

Krantiguru Shyamji Krishna Verma Kachchh University



CURRICULAM AND CREDIT FRAMEWORK FOR BCA 3 YEARS AND 4 YEARS PROGRAMMES Semester 5 and 6 (Effective from 2025-26)

AS PER THE NEP 2020



BCA Course Outline with Subject Titles for Semester 5 (NEP 2020)

Semester	Course No.	Course Type	Name of the Subject	Theory/ Practical	Credits
5	501	BCAMJ501	Understanding the Operating Systems	Theory	4
	502	BCAMJ502	Advanced Database Management Systems	Theory	2
		BCAMJ502-P	Lab: MongoDB & NOSQL	Practical	2
	503	BCAMJ503-P	Lab: Mobile Application Development	Practical	4
	501	BCAMN501	Software Engineering	Theory	4
	502	BCAMN502	Operational Research	Theory	4
	501	SEC501-P	Lab: OS Commands & Scripts	Practical	2
Total Credits					22



BCA - Semester: V

Course Code:	BCAMJ501	Course Title:	Understanding the Operating Systems
Course Credits:	04	Hour of Teaching/Week:	08 Hrs
Internal Assessment Marks:	50	External Exam Marks:	50
Exam Duration	2 Hrs		

Unit	Contents
1	Introduction, Uses of OS, Functions of OS, Objective of OS, Types of OS, Example of OS. Batch Processing Operating System (BPOS), Features of BPOS, Working, Advantages and Disadvantages of BPOS, Multiprogramming OS, Features of Multiprogramming, Advantages and disadvantages of multiprogramming, Working of Multiprogramming OS, Time Sharing System, Advantages and disadvantages of Time Sharing Systems, Network Operating Systems, Real Time Operating Systems.
2.	Process Management: Introduction, Process Table and Process Control Block (PCB), Operations on Process, Process Schedulers in Operating Systems, Intern Process Communication, Context Switching in Operating System, Pre-emptive and Non-Pre-emptive Scheduling, CPU Scheduling and its Criteria, CPU Scheduling Algorithms: FCFS, SJF, LJF, Priority, RR. Process Synchronization, Test and set, WAIT and SIGNAL, Semaphores, Process Cooperation, Producer and Consumers, Readers, and Writers
3.	Deadlock and Deadlock Handling Methods: Introduction and Example, Conditions of Deadlock, Bankers' Algorithm, Deadlock detection in distributed systems, Handling Deadlocks, Deadlock Prevention and Avoidance, Deadlock detection and recovery, Deadlock ignorance, Recovery from deadlock.
4.	Memory Management in OS: Main Memory, Logical and Physical Address Space, Static and Dynamic Loading, Static and Dynamic Linking, Swapping, Logical Vs Physical Address Space, Contiguous Memory Space, Memory Allocation – First Fit, Best Fit and Worst Fit, Fragmentation – Internal and External, Paging and Page replacement algorithm. Paged memory allocation, Demand paging, Page replacement algorithms (FIFO, LRU), Paging, Segmentation, Virtual Memory
	<p>Reference Books:</p> <p>Understanding Operating Systems Ida M. Flynn/Ann Mciver Mchoes, Thomson Learning</p> <p>UNIX Concepts and applications, Sumitabha Das, 3rd Edition TMH</p>



BCA - Semester: V

Course Code:	BCAMJ502	Course Title:	Advanced Database Management Systems
Course Credits:	02	Hour of Teaching/Week:	2 Hrs
Internal Assessment Marks:	25	External Exam Marks:	25
Exam Duration	1 Hrs		

Unit	Content
1	<p>Parallel Database Distributed Database and ORDBMS: Architecture for Parallel Databases, Types of Distributed Databases, Distributed DBMS Architecture, Storing Data in a Distributed DBMS. ORDBMS: Structured Data Types, Operations on Structured Data, Objects, Inheritance, Object oriented versus Object relational database.</p> <p>Transaction Processing Concepts, Transaction and System Concepts, Desirable Properties of a Transaction, Schedules and Recoverability, Serializability of Schedules, Transaction Support in SQL, Recovery Techniques, Database Backup, Concurrency control, locking techniques for Concurrency Control, Concurrency Control Techniques, Granularity of Data Items</p>
2	<p>NoSQL: Introduction(What is it?, Where It is Used, Types of NoSQL databases, Why NoSQL?, Advantages of NoSQL, Use of NoSQL in Industry, SQL vs NoSQL, NewSQL)</p> <p>MongoDB: Introduction (What is MongoDB, Why MongoDB, using JSON to MongoDB key features, Core Server tools, MongoDB through the JavaScript's Shell, Creating and Querying through Indexes, DocumentOriented, principles of schema design, Constructing queries on Databases, collections and Documents , MongoDB Query Language.</p>
	<p>Reference Name:</p> <p>1 Ramakrishnan, Raghu, Johannes Gehrke, and Johannes Gehrke, Database management systems, Vol. 3, McGraw-Hill, 2003.</p> <p>2. An Introduction to Database System by Bipin Desai</p>



