
Osmania University

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Faculty of Informatics

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# Bachelor of Computer Applications (BCA)
# Semester III and IV
# 2020 – 2021

## AICTE
Scheme of Instruction
and
Syllabi

Osmania University
Hyderabad

## PROPOSED SCHEME OF INSTRUCTION
## BACHELOR OF COMPUTER APPLICATIONS (BCA)
## SEMESTER- III

| SNo | Course Code | Course Title | Cate-gory | Hours/ Week | | No of Credits | Scheme of Examination | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Max Marks | | Duration (hrs) |
| **THEORY** | | | | **L** | **P** | | **SEE** | **CIE** | **SEE** |
| **1** | BSC301 | Applied Mathematics | **BSC** | **4** | **-** | **4** | **70** | **30** | **3** |
| **2** | PCC302 | Java Programming | **PCC** | **4** | **-** | **4** | **70** | **30** | **3** |
| **3** | MC303 | Environmental Science | **MC** | **4** | **-** | **4** | **70** | **30** | **3** |
| **4** | PCC304 | Operating System Concepts | **PCC** | **4** | **-** | **4** | **70** | **30** | **3** |
| **5** | PCC305 | Database Design | **PCC** | **4** | **-** | **4** | **70** | **30** | **3** |
| **PRACTICALS** | | | | | | | | | |
| **6** | LCC351 | Java Programming Lab | **LCC** | **-** | **4** | **2** | **50** | **25** | **3** |
| **7** | LCC352 | Operating System Concepts Lab | **LCC** | **-** | **4** | **2** | **50** | **25** | **3** |
| **8** | LCC353 | Database Design Lab | **LCC** | **-** | **4** | **2** | **50** | **25** | **3** |
| | | | **Total** | **20** | **12** | **26** | **500** | **225** | **-** |

| Abbreviation | Full Form | Abbreviation | Full Form |
|---|---|---|---|
| BSC | Basic Science Course | LTC | Laboratory Technological Course |
| PCC | Professional Core Course | LPC | Laboratory Professional Course |
| ETC | Emerging Technological Course | LHC | Laboratory Humanities Course |
| HSC | Humanities and Social Science Course | CIE | Continuous Internal Evaluation |
| MGC | Management Course | SEE | Semester End Evaluation |
| PEC | Professional Elective Course | L | Lecture |
| LCC | Laboratory Core Course | P | Practical |

| BCA SEM III – THEORY | | | Hours /week | | | Scheme of Examination | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MaxMarks | | Duration(hrs) | |
| Course Code | Course Title | Cate-gory | L | P | Cre-dits | SEE | CIE | SEE | CIE |
| **BSC301** | **Applied Mathematics** | **BSC** | **4** | **-** | **4** | **70** | **30** | **3** | **1** |

**Unit- I**

Partial Differentiation: Introduction - Functions of two variables - Neighborhood of a point (a, b) - Continuity of a Function of two variables, Continuity at a point - Limit of a Function of two variables - Partial Derivatives - Homogeneous Functions.

**Unit- II**

Theorem on Total Differentials - Composite Functions - Differentiation of Composite Functions - Implicit Functions - Maxima and Minima of functions of two variables – Lagrange's Method of undetermined multipliers.

**Unit- III**

Linear Equations in Linear Algebra – Systems of Linear Equations – Consistent and Inconsistent Systems; Solution sets of Linear Systems – trivial and Non trivial Solutions; Linear Independence – Linear Independence of Matrix Columns and Characterization of Linearly Dependent sets.

**Unit- IV**

Vector spaces and Subspaces, Linearly independent sets; bases.

Eigenvalues and Eigenvectors - The Characteristic Equation.

**Unit- V**

Diagonalization – Diagonalizing Matrices with distinct eigen values and non distinct eigen values; Applications to Differential Equations.

