanenbaum A.S., Operating System- Design and Implementation, PHI Learning.

Recommended e-content:

1. www. W3school.com
2. https://www.geeksforgeeks.org/what-is-an-operating-system/

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BCA/SM/4/DSC/114: Computer Network								
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Core Theory	04	04	Lecture	70	30		3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Note for the Paper Setter: The question paper will consist of ***nine*** questions in all. The first question will be compulsory and will consist of seven short questions of 2 marks each covering the whole syllabus. In addition, eight more questions of 14 marks each will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt one compulsory question and four more questions selecting one question from each unit.

Course Objectives: The objective of this course is to make the students familiar with the topics of networking, data communication, modes of transmission, communication media, routing, error control and congestion control.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: the terms and concepts of data communication and computer networking including types of network topologies, reference models, protocols used in data communication, transmission modes and media, switching and multiplexing.
CO.2	understand: various concepts of data communication and computer networking including network topologies, reference models, protocols used in data communication, data transmission modes and transmission media, switching and multiplexing.
CO3	apply: techniques learnt here in the design and evaluation of computer and communication networks and decide which competing communication media, and network topology/switching/protocol/technology will suit a particular situation.
CO4	differentiate: various types of: computer and data communication networks, network topologies, switching and multiplexing mechanisms, error control mechanisms, routing protocols, transmission modes, transmission media, congestion control techniques.
CO5	compare: evaluate and choose between network topologies, transmission media, switching and multiplexing techniques, protocols and different layers, error control mechanisms, congestion control techniques.
CO6	choose: transmission media, switching and multiplexing techniques, protocols.

Unit 1

Network: Introduction, need and applications of computer networks, Signal and Data, Analog and Digital Signals, bit rate, baud rate, bandwidth, types of network (Client, Server and Peers), introduction to various types of servers, client/server architecture, topologies (star, bus, ring, tree, mesh, hybrid), categories of networks (LAN, MAN, WAN, PAN, CAN).

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Unit 2

Data communication: components of a data communication system, types of communication (synchronous and asynchronous), transmission modes (simplex, half duplex, full duplex), transmission media (guided and wireless media), introduction to switching (circuit, message and packet) and multiplexing (frequency division and time division), modem.

Unit 3

Networks architecture: concepts of protocols & services, OSI reference model, TCP/IP reference model, TCP/IP, elements of transport protocols, transmission control protocol (TCP), user datagram protocol (UDP), internet protocol (IP), file transfer protocol(FTP), simple mail transfer protocol (SMTP), HTTP, HTTPs, connectivity devices(hub, bridge, switch, router and gateway).

Unit 4

Framing and error control: framing techniques, error control, error detection & correction.
Data link control: acknowledgments, sliding window protocols. Multiple Access Control, flow and error control
Routing Algorithms: Shortest Path Routing, Distance Vector Routing.

Recommended Books:

1. Behrouz A Forouzan, Introduction to Data Communications and Networking, 3rd or higher edition Tata McGraw Hill.
2. Andrew S. Tanenbaum, Computer Networks, 3rd or higher edition, PHI.
3. William Stallings, Data and Computer Communications, 5th or higher edition, PHI.

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BCA/SM/4/DSC/115: Web Development								
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Core Theory	04	04	Lecture	70	30		4 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Term-End Examination: *The Term-End examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting SEVEN short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.*

Course Objectives	To illustrate the basic concepts and building blocks of web pages and web sites. Learn how to design and develop simple webpages.
Course Outcomes	On completion of this course, the students will be able to understand
CO1	learn: the WWW and basic HTML tags
CO2	identify: to link web pages, placing images in web pages and frame
CO3	understand: the way to create CSS and format it
CO4	analyse: Learn the basic concepts of java script used in web development.
CO5	choose: programming approaches for frontend and backend using HTML and CSS, JavaScript and PHP.
CO6	develop: frontend and backend using HTML and CSS, JavaScript and PHP.

Unit 1

Introduction to HTML: A brief history of HTML, creating a simple web page, types of tags in HTML, lists, tables, alignment and spanning within the table, working with forms.
CSS-Cascading Style Sheets: Working of CSS, basic style sheet, layout properties, formatting properties, using style classes and style id, Internal style sheet and inline styles, CSS properties, set colours, styling tables and hyperlinks.

Unit 2

Introduction to Javascript: Syntax rules, statements, functions, variables, objects, conditions, loops, event handlers, comments, expressions and operators, data types, working with strings, numeric array.

Unit 3

Introduction to PHP: Evaluation of PHP, Basic Syntax, Defining variable and constant, PHP Data type, Operator and Expression, Decisions and loop
Array: Anatomy of an Array, Creating index based and Associative array Accessing array, Element Looping with Index based array, Looping with associative array using each () and

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foreach(). Some useful Library function.

