Curriculum and Credit Framework for Undergraduate Programme

(Single-Major) as per NEP-2020

BACHELOR OF COMPUTER APPLICATIONS (B.C.A.)

3rd & 4th Semesters

For Batch w.e.f. Session: 2022-23

Department of Computer Science & Engineering

Faculty of Engineering & Technology

Chaudhary Devi Lal University

Sirsa-125055, Haryana

2023

Exit options and Credit requirements

SINGLE-MAJOR

Exit with	Credit requirement
Certificate in Computer Applications: After successful completion of First year (Two semesters) of the Four-Year Undergraduate Degree Programme.	**48** (Including Internship of 4 Credits)
Diploma in Computer Applications: After successful completion of Two years (Four semesters) of the Four-Year Undergraduate Degree Programme.	**94** (Including Internship of 4 Credits)
Bachelor of Computer Applications: After successful completion of Three years (Six semesters) of the Four-Year Undergraduate Degree Programme.	**136**
Bachelor of Computer Applications (Honours/Honours with Research) After successful completion of Four Years (Eight semesters) of the Undergraduate Degree Programme.	**184**

Semester -3

Sr. no	Course Code	Course Type	Course Title	Int. (Th.)	Ext. (Th.)	Ext. (Pra.)	Total	Credit
						Max. Marks		
1.	BCA/SM/3/DSC/201	Major	Data Structure	15	35	50	100	2+2
2.	BCA/SM/3/DSC/202	Major	Programming in Java	15	35	50	100	2+2
3.	BCA/SM/3/MIC/201	Minor	Discrete Mathematics	30	70	-	100	4
4.	BCA/SM/3/MIC/202	Minor	Management Information System	30	70	-	100	4
5.	BCA/SM/3/MDC/201	MDC	E-Commerce	25	50	-	75	3
6.	BCA/SM/3/MDC/202	MDC	Cyber Space	25	50	-	75	3
7.	BCA/SM/3/SEC/201	SEC	Cyber Law & Computing Ethics	25	50	-	75	3
8.	EVS/VAC/102	VAC	EVS-II	15	35	-	50	2
Sub Total Semester III							**675**	**27**

Semester -4

Sr. no	Course Code	Course Type	Course Title	Int. (Th.)	Ext. (Th.)	Ext. (Pra.)	Total	Credit
						Max. Marks		
1.	BCA/SM/4/DSC/203	Major	Computer Network	30	70	-	100	4
2.	BCA/SM/4/DSC/204	Major	Programming with C#	15	35	50	100	2+2
3.	BCA/SM/4/DSC/205	Major	Computer Graphics	30	70	-	100	4
4.	BCA/SM/4//MIC/203	Minor	Linux and Shell Script	15	35	50	100	2+2
5.	BCA/SM/4/MIC/204	Minor	Web Development	15	35	50	100	2+2
6.	BCA/SM/4/MDC/203	MDC	Digital Marketing	25	50	-	75	3
7.	BCA/SM/4/SEC/202	SEC	Green Computing	25	50	-	75	3
8.	CDLU/VAC/101	VAC	Communication Skills	15	35	-	50	2
9.	CDLU/VAC/105	VAC	Vedic Mathematics	15	35	-	50	2
Sub Total Semester IV							**750**	**30**

THIRD SEMESTER

BCA/SM/3/ DSC/201: Data Structure

Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
DSC	2T	02	Lecture	35	15	2 Hours	TEE/MTE/ Assignment/ Attendance
	2P	04	Practical	50	-	3 Hours	

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 one question from each unit.

Course Objectives	To impart the basic concepts of data structures and algorithms. To understand concepts about searching and sorting techniques. To understand basic concepts about stacks, queues, lists, trees and graphs.
Course Outcomes	After completion of the course, learners will
CO1	define complexity and analysis of algorithms
CO2	understand different types of array and stack
CO3	understand different types of queues and linked list and different operations on them
CO4	implement searching and sorting algorithms

Unit 1

Data Structure and algorithm preliminaries: Definitions, Time and Space analysis of Algorithms, Time-Space Tradeoffs, Mathematical Notation and functions, Asymptotic Notations for complexity of algorithms, Recursion, Divide and Conquer Strategy
Array - Single and Multi-dimensional Arrays, Sparse Matrices (Array and Linked Representation),
Stack -Implementing of stack; Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Applications of stack.

Unit 2

Queues- Operation on Queues, Circular queue, Priority queues and dequeue.
Linked list – Single, Double, Circular Linked List Implementation
Trees –Binary tree,Tree Traversals, Binary Search Tree, Threaded Binary Tree ,AVL Trees, Height balanced tree , Heap and its applications.
Searching, Sorting: Searching –Linear Search, Binary Search. Sorting- Bubble sort, Selection sort, Insertion sort, Merge Sort ,Quick Sort, Heap sort,

Text Books:
1. Seymour Lipschutz, Data Structures, McGraw-Hill Book Company, Schaum's Outline series, New York (1986).
2. Narasimha Karumanchi, Data Structures And Algorithms Made Easy, Career

BCA/SM/3/ DSC/202 : Programming in Java							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
DSC	2T	02	Lecture	35	15	2 hours	TEE/MTE/ Assignment/ Attendance
	2P	04	Practical	50	-	3 hours	

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 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	categorize: data types, programming approaches, flow controls constructs, loops, single and multithreaded programming, various classes in collection framework, GUI controls.