BCA - Semester: V

Course Code:	BCAMJ502-P	Course Title:	Lab: Advanced Database Management Systems
Course Credits:	02	Hour of Teaching/Week:	2 Hrs
Internal Assessment Marks:	25	External Exam Marks:	25
Exam Duration	1 Hrs		

Unit	Content
1	Introduction and Types of NoSQL Databases, Introduction and Installation of MongoDB, Connecting to MongoDB, Data modeling in MongoDB
2	MongoDB Shell Commands / Queries: View all databases, Create new database, Drop existing database, View current database, Switch over to a given database, db.help(), Display statistics of a given database, Display current version of MongoDB Server, Display list of collections in current database, Create Collection, Drop Collection, CRUD operations (Create, Read, Update, Delete), Insert, Update else insert, save, update, remove, Find, Dealing with Using NULL Values, Count, Limit, Sort, Skip, Arrays and Array Operations, Aggregate
	<p>Reference Name:</p> <p>1 MongoDB: The Definitive Guide, Kristina Chodorow and Shannon Bradshaw</p> <p>2. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pramod J. Sadalage and Martin Fowler</p>



BCA - Semester: V

Course Code:	BCAMJ503-P	Course Title:	Lab: Mobile Application Development
Course Credits:	04	Hour of Teaching/Week:	4 Hrs
Internal Assessment Marks:	50	External Exam Marks:	50
Exam Duration	2 Hrs		

Unit	Contents
1	Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, building you First Android application, Understanding Anatomy of Android Application, Android Manifest file
2.	Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.
3.	Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation. Testing Android applications, Publishing Android Application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.
4.	Using Common Android APIs: Using Android Data and Storage APIs, Managing data using SQLite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Darcey, L. and Conder, S., Android Wireless Application Development, Pearson Education, 2nd ed. (2011). 2. Meier, R., Professional Android 2 Application Development, Wiley India Pvt Ltd. 3. Murphy, M. L., Beginning Android, Wiley India Pvt Ltd. 4. Burd, B., Android Application Development All in one for Dummies, Edition: I.

**** Student can develop a project in a group of maximum 3 students.**



BCA - Semester: V

Course Code:	BCAMN501	Course Title:	Software Engineering
Course Credits:	04	Hour of Teaching/Week:	4 Hrs
Internal Assessment Marks:	50	External Exam Marks:	50
Exam Duration	2 Hrs		

Unit	Contents
1	Introduction to Software Engineering: Definitions - Size Factors - Quality and Productivity Factors Planning a Software Project: Defining the Problem - Goals and Requirements - Solution Strategy Planning the Development Process: Various Models - Planning an Organizational Structure - Planning Activities
2.	Software cost estimation: Introduction - Software Cost Factors - Software Cost Estimation Techniques - Starting Level estimation - Estimating Software Maintenance Costs Software Requirements Definition - Software Requirements Specification - Specification Techniques - Languages and Processors for Requirements.
3.	Software design - Design concepts - Modules and Modularization Criteria - Design Notations - Design Techniques - Design Considerations - Real Time and Distributed System Design - Test Plans - Milestones, Walkthroughs, and Inspections - Design Guidelines Implementation Issues: Structure Loading Techniques - Coding Style - Standards and Guidelines - Documentation Guidelines
4.	Modern programming Language Features - Type Checking - Separate Compilation - User Defined Data Types - Data Abstraction - Scoping Rules - Exception Handling - Currency Mechanism Verification and Validation Techniques - Quality Assurance - States Analysis - Symbolic Excretion
	Reference Books: Software Engineering Concepts 1997 Edition Author: RICHARD FAIRLEY Publishers: TATA Mc GRAW-Hill Edition. Software Engineering VI Edition, Author: ROGER S. PRESSMAN Publishers TATA McGRAW - HILL International Edition



