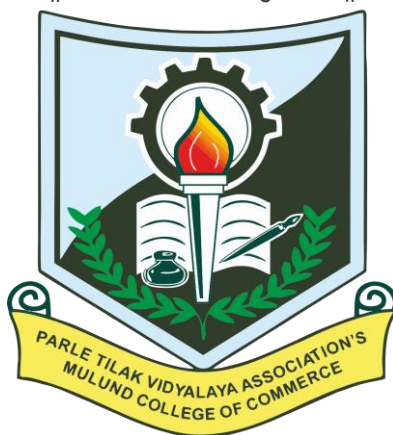Parle Tilak Vidyalaya Association's

# MULUND COLLEGE OF COMMERCE (AUTONOMOUS)

|| आ नो भद्रा: क्रतवो यन्तु विश्वत: ||



# Syllabus for S.Y. B.Sc.(C.A)

# Programme: B.Sc.(Computer Applications)
# Code:

**BASED ON LEARNING OUTCOME CURRICULUM FRAMEWORK (LOCF) and NEP**

# Semester III & IV

with effect from the academic year

# 2024 – 2025

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**S. Y. B.C.A Syllabus 2024 - 2025**

| Semester – III | | | |
|---|---|---|---|
| **Course Code** | **Course Type** | **Course Title** | **Credits** |
| MCCSCT113 | Major | Python Programming | 4 |
| MCCSCT220 | Major | Embedded Systems | 4 |
| MCCSCT214 | Major | Design and analysis of algorithm | 4 |
| MCCMATH106 | Minor | Numerical Methods | 2 |
| MCCBAF222 | GE/OE | Advanced Tally | 2 |
| MCCFM110 | (Choose any one) | Personal Finance Management | |
| MCCSCT221 | SEC | Linux Operating System | 4 |
| MCCLANG203 | | Hindi Lekhan Kaushal | |
| MCCLANG202 | AEC | Marathi Lekhan Kaushalya | 2 |
| MCCLANG204 | | Sanskrit Parichayah | |
| | | **Total Credits** | **22** |

GE / OE: General Elective / Open Elective

AEC: Ability Enhancement Course

SEC: Skill Enhancement Course

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# Contents

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# SEMESTER III

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# MCCSCT113 Python Programming

| B. Sc. (Computer Applications) | | Semester – III | | |
|---|---|---|---|---|
| **Course Name: Python Programming** | | **Course Code: MCCSCT113** | | |
| **Vertical:** | | **Major** | | |
| **Periods per week (1 Period is 60 minutes)** | | **03** | | |
| **Practical per week (1 Period is 60 minutes)** | | **02** | | |
| **Credits** | | **04** | | |
| **Evaluation System** | | **Duration (in Hours)** | **Total Marks** | **Minimum Passing Marks** |
| **Theory** | **Continuous Internal Assessment** | -- | 40 | 16 |
| | **End Semester Examination** | 2 | 60 | 24 |
| **Practical** | **Continuous Internal Assessment** | -- | 20 | 8 |
| | **End Semester Examination** | 2 | 30 | 12 |

**Course Objectives:**

1. Students will have a foundational understanding of Python programming, including language features, installation, debugging techniques, and basic programming constructs.
2. Students will be proficient in utilizing functions, strings, and modules in Python programming for developing simple applications.
3. Students will have a comprehensive understanding of advanced Python operations, including working with lists, tuples, dictionaries, files, exceptions, and basic object-oriented programming concepts.
4. Students will be proficient in utilizing advanced Python operations for data manipulation, file handling, exception handling, and object-oriented programming.
5. Students will have an advanced understanding of Python programming, including regular expressions, multithreaded programming, creating GUI forms, and interacting with databases, and Students will be proficient in developing advanced Python applications, including creating GUI forms with various widgets and layout management, and storing and retrieving data from MySQL databases using PyQt.

| Module | Name | Lectures |
|---|---|---|
| **I** | **Basics of Python** | **9** |
| **II** | **More Python Operations** | **9** |
| **III** | **Mastering Python: Working with Files, Handling Exceptions, and Understanding Object-Oriented Programming** | **9** |
| **IV** | **Advanced Python** | **9** |
| **V** | **A Hands-On Guide to Connecting, Storing, and Manipulating Data** | **9** |
| | **Total** | **45** |

| **R- Remember, U- Understand, A – Apply, AN- Analyze, EV- Evaluate, CR - Create** |
|---|

| Unit | Syllabus | Level of Knowledge Applicable as per Blooms Taxonomy |
|---|---|---|
| I | **Basics of Python**<br>**A**) **Introduction:** The Python Programming Language, features, Installing Python, Running Python program, Debugging: Syntax Errors, Runtime Errors, Semantic Errors, Experimental Debugging, Formal and Natural Languages, The Difference Between Brackets, Braces, and Parentheses,<br><br>**B**) **Basics of Python**: Values and Types, Variables, Variable Names and Keywords, Type conversion, Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations., Conditional Statements, Looping, Control statements.<br>**C**) **Functions and Strings:** Function Calls, Definitions and Uses, Flow of Execution, Parameters and Arguments, Stack Diagrams, Fruitful Functions and Void Functions, String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparison, String Operations, Importing module, Creating and exploring modules | A) U, A, AN<br><br><br><br><br>B) U, A, AN<br><br><br><br>C) U, A, AN |
| II | **More Python Operations**<br>**A) Lists, Tuples and Dictionaries:** Values and Accessing Elements, Lists are mutable, traversing a List, Deleting elements from List, Built-in List Operators, Concatenation, Repetition, In Operator, Built-in List functions and methods ,Tuples, Accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable-length argument tuples, Basic tuples operations, Concatenation, Repetition, in Operator, Iteration, Built-in Tuple Functions ,Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys, Operations in Dictionary, Built-In Dictionary Functions, Built-in Dictionary Methods. | A) U, A, AN, CR |
| III | **Mastering Python: Working with Files, Handling Exceptions, and Understanding Object-Oriented Programming**<br>**A) Files and Exceptions:** Text Files, The File Object Attributes, Directories, Built-in Exceptions, Handling Exceptions, Exception with Arguments, User-defined Exceptions.<br>**B) Classes and Objects:** Overview of OOP (Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding | A) U, A, AN, CR<br><br><br>B) U, A, AN, CR |

| IV | **Advanced Python** <br> **A) Regular Expressions**: Concept of regular expression, various types of regular expressions, using match function. <br> **B) Multithreaded Programming**: Thread Module, creating a thread, synchronizing threads, multithreaded priority queue <br> **C) Creating the GUI Form and Adding Widgets and Layout Management:** Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, text, Toplevel, Spinbox, Paned Window, LabelFrame, tkMessagebox., Handling Standard attributes and Properties of Widgets, Designing GUI applications with proper Layout Management features. | **A) U, A, AN** <br><br> **B) U, A, AN** <br><br> **C) U, A, AN, CR** |
|---|---|---|
| V | **A Hands-On Guide to Connecting, Storing, and Manipulating Data** <br> **A) Storing Data in Our MySQL Database using PyQt:** Connecting to a MySQL database from Python, Configuring the MySQL connection, Designing the Python GUI database, Using the INSERT command, Using the UPDATE command, Using the DELETE command, Storing and retrieving data from MySQL database. | **A) U, A, AN, CR** |

| List of Practical: | Level of Knowledge Applicable as per Blooms Taxonomy |
|---|---|
| 1. Programs on Python Basics | U, A, CR |
| | |
| 2. Programs on Functions | U, A, CR |
| | |
| 3. Programs on Strings | U, A, CR |
| | |
| 4. Programs on List and tuples | U, A, CR |
| | |
| 5. Programs on dictionary | U, A, CR |
| | |
| 6. Programs on File handling | U, A, CR |
| | |
| 7. Programs on Modules | U, A, CR |
| | |
| 8. Programs on Classes and objects | U, A, CR |
| | |
| 9. Programs on Tkinter Widgets | U, A, CR |
| | |

| 10. | Programs on GUI and database. | U, A, CR |
|-----|-------------------------------|----------|

**Learning Outcomes: After Completion of Course, the learners will be able to**

1. Recall and explain the features of the Python programming language, including its syntax, runtime behavior, and debugging methodologies.

