

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY

UTTAR PRADESH, LUCKNOW



EVALUATION SCHEME & SYLLABUS
(Third Year)

for

Bachelor of Computer Application

BCA

(Under Graduate Three Year Course in Computer Applications)

As per
AICTE & National Education Policy 2020

(Effective from the Session: 2026-27)

BCA Third Year Evaluation Scheme, 2026-27

SEMESTER-V

S. No.	Subject Code	Subject Name	Periods			Sessional			ESE	Total	Credit
			L	T	P	CT	TA	Total			
1.	BBC501	Artificial Intelligence & Machine Learning	3	0	0	20	10	30	70	100	3
2.	BBC502	Python Programming	2	1	0	20	10	30	70	100	3
3.	BBC503	Computer Networks	3	0	0	20	10	30	70	100	3
4.	BBC504	Software Project Management	2	0	0	20	10	30	70	100	2
5.		Elective-I	2	0	0	20	10	30	70	100	2
6.	BBC551	Artificial Intelligence & Machine Learning Lab	0	0	2	30	20	50	50	100	1
7.	BBC552	Mini Project Lab	0	0	3	30	20	50	50	100	2
Total			12	1	5					700	16

CT: Class Test **TA:** Teacher Assessment **L/T/P:** Lecture/Tutorial/Practical

SEMESTER-VI

S. No.	Subject Code	Subject Name	Periods			Sessional			ESE	Total	Credit
			L	T	P	CT	TA	Total			
1.	BBC601	Cyber Security	2	0	0	20	10	30	70	100	2
2.	BBC602	Digital Marketing	2	0	0	20	10	30	70	100	2
3.	BBC603	Software Testing & Quality Assurance	3	0	0	20	10	30	70	100	3
4.	BBC651	Startup and Entrepreneurial Activity Assessment	0	0	4		100	100		100	2
5.	BBC652	Project	0	0	14		100	100	200	300	7
Total			7	0	18					700	16

CT: Class Test **TA:** Teacher Assessment **L/T/P:** Lecture/Tutorial/Practical

Elective-1

BBC011 Cryptography & Network Security

BBC012 Internet of Things

BBC013 Theory of Computation

BBC014 Cloud Computing

BBC015 Distributed DBMS

**BCA
THIRD YEAR SYLLABUS
SEMESTER-V**

BBC501: Artificial Intelligence & Machine Learning		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO1	Explain basic concepts, foundation areas, historical development, applications of Artificial intelligence and intelligent agents.	K ₂
CO2	Apply uniformed, informed and local search techniques for solving AI problems	K ₃
CO3	Understand, apply and analyze knowledge representation and reasoning techniques to create knowledge base of an intelligent machine.	K ₂
CO4	Identify fundamental concepts, types, issues and application areas of machine learning and data preprocessing.	K ₁
CO5	Apply and evaluate machine learning algorithms to solving real-world problems Introduction, types, components of learning process, issues, application areas and performance measurement criteria of learning algorithm.	K ₃
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Artificial Intelligence: Introduction, historical development, foundation areas, tasks and application areas. Intelligent Agents: Introduction, types and structure of intelligent agents. Computer Vision, Natural language processing.	08
II	Searching Techniques: Introduction, Problem solving by searching, Searching for solutions, Uniformed and Informed searching techniques. Local search algorithms, Adversarial search methods, Search techniques used in games, Alpha-Beta pruning.	08
III	Knowledge Representation and Reasoning: Propositional logic, Predicate logic, First order logic, Inference in first order logic, Clause form conversion, Resolution. Chaining: Concept, forward chaining and backward chaining, Utility theory and Probabilistic reasoning.	08
IV	Machine Learning: Introduction, types, components of learning process, issues, application areas and performance measurement criteria of learning algorithm, Data preprocessing, Data transformation, Scaling training and test data. Supervised Learning: Introduction, operations, types of learning algorithms, Regression, Classification algorithms – Decision tree, Support vector machine, K-Nearest Neighbors, Naïve Bayes.	08