BCA - Semester: V

Course Code:	BCAMN502	Course Title:	Operational Research
Course Credits:	04	Hour of Teaching/Week:	4 Hrs
Internal Assessment Marks:	50	External Exam Marks:	50
Exam Duration	2 Hrs		

Unit	Contents
1	Linear Programming Model Mathematical Formulation Graphical Solution of linear programming models Simplex method Artificial variable Techniques
2.	Transportation and Assignment Model Mathematical formulation of transportation problem Methods for finding initial basic feasible solution optimum solution Degeneracy Mathematical formulation of assignment models Hungarian Algorithm, Feasibility of Hungarian Algorithm Variants of the Assignment problem
3.	Scheduling by PERT and CPM Network Construction – Critical Path Method – Project Evaluation and Review Technique – Resource Analysis in Network Scheduling
4.	Sequencing and Simulation Two Machine Problem Three Machine Problem Simulation and related numerical Importance of Simulation in Computer Science
	Reference Books: Taha H.A., “Operations Research: An Introduction “8th Edition, Pearson Education, 2008. John W. Chinneck “Feasibility and Infeasibility in Optimization Algorithms and Computational Methods’ Springer, 2008



BCA - Semester: V

Course Code:	BCASEC501-P	Course Title:	Lab: Operating System Commands & Scripts
Course Credits:	02	Hour of Teaching/Week:	2 Hrs
Internal Assessment Marks:	25	External Exam Marks:	25
Exam Duration	1 Hrs		

Unit	Contents
1	<p>Locating commands, Internal and external commands, Command structure.</p> <p>List of Commands: man, cal, date, echo, printf, bc, script, passwd, who, uname, tty</p> <p>The parent-child relationship, Absolute and relative path names, The HOME variable, file attributes, compressing and archiving files, ls, pwd, mkdir, cd, rmdir, cat, cp, rm, mv, more, file, wc, od, cpm, comm., diff, gzip, gunzip, tar, zip and unzip, chmod, ln, unmask, find</p>
2.	<p>Working with Bourne shell and Bash shell.</p> <p>Working with Files in linux using shell scripts.</p> <p>Writing Shell scripts to demonstrate programming functionalities available in scripts.</p> <p>Wild-card, Redirection, Pipes and tee.</p>



BCA Course Outline with Subject Titles for Semester 6 (NEP 2020)

Semester	Course No.	Course Type	Name of the Subject	Theory/ Practical	Credits
6	601	BCAMJ601	An Introduction to the cryptography	Theory	4
	602	BCAMJ602 BCAMJ602-P	Advanced Python Lab: Advanced Python	Theory Practical	2 2
	603	BCAMJ603	Web Services	Theory	2
		BCAMJ603-P	Lab: Web Services	Practical	2
	601	BCAMN601	Software Testing	Theory	4
	602	BCAMN602	Industrial Project	Project/Viva	4
	601	SEC	To be chosen from Commerce & Arts Basket		2
Total Credits					22



BCA - Semester: VI

Course Code:	BCAMJ601	Course Title:	An Introduction to the cryptography
Course Credits:	04	Hour of Teaching/Week:	4 Hrs
Internal Assessment Marks:	50	External Exam Marks:	50
Exam Duration	2 Hrs		

Unit	Contents
1	Introduction to security attacks - services and mechanism - introduction to cryptography -Conventional Encryption: Conventional encryption model - classical encryption techniques -substitution ciphers and transposition ciphers – cryptanalysis – steganography - stream and block ciphers - Modern Block Ciphers: Block ciphers principals - Shannon’s theory of confusion and diffusion - fiestal structure - data encryption standard (DES) - strength of DES – differentialand linear cryptanalysis of DES - block cipher modes of operations - triple DES – AES.
2.	Confidentiality using conventional encryption - traffic confidentiality - key distribution – randomnumber generation - Introduction to graph - ring and field - prime and relatively prime numbers -modular arithmetic - Fermat’s and Euler’s theorem - primality testing - Euclid’s Algorithm -Chinese Remainder theorem - discrete algorithms.
3.	Principles of public key crypto systems - RSA algorithm - security of RSA - key management –Difflle-Hellman key exchange algorithm - introductory idea of Elliptic curve cryptography –Elgamal encryption - Message Authentication and Hash Function: Authentication requirements -authentication functions - message authentication code - hash functions - birthday attacks –security of hash functions and MACS.
4.	MD5 message digest algorithm - Secure hash algorithm (SHA) Digital Signatures: DigitalSignatures - authentication protocols - digital signature standards (DSS) - proof of digitalsignature algorithm - Authentication Applications: Kerberos and X.509 - directory authenticationservice - electronic mail security-pretty good privacy (PGP) - S/MIME.
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. William Stallings, “Cryptography and Network security Principles and Practices”, Pearson/PHI. 2. Wade Trappe, Lawrence C Washington, “ Introduction to Cryptography with coding theory”, Pearson 1. W. Mao, “Modern Cryptography – Theory and Practice”, Pearson Education. 2. Charles P. Pfleeger, Shari Lawrence Pfleeger Security in computing – Prentice Hall of India.