2. Apply their knowledge of functions and strings in Python programming, including function calls, definitions, parameters, arguments, and string manipulation techniques.

3. Recall and explain the properties and operations associated with lists, tuples, and dictionaries in Python, including accessing elements, traversing, deleting, and updating elements.

4. Apply their knowledge of advanced Python operations, including lists, tuples, dictionaries, files, exceptions, and classes, to solve programming problems and develop applications.

5. Recall and explain the concepts of regular expressions in Python, including the types of regular expressions and their usage with the match function, Apply their knowledge of GUI programming in Python, including adding widgets, managing layouts, and handling standard attributes and properties of widgets, to design GUI applications with proper layout management features.

**Books & References:**

1. Balagurusamy, E. (2016). Introduction to problem solving with Python (1st ed.). TMH.

2. Downey, A. (2012). Think Python (1st ed.). O'Reilly.

3. Montojo, J., Campbell, J., & Gries, P. (2014). An introduction to computer science using Python 3 (1st ed.). SPD.

4. Goldwasser, M. H., & Letscher, D. (2008). Object-oriented programming in Python (1st ed.). Pearson Prentice Hall.

5. Budd, T. (2016). Exploring Python (1st ed.). TMH.

6. Zelle, J. M. (2010). Python programming: An introduction to computer science (2nd ed.). Franklin, Beedle & Associates.

**Percentage of 6 categories of Blooms Taxonomy in question paper**

|                    | Remember | Understand | Apply | Analyze | Evaluate | Create |      |
|--------------------|----------|------------|-------|---------|----------|--------|------|
| % in Question Paper | 20       | 20         | 20    | 20      | -        | 20     | 100% |

# MCCSCT220 Embedded Systems

| B. Sc. (Computer Applications) | | Semester – III | | |
|---|---|---|---|---|
| **Course Name: Embedded Systems** | | **Course Code: MCCSCT220** | | |
| **Vertical:** | | **Major** | | |
| **Periods per week (1 Period is 60 minutes)** | | **03** | | |
| **Practical per week (1 Period is 60 minutes)** | | **02** | | |
| **Credits** | | **04** | | |
| **Evaluation System** | | **Duration (in Hours)** | **Total Marks** | **Minimum Passing Marks** |
| **Theory** | Continuous Internal Assessment | -- | 40 | 16 |
| | End Semester Examination | 2 | 60 | 24 |
| **Practical** | Continuous Internal Assessment | -- | 20 | 8 |
| | End Semester Examination | 2 | 30 | 12 |

**Objectives of the Course:**

1. Understand the architecture, memory organization, addressing modes, and instruction set of PIC microcontrollers.
2. Gain an advanced understanding of ARM controllers, including their features, architecture, memory organization, addressing modes, and the ARM Programmer's model.
3. Understand the basics of Arduino, including its variants, installation of drivers, and use of the Arduino IDE and master basic Arduino functions such as digital I/O, analog I/O, advanced I/O, timers, communication, and interrupts.
4. Learn to integrate a wide range of sensors with Arduino for various applications, including light, temperature, humidity, motion, gas, sound, and vibration sensing.
5. Apply the knowledge gained in the course to develop case studies such as an air quality monitor, a fire-fighting robot, and an intelligent lock system using Arduino.

| Module | Name | Lectures |
|---|---|---|
| **I** | **Basics of Embedded Systems** | **09** |
| **II** | **Communication Protocols: Theory and Practice** | **09** |
| **III** | **Arduino Essentials - Basics** | **09** |
| **IV** | **Arduino Essentials - Sensor Integration** | **09** |
| **V** | **Arduino - Electromechanical and Wireless Control for Smart Solutions** | **09** |
| | **Total** | **45** |

| Module /Unit | Syllabus As per SSC framework of NEP | Level of Knowledge Applicable as per Blooms Taxonomy |
|---|---|---|
| I | **Basics of Embedded Systems:** <br>     A) **PIC MICROCONTROLLER:** Architecture – memory organization – addressing modes – instruction set – PIC programming in Assembly & C –I/O port, Data Conversion, RAM & ROM Allocation, Timer programming. <br>     B) **Advanced ARM Controllers:** Introduction to ARM and its Features, Architecture – memory organization – addressing modes –The ARM Programmer's model - Registers – Pipeline - Interrupts – Coprocessors – Interrupt Structure. | A) U, AN <br><br><br><br><br> B) U, EV, CR |
| II | **Communication Protocols: Theory and Practice:** <br>     A) **Communication Protocol & Implementation:** Introduction to Communication Protocol, I2C - Interfacing with micro controller using bit-banking method, I2C devices – RTC, Memory, ADC-DAC, Port Expander, SPI (Serial Peripheral Interface), Bluetooth, Wi-Fi and RFID. Understanding Serial, Communication, Bluetooth Communication, SPI Interface ZigBee, Wi-Fi, $I^2C$, Infrared, RFID, GSM, GPS, PDH/SDH/Ethernet | A) R, U, AN |
| III | **Arduino Essentials - Basics:** <br>     A) **Getting Started with Arduino:** Introduction, Arduino Variants, Install the Drivers, Arduino IDE. <br>     B) **Basic Functions:** Overview, Structure, Digital I/O Functions, Analog I/O Functions, Advanced I/O Functions, Timer Functions, Communication Functions, Interrupt Functions, Math Functions, Programming Language Reference. | A) U, CR <br><br> B) R, U, AN |
| IV | **Arduino Essentials - Sensor Integration** <br>     A) **Using Sensors with the Arduino:** Light Sensitive Sensors, Temperature Sensors, Temperature and Humidity Sensor, Line-Tracking Sensor, Ultrasonic Sensors, Digital Infrared Motion Sensor, Joystick Module, Gas Sensor, Hall Sensor, Color Sensor, Digital Tilt Sensor, Triple Axis Acceleration Sensor, Analog Sound Sensor, Voice Recognition Module, Digital Vibration Sensor, Flame Sensor, Capacitive Touch Sensor | A) R, U, AN |
| V | **Arduino - Electromechanical and Wireless Control for Smart Solutions:** | |

| | | |
|---|---|---|
| | **A) Electromechanical Control Using the Arduino:** DC Motor, Stepper Motor, Servo Motor | **A) R, U, AN** |
| | **B) Wireless Control Using the Arduino:** Infrared Transmitter and Receiver, Wireless Radio Frequency, Bluetooth, GSM/GPRS, Wi-Fi | **B) U, EV, CR** |
| | **Case Studies:** <br> • Air Quality Monitor Using Arduino <br> • A Fire-Fighting Robot Using Arduino <br> • Intelligent Lock System Using Arduino | |

| **Embedded Systems - Practical** | | |
|---|---|---|
| **List of Practical: All practical's to be done online using TinkerCAD** | | **Level of Knowledge Applicable as per Blooms Taxonomy** |
| **1.** | **Introduction to Arduino** | **U, CR** |
| **a.** | Introduction to Arduino circuits and breadboarding | |
| **b.** | Blinking of LEDs | |
| | | |
| **2.** | Program using Light Sensitive Sensors | **AN, CR** |
| | | |
| **3.** | Program using temperature sensors | **AN, CR** |
| | | |
| **4.** | Programs using humidity sensors | **AN, CR** |
| | | |
| **5.** | Programs using Line tracking sensors | **AN, CR** |
| | | |
| **6.** | Programs using Ultrasonic Sensors | **AN, CR** |
| | | |
| **7.** | Programs using digital infrared motion sensors | **AN, CR** |
| | | |
| **8.** | Programs using gas sensors | **AN, CR** |
| | | |
| **9.** | Programs using servo motors | **AN, CR** |
| | | |
| **10.** | Programs making Joystick with Arduino | **A, EV** |

**Learning Outcomes: After completion of Course, the learners will be able to:**

1. Memorize the instruction set for PIC programming in Assembly and C languages.

2. Interpret the functioning of communication protocols such as I2C, SPI, Bluetooth, and Wi-Fi in the context of microcontroller interfacing.