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V	Unsupervised learning: Introduction, types, working, issues, application areas, clustering algorithms (K-means, Hierarchical), Association rule learning and dimensionality reduction. Reinforcement learning: Introduction, components, types, working, issues and application areas.	08
Suggested Readings: 1. Russell S. and Norvig P., “Artificial Intelligence – A Modern Approach”, Pearson Education. 2. Rich E. and Knight K., “Artificial Intelligence”, McGraw Hill Publications. 3. Charnik E. and McDermott D., “Introduction to Artificial Intelligence”, Pearson Education. 4. Patterson D. W., “Artificial Intelligence and Expert Systems”, PHI Publications. 5. Khemani D., “A First Course in Artificial Intelligence”, McGraw Hill. 6. Winston P. H., “Artificial Intelligence”, Pearson Education. 7. Mitchell T.M., “Machine Learning”, McGraw Hill. 8. Alpaydin E. “Introduction to Machine Learning”, MIT Press.		

BBC502: Python Programming		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO1	Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.	K1
CO2	Express proficiency in the handling of strings and functions	K2
CO3	Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets.	K3
CO4	Use OO concepts while programming in Python	K3
CO5	Work with Python using GUI.	K2
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction to Python: Introduction and Basics; Setting up path Python Data Variables & Operators: Data Variables and its types, id() and type() functions, Coding Standards; Control Structures: if-else, elif, Nested if, Iteration Control structures, Break, Continue & Pass, Loops, Python Classes and Objects.	08
II	String Manipulation: Accessing Strings, Basic Operations, String slices, Function and Methods. Lists: Introduction, Accessing list, Operations, Working with lists, Function and Methods. Tuple: Introduction, accessing tuples, Operations, Working, Functions and Methods.	08
III	Dictionaries: Introduction, accessing values in dictionaries, Working with dictionaries, Properties, Functions. Functions: Defining & Calling a function, Passing arguments to functions – Mutable & Immutable Data Types, Different types of arguments, Recursion, Scope of variables;	08
IV	Modules and Packages: User-defined modules and Standard Library: random, numpy, scipy, sys, Math Module, String Module, List Module, Date & Time Module, Regular Expressions: match, search, replace; Input-Output: Printing on screen, Reading data from keyboard, Opening and closing file, Reading and writing files, Functions.	08
V	Exception Handling: Exception, Exception Handling, Except clause, Try? finally clause, User Defined Exceptions. Basics of Python for Data Analysis, Introduction to series and data frames & Python	08

Suggested Readings:

1. Basin Harsh, "Python For Beginners", New Age International Publishers.
2. Ramalho Luciano, "Fluent Python", SPD.
3. Severance Charles, "Python For Everybody", SPD.
4. Brown Martin C., "The Complete Reference", Mc Graw Hill.
5. Kanetkar Yashavant, Kanetkar Aditya, "Let Us Python", Bpb.
6. Lutz Mark, "Learning Python", SPD.