**References:**

• David C Lay, Linear Algebra and its Applications 4e
• S Lang, Introduction to Linear Algebra
• Gilbert Strang , Linear Algebra and its Applications
• Shanti Narayan, P.K. Mittal Differential Calculus, S.CHAND, NEW DELHI
• Shanti Narayan Integral Calculus, S.CHAND, NEW DELHI

| BCA SEM III – THEORY | | | Hours /week | | | Scheme of Examination | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MaxMarks | | Duration(hrs) | |
| Course Code | Course Title | Cate-gory | L | P | Cre-dits | SEE | CIE | SEE | CIE |
| **PCC302** | **Java Programming** | **PCC** | **4** | **-** | **4** | **70** | **30** | **3** | **1** |

**Unit-I**

**Introduction to Java:** Java History – Features of java, how java differ from C and C++, Introduction to JDK and JRE, Java Primitive Types, Basic Operators, Conditional and Logical statements, Some Typical Differences Between C and Java.
**Defining Classes:** Adding Instance Fields and Methods, Constructors, Access Modifiers (Visibility Modes), Object Creation Examples, Method Overloading and Constructor Overloading, use of static and final keywords, Objects as parameters, Difference between local variable and instance field, Introduction to Object class, How to read user input (from keyboard).

**Unit-II**

**Arrays, Strings in Java:** How to create and define arrays, Introduction to java.util.Array class, Difference between String &StringBuffer classes, StringTokenizer class and Wrapper classes and conversion between Objects and primitives
**Inheritance, Interfaces and Packages in Java:** Defining super / sub classes, Abstract classes, Method overriding, Interfaces, Using Library Interfaces, Comparable and Comparator, Creating and Defining packages.
**Inner classes in Java:** Types of inner classes, Creating static / non-static inner classes, Local and anonymous inner classes.

**Unit-III**

**Exception Handling in Java:** What are exceptions, writing your own exception classes, try, catch, throw, throws clauses, Difference between checked vs unchecked Exceptions, Error Vs. Exception.
**Multithreading in Java:** Thread and its Life cycle, how to create threads, Thread class in java, use of synchronized keyword, how to avoid deadlock.

**Unit-IV**

**GUI Design & Event Handling:** Component, Container, Color, GUI Controls, Layout Managers, Introduction to Swings, Events, Listeners, Icon interface, Writing GUI Based applications, Applets, Running Applets.

**Unit-V**

**File Handling:** Stream classes, Reader and Writer classes, File and Directory class
**Generics and Frameworks:** Generics, Collections Framework, Collection interfaces

and classes ArrayList, LinkedList, Vector.

**Suggested Reading**

1. Herbert Schildt: "Java™: The Complete Reference Java", Eighth Edition, Tata McGraw Hill Publications, 2011, ISBN: 9781259002465.

| BCA SEM III – THEORY | | | Hours /week | | | Scheme of Examination | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MaxMarks | | Duration(hrs) | |
| Course Code | Course Title | Cate-gory | L | P | Cre-dits | SEE | CIE | SEE | CIE |
| **MC303** | **Environmental Science** | **MC** | **4** | **-** | **4** | **70** | **30** | **3** | **1** |

**Unit I**

**Environmental Studies:** Definition, scope and importance, need for public awareness. **Natural resources:** Water resources; use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams: benefits and problems. Effects of modern agriculture, fertilizer- pesticide problems, water logging and salinity.

**Unit II**

**Ecosystems:** Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in ecosystem, food chains, ecological pyramids, aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries).
**Energy resources:** Growing energy needs, renewable and non-renewable energy sources. Land Resources, land as a resource, land degradation, soil erosion and desertification.

**Unit III**

**Biodiversity:** Genetic species and ecosystem diversity, bio-geographical classification of India. Value of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

**Unit IV**

**Environmental Pollution:** Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution; solid and liquid waste management.
**Environment Protection Act:** Air, water, forest and wild life Acts, enforcement of environmental legislation.

**Unit V**

**Social Issues and the Environment:** Water conservation, watershed management, and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion.
**Environmental Disaster Management:** Types of disasters, impact of disasters on environment, infrastructure, and development. Basic principles of disaster mitigation, disaster management, and methodology. Disaster management cycle, and disaster management in India.

**Suggested Readings**

1. A.K. De, Environmental Chemistry, Wiley Eastern Ltd.

2. E.P. Odum, Fundamentals of Ecology, W.B. Sunders Co., USA.
3. M.N. Rao and A.K. Datta , Waste Water Treatment, Oxford and IBK Publications.
4. Benny Joseph, Environmental Studies, Tata McGraw Hill, 2005.
5. V.K. Sharma, Disaster Management, National Centre for Disaster Management, IIPE,1999.
6. Green Building Council of India, Teri Document.

| BCA SEM III – THEORY | | | Hours /week | | | Scheme of Examination | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MaxMarks | | Duration(hrs) | |
| Course Code | Course Title | Cate-gory | L | P | Cre-dits | SEE | CIE | SEE | CIE |
| **PCC304** | **Operating System Concepts** | **PCC** | **4** | **-** | **4** | **70** | **30** | **3** | **1** |

**Unit I**

**Introduction:** Definition of Operating System, Computer-System Organization, Computer-System Architecture, Operating-System Structure, Operating **System Structures**: Operating- System Services, System Calls, Types of System Calls. **Process:** Process Concept, Process Scheduling, Operations on Processes, Inter process Communication, **Threads:** Overview, Multi core Programming, Multithreading Models, Threading Issues. **CPU Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms

**Unit II**

**Process Synchronization:** Background, The Critical-Section Problem, Peterson'sSolution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors.

**Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

**Unit III**

**Main Memory:** Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table.

**Virtual Memory:** Background, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files, Mass-Storage Structure, Overview of Mass- Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Formatting, RAID Structure

**Unit IV**

**File-System Interface:** File Concept, Access Methods, Directory and Disk Structure, Protection.

**File-System Implementation:** File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance.

**I/O Systems:** Overview, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Hardware Operations.

**Unit V**

**Protection:** Goals of Protection, Principles of Protection, Domain of Protection Access Matrix, Implementation of the Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems.

**Security:** The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication.

**Suggested Readings**


1. Abraham Silberschatz, Peter Galvin, Greg Gagne, "Operating System Concepts", Ninth Edition, John wiley and sons publication, 2013.
2. A.Tanenbaum,"Modern Operation Systems", Third Edition, Pearson Education, 2008.
3. William Stallings, "Operating Systems", Fifth Edition, Pearson Education, 2005.
4. Ida M.Flynn, "Understanding Operating Systems", Sixth Edition, Cengage, 2011.
5. D.M.Dhamdhere,"Operating systems a concept based approach", Second Edition, McGraw-Hill, 2007

| BCA SEM III – THEORY | | | Hours /week | | | Scheme of Examination | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MaxMarks | | Duration(hrs) | |
| Course Code | Course Title | Cate-gory | L | P | Cre-dits | SEE | CIE | SEE | CIE |
| **PCC305** | **Database Design** | **PCC** | **4** | **-** | **4** | **70** | **30** | **3** | **1** |

**Unit I**

**Database Environment** - concepts and definitions, traditional file processing systems, database approach, range of database applications, advantages, costs and risks, components. Database Development process - IS development, three schema Architecture, Database Analysis - E-R Model - Entities, attributes, Relationships, degree and cardinality - case studies

**Unit II**

**Enhanced E-R model** - super type, sub type, specialization and generalization, constraints, disjointness, subtype discriminator, super type /subtype hierarchies, business rules, scope classification, structural constraints operational constraints, case study. Relational model
- Definitions, integrity constraints, transforming EER diagrams into relations, normalization - normal forms, merging relations, case study.

**Unit III**

**Relational Algebra and Calculus:** Preliminaries, Relational Algebra, Relational Calculus, Expressive Power of Algebra and Calculus.
**SQL**: Queries, Constraints, Triggers: The Form of Basic SQL Query, Set Operators, Nested Queries, Aggregate Operators, Procedures and functions, Triggers

**Unit IV**

**Overview of Storage and Indexing:** File Organizations and Indexing, Index Data Structures, Comparison of File Organizations.
**Tree-Structured Indexing**: Indexed Sequential Access Method (ISAM), B+ Trees, Search, Insert Delete, B+ Trees in Practice.
**Hash-Based Indexing**: Static Hashing, Extendible Hashing, Linear Hashing, Extendible versus Linear Hashing.

**Unit V**

**Transaction Management:** ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control.
**Concurrency Control:** 2PL, Serializability, and Recoverability, Introduction to Lock Management, Dealing with Deadlock

**Suggested Readings**


1. Fred R Me Fadden. Jeffrey A Hoffer, Mary B Prescott - Modern Database Management, Fifth edition. Addition Wesly 1999 ( Unit-1,2)
2. Raghu Ramakrishnan, Johannes Gehrke, "*Database Management Systems*", Third Edition, McGraw Hill, 2003.(Unit-3,4,5)
3. Abraham Silberschatz, Henry F Korth, S Sudharshan, "*Database System Concepts*", Sixth Edition, McGraw-Hill International Edition, 2011

| BCA SEM III – Laboratory | | | Hours /week | | | Scheme of Examination | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MaxMarks | | Duration(hrs) | |
| Course Code | Course Title | Cate-gory | L | P | Cre-dits | SEE | CIE | SEE | CIE |
| **LCC351** | **Java Programming Lab** | **LCC** | **-** | **4** | **2** | **50** | **25** | **3** | **2** |