Unit I

Java: Introduction of java, basic concepts, data types, reference types, operators and its types, decision controls, control statements, loops, 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 II

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 stream in Java: input and output stream, file handling operations.

Text Books:
1. Darrel Ince& Adam Freeman, Programming the Internet with Java, 2e, Addison Wesley.
2. K.A. Mughal, R.W. Rasmussen, A Programmer's Guide to Java Certification, Addison Wesley.
3. E. Balagurusamy, Programming with Java, 6e, Tata McGraw Hill.

Reference Books:
1. Herbert Schildt, The Complete Reference Java, 10e, Tata McGraw Hill.

BCA/ SM/3/MIC/201 : Discrete Mathematics							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
MIC	04	04	Lecture	70	30	3 Hours	TEE/MTE/ Assignment/ Attendance

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: This course is aimed at making the students familiar with various discrete structures, operations performed thereupon and their implementation mechanism.

Course Outcomes	By the end of this course, the student will be able to
CO1	define: sets and elements, introduction and representation of relations, types of functions, graphs and multigraphs, Boolean algebra, group, and subgroups
CO2	describe and discuss: inclusion-exclusion principle, finite and Infinite sets., types & composition of relations, types of graphs, sorting and searching, Boolean algebra and groups.
CO3	solve: various mathematical problems related to sets, graphs, Boolean algebra and groups, directed and undirected graphs, basic logical operations on propositions and truth tables.
CO4	illustrate: sets and elements, representation of relations, types of graphs and multigraph, Boolean algebra operations, group and subgroups lattices.
CO5	determine: complex problem related to sets and elements, graphs and multigraphs, Boolean algebra, groups and subgroups.

Unit – I

Sets and elements, inclusion-exclusion principle, finite and Infinite sets, power sets, multisets, introduction and representation of relations, types of relations, composition of relations: introduction to functions, types of functions.

Unit – II

Graphs and multigraphs, sequential and linked representation of graphs, Directed and Undirected graphs: Types of graphs, labelled and weighted graphs, complete, regular and bipartile graphs, planar graphs, tree graphs, paths, connectivity.

Unit – III

Boolean algebra, basic definitions, duality, truth tables, boolean functions, basic logical operations on propositions, proposition and truth tables, tautologies and contradictions, algebra of propositions, rules of inference.

Unit – IV

Group and subgroups, semigroups groups, normal subgroups, hasse diagram of partially ordered sets, lattices, GLB, LUB, LB,UB

Text Books:

1. Seymour Lipschutz, Marc Lars Lipson, Discrete Mathematics, McGraw-Hill International Editions, Schaum's Series.
2. Bernard Kolman, Robert C. Busbym, Discrete Mathematical Structures for Computer Science, Prentice-Hall of India Pvt. Ltd.

Reference Books

1. Alan Doerr, Kenneth Levaseur, Applied Discrete Structures for Computer Science, Galgotia Publication Pvt. Ltd.
2. Kennech G. Rosen, Discrete Mathematics and its Applications, McGraw-Hill International Editions, Mathematics Series.

BCA/SM/3/MIC/202: Management Information System							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
MIC	04	04	Lecture	70	30	3 Hours	TEE/MTE/ Assignment/ Attendance

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: This course is aimed at making the students familiar with various discrete structures, operations performed thereupon and their implementation mechanism.

Course Outcomes	By the end of this course, the student will be able to
CO1	provide information for decision making on planning, initiating, organizing, and controlling the operations of the subsystems of the firm and to provide a synergistic organization in the process.
CO2	apply sound managerial concepts and principles in the development and operation of information systems.
CO3	effectively apply systems analysis, IS design and project management concepts.
CO4	effectively apply technical concepts in information technology.
CO5	support the delivery, use and management of information systems within an information systems environment.

Unit – I

Introduction to system and Basic System Concepts, Types of Systems, The Systems Approach, Information System: Definition & Characteristics, Types of information, Role of Information in Decision-Making, Sub-Systems of an Information system: EDP and MIS management levels, EDP/MIS/DSS.

Unit – II

An overview of Management Information System: Definition & Characteristics, Components of MIS, Frame Work for Understanding MIS: Information requirements & Levels of Management, Simon's Model of decision-Making, Structured Vs Un-structured decisions, Formal vs. Informal systems

Unit – III

Developing Information Systems: Analysis & Design of Information Systems: Implementation & Evaluation, Pitfalls in MIS Development.