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BBC503: Computer Networks		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand		
CO1	Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission.	K ₂
CO2	Apply channel allocation, framing, error and flow control techniques.	K ₂
CO3	Describe the functions of Network Layer i.e. Logical addressing, sub netting & Routing Mechanism.	K ₂
CO4	Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.	K ₃
CO5	Explain the functions offered by session and presentation layer and their Implementation. Explain the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, TELNET and VPN.	K ₃
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introductory Concepts: Goals and applications of networks, Categories of networks, Organization of the Internet, ISP, Network structure and architecture (layering principles, services, protocols and standards), The OSI reference model, TCP/IP protocol suite, Network devices and components. Physical Layer: Network topology design, Types of connections, Transmission media, Signal transmission and encoding, Network performance and transmission impairments, Switching techniques and multiplexing.	08
II	Data Link layer: Framing, Error Detection and Correction, Flow control (Elementary Data Link Protocols, Sliding Window protocols). Medium Access Control and Local Area Networks: Channel allocation, Multiple access protocols, LAN standards, Link layer switches & bridges (learning bridge and spanning tree algorithms).	08
III	Network Layer: Point-to-point networks, Logical addressing, Basic internetworking (IP, CIDR, ARP, RARP, DHCP, ICMP), Routing, forwarding and delivery, Static and dynamic routing, Routing algorithms and protocols, Congestion control algorithms, IPv6	08
IV	Transport Layer: Process-to-process delivery, Transport layer protocols (UDP and TCP), Multiplexing, Connection management, Flow control and retransmission, Window management, TCP Congestion control, Quality of service.	08
V	Application Layer: Domain Name System, World Wide Web and Hyper Text Transfer Protocol, Electronic mail, File Transfer Protocol, Remote login, Network management, Data compression, Cryptography – Basic concepts.	08

Suggested Readings:

1. Behrouz Forouzan, "Data Communication and Networking", McGraw Hill
2. Andrew Tanenbaum "Computer Networks", Prentice Hall.
3. William Stallings, "Data and Computer Communication", Pearson.
4. Kurose and Ross, "Computer Networking- A Top-Down Approach", Pearson.
5. Peterson and Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann
6. W. A. Shay, "Understanding Communications and Networks", Cengage Learning.
7. D. Comer, "Computer Networks and Internets", Pearson.
8. Behrouz Forouzan, "TCP/IP Protocol Suite", McGraw Hill

BBC504: Software Project Management		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand		
CO 1	Identify project planning objectives, along with various cost/effort estimation models.	K1
CO 2	Organize & schedule project activities to compute critical path for risk analysis	K3
CO 3	Monitor and control project activities.	K3
CO 4	Formulate testing objectives and test plan to ensure good software quality under SEI-CMM	K2
CO 5	Configure changes and manage risks using project management tools.	K2
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Project Evaluation and Project Planning: Importance of Software Project Management – Activities – Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.	08
II	Project Life Cycle and Effort Estimation: Software process and Process Models – Choice of Process models – Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points – COCOMO II – a Parametric Productivity Model.	08
III	Activity Planning and Risk Management: Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning –Risk Management – – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of Critical paths – Cost schedules.	08
IV	Project Management and Control: Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control Software Configuration Management – Managing contracts – Contract Management.	08
V	Staffing in Software Projects: Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.	08

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Suggested Readings:

1. Bob Hughes, Mike Cotterell and Rajib Mall: "Software Project Management" – Fifth Edition, McGraw Hill, New Delhi, 2012.
2. Robert K. Wysocki – "Effective Software Project Management" – Wiley Publication, 2011.
3. Walker Royce: – "Software Project Management" - Addison-Wesley, 1998.
4. Gopalaswamy Ramesh, – "Managing Global Software Projects" – McGraw Hill Education (India), Fourteenth Reprint 2013.
5. Koontz Harold & Weihrich Heinz, "Essentials of Management", McGraw Hill 5th Edition 2008.
6. Robbins and Coulter, "Management", Prentice Hall of India, 9th edition.
7. James A. F., Stoner, "Management", Pearson Education Delhi.
8. P. D. Chaturvedi, "Business Communication", Pearson Education.