1. Programs on if-else, if-else-if
2. Program on switch
3. Program on while
4. Program on for loop
5. Program on do-while
6. Program to demonstrate class concept.
7. Program to demonstrate methods
8. Program to demonstrate method overloading
9. Program to demonstrate constructors
10. Program to demonstrate constructor overloading
11. Program to demonstrate an Array
12. Program to demonstrate multidimensional array
13. Program to demonstrate Strings
14. Program to demonstrate inheritance
15. Program to demonstrate method overriding
16. Program to demonstrate abstract class
17. Program to demonstrate reading console input
18. Program to demonstrate interfaces
19. Program to demonstrate packages
20. Program to demonstrate exceptional handling
21. Program to demonstrate creating a thread by extending Thread class
22. Program to demonstrate creating a thread by implementing Runnable interface
23. Program to demonstrate AWT controls
24. Program to demonstrate Layout Manager
25. Program to demonstrate Events
26. Program to demonstrate applets

| BCA SEM III – Laboratory | | | Hours /week | | | Scheme of Examination | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MaxMarks | | Duration(hrs) | |
| Course Code | Course Title | Cate-gory | L | P | Cre-dits | SEE | CIE | SEE | CIE |
| **LCC352** | **Operating System Concepts Lab** | **LCC** | **-** | **4** | **2** | **50** | **25** | **3** | **2** |

**OS Lab practical programs**

1. Process System Calls
2. IO System Calls
3. IPC using Pipe Processing
4. First Come First Serve Scheduling
5. Shortest job first Scheduling
6. Priority Scheduling
7. Round Robin Scheduling
8. Simulate Page Replacement Algorithms FIFO
9. Simulate Page Replacement Algorithms LRU
10. Simulate Page Replacement Algorithms OPTIMAL

| BCA SEM III – Laboratory | | | Hours /week | | | Scheme of Examination | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MaxMarks | | Duration(hrs) | |
| Course Code | Course Title | Cate-gory | L | P | Cre-dits | SEE | CIE | SEE | CIE |
| **LCC353** | **Database Design Lab** | **LCC** | **-** | **4** | **2** | **50** | **25** | **3** | **2** |

1. Create command for creating a table using primary key
2. Alter command for altering the column name and datatype of a column in the table
3. Alter command to add new column to the existing table
4. Alter command to modify the existing name of the column in the table
5. Drop command of the table
6. Truncate command for the table
7. Insert command for storing the records in the database table
8. Update command for updating a particular record by using where clause
9. Delete command for removing a particular record from the table
10. Select command for selecting data from the table
11. Select command for selecting the specific data from the data by using where clause and select distinct statement
12. Select command for selecting the records by using ORDER BY clause ASC
13. Select command for selecting the records by using ORDER BY clause DESC
14. SQL Built in functions (MIN. MAX, COUNT, AVG, SUM)
15. SQL Query to perform AND Operator and OR Operator
16. SQL Query to perform GROUPBY Clause
17. SQL Query to perform HAVING Clause
18. SQL l Queries to perform integrity constraints
19. SQL Query to perform SQL BETWEEN Operator
20. Joins – Equi Join, Non-Equi Join, Outer Join and Self Join
21. Stored Procedures
22. Triggers

## PROPOSED SCHEME OF INSTRUCTION
## BACHELOR OF COMPUTER APPLICATIONS (BCA)
## SEMESTER- IV

| SNo | Course Code | Course Title | Cate-gory | Hours/ Week | | No of Credits | Scheme of Examination | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Max Marks | | Duration (hrs) |
| **THEORY** | | | | **L** | **P** | | **SEE** | **CIE** | **SEE** |
| **1** | ETC401 | Distributed and Cloud Computing | **ETC** | **4** | **-** | **4** | **70** | **30** | **3** |
| **2** | PCC402 | Network Security | **PCC** | **4** | **-** | **4** | **70** | **30** | **3** |
| **3** | PCC403 | Software Engineering | **PCC** | **4** | **-** | **4** | **70** | **30** | **3** |
| **4** | ETC404 | Data Science using Python | **ETC** | **4** | **-** | **4** | **70** | **30** | **3** |
| **5** | ETC405 | Artificial Intelligence | **ETC** | **4** | **-** | **4** | **70** | **30** | **3** |
| **PRACTICALS** | | | | | | | | | |
| **6** | LTC451 | Data Science using Python Lab | **LTC** | **-** | **4** | **2** | **50** | **25** | **3** |
| **7** | LCC452 | Software Engineering Lab | **LCC** | **-** | **4** | **2** | **50** | **25** | **3** |
| **8** | LCC453 | Computer Networks Lab | **LCC** | **-** | **4** | **2** | **50** | **25** | **3** |
| | | | **Total** | **20** | **10** | **26** | **500** | **225** | **-** |