3. Explain the basic structure and components of Arduino programs and interpret the functionality of digital and analog input/output functions in Arduino programming.

4. Evaluate different methods of sensor integration with Arduino boards and assess their suitability for specific applications.

5. Design innovative solutions for real-world problems using PIC microcontrollers, ARM controllers, and Arduino platforms.

**Books & References:**

1. Pan, T., & Zhu, Y. (2018). Designing embedded systems with Arduino: A fundamental technology for makers (1st ed.). Springer.
2. Shibu, K. V. (2012). Introduction to embedded systems (1st ed.). Tata McGraw-Hill.
3. Mazidi, M. A. (2011). The 8051 microcontroller and embedded systems (2nd ed.). Pearson.
4. Rajkamal. (n.d.). Embedded systems. Tata McGraw-Hill.
5. Prasad, K. V. K. (2003). Embedded / Real-Time Systems: Concepts, Design and Programming Black Book (1st ed.). Wiley India.
6. Ganguly, A. K. (2014). Embedded Systems: Design, Programming and Applications (1st ed.). Alpha Science International Ltd.

**Percentage of 6 categories of Blooms Taxonomy in question paper**

|  | Remember | Understand | Apply | Analyze | Evaluate | Create |  |
|---|---|---|---|---|---|---|---|
| % in Question Paper | 20 | 20 | 20 | 20 | 10 | 10 | 100% |

# MCCSCT214 Design and Analysis of Algorithm

| B. Sc. (Computer Applications) | | Semester – III | | |
|---|---|---|---|---|
| **Course Name: Design and Analysis of Algorithm** | | **Course Code: MCCSCT214** | | |
| **Vertical:** | | **Major** | | |
| **Periods per week (1 Period is 60 minutes)** | | **03** | | |
| **Practical per week (1 Period is 60 minutes)** | | **02** | | |
| **Credits** | | **04** | | |
| **Evaluation System** | | **Duration (in Hours)** | **Total Marks** | **Minimum Passing Marks** |
| **Theory** | **Continuous Internal Assessment** | -- | 40 | 16 |
| | **End Semester Examination** | 2 | 60 | 24 |
| **Practical** | **Continuous Internal Assessment** | -- | 20 | 8 |
| | **End Semester Examination** | 2 | 30 | 12 |

**Course Objectives**

1. To teach students the fundamentals of algorithms, including their specification, performance analysis, and application of randomized algorithms, as well as to introduce key elementary data structures such as stacks, queues, trees, and graphs, facilitating their development of algorithmic design and problem-solving skills.

2. To teach students the divide and conquer algorithmic paradigm, focusing on essential techniques like Binary Search, Merge Sort, Quick Sort, and Strassen's Matrix Multiplication, empowering them to solve computational problems effectively through algorithmic decomposition and conquer strategies.

3. The course objective is to educate students on the Greedy Method and Dynamic Programming, focusing on key concepts such as the Knapsack problem, Single-Source Shortest Paths, Optimal Binary Search Trees, and the Travelling Salesperson Problem, enabling them to apply these algorithms effectively in problem-solving scenarios with optimal solutions.

4. The course objective is to instruct students in fundamental traversal and search techniques, emphasizing binary search, graph traversal, and DFS for connected components and spanning trees. This will equip them with the skills to efficiently navigate and analyze data structures, enhancing their problem-solving abilities in computational contexts.

5. The course aims to familiarize students with Backtracking and Branch-and-Bound techniques, emphasizing problem-solving in scenarios like the 8-Queens Problem, Knapsack Problem, and Travelling Salesperson Problem. This equips them with the capability to explore and optimize solutions for complex computational challenges effectively. And To teach students algebraic problem-solving methods like Evaluation and Interpolation, Modular Arithmetic, and the Faster Fourier Transform, enhancing their ability to address complex computational tasks effectively.

| Module | Name | Lectures |
|--------|------|----------|
| I | **Foundations of Algorithms and Data Structures: From Basics to Advanced Concepts** | **9** |
| II | **Algorithm Design Techniques: Divide and Conquer vs. Greedy Methods** | **9** |
| III | **Dynamic Programming: Solving Optimization Problems and Complex Algorithms** | **9** |
| IV | **Fundamentals of Algorithmic Techniques: Search, Traversal, and Backtracking** | **9** |
| V | **Advanced Algorithmic Techniques: Optimization and Algebraic Methods** | **9** |
| | **Total** | **45** |

**R- Remember, U- Understand, A – Apply, AN- Analyze, EV- Evaluate, CR - Create**

| Unit | Details | Level of Knowledge Applicable as per Blooms Taxonomy |
|------|---------|------|
| I | **<u>Foundations of Algorithms and Data Structures: From Basics to Advanced Concepts</u>**<br>**A) Introduction**<br>What is an Algorithm? Algorithm Specification, Performance analysis, Randomized Algorithms.<br>**B) Elementary Data Structures**<br>Stacks and Queues, Dictionaries, Trees, Priority Queues, Sets and Disjoint Set unions, Graphs. | A) U, AN<br><br>B) U, EV, CR |
| II | **<u>Algorithm Design Techniques: Divide and Conquer vs. Greedy Methods</u>**<br>A) **Divide And Conquer**<br>General Method, Binary Search, Finding Maximum and Minimum, Merge Sort, Quick Sort, Selection, Strassen's Matrix Multiplication, Convex Hull.<br>B) **The Greedy Method**<br>General Method, Knapsack problem, Tree vertex splitting, Job Sequencing With Deadlines, Minimum Cost Spanning Trees, Optimal Storage On Tapes, Optimal Merge Patterns, Single-Source Shortest Paths. | C) R, U, A<br><br>A) R, U, AN |

| | | | |
|---|---|---|---|
| **III** | **Dynamic Programming: Solving Optimization Problems and Complex Algorithms**<br>**A) Dynamic Programming**<br>The General Method, Multistage Graphs, All Pairs shortest Paths, Single-Source Shortest Paths, Optimal Binary Search Trees, Knapsack, Reliability Design, The Travelling Salesperson Problem, Flow Shop Scheduling. | A) U, EV, CR | |
| **IV** | **Fundamentals of Algorithmic Techniques: Search, Traversal, and Backtracking**<br>**A) Basic Traversal And Search Technique**<br>Techniques For Binary Search, Techniques For Graphs, Connected Components And Spanning Trees, Bi-connected Components and DFS.<br>**B) Backtracking**<br>General Method, 8-Queens Problem, Sum Of Subsets, Graph Coloring, Hamiltonian Cycle, Knapsack Problem. | A) U, EV, CR, A<br><br>B) R, U, AN | |
| **V** | **Advanced Algorithmic Techniques: Optimization and Algebraic Methods**<br>**A) Branch-And-Bound**<br>The Method, 0/1 Knapsack Problem, Travelling Salesperson, Efficiency Considerations.<br>**B) Algebraic Problems**<br>The General Method, Evaluation And Interpolation, The Faster Fourier Transform, Modular Arithmetic, Even Faster Evaluation and Interpolation. | A) U, EV, CR, A<br><br>B) U, EV, CR | |

| List of Practical: | | Level of Knowledge Applicable as per Blooms Taxonomy |
|---|---|---|
| **1.** | Programs on Arrays and operations | U, CR,A |
| | | |
| **2.** | **Stack:** | |
| a) | Write a program to implement the concept of Stack with Push, Pop, Display and Exit operations. | U, CR, EV |
| b) | Write a program to convert an infix expression to postfix and prefix conversion. | U, CR, AN |
| c) | Write a program to implement Tower of Hanoi problem. | U, CR, EV |
| | | |
| **3.** | **Queue:** | |