Elective-1

BBC011: Cryptography & Network Security		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand		
CO 1	Understand various security attacks and their protection mechanism.	K ₂
CO 2	Apply and analyze various encryption algorithms.	K ₃
CO 3	Understand functions and algorithms to authenticate messages and study and apply different digital signature techniques.	K ₂
CO 4	Analyze different types of key distributions.	K ₃
CO 5	Study and appraise different IP and system security mechanism.	K ₁
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction to security attacks, Services and mechanism, Classical encryption techniques substitution ciphers and transposition ciphers, Cryptanalysis, Steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, Feistel structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, Block cipher modes of operations, Triple DES	08
II	Introduction to group, field, finite field of the form GF(p), Modular arithmetic, Prime and relative prime numbers, Extended Euclidean Algorithm, Advanced Encryption Standard (AES). Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem, Principals of public key crypto systems, RSA algorithm, Security of RSA	08
III	Message Authentication Codes: Authentication requirements, Authentication functions, Message authentication code, Hash functions, Birthday attacks, Security of hash functions, Secure hash algorithm (SHA). Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), Proof of digital signature algorithm.	08
IV	Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Authentication Applications: Kerberos Electronic mail security: pretty good privacy (PGP), S/MIME.	08
V	IP Security: Architecture, Authentication header, Encapsulating security payloads, Combining security associations, Key management. Introduction to Secure Socket Layer, Secure electronic transaction (SET). System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls and Network Security Tools.	08

Suggested Readings:

1. Stallings W., "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Frouzan B. A., "Cryptography and Network Security", McGraw Hill.
3. Kahate A., "Cryptography and Network Security", Tata McGraw Hill.

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BBC012: Internet of Things		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand		
CO 1	Demonstrate basic concepts, principles and challenges in IoT.	K ₁
CO 2	Illustrate functioning of hardware devices and sensors used for IoT.	K ₂
CO 3	Analyze network communication aspects and protocols used in IoT.	K ₃
CO 4	Apply IoT for developing real life applications using Arduinio programming.	K ₃
CP 5	To develop IoT infrastructure for popular applications	K ₃
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Internet of Things (IoT): Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, Sources of the IoT, M2M Communication, IoT Examples. Design Principles for Connected Devices: IoT/M2M systems layers and design standardization, communication technologies, data enrichment and consolidation, ease of designing and affordability	08
II	Hardware for IoT: Sensors, Digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology. Embedded Platforms for IoT: Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, NetArduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex.	08
III	Network & Communication aspects in IoT: Wireless Medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination	08
IV	Programming the Arduinio: Arduinio Platform Boards Anatomy, Arduinio IDE, coding, using emulator, using libraries, additions in arduinio, programming the arduinio for IoT.	08
V	Challenges in IoT Design challenges: Development Challenges, Security Challenges, Other challenges IoT Applications: Smart Metering, E-health, City Automation, Automotive Applications, home automation, smart cards, communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city.	08

Suggested Readings:

1. Olivier Hersent, David Boswarthick, Omar Elloumi "The Internet of Things key applications and protocols", Wiley
2. Jeeva Jose, Internet of Things, Khanna Publishing House
3. Michael Miller "The Internet of Things" by Pearson
4. Raj Kamal "INTERNET OF THINGS", McGraw-Hill, 1ST Edition, 2016
5. Arshdeep Bahga, Vijay Madisetti "Internet of Things (A hands on approach)" 1ST edition, VPI publications, 2014
6. Adrian McEwen, Hakin Cassimally "Designing the Internet of Things" Wiley India

BACHELOR OF COMPUTER APPLICATION (Three Year Course) BCA IIIrd Year

BBC013: Theory of Computation		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO1	Explain the fundamentals of automata theory and construct DFA, NFA, and regular expressions for regular languages	K ₂
CO2	Analyze regular languages using pumping lemma and design context-free grammars for context-free languages.	K ₄
CO3	Design pushdown automata and relate them with context-free grammars for solving language recognition problems.	K ₃
CO4	Explain Turing machines and evaluate computability and decidability of problems.	K ₂
CO5	Analyze computational complexity of algorithms and distinguish between tractable and intractable problems.	K ₄
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction to Automata and Regular Language: Mathematical preliminaries, Alphabets, Strings, Languages, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata.	08
II	Regular Expression Languages and Context-Free Grammars: Regular expression (RE), Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.	08
III	Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Pumping lemma for CFLs.	08
IV	Pushdown Automata and Context-Free Languages: Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.	08
V	Turing Machines and Computability: Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability,	08