BCA - Semester: VI

Course Code:	BCAMJ602	Course Title:	Advanced Python
Course Credits:	02	Hour of Teaching/Week:	2 Hrs
Internal Assessment Marks:	25	External Exam Marks:	25
Exam Duration	1 Hrs		

Unit	Contents
1	<p>File Handling: File Types; Operations on Files– Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator.</p> <p>GU Interface: The tkinter Module; Window and Widgets; Layout Management- pack, grid and place.</p> <p>Python SQLite: The SQLite3 module; SQLite Methods- connect, cursor, execute, close; Connect to Database; Create Table; Operations on Tables Insert, Select, Update. Delete and Drop Records.</p>
2.	<p>Data Analysis: NumPy- Introduction to NumPy, Array Creation using NumPy, Operations on Arrays; Pandas- Introduction to Pandas, Series and DataFrames, Creating DataFrames from Excel Sheet and .csv file, Dictionary and Tuples. Operations on DataFrames.</p> <p>Data Visualization: Introduction to Data Visualization; Using Matplotlib Library for Data Visualization; Different Types of Charts using Pyplot- Line chart, Bar chart and Histogram and Pie chart.</p>
	<p>References:</p> <ol style="list-style-type: none"> 1. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, Green Tea Press. Freely available online @ https://www.greenteapress.com/thinkpython/thinkCSpy.pdf, 2015. 2. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019. 3. Python Data Analytics: Data Analysis and Science Using Pandas, matplotlib, and the Python Programming Language, Fabio Nelli, Apress®, 2015 4. Advance Core Python Programming, Meenu Kohli, BPB Publications, 2021. 5. Core PYTHON Applications Programming, Wesley J. Chun, 3rd Edition, Prentice Hall, 2012. 6. Automate the Boring Stuff, Al Sweigart, No Starch Press, Inc, 2015. 7. Data Structures and Program Design Using Python, D Malhotra et al., Mercury Learning and Information LLC, 2021. 8. http://www.ibiblio.org/g2swap/byteofpython/read/ 9. https://docs.python.org/3/tutorial/index.html

BCA - Semester: VI

Course Code:	BCAMJ602-P	Course Title:	Lab: Advanced Python
Course Credits:	02	Hour of Teaching/Week:	2 Hrs
Internal Assessment Marks:	25	External Exam Marks:	25
Exam Duration	1 Hrs		

Unit	Contents
1	1. Read and write into a file 2. Create SQLite Database and Perform Operations on Tables 3. Create a GUI using Tkinter module 4. Demonstrate Exceptions in Python
2.	5. Demonstrate Exceptions in Python 6. Drawing Line chart and Bar chart using Matplotlib 7. Drawing Histogram and Pie chart using Matplotlib 8. Create Array using Num Py and Perform Operations on Array 9. Create Data Frame from Excel sheet using Pandas and Perform Operations on Data Frames



BCA - Semester: VI

Course Code:	BCAMJ603	Course Title:	Web Services
Course Credits:	02	Hour of Teaching/Week:	2 Hrs
Internal Assessment Marks:	25	External Exam Marks:	25
Exam Duration	1 Hrs		

Unit	Contents
1	<p>Web Services basic : What are Web Services? Types of Web Services Distributed computing infrastructure, overview of XML, SOAP, building Web Services with JAX-WS, Registering and Discovering Web Services, Service oriented Architecture, Web Services Development Life Cycle, Developing and consuming simple Web Services across platform.</p> <p>Introducing HTTP, The core architectural elements of a RESTful system, Description and discovery of RESTful web services, Java tools and frameworks for building RESTful web services, JSON message format and tools and frameworks around JSON.</p>
2.	<p>Introduction to Cloud Computing; Characteristics and benefits of cloud computing; Historical developments and evolution of cloud computing.</p> <p>Cloud Computing Architecture; Service models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS); Deployment models: Public, Private, Hybrid, Community; IaaS: Introduction to IaaS, Resource Virtualization i.e. Server, Storage and Network virtualization; PaaS: Introduction to PaaS, Cloud platform & Management of Computation and Storage; SaaS: Introduction to SaaS, Cloud Services, Web services, Web 2.0, Web OS; Case studies related to IaaS, PaaS and SaaS.</p>
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. R. Buyya, C. Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing, McGraw Hill Education. 2. B.Sosinsky, Cloud Computing Bible, Wiley. 3. K. Hwang, G. C. Fox, J. Dongarra, Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, Morgan Kaufmann 4. Web Services : principles and Technology, Michael P. Papazoglou, Pearson Education Limited, 2008. 5. RESTful Java Services, Jobinesh Purushothaman. PACKT Publishing, 2nd Edition, 2015.