Unit – IV

Functional MIS: A Study of Personnel, Financial and production MIS, Introduction to e-business systems, ecommerce – technologies, applications, Decision support systems – support systems for planning, control and decision-making

Text Books:

1. Kanter, "Management/Information Systems",PHI.
2. Gordon B. Davis, M. H. Olson, "Management Information Systems – Conceptual foundations, structure and Development", McGrawHill

Reference Books   :

1.   James A. O"Brien, "Management Information Systems", TataMcGraw-Hill.
2.   James A. Senn, "Analysis & Design of Information Systems", Second edition, McGrawHill.
3.   Robert G. Murdick & Joel E. Ross & James R. Claggett, "Information Systems for Modern Management", PHI.
4.   Lucas, "Analysis, Design & Implementation of Information System", McGrawHill

BCA/SM/3/MDC/201: E-Commerce							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
MDC	03	03	Lecture	50	25	3 Hours	TEE/MTE/ Assignment/ Attendance
Note for the Paper Setter: The question paper will consist of seven questions in all. The first question will be compulsory and will consist of four short questions of 2 marks each covering the whole syllabus. In addition, six more questions of 14 marks each will be set unit-wise comprising of two questions from each of the three units. The candidates are required to attempt one compulsory question and three more questions selecting one question from each unit.							
Course Objectives		The objective of this course is to understand concepts of e-commerce, model, framework, EDI and also know various issues of e-commerce.					
Course Outcomes		On completion of this course, the students will be able to:					

Unit I

E-commerce and its Technological Aspects: Overview of developments in Information Technology and defining E-Commerce, scope of E commerce, Electronic Market, Electronic Data Interchange, Internet Commerce, Benefits and limitations of E-Commerce, produce a generic framework for E-Commerce, Architectural framework of Electronic Commerce, Web based E- Commerce Architecture.

Consumer Oriented E Commerce E-Retailing: Traditional retailing and e retailing, Benefits of e- retailing, Key success factors, Models of e retailing, Features of e retailing. E services: Categories of e-services, Web-enabled services, match making services, Information-selling on the web, e- entertainment, Auctions and other specialized services. Business to Business Electronic Commerce

Unit II

Electronic Data Interchange: Benefits of EDI, EDI technology, EDI standards, EDI communications, EDI Implementation, EDI Agreements, EDI Security. Electronic Payment Systems, Need of Electronic Payment System: Study and examine the use of Electronic Payment system and the protocols used, Study Electronic Fund Transfer and secure electronic transaction protocol for credit card payment. Digital economy: Identify the methods of payments on the net – Electronic Cash, cheques and credit cards on the Internet.

Unit III

Issues in E Commerce Understanding Ethical, Social and Political issues in E-Commerce: A model for Organizing the issues, Basic Ethical Concepts, Analysing Ethical Dilemmas, Candidate Ethical principles Privacy and Information Rights: Information collected at E-Commerce Websites, The Concept of Privacy, Legal protections Intellectual Property Rights: Types of Intellectual Property protection, Governance.

Text Books:

1. Elias. M. Awad, " Electronic Commerce", Prentice-Hall of India Pvt Ltd.
2. RaviKalakota, Andrew B. Whinston, "Electronic Commerce-A Manager's guide", Addison-Wesley.
3. Efraim Turban, Jae Lee, David King, H.Michael Chung, "Electronic Commerce–A ManagerialPerspective", Addison-Wesley.
4. Elias M Award, "Electronic Commerce from Vision to Fulfilment", 3rd Edition, PHI, Judy Strauss, Adel El-Ansary, Raymond Frost, "E-Marketing", 3RDEdition, Pearson Education.

BCA/SM/3/MDC/201 : Cyber Space								
Course Type	Course Component	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duratio n	Assessment Methods
					External	Internal		
MDC	Theory	03	03	Lecture	50	25	3 Hours	TEE/MTE/ Assignment/ Attendance

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

Course Objectives: Objective of this course is to make the students familiar with the functioning of the Internet, email, web-browsers, and e-commerce; surfing the Internet and downloading contents therefrom; legal and payment issues in e-commerce.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: Internet and its applications, ISP, HTML, Email, Web Browsers, Social Media and E-commerce.
CO2	explain: internet, intranet, internet service provider, HTML, structure and working of email, configuration of mail client like Outlook Express with mail server, functionality of web browsers, social media and concept of E-commerce.
CO-3	illustrate: internet and its applications, evolution of internet, structure of HTML, various tags with their uses in HTML, structure and working of email, concept and use of different type of web browser, searching and downloading from websites, use of social media and introduction to E-commerce
CO4	categorize: applications of internet, ISP, HTML elements, email messaging, function of web browsers, searching software's, various social media networks, their impact and issues and concept of e-commerce with payment issues.
CO5	compare: internet and intranet, different internet service providers on the basis of their service, email advantages and disadvantages, working of various web browsers and social media types.
CO6	design: various types of HTML application with the help of different elements along with their attributes and development of webpages.