| Abbreviation | Full Form | Abbreviation | Full Form |
|---|---|---|---|
| BSC | Basic Science Course | LTC | Laboratory Technological Course |
| PCC | Professional Core Course | LPC | Laboratory Professional Course |
| ETC | Emerging Technological Course | LHC | Laboratory Humanities Course |
| HSC | Humanities and Social Science Course | CIE | Continuous Internal Evaluation |
| MGC | Management Course | SEE | Semester End Evaluation |
| PEC | Professional Elective Course | L | Lecture |
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| BCA SEM IV – THEORY | | | Hours /week | | | Scheme of Examination | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MaxMarks | | Duration(hrs) | |
| Course Code | Course Title | Cate-gory | L | P | Cre-dits | SEE | CIE | SEE | CIE |
| **ETC401** | **Distributed and Cloud Computing** | **ETC** | **4** | **-** | **4** | **70** | **30** | **3** | **1** |

**Unit I**

Examples of Distributed Systems–Trends in Distributed Systems – Focus on resource sharing – Challenges. Case study: World Wide Web.
System Model – Inter process Communication – the API for internet protocols – External data representation and Multicast communication.

**Unit II**

Network virtualization: Overlay networks. Case study: MPI Remote Method Invocation and Objects: Remote Invocation – Introduction – Request-reply protocols – Remote procedure call – Remote method invocation.
Case study: Java RMI – Group communication – Publish-subscribe systems – Message queues – Shared memory approaches – Distributed objects – Case study: Enterprise Java Beans -from objects to components.

**Unit III**

Introduction to Cloud Computing: Cloud Computing in a Nutshell, System Models for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles of Cloud Computing, Challenges and Risks, Service Models.

**Unit IV**

Virtual Machines and Virtualization of Clusters and Data Centers: Levels of Virtualization, Virtualization Structures Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization Data-Center Automation. Case studies: Xen Virtual machine monitors- Xen API. VMware - VMware products-Vmware Features.

**Unit V**

Cloud computing architectures over Virtualized Data Centers: Data-Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, GAE, AWS, Azure, Inter-cloud Resource Management.

**Suggested Readings**


1. Pradeep K Sinha, “Distributed Operating Systems: Concepts and Design”, Prentice Hall of India, 2007.
2. Tanenbaum A.S., Van Steen M., “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007.
3. John W. Rittinghouse, "Cloud Computing: Implementation, Management, and Security ". James F. Ransome, CRC Press 2009.
4. Kai Hwang. Geoffrey C.Fox, Jack J. Dongarra, “Distributed and Cloud Computing From Parallel Processing to the Internet of Things”, Elsevier, 2012.
5. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski,” Cloud Computing: Principles and Paradigms (Wiley Series on Parallel and Distributed Computing), Wiley Publishing ©2011

| BCA SEM IV – THEORY | | | Hours /week | | | Scheme of Examination | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MaxMarks | | Duration(hrs) | |
| Course Code | Course Title | Cate-gory | L | P | Cre-dits | SEE | CIE | SEE | CIE |
| **PCC402** | **Network Security** | **PCC** | **4** | **-** | **4** | **70** | **30** | **3** | **1** |

**UNIT-I**

Cryptography Terminology, Stenography, Subscription ciphers, onetime patios,
Cryptographic Protocols-Introduction using Symmetric Cryptography , one-way Hash Functions , communication using public -key cryptography and hybrid cryptosystems, Digital Signatures, Digital Signatures with encryption, Random and pseudo random sequence generation,
Basic protocols- key Exchange, authentication and key exchange, formal analysis,
secret splitting, secret sharing, cryptographic protection of databases.

**UNIT-II**

Intermediate protocols-Time stamping, sublimal channel, Signatures, Bit commitment, fair coin flops, mental poker, key Escrow.
Advanced Protocols-Zero Knowledge proofs, Blind signatures, identity based Public-key cryptography obvious transfer, simultaneous contract signing ,Digital certified main, simultaneous exchange of secrets.
Esoteric Protocols-Secret Elections, secure multiparty computation, anonymous Message Broadcast Digital cash.