BCA - Semester: VI

Course Code:	BCAMJ603-P	Course Title:	Lab: Web Services
Course Credits:	02	Hour of Teaching/Week:	2 Hrs
Internal Assessment Marks:	25	External Exam Marks:	25
Exam Duration	1 Hrs		

Unit	Contents
1 & 2	<ol style="list-style-type: none">1. XML Scripts2. Developing and consuming simple Web Services across platform.3. Build RESTful Web Services with JAX-RS APIs4. Basic WCF Programming.5. Incorporating AWS in a Website.



BCA - Semester: VI

Course Code:	BCAMN601	Course Title:	Software Testing
Course Credits:	04	Hour of Teaching/Week:	4 Hrs
Internal Assessment Marks:	50	External Exam Marks:	50
Exam Duration	2 Hrs		

Unit	Contents
1	Introduction: Software Testing, Importance of testing, Roles and Responsibilities, Testing Principles, Attributes of Good Test, V-Model, Test Case Generation , SDLC Vs STLC, Software Testing Life Cycle-in detail.
2.	Testing Techniques Using White Box Approach to Test design, Static Testing Vs. Structural Testing, Code Functional Testing, Using Black Box Approaches to Test Case Design, Random Testing, Requirements based testing, Decision tables, Statebased testing, Error guessing, Compatibility testing, Levels of Testing, Unit Testing, Integration Testing, Defect Bash Elimination. System Testing, Usability and Accessibility Testing, Configuration Testing, Compatibility Testing.
3.	Test Automation Selecting and Installing Software Testing Tools, 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, Case study using Bug Tracking Tool
4.	Software Testing and Quality Matrices 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. Case Study for Complexity and Object, Oriented Metrics
	Reference Books: William Perry, “Effective Methods of Software Testing”, Third Edition, Wiley Publishing. Srinivasan Desikan and Gopalaswamy Ramesh, “Software Testing – Principles and Practices”, Pearson Education,



BCA - Semester: VI

Course Code:	BCAMN602	Course Title:	Industrial Project
Course Credits:	04	Hour of Teaching/Week:	4 Hrs
Internal Assessment Marks:	50	External Exam Marks:	50
Exam Duration	2 Hrs		

Unit	Contents
	<p>The project definition should be initiated during the summer break after semester V examination.</p> <ul style="list-style-type: none"> <input type="checkbox"/> “Shodh Yatras” to industries will help achieving this first major step. <input type="checkbox"/> Definition should ideally reflect current trends of IT industry and it should have a high application potential. <input type="checkbox"/> A “Letter of Acceptance” from the company must be obtained and submitted to the college/department by the student. <input type="checkbox"/> Team size for the project can consist of maximum 03 (three) students. <input type="checkbox"/> Project plan along with division of work amongst teammates would have been prepared and got certified by the head of the college within a maximum of 10 (ten) days of the start of the project. <input type="checkbox"/> Student must not pay any fee whatsoever to the company where he/she is selected for project. <input type="checkbox"/> Internal guides must devote the time allocated as per the time table to guide the students for the project the time allocation will be in accordance with the scheme for 6th semester project as given. <input type="checkbox"/> Coding standards should be followed meticulously. At the minimum, the code should be self-documented, modular, and should use the meaningful naming convention. <input type="checkbox"/> Database design is mandatory. At least portions of code (preferably full code) are mandatory. Student may be asked to write the code related to the project during examination. <input type="checkbox"/> A report should be prepared for the project work which should be duly signed by the internal project guide and head of the college/department. It should also include a “Certificate of Completion” from the company. <input type="checkbox"/> The report should be printed in colour and or greyscale and should be properly bound in spiral or hard cover. <input type="checkbox"/> A copy as specified above must be submitted at the time of external examination.