| | | | |
|---|---|---|---|
| | | Write a program to implement the concept of Queue with Insert, Delete, Display and Exit operations. | U, CR, A |
| | | Write a program to implement the concept of Circular Queue | U, CR,AN |
| | | Write a program to implement the concept of Deque. | U, CR, A |
| | | | |
| **4.** | **Tree:** | | |
| a) | | Write a program to create the tree and display the elements. | U, CR, EV |
| **b)** | | Write a program to construct the binary tree. | U, CR,A |
| c) | | Write a program for in order, post order and preorder traversal of tree | U, CR, AN |
| | | | |
| **5.** | **Sorting:** | | |
| a) | | Write a Program for implementing Insertion Sort | U, CR |
| b) | | Write a Program for implementing Bubble Sort | U, CR |
| c) | | Write a program for Merge Sort | U, CR |
| d) | | Write a program for Quick Sort | U, CR |
| e) | | Write a Python Program for implementing Selection Sort | U, CR |
| | | | |
| **6.** | | Heaps and Heapsort | U, CR |
| | | | |
| **7.** | **Programs on Graphs** | | |
| a) | | Write a Program on Breadth First Search and Traversal | U, CR,AN |
| b) | | Write a Program on Depth First Search and Traversal | U, CR, AN |
| | | | |
| **8.** | **Searching** | | |
| a) | | Write program for Linear Search | U, CR |
| b) | | Write Program for Binary Search | U, CR |
| | | | |
| **9.** | | Write a program for 15-Puzzle Solver | U, CR |
| | | | |
| **10.** | **BRANCH-AND-BOUND** | | |
| a) | | Write a Program on FIFO Branch-and-Bound | U, CR, A |
| b) | | Write a program on LC Branch-and-Bound | U, CR, EV |
| | | | |

**Learning Outcome: After completing the course, students will be able to**
1. proficient in analyzing, designing, and implementing efficient algorithms and data structures to solve a wide range of computational problems, demonstrating competency in algorithm specification, performance analysis, and the application of various data structures in problem-solving scenarios.
2. Upon mastering Divide and Conquer algorithms, including Binary Search, Merge Sort, Quick Sort, and advanced techniques like Strassen's Matrix Multiplication and Convex Hull, students will excel in algorithmic analysis, design, and implementation, equipping them to efficiently solve diverse computational problems.

3. Possess the skills to efficiently solve complex optimization problems, including the Knapsack problem, Job Sequencing with Deadlines, and the Travelling Salesperson Problem, demonstrating proficiency in algorithmic design and problem-solving strategies.
4. Having acquired proficiency in basic traversal and search techniques, including binary search, graph traversal, and DFS for connected components and spanning trees, students will demonstrate adeptness in algorithmic exploration and navigation. This skillset will enable them to efficiently search and analyze complex data structures and networks.
5. Having gained proficiency in Backtracking and Branch-and-Bound techniques, along with solving problems like the 8-Queens Problem, Graph Coloring, and the 0/1 Knapsack Problem, students will exhibit adeptness in algorithmic exploration and optimization, enhancing their problem-solving skills in complex computational scenarios. And, Upon completion of the study on algebraic problems, encompassing techniques such as evaluation, interpolation, modular arithmetic, and the Faster Fourier Transform, students will demonstrate proficiency in applying advanced mathematical concepts to solve computational problems efficiently, facilitating enhanced problem-solving abilities in various domains.

## Books & References:
1. Horowitz, E., Sahni, S., & Rajasekaran, S. (n.d.). Computer algorithms. Computer Science Press.
2. Graham, R., Knuth, D., & Patashnik, O. (1994). Concrete Mathematics: A Foundation for Computer Science (2nd ed.). Addison-Wesley.
3. Russell, S. J., & Norvig, P. (2020). Artificial Intelligence: A Modern Approach (4th ed.). Prentice Hall.
4. Hacker, H. (2013). Hacker's Delight (2nd ed.). Addison-Wesley.
5. Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2009). Introduction to Algorithms (3rd ed.). The MIT Press.
6. Knuth, D. E. (1998). The Art of Computer Programming, Volume 1: Fundamental Algorithms (3rd ed.). Addison-Wesley.

## Percentage of 6 categories of Blooms Taxonomy in question paper

| | Remember | Understand | Apply | Analyze | Evaluate | Create | |
|---|---|---|---|---|---|---|---|
| % in Question Paper | 20 | 10 | 20 | 20 | 10 | 20 | 100% |

# MCCMATH106 Numerical Methods

| B. Sc (Computer Applications) | | Semester – I | | |
|---|---|---|---|---|
| Course Name: Numerical Methods | | Course Code: MCCMATH106 | | |
| Vertical: | | Minor | | |
| Periods per week (1 Period is 60 minutes) | | 02 | | |
| Credits | | 02 | | |
| Evaluation System | | Duration (in Hours) | Total Marks | Minimum Passing Marks |
| Theory | Continuous Internal Assessment | -- | 20 | 8 |
| | End Semester Examination | 2 | 30 | 12 |

**Objectives of the Course:**

1. Numerical methods provide efficient techniques to approximate solutions for mathematical problems where analytical solutions are difficult or impossible.
2. This course covers numerical techniques for solving transcendental equations and interpolation methods for function approximation.
3. It also covers understanding and solving systems of equations, numerical differentiation and integration techniques, including for solving real-world problems.
4. Numerical methods are crucial in fields such as data science, computer graphics, cryptography, artificial intelligence, and scientific simulations, ensuring efficient and accurate computations in real-world applications.

| Module | Name | Lectures |
|---|---|---|
| I | Approximations & Errors, Solution of simultaneous algebraic equations (linear) using iterative methods | 6 |
| II | Solutions of Algebraic and Transcendental Equations | 6 |
| III | Interpolation | 6 |
| IV | Numerical Integration | 6 |
| V | Numerical solution of 1$^{st}$ order differential equations | 6 |
| | **Total** | **30** |

| R- Remember, U- Understand, A – Apply, AN- Analyze, EV- Evaluate, CR – Create |
|---|

| Module / Unit | Syllabus As per SSC framework of NEP | Level of Knowledge Applicable as per Blooms Taxonomy |
|---|---|---|
| I | **A) Mathematical Modeling, Approximations & Errors:** A Simple Mathematical Model, Significant Figures, Accuracy | A) R, U, A, AN, EV, CR |

| | | |
|---|---|---|
| | and Precision, Error Definitions, Round-Off Errors, Truncation Errors **B) Solution of simultaneous algebraic equations (linear) using iterative methods:** Gauss-Seidel Method, Jacobi Method. | R, U, A, AN, EV |
| II | **Solutions of Algebraic and Transcendental Equations:** The Bisection Method, The Newton-Raphson Method, The Regula-falsi method, The Secant Method. | R, U, A, AN, EV |
| III | **Interpolation:** Forward Difference, Backward Difference, Central Difference, Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Gauss' Central Difference, Lagrange's Interpolation. | R, U, A, AN, EV |
| IV | **Numerical Integration:** Numerical integration using Trapezoidal Rule, Simpson's 1/3rd and 3/8th rules, Boole's rule, Weddle's rule. | R, U, A, AN, EV |
| V | **Numerical solution of 1$^{st}$ order differential equations:** Taylor series, Picard's method, Euler's Method, Modified Euler's Method, Runge-Kutta Methods (RK(2), RK(4)). | R, U, A, AN, EV |

| Advanced Calculus – Tutorial | | |
|---|---|---|
| **Sr. No.** | **Syllabus** | **Level of Knowledge Applicable as per Blooms Taxonomy** |
| 1 | Solving of simultaneous algebraic equations | U, R, A, AN, EV |
| 2 | Bisection & Newton Raphson method | U, R, A, AN, EV |
| 3 | Regula-Falsi & Secant method | U, R, A, AN, EV |
| 4 | Interpolation – I (Difference tables) | U, R, A, AN, EV |
| 5 | Interpolation – II (Newton's, Gauss & Lagrange's method) | U, R, A, AN, EV |
| 6 | Integration – I (Trapezoidal, Simpson's Rule) | U, R, A, AN, EV |
| 7 | Integration – II (Boole's & Weddle's Rule) | U, R, A, AN, EV |

| 8 | ODE – I (Taylor's & Picard's Method) | U, R, A, AN, EV |
|---|---|---|
| 9 | ODE – II (Euler's & Modified Euler's Method) | U, R, A, AN, EV |
| 10 | ODE – II (& Runge-Kutta Method) | U, R, A, AN, EV |