**UNIT-III**

Key Length-symmetric key length, public key length
Key Management Generation transfer, verification use, Store Backup, life time, destruction, public key management.
Algorithm types and modes-Electronic codebook, Black replay, Cipher Block clouding, Stream Ciphers, self synchronizing,cipher-feedback,synchronous stream, output feedback ,counter mode, choosing cipher mode, comparison
Using Algorithms-choosing an algorithm, public key versus symmetric encrypting and communication channels. Encrypting data for storage hardware encryption versus software Encryption

**UNIT-IV**

Information theory, complexly theory, number theory, factoring, prime number generation
DBS –Background ,Description ,security of DES, Differential and linear crypto analysis, DB vacancy, pseudo random sequence generators, linear congruential, Linear feed back shift register stream ciphers, Design and analysis, Stream Cipher using LFSRs

**UNIT-V**

One way hash functions, Background, MDS, SHA
Public-key Algorithms-Backgrounders'
Digital Signature Algorithm
Diffie helman algorithm for key exchange
Implementation Examples-IBM, ISDN, Kerberos, ISO authentication framework, PBM PKC DEPS

**Suggested Reading**:

1. Bruce Schneier-Applied Cryptography, Wiley 2001.
2. William Stallings –Cryptography and Network Security, PH

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| | | | | | | MaxMarks | | Duration(hrs) | |
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| **PCC403** | **Software Engineering** | **PCC** | **4** | **-** | **4** | **70** | **30** | **3** | **1** |

**Unit I**

Software Engineering – Introduction, Program Versus Software, Software Engineering, Software Development Process and its Stages, Generic Software Development Process Models, Code of Ethics and Professional Practice, Software Development and Maintenance Cost Breakup.
Requirement Engineering Processes – Requirement Engineering Process, Feasibility Study, Cost and Benefit Analysis.

**Unit II**

Requirement Specification, Characteristics of a Good Requirement and Validation Techniques, Requirements Management Planning, Process of Requirement Change Management.
Software Requirement Specifications – Introduction, Stakeholder Analysis, Software Requirements Document, IEEE Standard of Software Requirement Specifications, Organizing Functional Requirements, Traceability and Validation of Specifications.

**Unit III**

Architectural Styles – Introduction, Architecture Styles, Object Oriented Architecture, Inter-organizational Communication, Cloud Computing Architecture Style, Core, Configurable and Customizable Architecture, Design Models, Architectural Design Principles.
Object Oriented System Analysis – Introduction, Object Oriented Design, Object Oriented Design Models, Object Oriented Analysis, Data Modeling, Comparison Between Top Down Structured and Object Oriented Analysis, Description of Logical and Static Modeling, Identification of Class Relationships.

**Unit IV**

Object Oriented Design Using UML – Introduction, Sequence Diagram, State Machine Diagram, Timing Diagram, Describing Detailed Object Oriented Design, Decision Tree and Decision Table, Composite Structure Diagram, Generating Test Cases, Moving Towards Physical Design, Structured Methods.
Software Development – Introduction, Good Coding Practices, Code Reuse, Design Pattern, Generator Based Reuse, Application/Software Developed on Product Lines Approach, Component Based Software Engineering, Agile Methods.

**Unit V**

Verification, Validation and Software Testing – Introduction, Software Verification and Validation Process, Software Testing, System Testing, Object Oriented Testing Strategy, Test Cases, Equivalence Partitioning (Black Box Testing), Art of Debugging.
Measurement and Metrics for Assessing Software Quality – Introduction, ISO 9126 Quality Standards, Quality Management Models, Ways to Build Quality in Software, Software Quality Control and Metrics, Defect Density Metrics, Chidamber and Kemerer Metric Suites for Object Oriented System, Class Coupling Metric-Coupling Between Objects, Monitoring Dynamic Quality Attributes (Visible Externally) of a Software

**Suggested Readings**


1. Rajesh Narang, Software Engineering: Principles and Practices
2. Ian Sommerville, Software Engineering
3. R. Mall, Fundamentals of Software Engineering
4. Pankaj Jalote, An Integrated Approach to Software Engineering
5. Frank Tsui, Orlando Karam, Barbara Bernal, Essentials of Software Engineering
6. Roger S Pressman, B R Maxim, Software Engineering – A Practitioner's Approach
7. Grady Booch, The Unified Modeling Language User Guide

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| **ETC404** | **Data Science using Python** | **ETC** | **4** | **-** | **4** | **70** | **30** | **3** | **1** |

**Unit I**

Introduction to data science – Introduction to data science, Data Science Components, Data Science Process, Data Science Jobs Roles, Tools for Data Science, Difference between Data Science with BI (Business Intelligence), Applications of Data science, Challenges of Datascience Technology.