Course Content
Cyber Space

Unit – I

Basics of internet and Intranet, Applications of Internet, Evolution of Internet, Internet Service Provider (ISP).

Introduction to HTML, Structure of HTML, Web Page, Head and Body Sections, General structure of HTML tags-starting and ending a tag, various text formatting tags in HTML, Adding images, audio and video objects, Hyper linking.

Unit - II

Email: Basic Introduction, Advantages and Disadvantage, Structure of an E-Mail Message, Working of E-Mail (sending & receiving messages), Managing Email (creating new folders, deleting messages, forwarding messages, filtering messages), Configuration of Outlook Express.

Unit - III

Introduction to the Functionality of Web Browsers: Internet Explorer, Netscape Navigator Concept of WWW, surfing through web sites. Web Browsing (opening, viewing, saving a web page and book mark). Searching and downloading of different sites and software.

Introduction to Social Media: Twitter, Facebook, YouTube, Whatsapp, LinkedIn, their advantages/disadvantages and issues.

Introduction to E-commerce, its history, advantages, challenges, payment issues, legal issues.

Text/Reference Books	
Text Books	1. Ritendra Goel, "e-commerce", New Age International Publisher, 2008 2. Dougals E. Comer, "Computer Network and Internet", Pearson, 2008 3. Thomas A. Powell, "HTML - The Complete Reference", Tata McGraw-Hill, ISBN: 0074633325 4. Khurana R., "HTML", APH Publishing
Reference Books	1. Oliver Heathcote, "Internet Right From The Start" BPB Publications

BCA/SM/3/SEC/201 : Cyber Laws and Computing Ethics							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
SEC	03	03	Lecture	50	25	3 Hours	TEE/MTE/ Assignment/ Attendance

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

Course Content SEC3 : Cyber Laws and Computing Ethics	
Unit I	Cyber laws in general, IT Act 2000 and its amendments, various provisions of IT Act to deal with cyber offences and cybercrimes. Case of Section 66A of IT Act 2000.
Unit II	Cybercrime: classification and typography, statistics, and issues; review of Indian cyber security strategy, privacy issues.
Unit III	Intellectual Property: Copy rights, Patents, Trade Secret Laws, Key Intellectual property issues, Plagiarism, Competitive Intelligence, Cybersquatting, Information warfare policy. Ethics in business world, Ethics in IT, Ethics for IT professionals and IT users, IT professional malpractices, communications eavesdropping, ACM ethics code.
Text/Reference Books	
Text Books	George Reynolds, "Ethics in information Technology", 5e, Cengage Learning. Debora Johnson," Computer Ethics", 3e, Pearson Education. Sara Baase, "A Gift of Fire: Social, Legal and Ethical Issues, for Computing and the Internet," PHI Publications. Mike W Martin and Roland Schinzinger, Ethics in Engineering, Tata McGraw Hill, 2003.
Reference Books	Michael Cross, Norris L Johnson, Tony Piltzecker, Security, Shroff Publishers and Distributors Ltd. Hon C Graff, Cryptography and E-Commerce - A Wiley Tech Brief, Wiley Computer Publisher, 2001. Govindarajan M, Natarajan S, Senthil Kumar V S, Engineering Ethics, Prentice Hall of India, 2004.

Environmental Studies –II

Credits: 2   **Internal Assessment: 15**
Duration of Examination: -2 hrs   **Semester End Examination: 35**
                                                                      Total Marks: 50

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 one question from each unit.

Objective: The objective of this paper is to create the awareness among the students towards Environmental concepts and issues for smooth life of species and human at earth.

UNIT I

Disaster Management: Floods, Cloud Burst, Earthquake, Tsunami, Landslide, Cyclone. **Natural Disaster Management:** Causes, effects and control measures of natural disasters, disaster preparedness – prevention and mitigation preparedness plan, community based planning, National and international efforts in disaster Management: NDRF; IMD. Role of armed forces , mass media, society and technology in disaster management. Role of in disaster management, Post disaster recovery measures: Rehabilitation, planning and construction, long term counter disaster planning. Solid waste management, causes, effects and control measures of urban and industrial wastes.

Environmental Conservation and Society: Social issue and the Environment: From Unsustainable to sustainable development. Urban problem related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and Rehabilitation of people; its problems and concerns. Climate change, National Action Plan for Climate change (NAPCC). global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation, Consumerism and waste products.