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	Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory	
Suggested Readings: 1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education. 2. KLP Mishra and N. Chandrasekaran, "Theory of Computer Science: Automata, Languages and Computation", PHI Learning Private Limited, Delhi India. 3. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house. 4. YN Singh "Mathematical Foundation of Computer Science", New Age International. 5. Malviya, AK "Theory of Computation and Application", BPaperback Publications . 6. Papadimitrou, C. and Lewis, CL, "Elements of the Theory of Computation", Pearson Publication. 7. K. Krithivasan and R. Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Education. 8. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd. 9. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Learning. 10. Katuri Viswanath, "Introduction to Mathematical Computer Science, An" Universities Press.		

BACHELOR OF COMPUTER APPLICATION (Three Year Course) BCA IIIrd Year

BBC014: Cloud Computing		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand		
CO 1	Understand the concepts of Cloud Computing, key technologies, strengths and limitations of cloud computing.	K ₂
CO 2	Develop the ability to understand and use the architecture to compute and storage cloud, service and models.	K ₂
CO 3	Understand the application in cloud computing.	K ₂
CO 4	Learn the key and enabling technologies that help in the development of cloud.	K ₃
CO 5	Explain the core issues of cloud computing such as resource management and security.	K ₂
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction: Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed, History of Cloud Computing - Cloud Architecture - Types of Clouds - Business models around Clouds – Major Players in Cloud Computing-issues in Clouds - Eucalyptus - Nimbus - Open Nebula, CloudSim.	08
II	Cloud Services: Types of Cloud services: Software as a Service-Platform as a Service –Infrastructure as a Service - Database as a Service - Monitoring as a Service –Communication as services. Service providers-Google, Amazon, Microsoft Azure, IBM, Sales force.	08
III	Collaborating Using Cloud Services: Email Communication over the Cloud - CRM Management – Project Management-Event Management - Task Management – Calendar - Schedules - Word Processing – Presentation – Spreadsheet - Databases – Desktop - Social Networks and Groupware.	08
IV	Virtualization for Cloud: Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization –System VM, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - supervisors – Xen, KVM, VMware, Virtual Box, Hyper-V.	08
V	Security, Standards and Applications: Security in Clouds: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud. Hadoop – MapReduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine	08

Suggested Readings:

1. David E.Y. Sarna, "Implementing and Developing Cloud Application", CRC press 2011.
2. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011.
3. Anthony T Velte, Toby J Velte, Robert Elsenpeter, "Cloud Computing : A Practical Approach", Tata McGraw-Hill 2010.
4. Haley Beard, "Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs", Emereo Pty Limited, July 2008.
5. G. J. Popek, R.P. Goldberg, "Formal requirements for virtualizable third generation Architectures, Communications of the ACM", No.7 Vol.17, July 1974.

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BBC015: Distributed DBMS		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to:		
CO 1	Understand theoretical and practical aspects of distributed database systems.	K ₂
CO 2	Study and identify various issues related to the development of distributed database system	K ₃
CO 3	Understand the design aspects of object-oriented database system and related development	K ₂
CO 4	Equip students with principles and knowledge of distributed reliability.	K ₃
CO 5	Equip students with principles and knowledge of parallel and object-oriented databases.	K ₃
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction: Distributed Data Processing, Distributed Database System, Promises of DDBSs, Problem areas. Distributed DBMS Architecture: Architectural Models for Distributed DBMS, DDMBS Architecture. Distributed Database Design: Alternative Design Strategies, Distribution Design issues, Fragmentation, Allocation.	08
II	Query processing and decomposition: Query processing objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data. Distributed query Optimization: Query optimization, centralized query optimization, distributed query optimization algorithms.	08
III	Transaction Management: Definition, properties of transaction, types of transactions, distributed concurrency control: Serializability, concurrency control mechanisms & algorithms, time - stamped & optimistic concurrency control Algorithms, deadlock Management.	08
IV	Distributed DBMS Reliability: Reliability concepts and measures, fault- tolerance in distributed systems, failures in Distributed DBMS, local & distributed reliability protocols, site failures and network partitioning. Parallel Database Systems: Parallel database system architectures, parallel data placement, parallel query processing, load balancing, database clusters.	08
V	Distributed object Database Management Systems: Fundamental object concepts and models, object distributed design, architectural issues, object management, distributed object storage, object query Processing. Object Oriented Data Model: Inheritance, object identity, persistent programming languages, persistence of objects, comparison OODBMS and ORDBMS	08