Data analysis – Introduction to data analysis, Data Analysis Tools, Types of Data Analysis: Techniques and Methods, Data Analysis Process

Introduction to Python, Python features, Python Interpreter, modes of Python Interpreter, Values and Data types, Variables, Key words, Identifiers, Statements.

**Unit II**

Expressions, Input & Output, Comments, Lines & Indentation, Quotations, Tuple assignment, Operators, Precedence of operators.

Functions: Definition and use, Types of functions, Flow of execution, Parameters and Arguments, Modules.

Conditionals: Conditional(if), Alternative(if-else), Chained Conditionals(if-elif-else), Nested conditionals; Iteration/Control statements: while, for, break, continue, pass; fruitful function vs void function, Parameters/Arguments, Return values, Variables scope(local, global), Function composition.

**Unit III**

Strings: Strings, String slices, Immutability, String functions & Methods, String module; List as array: Array, Methods of array.

Lists: List operations, List slices, List methods, List loops, Mutability, aliasing, Cloning list, List parameters; Tuple: Benefit of Tuple, Operations on Tuple, Tuple methods, Tuple assignment, Tuple as return value, Tuple as argument; Dictionaries: Operations on Dictionary, methods in Dictionary, Difference between List, Tuple and Dictionary; Advanced List processing: List comprehension, Nested List.

**Unit IV**

Introduction to Numpy – The basics of numpy array, computation on numpy arrays, aggregations, computations on arrays, comparisons, masks and Boolean logic, fancy indexing, sorting arrays, structured data.

**Unit V**

Data Manipulation with Pandas – Introducing pandas objects, data indexing and selection, operating on data in pandas, handling missing data, hierarchical indexing, combining datasets, aggregation and grouping

**Suggested Readings**


1. Allen B Downey, "Think Python: How to think like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.
2. Guido van Rossum and Fred L.Drake Jr, - An Introduction to Python - Revised and Updated for Python 3.2, Network Theory Ltd 2011.
3. Grus, Joel. Data science from scratch: first principles with python. O'Reilly Media, 2019.

| BCA SEM IV – THEORY | | | Hours /week | | | Scheme of Examination | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MaxMarks | | Duration(hrs) | |
| Course Code | Course Title | Cate-gory | L | P | Cre-dits | SEE | CIE | SEE | CIE |
| **ETC405** | **Artificial Intelligence** | **ETC** | **4** | **-** | **4** | **70** | **30** | **3** | **1** |

**Unit I**

Introduction & Problem Solving: AI problems, AI Technique, Defining problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics. Heuristic Search Techniques: Generate – and – test, Hill Climbing, Best – First Search, Problem Reduction, Constraint Satisfaction, Means-ends Analysis.

**Unit II**

Game Playing: Overview, Min-Max search Procedure, Adding Alpha-beta Cutoffs, Additional Refinements, Iterative Deepening. Knowledge Representation Issues: Approaches, Issues, Frame Problem, Using Predicate Logic: Representing simple facts in logic, Representing Instance and ISA Relationships, Computable Functions and predicates, Resolution, Natural Deduction.

**Unit III**

Uncertainty and Reasoning Techniques:Non monotonic reasoning, Logics for Non monotonic reasoning, Implementation issues, Augmenting a problem solver, implementation of Depth First Search and Breadth first search. Statistical reasoning:Probability and Bayes theorem, Certainty factors and Rule-based systems, Bayesian Networks, Dempster-Shafer Theory.

**Unit IV**

Learning: What is Learning, Rote learning, Learning by taking advice, Learning in problem solving, learning from examples: Induction, Learning by Decision trees. Expert System: Representing and Using Domain Knowledge, Expert systems shells, Explanation, Knowledge Acquisition.

**Unit V**

Perception and Action: Real Time Search, Vision, Speech Recognition, ACTION: Navigation, Manipulation, Robot architectures. Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Statistical NLP, Spell Checking.