UNIT II

Demography: Human population and the Environment: Population Growth, variation among nations. Population explosion- family Welfare Programme. Human rights, Value Education. HIV/AIDS. Women and Child welfare. Role of information technology in environment and Human health. **Drug Abuse:** Concept of Health: Physical Health, Mental Health, Factors affecting Mental and Physical Health, Management of positive mental health; Drugs and their

effects: What are drugs, useful and harmful drugs, stimulant and depressant drugs, use and abuse of drugs, Concept of drug de-addiction; Legal Position on drugs: Laws related to drugs i.e. NDPS etc., Concept of Narco- terriorism, role and responsibilities of legal service authorities, Awareness Programmers on drugs; Impacts of drugs/Alcohol/Smoking on Longevity

Environmental and Social movements: Bishnoi Movement, Chipko, Appiko,Save Silent valley, Narmada Bachao Andolan ,Swachh Bharat Abhiyaan, Tehri Dam Conflict.
Environmental legislation: Air (Prevention and control of pollution) Act, Water (Prevention and control of pollution) Act, Environmental Protection Act 1986. Wildlife Protection Act, Forest conservation Act. Issues involved in the enforcement of environmental legislation Public awareness. NGT (National Green Tribunal), Green Bench International agreements: Montreal Protocol, Kyoto Protocol, Convention on Climate change, Concept of Carbon footprint, Carbon credit and carbon trading, CBD: Clean development mechanism.

Suggested Readings

1. Bharucha Erach, The Biodiversityof India, Mapin Publishing Pvt.Ltd.
2. Fundamental of Environmental studies. Mahua Basu, Xavier Savarimuthu,SJ. Cambridge University Press, -2017 Chadha, K.L. and Swaminathan, M.S. 2006. Environment and Agriculture. Malhotra Publishing House, New Delhi.
3. Cunningham, W.P. and Saigo, B.W. 1997. Environment Science. McGraw-Hill, USA.
4. Deswal, S. and Deswal, A., 2003, Energy, ecology, Environment and Society, Dhanpat Rai&co ltd., Delhi.
5. Deswal, S. and Deswal, A. 2005. A Basic Course in Environmental Studies. Dhanpat Rai & Co ltd., Delhi.
6. Singh, G.B. and Sharma, B.R. 1998. Fifty Years of Natural Resource Management Research, Indian Council of Agriculture Research, New Delhi.
7. Singh, N. and Sontakke, N.A. 2002. On Climatic fluctuations and Environment changes on Indo-Gangetic Plains, India.
8. Paramjit S Jaswal. Allahabad Law agency. Environmental Law.
9. A textbook of Environmental Studies. Dr. D.K Asthana, Dr. Meera Asthana. Publisher: S Chand & Co Ltd.

FOURTH SEMESTER

BCA/SM/4/DSC/203: Computer Network							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
DSC	04	04	Lecture	70	30	3 Hours	TEE/MTE/ Assignment/ Attendance

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 and describe 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 the 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 candidate: network topologies, transmission media, switching and multiplexing techniques, protocols and different layers, error control mechanisms, congestion control techniques.

Unit – I

Network concepts: goals and applications of computer networks; topologies; categories of networks - LAN, MAN, WAN; point-to point, and broadcast networks.

Unit – II

Networks architecture: concepts of protocols & services; OSI model and functions of its layers; TCP/IP reference model. TCP/IP: elements of transport protocols; transmission control protocol (TCP); user datagram protocol (UDP); internet protocol (IP).

Unit – III

Data communication concepts: components of a data communication system; transmission modes; transmission media – guided and wireless media; introduction to switching (circuit, message and packet) and multiplexing (frequency division and time division); modem.

Unit – IV

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,

Text Books:

1. Andrews, Tananbaum, Computer Networks – PHI.
2. Fred Halsall, Data Communications, Computer Networks and Open Systems, 4e, Addison Wesley.
3. William Stalling, Data and Computer Communications, 5e, PHI.

Reference Books:

1.   Behrouz, Frozen, Introduction to Data Communications and Networking, Tata McGraw Hill.

BCA/SM/ 4/DSC/204: Programming with C#							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
DSC	2T	02	Lecture	35	15	2 Hours	TEE/MTE/ Assignment/ Attendance
	2P	04	Practical	50	-	3 Hours	

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 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	categorize: data types, programming approaches, flow controls constructs, loops, single and multithreaded programming, various classes in collection framework, GUI controls.

Unit-I

Introduction: C # environment, characteristics of C #.

Data types: Data types, value types, reference types, default value, constants variables, scope of variables, boxing and unboxing.

Operators and expressions: Arithmetic, relational, logical, bitwise, special operators, evolution of expressions, operator precedence & associativity. Control constructs: Decision making, loops. Array, Structure, Enums

Unit-II

Classes & methods: class, methods, constructors, destructors, overloading of operators & functions.
Inheritance & polymorphism: Visibility control, overriding, abstract class & methods, sealed classes & methods, interfaces.

Advanced features of C #, Exception handling & error handling, File Input Output, Multi-threading.

TextBook
1. E. Balaguruswamy, Programming in C #, Tata McGraw Hill.
2. Herbert Schildt, C #: A Beginner's Guide, Tata McGraw Hill.