**Learning Outcomes: After completion of Course, the learners will be able to:**

1. Explain the concepts of mathematical modelling, significant figures, accuracy, precision, and error types in numerical methods.
2. Use numerical methods such as the Bisection method, Newton-Raphson method, Regula-falsi method, and Secant method to solve algebraic and transcendental equations.
3. Analyze and compare different interpolation techniques (Newton's Forward and Backward Difference, Lagrange's Interpolation) and choose the most appropriate one for a given problem.
4. Evaluate the accuracy of numerical integration methods such as Trapezoidal Rule and Simpson's Rule for approximating definite integrals.
5. Design and implement numerical methods like Euler's method, Modified Euler's method, and Runge-Kutta methods to solve first-order differential equations.

**Books & References:**

1. Shastry, S. (2012). *Introductory Methods of Numerical Methods* (5th ed.)., PHI
2. Chapra, S., & Canale, R. (2010). *Numerical Methods for Engineers* (6th ed.)., Tata McGraw Hill
3. Gupta, R. (2019). *Numerical Methods: Fundamentals and Applications* (1st ed.)., Cambridge University Press
4. Burden, R., & Faires, D. (2011). *Numerical Analysis* (9th ed.)., Cengage Learning
5. Sambaiah, K. (2020). *Numerical Methods* (1st ed.)., White Falcon Publishing
6. Sharma, M., & Chandra, S. (2021). *Numerical Methods and Data Analysis in Science & Engineering with C & C++* (1st ed.)., Wiley
7. Epperson, J. (2021). *An Introduction to Numerical Methods and Analysis* (3rd ed.)., John Wiley & Sons, Inc.
8. Balagurusamy, E. (1999). *Numerical Methods* (1st ed.)., McGraw-Hill
9. Grewal, B. (2013). *Numerical Methods In Engineering & Science With Programs In C, C++ &Matlab* (11th ed.)., Khanna Publishers
10. Jain, M., Iyengar, S., & Jain, R. (2020). *Numerical Methods: Problems And Solutions* (3rd ed.)., New Age International Private Limited

**Percentage of 6 categories of Blooms Taxonomy in question paper**

| | Remember | Understand | Apply | Analyze | Evaluate | Create | |
|---|---|---|---|---|---|---|---|
| % in Question Paper | 10 | 15 | 30 | 20 | 20 | 05 | 100% |

# MCCBAF222 Advanced Tally

| B.Sc. (Computer Applications) | Semester – III | | |
|---|---|---|---|
| Course Name: Advanced Tally | Course Code: MCCBAF222 | | |
| Vertical: | General / Open Elective | | |
| Periods per week (1 Period is 60 minutes) | - | | |
| Practical per week (1 period is 60 minutes) | 02 | | |
| Credits | 02 | | |
| Evaluation System | Duration (in Hours) | Total Marks | Minimum Passing Marks |
| Continuous Internal Assessment | - | 50 | 20 |

**Objectives of the Course:**

1. Develop proficiency in inventory management techniques by mastering the creation and classification of inventory items, including stock groups, categories, warehouses, and batches.
2. Gain expertise in managing accounts receivable and payable, understanding outstanding management, and implementing bill-wise references for practical business scenarios.
3. Acquire skills in purchase and sales order management, including placing orders, handling rejections, invoicing, and managing receipts and payments efficiently.
4. Learn to track and manage additional costs associated with purchases, ensure compliance with Goods and Services Tax (GST) regulations, and efficiently allocate expenses and incomes to cost and profit centers for effective financial management

| R- Remember, U- Understand, A – Apply, AN- Analyze, EV- Evaluate, CR – Create |
|---|

| Sr. No | Syllabus As per SSC framework of NEP | Level of Knowledge Applicable as per Blooms Taxonomy |
|---|---|---|
| 1. | **Accounts Receivable and Payable Management**<br><br>A) Configure and enable bill-wise outstanding management for a company.<br><br>B) Record and analyze transactions using different bill-wise references.<br><br>C) Evaluate and manage credit limits and bill settlements. | R, U, A, AN, CR, EV |

| | | |
|---|---|---|
| 2. | **Purchase and Sales Order Management**<br><br>A) Record and process purchase and sales orders in TallyPrime.<br><br>B) Analyze order rejections and their impact on inventory and accounts.<br><br>C) Complete the purchase and sales cycle, including invoice generation and payment processing. | R, U, A, AN, CR, EV |
| 3. | **Tracking Additional Costs of Purchase**<br><br>A) Configure and apply additional costs to purchase transactions.<br><br>B) Analyze the impact of additional costs on stock valuation and pricing.<br><br>C) Create a report summarizing additional cost allocations for purchases. | R, U, A, AN, CR |
| 4. | **Goods and Services Tax (Fundamental)**<br><br>A) Configure and enable GST settings for a company in TallyPrime.<br><br>B) Record GST-compliant sales and purchase transactions.<br><br>C) Apply and adjust Input Tax Credit (ITC) against GST liability. | R, U, A, AN, CR, EV |
| 5. | **Goods and Services Tax (Advanced)**<br><br>A) Record intrastate and interstate sales transactions with GST.<br><br>B) Process purchase returns and manage input credit adjustments.<br><br>C) Generate and analyze GSTR-1 and GSTR-3B reports. | R, U, A, AN, CR, EV |
| 6. | **Tax Deducted at Source (TDS)**<br><br>A) Configure and enable TDS settings for a company.<br><br>B) Record TDS transactions for different payment categories.<br><br>C) Generate TDS challans and evaluate TDS reports. | R, U, A, AN, CR, EV |

| | | |
|---|---|---|
| 7. | **Cost/Profit Centres Management** <br><br> A) Allocate expenses and incomes to cost centres. <br><br> B) Automate cost centre allocation using cost centre classes. <br><br> C) Analyze cost centre reports for profitability assessment. | R, U, CR, AN, EV |
| 8. | **Budgets and Scenarios** <br><br> A) Configure and maintain budgets for financial control. <br><br> B) Create and compare financial scenarios in TallyPrime. <br><br> C) Analyze budget variance and evaluate financial performance. | R, U, A, AN, CR, EV |
| 9. | **Management of Business Data** <br><br> A) Export and import data in TallyPrime for business operations. <br><br> B) Configure ODBC settings for seamless data integration. <br><br> C) Create and execute ODBC queries for business reporting. | R, U, A, AN, EV, CR |
| 10. | **Moving to the Next Financial Year** <br><br> A) Export year-end financial data for transition. <br><br> B) Split company data and manage opening balances. <br><br> C) Generate comparative financial reports for evaluation. | R, U, A, AN, CR, EV |

**Learning Outcomes: After completion of Course, the learners will be able to:**

1. Recall key concepts of inventory, accounts receivable/payable, purchase and sales orders, additional costs, GST, cost/profit centres, budgets, and report generation in Tally.

2. Demonstrate understanding by explaining classifications, processes, regulations, and significance of financial and inventory management in Tally.

3. Apply knowledge by creating stock groups, managing payments, recording transactions, handling GST, allocating costs, maintaining budgets, and generating reports.