Suggested Readings:

1. M. Tamer OZSU and Patuck Valduriez: Principles of Distributed Database Systems, Pearson Edn. Asia, 2001.
2. Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.
3. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: "Database Systems: TheComplete Book", Second Edition, Pearson International Edition

BBC551: Artificial Intelligence & Machine Learning Lab		
Course Outcome(CO)		Bloom's Knowledge Level(KL)
At the end of course, the student will be able to		
CO1	Demonstrate the working of different types of intelligent agents and apply AI problem solving techniques to solve problems	K ₂
CO2	Implement and analyze uninformed, informed and local search techniques for AI problem solving.	K ₃
CO3	Develop programs for knowledge representation and reasoning.	K ₃
CO4	Implement and analyze various supervised, unsupervised and reinforcement machine learning algorithms.	K ₃
CO5	Implement and evaluate data preprocessing and data transformation techniques	K ₃
Detailed Syllabus: 1. Program to demonstrate different types of intelligent agents. 2. Program to solve AI problems (4-3 water jug, 8 -puzzle, 4 queens, 8 queens). 3. Program to implement uninformed search algorithm (Breadth-first search, Depth-first search, Bidirectional, Uniform Cost). 4. Program to implement heuristic search algorithm (Hill climbing, Best-first search, A*, AO*). 5. Program to implement different game playing techniques. 6. Program to implement various knowledge representation techniques. 7. Program to implement chaining algorithm (forward, backward). 8. Program to implement Regression (linear, multi-linear, logistic). 9. Program to implement Classification algorithm (Decision tree, support vector machine, K-nearest neighbor, Naïve Bayes) 10. Program to implement clustering algorithm (k-means, Hierarchical) 11. Program to implement Association rule learning techniques. 12. Program to implement algorithm for Reinforcement learning. 13. Program to pre-process a real-world data set. 14. Program to import and explore a dataset and identify the missing / duplicate values. 15. Program to split a dataset into training and testing datasets.		
Note: The Instructor may add/delete/modify experiments, wherever he/she feels in a justified manner.		

**BCA
THIRD YEAR SYLLABUS
SEMESTER-VI**

BBC601: Cyber Security		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO1	Understand the fundamentals of information systems, information security, the CIA triad, cyber security concepts, information assurance, security risk analysis, and the various threats affecting information systems.	K ₁
CO2	Understand application security, data security practices, access control mechanisms, security technologies, and the identification and mitigation of common cyber security threats and network attacks.	K ₂
CO3	Understand the principles of secure e-commerce, electronic payment systems, digital signatures, cryptography, secure information system development, information security governance, risk management, security architecture, and the protection of hardware, data storage, and physical IT assets.	K ₂
CO4	Understand the importance of information security policies, the policy development and review process, different types of organizational security policies, and their application in corporate security through case studies.	K ₃
CO5	Understand information security standards, cyber laws, the provisions of the IT Act 2000, intellectual property rights, copyright, patents, software licensing, and legal issues related to cyber crimes and software piracy.	K ₂
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Introduction- Introduction to Information Systems, Types of Information Systems, Development of Information Systems, Introduction to Information Security and CIA triad, Need for Information Security, Threats to Information Systems, Information Assurance and Security Risk Analysis, Cyber Security.	08
II	Application Security- (Database, E-mail and Internet), Data Security Considerations (Backups, Archival Storage and Disposal of Data), Security Technology(Firewall , VPNs, Intrusion Detection System), Access Control. Security Threats -Viruses, Worms, Trojan Horse, Trapdoors, Spoofs, E-mail Viruses, Macro Viruses, Malicious Software, Network and Denial of Services Attack.	08
III	Introduction to E-Commerce, Threats to E-Commerce, Electronic Payment System, e- Cash, Credit/Debit Cards. Digital Signature, Cryptography Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management,	08