BCA/SM/4/DSC/205 : Computer Graphics							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
DSC	04	04	Lecture	70	30	3 Hours	TEE/MTE/ Assignment/ Attendance

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: Objective of this course is to make the students familiar with the basic concepts of Computer Graphics and the working of various graphic devices and their applications.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: computer graphics, soft copy computer devices, hard copy computer devices use in computer graphics , 2D graphics, 3D graphics, multimedia , 2D transformation, 3D transformation, resolution, graphic operation.
CO2	describe: computer graphic application, random scan, raster scan, coordinate system, homogeneous coordinate system, scan conversion , DDA, Bresenham line drawing algorithm, 2D transformation, positioning, pointing, rubber band techniques.
CO3	apply algorithms: line drawing, clipping, hidden surface removal, projection.
CO4	categorize: scan conversion methods, projection techniques, clipping algorithms, shading methods.
CO5	compare and evalutate:scan conversion methods, projection techniques, clipping algorithms, shading methods.

Unit I

Introduction: survey of computer graphics and its applications; Interactive and passive graphics; Introduction to GKS primitives; display processors; graphic devices: display system-refresh CRTs, raster scan and random scan monitors grey shades, Interlacing,

Unit – II

Graphic devices: beam penetration shadow mask monitors, look up tables, plasma panel, LED and LCD monitors, LCD monitors, VGA and SVGA resolution; hard copy devices-printers, plotters Drawing geometry: coordinate system, resolution, use of homogeneous coordinate system;

Unit – III

Scan conversion: symmetrical DDA, simple DDA, Bresenham's line drawing algorithm, generation of ellipse;

2-D Transformations: translation; rotation; scaling; mirror reflection; shearing: zooming; panning; input techniques-pointing, positioning, rubber and methods and dragging;

Unit – IV

Graphic operations: clipping-line clipping using Sutherland-Cohen and midpoint sub-division algorithm, polygon clipping; window and view port; windowing transformation.

Multimedia: concepts of hypertext/hypermedia; multimedia applications; multimedia authoring; multimedia hardware; images; bitmaps; windows paint brush.

Text Books:

1. Donald Hearn and M. Pauline Baker, Computer Graphics, PHI.
2. Newman &Sproull, Principles of Interactive Computer Graphics, McGraw Hill.

Reference Books:

1. 1.John F. KoegelBufore, Multimedia Systems, Addison Wesley.
2. Foley, Computer Graphics Principles & Practice, Addison Wesley.
3. Rogers, Procedural elements of Computer Graphics, McGraw Hill.
4. D.P. Mukherjee, Fundamentals of computer Graphics and Multimedia, PHI.

BCA/SM/4/MIC/203 : Linux and Shell Scripts							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
MIC	2T	02	Lecture	35	15	2 Hours	TEE/MTE/ Assignment/ Attendance
	2P	04	Practical	50	-	3 Hours	

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 one question from each unit.

Course Objectives: The objectives of this course are to provide the in-depth coverage of various concepts of Linux. Linux administration is an essential course for the students.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define and outline: basic requirements, features, essential commands of Linux, vi editors, processes scheduling, communication commands, simple (grep, sed) and advanced filters (awk, perl).
CO2	explain: the organization, file system, Shells, file permissions, priorities, processes, communication commands in Linux and operations performed by the simple as well as advanced filters.
CO3	perform: operations in Linux, modes of operations in vi, mailing communication, regular expressions along with the simple and advanced filters.
CO4	categorize: the Linux commands, processes, priorities, communication commands, simple and advanced filters using regular expressions.
CO5	compare: shells, file permissions, processes, command with different options, simple filters like grep, sed and advanced filters like awk, perl.
CO6	create: Linux shell scripts showing the use of commands, regular expressions and filters.

Unit I

Introduction, hardware requirements for Unix/Linux, salient features of Unix-multiuser capability, multitasking, communication, security, portability.
Unix system organization, types of shells, Unix commands, the Unix file system, listing of files and directories, file permissions with chmod, disk related commands.
Essential Unix/ Linux commands: cal, touch, file, file related commands, viewing files, taking printouts, file compression, the on-line Unix manual.
I/O redirection and piping, the vi editor, modes of operations in vi.
Processes in Unix/Linux: background processes, nohup command, killing a process, changing process priorities, scheduling of processes- the at command, the batch command, the crontab command.

Unit – II

Communication: the write command, the wall command, motd command, mail- sending, handling incoming mail, customizing mail.
Simple Filters: the sample database, pr- paginating files, head, tail, cut, paste, sort, uniq, tr, displaying a word-count list.

Filters using regular expressions: grep – searching for a pattern, basic regular expression, extended regular expression.

Sed: the stream editor, line addressing, using multiple instruction (-E and –F), context addressing, text editing, substitution(s), basic regular expression revisited.