4. Analyze inventory, receivables, order processes, financial impacts, GST compliance, and reports for decision-making and efficiency.

**Books & References:**

1. Tally Education Private Limited (2021) Official Guide to Financial Accounting using TallyPrime: Managing Your Business Just Got Simpler – TEPL

2. Asok K. Nadhani (2022) TallyPrime Simplified: Complete Business Accounting & GST - BPB Publications

3. Rajgaria, A. (2022). Tally ERP 9 + GST Implementation (1st ed.). BPB Publications.

4. Nadhani, A. K. (2018). GST Accounting with Tally.ERP 9 (1st ed.). BPB Publications.

5. Tally Education Private Limited. (2021). Official Guide to Financial Accounting using TallyPrime (1st ed.). BPB Publications.

6. Nadhani, A. K. (2017). Simplest Book for Learning Tally ERP 9 Training Guide (4th ed.). BPB Publications.

**Percentage of 6 categories of Blooms Taxonomy in question paper**

|  | Remember | Understand | Apply | Analyze | Evaluate | Create |  |
|---|---|---|---|---|---|---|---|
| % in Question Paper | 10 | 10 | 20 | 20 | 20 | 20 | 100 |

# MCCFM110 Personal Finance Management

| B. Sc (Computer Applications) | | Semester – III | | |
|---|---|---|---|---|
| Course Name: Personal Finance Management | | Course Code: MCCFM110 | | |
| Vertical: | | General Elective / Open Elective | | |
| Periods per week (1 Period is 60 minutes) | | 02 | | |
| Credits | | 02 | | |
| Evaluation System | | Duration (in Hours) | Total Marks | Minimum Passing Marks |
| Theory | End Semester Examination | -- | 30 | 12 |
| | Continuous Internal Assessment | -- | 20 | 08 |

**Course Objectives:**

1. To understand the key principles of personal finance, including financial goal setting, budgeting, and maintaining financial discipline for long-term financial stability.

2. To learn the process of investment planning, focusing on measuring return and risk for various asset classes and forming a diversified investment portfolio.

3. To develop an understanding of investment in greenfield and brownfield projects, along with other financial instruments, derivatives, and international investment avenues.

4. To gain a clear understanding of India's personal tax structure, tax planning, exemptions, deductions, and the comparison between the special provisions under section 115 BAC and general provisions of the Income-tax Act.

5. To learn about retirement planning strategies, focusing on pension plans, reverse mortgage, and estate planning to ensure financial security after retirement.

| Module | Name | Lectures |
|---|---|---|
| 1 | **Personal Finance Management: Goals, Planning, Budgeting, and Discipline** | **6** |
| 2 | **Investment Planning** | **6** |
| 3 | **Investment Strategies: Greenfield & Brownfield Projects, Financial Instruments, and Global Avenues** | **6** |
| 4 | **Personal Taxation and Planning in India: Structure, Deductions, and Taxation Strategies** | **6** |
| 5 | **Retirement Benefits Planning** | **6** |
| | **Total** | **30** |

| | R- Remember, U- Understand, A – Apply, AN- Analyze, EV- Evaluate, CR - Create |
|---|---|

| Unit | Syllabus | Level of Knowledge Applicable as per Blooms Taxonomy |
|---|---|---|
| I | **Personal Finance Management: Goals, Planning, Budgeting, and Discipline** <br> Financial goals, steps in financial planning, budgeting incomes and payments, time value of money. Introduction to savings, benefits of savings, management of spending & financial discipline, Setting alerts and maintaining sufficient funds for fixed commitments. | U, R |
| II | **Investment Planning**: Process and objectives of investment, concept and measurement of return & risk for various asset classes, measurement of portfolio risk and return, diversification & portfolio formation. Gold bond; Real estate; | U, R |
| III | **Investment Strategies: Greenfield & Brownfield Projects, Financial Instruments, and Global Avenues** <br> Investment in greenfield and brownfield Projects; Investment in fixed income instruments, financial derivatives &commodity market in India. Mutual fund schemes; International investment avenues. Currency derivatives and digital currency. | U, R, A |
| IV | **Personal Taxation and Planning in India: Structure, Deductions, and Taxation Strategies:**Tax structure in India for personal taxation, Scope of personal tax planning, exemptions and deductions available to individuals under different heads of income and gross total income. Comparison of benefits - Special provision u/s 115 BAC vis-à-vis General provisions of the Income-tax Act, 1961, tax avoidance versus tax evasion. | U, R, A |
| V | **Retirement Benefits Planning**: Retirement planning goals, process of retirement planning, Pension plans available in India, Reverse mortgage, Estate planning. | U, R, A |

**Learning Outcome: After completion of Course, the learners will be able to:**

1. Understand the significance of financial goals, budgeting, and financial discipline in achieving long-term financial security.

2. Apply the concepts of return and risk to develop a diversified investment portfolio.

3. Analyze the benefits and challenges of investing in greenfield and brownfield projects, financial instruments, and international markets.

4. Understand the structure of personal taxation in India and how exemptions and deductions can be used for effective tax planning.

5. Apply retirement planning strategies, including pension plans and estate planning, to ensure financial security after retirement.

**Books and References:**

1. Halan. M. "Let's Talk Money: You've Worked Hard for It. Now Make It Work for
2. You" Harper Collins Publishers, New York.
3. Indian Institute of Banking & Finance. "Introduction to Financial Planning" Taxmann Publication, New Delhi.
4. Keown A.J. "Personal Finance" Pearson, New York.
5. Madura, J. "Personal Finance", Pearson
6. Pandit, A. "The Only Financial Planning Book that You Will Ever Need" Network 18 Publications Ltd., Mumbai.
7. Sinha, M. "Financial Planning: A Ready Reckoner" McGraw Hill Education, New York.
8. Tripathi, V. "Fundamentals ofInvestment" Taxmann Publication, New Delhi.

**Percentage of 6 categories of Blooms Taxonomy in question paper**

|  | Remember | Understand | Apply | Analyze | Evaluate | Create |  |
|---|---|---|---|---|---|---|---|
| % in Question Paper | 35 | 35 | 30 | - | - | - | 100% |

# MCCSCT221 Linux Operating System

| B.Sc. ( Computer Applications ) | | Semester – III | | |
|---|---|---|---|---|
| Course Name: Linux Operating System | | Course Code: MCCSCT221 | | |
| Vertical: | | Skill Enhancement Course | | |
| Periods per week (1 Period is 60 minutes) | | 03 | | |
| Practical per week (1 Period is 60 minutes) | | 02 | | |
| Credits | | 04 | | |
| Evaluation System | | Duration (in Hours) | Total Marks | Minimum Passing Marks |
| Theory | Continuous Internal Assessment | -- | 40 | 16 |
| | End Semester Examination | 2 | 60 | 24 |
| Practical | Continuous Internal Assessment | -- | 20 | 8 |
| | End Semester Examination | 2 | 30 | 12 |

**Course Objectives:**
1. Introduces the fundamentals of Linux, its distributions, and the role of a system administrator while developing proficiency in Bash shell commands.
2. Covers system administration tasks such as process management, job scheduling, logging, backups, and software management using RPM and Yum.
3. Explores Linux security practices, user authentication, and networking concepts, including SSH configuration and troubleshooting network issues.
4. Provides in-depth knowledge of the Linux file system, user and group management, permissions, and access control mechanisms.
5. Develops practical Linux administration and automation skills, enabling students to excel in system administration.