BACHELOR OF COMPUTER APPLICATION (Three Year Course) BCA IIIrd Year

	Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets - Access Control, CCTV, Backup Security Measures.	
IV	Security Policies - Why policies should be developed, Policy Review Process, Publication and Notification Requirement of policies, Types of policies – WWW policies, Email Security policies, Corporate Policies, Sample Security Policies. Case Study – Corporate Security	08
V	Information Security Standards -ISO, IT Act, Copyright Act, IPR. Cyber Crimes, Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law, Copy Right Law, Semiconductor Law and Patent Law, Software Piracy and Software License.	08
Suggested Readings: 1. Pfleeger C. P., Pfleeger S. L., "Analysing Computer Security", Pearson Education India. 2. Pachghare V.K., "Cryptography and information Security", PHI Learning Private Limited. 3. Goyal K. K. and Garg A. "Cyber Security", University Science Press. 4. Whitman M. E. and Mattord H. J, "Principle of Information Security" Cengage. 5. Chapple M. and Seidl D., "Cyberwarfare: Information operations in a connected world" Jones & Bartlett Learning. 6. Goyal K. K., Garg A. and Singhal S., "Cyber Security & Data Privacy", HP Hamilton. 7. Schou C.D. and Shoemaker D. P., "Information Assurance for the Enterprise", Tata McGraw Hill.		

BACHELOR OF COMPUTER APPLICATION (Three Year Course) BCA IIIrd Year

BBC602: Digital Marketing		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand		
CO1	Understanding the digital marketing concepts and its usefulness in business.	K ₁
CO2	Planning steps for digital marketing strategy and successfully executing it.	K ₂
CO3	Understand the importance of Social Media Platforms and Social Media Marketing for online communication.	K ₂
CO4	Applying Search Engine Optimization techniques (SEO) and Search Engine Marketing (SEM) to maximize reach and enhance engagement of users.	K ₃
CO5	Analyzing web using analytics tools and gaining insights to various tools for Social Media Marketing.	K ₄
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Digital Marketing Basics: Digital Marketing meaning and its importance, Traditional vs Digital Marketing, Benefits of Digital Marketing, Internet Marketing basics, Digital Marketing channels, Types of Business models, Digital Marketing strategies (P.O.E.M framework), Inbound and Outbound marketing, Digital Transformation model, 4Cs of Digital Marketing.	08
II	Social Media Marketing : Introduction to Social Media Marketing, Social Media marketing strategies, Overview of Social Media platforms — Instagram, Snapchat, Facebook, Mobile, Twitter, Content Planning and Strategy, Influential marketing, Content marketing, Digital Marketing campaign.	08
III	Search Engine Optimization (SEO): Introduction to SEO, On-Page and Off-Page Optimization, Role of Keywords in SEO, Organic vs Non-Organic SEO, Blogging as marketing strategy, Types of Blogs.	08
IV	Web Analytics: Meaning, Purpose and process, Types and Tools for analytics — Google analytics, Audience analytics, Acquisition analytics, Behavior analytics Conversion analytics.	08

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V	E-Commerce & Digital Trends E-Commerce: Introduction, fundamental concepts, and online payment gateways. Digital Innovation: Virtual reality, geo-location targeting, programmatic advertising, and privacy/security issues in digital marketing.	08
Suggested Readings: 1. Rajan Gupta, Supriya Madan, "Digital Marketing", BPB Publication, 1st edition, 2022. 2. Seema Gupta, "Digital Marketing", McGraw Hill, 2nd Edition, 2018. 3. Puneet Singh Bhatia, "Fundamentals of Digital Marketing", Pearson, 2nd edition, 2020. 4. Vandana Ahuja, "Digital Marketing", Oxford University Press, 8th Edition, 2019.		