**Suggested Readings**

1. Elaine Rich, Kevin Night, Shivashankar B Nair,“Artificial Intelligence”,3rd Edition.,2008
2. Russell Norvig,“Artificial Intelligence-Modern Approach”, 3 rd edition,2009.

3. SarojKaushik, “Artificial Intelligence”, Cengage Learning India, 2012.
4. Nelson M. Mattos ,“An Approach to Knowledge Base Management”, Springer Berli

| BCA SEM IV – Laboratory | | | Hours /week | | | Scheme of Examination | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MaxMarks | | Duration(hrs) | |
| Course Code | Course Title | Cate-gory | L | P | Cre-dits | SEE | CIE | SEE | CIE |
| **LTC451** | **Data Science using Python Lab** | **LTC** | **-** | **4** | **2** | **50** | **25** | **3** | **2** |

**Python**

1. Write a program to demonstrate different numbers data types in python.
2. Write a python program to design simple calculator using functions.
3. Write a python program to check whether a given number is Armstrong number or not.
4. Write a python program to generate prime numbers between different intervals.
5. Write a python program to find factorial of a number using recursion.
6. Write a python program to check whether a string is palindrome or not.
7. Write a python program to count the number of characters present in a word.
8. Write a python program to create, append and remove lists.
9. Write a program to demonstrate working with tuples in python.
10. Write a program to demonstrate dictionaries in python.

**Numpy**

11. Python program to demonstrate basic array characteristics
12. Python program to demonstrate array creation techniques
13. Python program to demonstrate indexing in numpy
14. Python program to demonstrate basic operations on single array
15. Python program to demonstrate unary operators in numpy

**Pandas**

16. Python code demonstrate to make a Pandas DataFrame with two-dimensional list
17. Python code demonstrate creating DataFrame from dictionary of narray and lists
18. Python code demonstrate creating a Pandas dataframe using list of tuples
19. Python code demonstrate how to iterate over rows in Pandas Dataframe
20. Python code demonstrate how to get column names in Pandas dataframe

| BCA SEM IV – Laboratory | | | Hours /week | | | Scheme of Examination | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MaxMarks | | Duration(hrs) | |
| Course Code | Course Title | Cate-gory | L | P | Cre-dits | SEE | CIE | SEE | CIE |
| **LCC452** | **Software Engineering Lab** | **LCC** | **-** | **4** | **2** | **50** | **25** | **3** | **2** |

**Case Studies**

1. Banking System
2. Hotel management system
3. Inventory Control System
4. Library management system
5. Railway Reservation System

**Choose any two of above case studies and do the following exercises for that case studies**

1. Write the complete problem statement
2. Write the software requirements specification document
3. Draw the entity relationship diagram
4. Draw the data flow diagrams
5. Draw use case diagrams
6. Draw activity diagrams for all use cases
7. Draw sequence diagrams for all use cases
8. Draw collaboration diagram
9. Assign objects in sequence diagrams to classes and make class diagram.

**Note**

To draw dataflow diagrams using Microsoft Visio Software, SmartDraw, etc…

1. To draw UML diagrams using Rational Rose Software, StarUML, etc...

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|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MaxMarks | | Duration(hrs) | |
| Course Code | Course Title | Cate-gory | L | P | Cre-dits | SEE | CIE | SEE | CIE |
| **LCC453** | **Computer Networks Lab** | **LCC** | **-** | **4** | **2** | **50** | **25** | **3** | **2** |

**Networking concepts demonstration**

1. Demonstrations of IP address and ports in computer system.
2. Explanation of settings in network connections
3. Testing of networking connectivity using ping, tracepath
4. Checking network statistics with netstat
5. Demonstration of static and dynamic IP address settings
6. Understanding ethernet cabling and switched networks
7. Comprehension of routers and firewalls
8. Significance of DNS

**Network programming**

1. Implement IPC using a) Pipes b) FIFO
2. Implement file transfer using Message Queue form of IPC
3. Design TCP iterative Client and server application to reverse the given input sentence
4. Design TCP concurrent Client and server application to reverse the given input sentence
5. Design TCP client and server application to transfer file
6. Design UDP Client and server application to reverse the given input sentence
7. Design UDP Client and server application to reverse the given input sentence
8. Design UDP Client server to transfer a file

**Suggested Reading**

1. Advance UNIX Programming Richard Stevens, Second Edition Pearson Education
2. Advance UNIX Programming, N.B. Venkateswarlu, BS Publication.