| Module | Name | Lectures |
|---|---|---|
| I | **Introduction to Red Hat Linux & Bash Command Line** | 9 |
| II | **System Administration & Software Management in Linux** | 9 |
| III | **Linux Security & Network Configuration** | 9 |
| IV | **Linux File System & User Management** | 9 |
| V | **Bash Shell Scripting & GRUB Configuration** | 9 |
| | **Total** | 45 |

| R- Remember, U- Understand, A – Apply, AN- Analyze, EV- Evaluate, CR - Create |
|---|

| Unit | Details | Level of Knowledge Applicable as per Blooms Taxonomy |
|---|---|---|
| I | **Introduction to Red Hat Linux & Bash Command Line:-**<br>A) **Introduction to Red Hat Enterprise Linux:** Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator.<br>B) **Command Line:** Working with the Bash Shell, Getting the Best of Bash, Useful Bash Key Sequences, Working with Bash History, Performing Basic File System Management Tasks, Working with Directories, Piping and Redirection, Finding Files. | A) R, U<br><br><br>B) U, A |
| II | **System Administration & Software Management in Linux:-**<br>A) **System Administration Tasks:** Performing Job Management Tasks, System and Process Monitoring and Management, Managing Processes with ps, Sending Signals to Processes with the kill Command, using top to Show Current System Activity, Managing process Niceness, Scheduling Jobs, Mounting Devices, Working with Links, Creating Backups, Managing Printers, Setting Up System Logging, Setting Up Rsyslog, Common Log Files, Setting Up Logrotate.<br>B) **Managing Software:** Understanding RPM, Understanding Meta Package Handlers, Creating Your Own Repositories, Managing Repositories, Installing Software with Yum, Querying Software, Extracting Files from RPM Packages. | A) U, AN, CR<br><br><br><br><br><br><br><br>B) U, AN, EV, CR |
| III | **Linux Security & Network Configuration:-**<br>A) **Security:** Understanding Linux Security, Uses of root, sudo command, working with passwords, Bypassing user, authentication, Understanding ssh Networking Basic introduction to Networking, Network protocols: http, ftp etc., IP address, DNS, Browsers, Transferring files. ssh, telnet, ping, traceroute, route, hostname, networking GUI.<br>B) **Connecting to the Network:** Understanding Network Manager, Working with Services and Run levels, Configuring the Network with Network Manager, Working with system-config-network, Network Manager Configuration Files, Network Service Scripts, Networking from the Command Line, Troubleshooting Networking, Setting Up IPv6, Configuring SSH, Enabling the SSH Server, Using the SSH Client, Using PuTTY on Windows Machines, Configuring Key-Based SSH Authentication, Using Graphical Applications with SSH, | A) AN, EV<br><br><br><br><br>B) U, AN, EV |

| | | |
|---|---|---|
| | Using SSH Port Forwarding, Configuring VNC Server Access | |
| **IV** | **<u>Linux File System & User Management :-</u>**<br>    A) **Linux File System:** Introduction to Files, Linux File Hierarchy Structure, Linux Directory Structure, File System Navigation, File Commands in Linux, Absolute and Relative Pathnames in Linux.<br>    B) **Working with Users, Groups, and Permissions:** Managing Users and Groups, Commands for User Management, Managing Passwords, Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management, Using External Authentication Sources, the Authentication Process, sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership, Basic Permissions: Read, Write, and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes | A) U, AN, CR<br><br><br><br><br>B) U, AN, EV, CR |
| **V** | **<u>Bash Shell Scripting & GRUB Configuration:-</u>**<br>    A) **Introducing Bash Shell Scripting:** Introduction, Elements of a Good Shell Script, Executing the Script, Working with Variables and Input, Understanding Variables, Variables, Subshells, and Sourcing, Working with Script Arguments, Asking for Input, Using Command Substitution, Substitution Operators, Changing Variable Content with Pattern Matching, Performing Calculations, Using Control Structures, Using if...then...else, Using case, Using while, Using until, Using for, Configuring booting with GRUB. | A) U, AN, CR |

| List of Practical | | Level of Knowledge Applicable as per Blooms Taxonomy |
|---|---|---|
| **0** | **Installation of RHEL 6.X/7** | **R, U** |
| **1** | **Graphical User Interface and Command Line Interface and Processes** | **U, EV** |
| **a** | Exploring the Graphical Desktop | |
| **b** | The Command Line Interface | |
| **c** | Managing Processes | |
| | | |
| **2** | **Storage Devices and Links, Backup and Repository** | **U, AN, CR** |
| **b** | How to Extended Swap | |

| | | |
|---|---|---|
| **a** | Making a Backup | |
| **C** | Creating LVM | |
| | | |
| **3** | **Working with RPM, YUM and Networking** | **A, EV, CR** |
| **a** | Connecting to the Network | |
| **b** | Install RPM | |
| **c** | Install YUM | |
| | | |
| **4** | **Working with Users, Groups, and Permissions** | **EV, CR** |
| | | |
| **5** | **Fdisk Task create partition** | **AN, CR** |
| | | |
| **6** | **Daemon and process** | **A, EV, CR** |
| **a** | Start  firefox  2 times and  kill  the same | |
| **b** | Open multiple terminal and kill all terminal except current terminal | |
| **c** | Try uptime \| /proc/uptime \| pstree \| pidof \| pgrep \| kill \| pkill \| kill -9 \| kill -l | |
| | | |
| **7** | **Runlevel** | **A, EV, CR** |
| **a** | Try switch to runlevels 123 45678 | |
| **b** | Go to single user mode from splash screen reset root password | |
| **c** | Change default runlevel 5 to 3 and try changing runlevel 6 under /etc/inittab and resolve with a reboot | |
| | | |
| **8** | **Web Server** | **AN, EV, CR** |
| **a** | Configuring Apache on Red Hat Enterprise Linux | |
| **b** | Writing a Script to Monitor Activity on the Apache Web Server | |
| **c** | Using the select Command | |
| | | |
| **9** | **Shell Scripts** | **AN, EV, CR** |
| **a** | Create a function called backup to take backup /opt/ to /mnt/ and create another function called versions which should display create function command | |
| **b** | Create a script in such a way if given number 5 then rsync /opt/ /mnt if apart from 5 then should delete the os | |
| **c** | Run a case condition if given value 1 print hello, if given value 2 print Hola | |
| | | |
| **10** | **Setting Up an Installation Server** | **AN, CR** |
| **a** | Configuring Network Server as an Installation Server | |
| **b** | Setting Up a TFTP and DHCP Server for PXE Boot | |

**Learning Outcome: After completion of Course, the learners will be able to:**

1. Demonstrate proficiency in Linux system administration fundamentals, including Bash shell usage, file system management, and command-line operations

2. Effectively manage system processes, job scheduling, logging, backups, and software installation using RPM and Yum.

3. Understand Linux security measures, user authentication, SSH configuration, and network management for secure and efficient connectivity.

4. Administer Linux file systems, directory structures, user accounts, groups, and permission management, including advanced access control.

5. Develop and execute efficient Bash scripts for automation, system management, and boot process configuration using GRUB.

<u>**Books & References:**</u>

1. van Vugt, S. (2022). Red Hat Enterprise Linux 6 Administration (9th ed.). John Wiley & Sons.
2. Collings, T., & Wall, K. (n.d.). Red Hat Linux Networking and System Administration (3rd ed.). Wiley.
3. Soyinka, W. (2012). Linux Administration: A Beginner's Guide (6th ed.). McGraw-Hill Education.
4. Kerrisk, M. (2010). The Linux Programming Interface: A Linux and UNIX System Programming Handbook. No Starch Press.
5. Stevens, W. R., & Rago, S. A. (2005). Advanced Programming in the UNIX Environment (2nd ed.). Addison-Wesley.
6. Raymond, E. S. (2003). The Art of Unix Programming. Addison-Wesley.