Text Books:

1. Sumitabha Das, Your Unix – The Ultimate Guide, Tata McGraw Hill, 2008.
2. YaswantKanetkar, "Unix Shell Programming", BPB Publication, (2009).

Reference Books:

1. Matthew Neil, Stones Richard, Beginning Linux Programming, Wiley India Pvt. Ltd.
2. Christopher Negus, Linux Bible, Wiley India Pvt. Ltd.
3. Richard Peterson, Linux – The Complete Reference, Tata McGraw Hill

BCA/SM/4/MIC/204: Web Development							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
MIC	2T	02	Lecture	35	15	2 Hours	TEE/MTE/ Assignment/ Attendance
	2P	04	Practical	50	-	3 Hours	

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 one question from each unit.

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
CO	Learn the WWW and basic HTML tags
CO	Learn to link web pages, placing images in web pages and frame
CO	Understand the way to create CSS and format it
CO	Learn the basic concepts of java script used in web development.

Unit I

Introduction to HTML: A brief history of HTML and the World Wide Web, creating a simple web page, types of tags in HTML, HTML tag, head tag, body tag, paragraph and line break, headings, text formatting tags, special characters, lists, tables, alignment and spanning within the table.

Links, Images, Forms and Frames in HTML: Linking within a web page, linking between your own web content, linking to external web content, linking to e-mail address, placing images on web page, turning images into links, working with forms, frames.

Unit II

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.

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

Text Books:
1. Julie C. Meloni: Sams TeachYourself HTML, CSS and JavaScript, Pearson Education.
2. Thomas A Powell: HTML & CSS-The Complete Reference, Tata McGraw Hill.

Reference Books:
1. Thomas A Powell: HTML-The Complete Reference, Tata McGraw Hill.

BCA/SM/4/MDC/203

DIGITAL MARKETING

CREDITS: 3	**DURATION OF EXAM: 3 HOURS**
	MAXIMUM MARKS: 75
Lecture-45	**(END TERM EXAM: 50, INTERNAL ASSESEMENT: 25)**

Course objective: The course aims to provide knowledge regarding the concepts, tools, techniques and relevance of digital marketing in the current scenario of today's business world.

Course learning outcomes: After completion of the course, learners will be able to:

LO1-Describe the functioning of the digital marketers and how it is different than the traditional market practices.

LO2-Explain the significance of digital marketing tools like SEO, online advertising.

LO3-Gather knowledge about the Content marketing, Social Media Marketing and framework of digital marketing in India.

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

Unit-I	Introduction: Concept, Scope and Importance of Digital Marketing, Traditional Marketing vs. Digital Marketing, Digital marketing as new trends and current scenario of the world, Digital Marketing categorization, SWOT analysis of business, Promotion Plan, Setting up Vision, Mission and Goals of Digital Marketing.
Unit-II	Search Engine Optimization-introduction, Uses, Advantages, on page optimization Techniques, off page optimization Techniques, Online Advertising: types, Formats, Requisites of a good online advertisement, Digital Consumers and their Buying Decision process, Content Marketing.
Unit -III	Interactive marketing: Interactive marketing: concept and options, Social Media marketing: concept and tools, video marketing: tools and techniques, Mobile marketing Tools, Pay Per Click marketing, payment options and gateways.
Reference Books	- Abuja V (2015). Digital Marketing. Oxford University Press. - Charles worth, A. (2018). Digital Marketing: A Practical Approach. Abingdon:Rout ledge. - Gay, R., Charles worth, A., & Esen, R. (2007). Online Marketing: A Customer LedApproach. - Gupta, S. (2018). Digital Marketing. Delhi: Tata McGraw Hill Education. - Kotler, P., Kartajaya, H., & Setiawan, I. (2017). Digital Marketing: 4.0 Moving fromTraditional to Digital. New Jersey: John Wiley & Sons. - Maity M (2022). Digital Marketing. Oxford University Press. - By Puneet Bhatia (Author)-Fundamentals of Digital Marketing	By Pearson education| Second Edition 30 June2019.

BCA/SM/4/SEC/202: Green Computing							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
SEC	03	03	Lecture	50	25	3 Hours	TEE/MTE/ Assignment/ Attendance

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

<table>
<tr><td colspan="2" align="center">**Course Content**
SEC -01: Green Computing</td></tr>
<tr><td>**Unit I**</td><td>The concept, importance and issues involved in Green Computing/ Information Technology; Carbon footprint in manufacturing of computing and IT products; other effluents in IT manufacturing; the concept of design for environment;</td></tr>
<tr><td>**Unit II**</td><td>Carbon footprint in operations of IT/computing gadget; green IT usage; Data centre and server farms design, power, cooling and location; virtualization; BPR for sustainable IT/computing.</td></tr>
<tr><td>**Unit III**</td><td>Disposal practices in e-waste; e-waste recycling, formal vs. informal e-waste recycling; extended producer responsibility; IT for paperless offices; IT for saving travel cost, time and environment; Electronic waste management regulations in India; IEEE 1680 standard for green computing.</td></tr>
<tr><td colspan="2" align="center">**Text/Reference Books**</td></tr>
<tr><td>**Text Books**</td><td>1. John Lamb, The Greening of IT – How Companies Can Make a Difference for the Environment" IBM Press, 2009.</td></tr>
<tr><td>**Reference Books**</td><td>1. Toby J. Velete, Anthony T. Velete, Robert Elsenpeter, Green IT – Reduce Your Information System's Environmental Impact While Adding to the Bottom Line" 1e, McGraw-Hill, 2008.</td></tr>
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CDLU/VAC/101: Communication Skills							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
VAC	02	02	Lecture	35	15	2 Hours	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 one question from each unit.