Unit 4

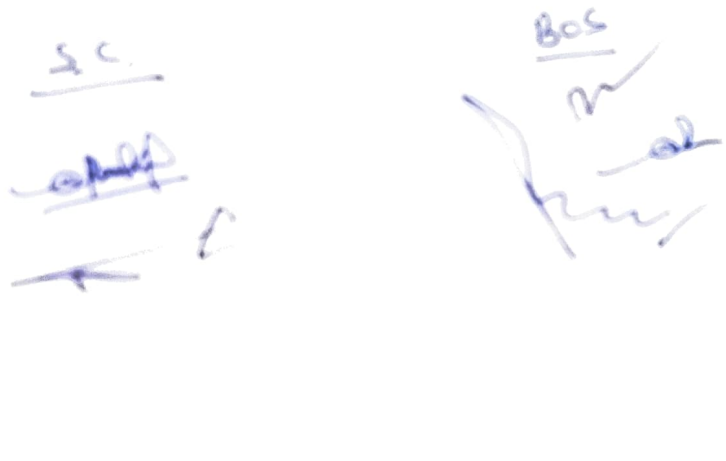
Handling HTML Form with PHP: Capturing Form, Data Dealing with Multi-value filed, and Generating File uploaded form, redirecting a form after submission.
Session and Cookie: Introduction to Session Control, Session Functionality What is a Cookie, Setting Cookies with PHP

Recommended Books:

1. Thomas A Powell: HTML-The Complete Reference, 5th Edition, Tata McGraw Hill.
2. Robin Nixon, Learning PHP, MySQL & JavaScript, 6th Edition, ' O' riley Press

Recommended E-Contents

1. https://www.w3schools.com
2. https://www.youtube.com/@raylilaby



BCA/SM/4/DSC/116: Computer Network (Lab-Work based on DSC/114)							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Core Practical	02	04	Practical	50	-	3 Hours	Practical/ Viva-voce

Instructions to paper setter for Term-End Examination: The Term-End examination shall be conducted by a panel of one external and one internal examiner. The question paper for practical examination shall be set on the spot.

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BCA/SM/4/DSC/117: Web Development (Lab-Work based on DSC/115)

Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Core Practical	02	04	Practical	50	-	3 Hours	Practical/ Viva-voce

Instructions to paper setter for Term-End Examination: The Term-End examination shall be conducted by a panel of one external and one internal examiner. The question paper for practical examination shall be set on the spot.

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BCA/SM/4/MIC/107: Multimedia Tools								
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Core Theory	02	02	Lecture	35	15		2 Hrs	TEE/MTE/ Assignment/ Attendance
					10	3 2		

Note for the Paper Setter: *The question paper will consist of* ***five*** *questions in all. The first question will be compulsory and will consist of* ***seven*** *short questions of* ***1*** *mark each covering the whole syllabus. In addition,* ***four*** *more questions of* ***14 marks each*** *will be set unit-wise comprising of* ***two*** *questions from each of the* ***two*** *units. The candidates are required to attempt* ***one compulsory question*** *and* ***two more questions*** *selecting at least one question from each unit.*

Course Objectives	The objective of the course is to introduce the fundamental elements of multimedia and to learn the concepts of multimedia like text, speech, image, and video processing. Software skills and hands on work on digital media will also be emphasized.
Course Outcomes	After completion of the course, student will able to
CO1	define: multimedia, fonts, audio and video file format
CO2	understand: multimedia devices, the basic concepts about images, video multimedia authoring.
CO3	use: appropriate tools for the design, development and creation of digital media.
CO4	analyse: data compression techniques, image compression techniques like JPEG, video compression techniques like MPEG, and the basic concepts of multimedia animation.
CO5	justify: the right way of manipulating multimedia systems.
CO6	develop: an interactive multimedia presentation by using multimedia devices and multimedia applications surrounding the emergence of multimedia technology.

Unit 1

Introduction to Multimedia, Components of Multimedia, Web and Internet Multimedia Applications, Transition from Conventional Media to Digital Media.

Computer Fonts and Hypertext: Usage of text in multimedia, Families and Faces of Fonts, Outline Fonts, Bitmap Fonts, International Character Sets and Hypertext, Digital Fonts Techniques.

Audio Fundamentals and Representations : Digitization of Sound, Frequency and Bandwidth, Decibel System, Data Rate, Audio File Format, Sound Synthesis, MIDI, Wavetable, Compression and transmission of audio on Internet, Adding sound to your multimedia project, Audio software and hardware.

Unit 2

Image fundamentals and representations : Colour Science , Colour, Colour Models, Colour palettes, Dithering, 2D Graphics, Image Compression and File Formats :GIF, JPEG, JPEG 2000, PNG, TIFF, EXIF, PS, PDF, Basic Image Processing , Use of image editing software.

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White balance correction, Dynamic range correction, Gamma correction, Photo Retouching. Video and Animation: Video Basics, working of video, Broadcast Video Standards, Analog video, Digital video, Video Recording and Tape formats, Shooting and Editing Video (Use Adobe Premier for editing), Video Compression and File Formats. Video compression based on motion compensation, MPEG-1, MPEG-2, MPEG-4, MPEG-7, MPEG-21, Animation: Cell Animation, Computer Animation, Morphing.
Multimedia Authoring: Multimedia Authoring Basics, Some Authoring Tools, Macromedia Director & Flash.

Recommended Books:

1. Li, Ze-Nian, Mark S. Drew, and Jiangchuan Liu, Fundamentals of Multimedia, 2009, Pearson Education.
2. Tay Vaughan, Multimedia making it work, 9ed, 2014, Tata McGraw-Hill.
3. Rajneesh Aggarwal & B. B Tiwari, Multimedia Systems, 2007, Excel Publication, New Delhi.
4. Parekh Ranjan, Principles of Multimedia, 2006, Tata McGraw-Hill.

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BCA/SM/4/MIC/108: Multimedia Tools (Lab-Work based on MIC/107)							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Core Practical	02	04	Practical	50	-	3 Hours	Practical/ Viva-voce

Instructions to paper setter for Term-End Examination: The Term-End examination shall be conducted by a panel of one external and one internal examiner. The question paper for practical examination shall be set on the spot.

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