**Percentage of 6 categories of Blooms Taxonomy in question paper**

|  | Remember | Understand | Apply | Analyze | Evaluate | Create |  |
|---|---|---|---|---|---|---|---|
| % in Question Paper | 10 | 20 | 10 | 20 | 20 | 20 | **100%** |

# MCCLANG203 Hindi Lekhan Kaushal

| B. Sc. (Computer Applications) | | Semester – III | | |
|---|---|---|---|---|
| **Course Name: Hindi Lekhan Kaushal** | | **Course Code: MCCLANG203** | | |
| **Vertical:** | | **Ability Enhancement Course** | | |
| **Periods per week (1 Period is 60 minutes)** | | **02** | | |
| **Credits** | | **02** | | |
| **Evaluation System** | | **Duration (in Hours)** | **Total Marks** | **Minimum Passing Marks** |
| Theory | Continuous Internal Assessment | -- | 50 | 20 |

**Course Objectives:**

1. मात्रात्मक हिंदी भाषा लेखन कौशल प्राप्त करना
2. हिंदी लेखन शैलियों की पहचान करना
3. दैनिक जीवन में हिंदी भाषा का प्रयोग करना

| Module | Name | Lectures |
|---|---|---|
| **1** | लेखन प्रकार | **15** |
| **2** | मुद्रित माध्यम के लिए लेखन का प्रकार | **15** |
| | **Total** | **30** |

| R- Remember, U- Understand, A – Apply, AN- Analyze, EV- Evaluate, CR - Create |
|---|

| Unit | Syllabus | Level of Knowledge Applicable as per Blooms Taxonomy |
|---|---|---|
| I | **लेखन प्रकार:**<br><br>लेखन प्रकार – उपन्यास, कहानियाँ, कविताएँ, निबंध, जीवनियाँ, आत्मकथाएँ, समाचार पत्र, पत्रिकाएँ | R, U, CR |
| II | **मुद्रित माध्यम के लिए लेखन का प्रकार:**<br><br>प्रतिवेदन लेखन, समाचार लेखन, विज्ञापन, स्तंभ लेखन, आलोचनात्मक लेखन, संपादन, मुद्रितशोधन | U, A, CR, EV, AN |

**Learning Outcome:   After completion of Course, the learners will be able to:**

☐. विद्यार्थी विभिन्न प्रकार के हिंदी लेखन की पहचान करने में सक्षम होंगे
☐. विद्यार्थी में बोलने और लिखने का कौशल विकसित होगा
☐. विद्यार्थी दैनिक जीवन में हिंदी भाषा का प्रयोग कर सकेंगे

## संदर्भ सूची:

□. व्यावहारिक एवं प्रशासनिक हिंदी - कमलेश बजाज - डायमंड बुक्स
□. व्यावहारिक हिंदी – डॉ. प्रकाश चंद्र सेन


**Percentage of 6 categories of Blooms Taxonomy in question paper**

|  | Remember | Understand | Apply | Analyze | Evaluate | Create |  |
|---|---|---|---|---|---|---|---|
| % in Question Paper |  |  |  |  |  |  | 100% |

# MCCLANG202 Marathi Lekhan Kaushalya

| B. Sc. (Computer Applications) | | Semester – III | | |
|---|---|---|---|---|
| Course Name: Marathi Lekhan Kaushalya | | Course Code: MCCLANG202 | | |
| Vertical: | | Ability Enhancement Course | | |
| Periods per week (1 Period is 60 minutes) | | 02 | | |
| Credits | | 02 | | |
| Evaluation System | | Duration (in Hours) | Total Marks | Minimum Passing Marks |
| Theory | Continuous Internal Assessment | -- | 50 | 20 |

**Course Objectives:**

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| Module | Name | Lectures |
|---|---|---|
| 1 | □□□□ □□□□□□ | 15 |
| 2 | □□□□□□□ □□□□□□□□□□□ □□□□ □□□□□□ | 15 |
| | **Total** | **30** |

| R- Remember, U- Understand, A – Apply, AN- Analyze, EV- Evaluate, CR - Create |
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| Unit | Syllabus | Level of Knowledge Applicable as per Blooms Taxonomy |
|---|---|---|
| I | <u>□□□□ □□□□□□</u> <br> □□□□ □□□□□□ – □□□□□□, □□□, □□□□□, □□□□□, □□□□□, □□□□□□□□, □□□□□□□□□, □□□□□□□□□□ | U, CR |
| II | <u>□□□□□□ □□□□□□□□□□□ □□□□ □□□□□□</u> <br> □□□□□□□ / □□□□□□□ □□□□, □□□□□ □□□□, □□□□□□□, □□□□□ □□□□, □□□□□□□□□□ □□□□, □□□□□□, □□□□□□□□□□ | U, CR, EV, AN |

**Learning Outcome: After completion of Course, the learners will be able to:**

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<u>**Books and References:**</u>

1. नसिराबादकर, ल.रा., व्यावहारिक मराठी, फडके प्रकाशन, कोल्हापूर
2. सावंत रसिका, आशय लेखन, सेठ प्रकाशन, मुंबई


**Percentage of 6 categories of Blooms Taxonomy in question paper**

| | Remember | Understand | Apply | Analyze | Evaluate | Create | |
|---|---|---|---|---|---|---|---|
| % in Question Paper | | | | | | | 100% |

# MCCLANG204 Sanskrit Parichayah

| B. Sc. (Computer Applications) | Semester – III | | |
|---|---|---|---|
| Course Name: Sanskrit Parichayah | Course Code: MCCLANG204 | | |
| Vertical: | Ability Enhancement Course | | |
| Periods per week (1 Period is 60 minutes) | 02 | | |
| Credits | 02 | | |
| Evaluation System | Duration (in Hours) | Total Marks | Minimum Passing Marks |
| Theory    Continuous Internal Assessment | -- | 50 | 20 |

**Course Objectives:**

1. To familiarize students with foundational grammatical structures in Sanskrit, facilitating their understanding and usage in everyday contexts.
2. To introduce students to basic conversational Sanskrit, enhancing their ability to communicate simple ideas and thoughts.
3. To cultivate an appreciation for Sanskrit literature and culture, encouraging students to explore and engage with ancient texts and traditions.

| Module | Name | Lectures |
|---|---|---|
| 1 | मूलभूतसंस्कृतज्ञानम् (Basic Sanskrit Knowledge) | 15 |
| 2 | संस्कृतभाषायाः विस्तृत् अभ्यासः (Advanced Sanskrit Practice) | 15 |
| | **Total** | **30** |

| R- Remember, U- Understand, A – Apply, AN- Analyze, EV- Evaluate, CR - Create |
|---|

| Unit | Syllabus | Level of Knowledge Applicable as per Blooms Taxonomy |
|---|---|---|
| I | **मूलभूतसंस्कृतज्ञानम् (Basic Sanskrit Knowledge)**<br><br>1. मम परिचयः (My Introduction)<br>2. मम परिवारः (My Family)<br>3. प्रकृति तथा वर्णाः (Nature and Colours)<br>क्रियापदानि १ (Verbs 1) | R, U, A |
| II | **संस्कृतभाषायाः विस्तृत् अभ्यासः (Advanced Sanskrit Practice)**<br><br>1. वाक्यप्रयोगः (Sentence Construction) | A, U, AN, CR |

| | 2. तृतीय विभक्ति परिचयः (Vibhakti Parichaya 2) | |
| | 3. पंचमी विभक्ति परिचयः (Vibhakti Parichaya 3) | |
| | 4. चतुर्थी विभक्ति परिचयः (Vibhakti Parichaya 4) | |
| | द्वितीया विभक्ति परिचयः (Vibhakti Parichaya 5) | |

**Learning Outcome: After completion of Course, the learners will be able to:**
- Students will be able to recognize and pronounce a wide range of Sanskrit words related to everyday life, nature, and family.
- Students will develop the ability to introduce themselves and describe their surroundings in simple Sanskrit sentences.
- Students will gain a solid understanding of basic Sanskrit grammar, including the use of different Vibhaktis (cases), and will be able to construct grammatically correct sentences.

**Books and References:**
1. Vibhakti Vallari – Samskrita Bharati
2. Supada (Level 4) – Samskrita Bharati
3. Abhyasapustakam – Samskrita Bharati


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|---|---|---|---|---|---|---|---|
| % in Question Paper | | | | | | | |