Course Objective: The main aim of the course is to build competence in English grammar and vocabulary and to enhance effective communication by developing Reading, Writing, Listening and Speaking skills of students.

Course Content VAC-01: Communication Skills	
Unit I	**Fundamentals of Communication Skills** Scope and Significance of Communication Skills, Listening, Speaking, Reading and Writing, Technical Communication, Tools of Effective Communication. **Writing Skills Basics of Grammar** – Placing of Subject and Verb, Parts of Speech, Uses of Tenses, Active- Passive, and Narration. Vocabulary Building and Writing Word Formation & Synonyms, Antonyms, Words Often Confused, One-Word Substitutes, Idioms and Phrasal Verbs, Abbreviations of Scientific and Technical Words.
Unit II	Speaking Skills Introduction to Phonetic Sounds & Articulation, Word Accent, Rhythm and Intonation, Interpersonal Communication, Oral Presentation, Body Language and Voice Modulation (Para linguistics and Non- Verbal), Negotiation and Persuasion, Group Discussion, Interview Techniques (Telephonic and Video Conferencing). Technical Writing Job Application, CV Writing, Business Letters, Memos, Minutes, Notices, Report Writing & Structure, E-mail Etiquette, Blog Writing.
Text/Reference Books	

1. "The Essence of Effective Communication", Ludlow R. and Panton F., Pubs: Prentice Hall,1992
2. "Effective Communication Skills", Kulbhushan Kumar, Khanna Publishing House, 2019.
3. "A University Grammar of English", Quirk R. and Sidney G., 3rd Edition, Pubs: PearsonEducation, 2008
4. "High School English Grammar", Wren and Martin, Pubs: S. Chand & Company Ltd, 2007
5. "Essentials of Business Communication", Guffrey M.E., 8th Edition, Pubs: South-WesternCollege Publishing, 2009
6. "Technical Communication: Principles and Practice", Raman M. and Sharma S., 2ndEdition, Pubs: Oxford University Press, 2012
7. "Effective Business Communication", Rodrigues M.V., Pubs: Concept PublishingCompany, Delhi, 2003
8. "English Vocabulary in Use", McCarthy M. and Felicity O' Dell, 2nd Edition, Pubs:2010

CDLU/VAC/105

Vedic Mathematics

Marks (Theory): 35   **Marks(Total) : 50**
Marks (Internal Assessment) : 15   **Time : 2 Hrs**
Credits: 02

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** marks 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 Outcomes (COs): At the end of the course, the students will be able

CO1: Discuss the rich heritage of mathematical temper of Ancient India Learning Outcomes: Overcome the fear of maths, Improved critical thinking

CO2: Familiarity with the mathematical underpinnings and techniques, Ability to dobasic maths faster and with ease.

UNIT-I

Vedic Maths- High Speed Addition and Subtraction Sessions/Lectures, Vedic Maths: History of Vedic Maths and its Features, Vedic Maths formulae: Sutras and Upsutras, Addition in Vedic Maths: Without carrying, Dot Method, Subtraction in Vedic Maths: Nikhilam Navatashcaramam Dashatah, Fraction–Addition and Subtraction.

Unit II

Vedic Math - Miracle Multiplication and Excellent Division, Multiplication in Vedic Maths: Base Method (any two numbers upto three digits), Multiplication by Urdhva Tiryak Sutra, Miracle multiplication: Any three-digit number by series of 1's and 9's, Division by Urdhva Tiryak Sutra (Vinculum method).

Books suggested:

1. The Essential of Vedic Mathematics, Rajesh Kumar Thakur, Rupa Publications, New Delhi 2019.
2. Vedic Mathematics Made Easy, Dahaval Bathia, Jaico Publishing, New Delhi 2011
3. Vedic Mathematics: Sixteen Simple Mathematical formulae from the Vedas, Jagadguru Swami Sri Bharati Krishna Trithaji, Motilal Banarasidas, New Delhi 2015.
4. Learn Vedic Speed Mathematics Systematically, Chaitnaya A. Patil 2018. 17 Suggested Readings
5. A Modern Introduction to Ancient Indian Mathematics, T S Bhanumurthy, Wiley Eastern Limited, New Delhi.