BACHELOR OF COMPUTER APPLICATION (Three Year Course) BCA IIIrd Year

BBC603: Software Testing & Quality Assurance		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to understand		
CO1	Test the software by applying testing techniques to deliver a product free from bugs.	K ₃
CO2	Investigate the scenario and select the proper testing technique.	K ₁
CO3	Explore the test automation concepts and tools and estimation of cost, schedule based on standard metrics.	K ₂
CO4	Understand how to detect, classify, prevent and remove defects.	K ₂
CO5	Choose appropriate quality assurance models and develop quality. Ability to conduct formal inspections, record and evaluate results of inspections.	K ₃
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	Software Testing Basics: Testing as an engineering activity, Role of process in software quality, Testing as a process, Basic definitions, Software testing principles, The tester's role in a software development organization, Origins of defects, Defect classes, The defect repository and test design, Defect examples, Developer / Tester support for developing a defect repository.	08
II	Testing Techniques and Levels of Testing: Using White Box Approach to Test design- Static Testing Vs. Structural Testing, Code Functional Testing, Coverage and Control Flow Graphs, Using Black Box Approaches to Test Case Design, Random Testing, Requirements based testing, Decision tables, State-based testing, Cause-effect graphing, Error guessing, Compatibility testing, Levels of Testing -Unit Testing, Integration Testing, Defect Bash Elimination. System Testing - Usability and Accessibility Testing, Configuration Testing, Compatibility Testing.	08
III	Software Test Automation And Quality Metrics: Software Test Automation, Skills needed for Automation, Scope of Automation, Design and Architecture for Automation, Requirements for a Test Tool, Challenges in Automation Tracking the Bug, Debugging. Testing Software System Security - Six-Sigma, TQM - Complexity Metrics and Models, Quality Management Metrics, Availability Metrics, Defect Removal Effectiveness, FMEA, Quality Function Deployment, Taguchi Quality Loss Function, Cost of Quality.	08
IV	Fundamentals of Software Quality Assurance: SQA basics, Components of the Software Quality Assurance System, software quality in business context, planning for software quality assurance, product quality and process quality, software process models, 7 QC Tools and Modern Tools.	08

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V	Software Assurance Models: Models for Quality Assurance, ISO-9000 series, CMM, CMMI, Test Maturity Models, SPICE, Malcolm Baldrige Model- P- CMM. Software Quality Assurance Trends: Software Process- PSP and TSP, OO Methodology, Clean room software engineering, Defect Injection and prevention, Internal Auditing and Assessments, Inspections & Walkthroughs, Case Tools and their affect on Software Quality.	08
Suggested Readings: 1. Srinivasan Desikan, Gopalaswamy Ramesh, “Software Testing: Principles and Practices”, Pearson. 2. Daniel Galin, “Software Quality Assurance: From Theory to Implementation”, Pearson 3. Aditya P. Mathur, “Foundations of Software Testing”, Pearson. 4. Paul Ammann, Jeff Offutt, “Introduction to Software Testing”, Cambridge University Press. 5. Paul C. Jorgensen, “Software Testing: A Craftsman's Approach”, Auerbach Publications. 6. William Perry, “Effective Methods of Software Testing”, Wiley Publishing, Third Edition. 7. Renu Rajani, Pradeep Oak, “Software Testing – Effective Methods, Tools and Techniques”, Tata McGraw Hill. 8. Stephen Kan, “Metrics and Models in Software Quality”, Addison – Wesley, Second Edition. 9. S. A. Kelkar, “Software quality and Testing”, PHI Learning Pvt, Ltd. 10. Watts S Humphrey, “Managing the Software Process”, Pearson Education Inc.		