NEW HORIZON
COLLEGE OF ENGINEERING
New Horizon Knowledge Park, Ring Road, Marathalli
Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade. Accredited by NBA

# Department of Master of Computer Applications

## Academic Year 2023-24

# First and Second Semester MCA
# Scheme & Syllabus

## Batch: 2023-25

## Credits: 100

# CONTENTS

# NEW HORIZON COLLEGE OF ENGINEERING

## VISION

To emerge as an institute of eminence in the fields of engineering, technology and management in serving the industry and the nation by empowering students with a high degree of technical, managerial and practical competence.

## MISSION

To strengthen the theoretical, practical and ethical dimensions of the learning process by fostering a culture of research and innovation among faculty members and students.

To encourage long-term interaction between the academia and industry through their involvement in the design of curriculum and its hands-on implementation.

To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities.

## QUALITY POLICY

To provide educational services of the highest quality both curricular and co-curricular to enable students integrate skills and serve the industry and society equally well at global level.

## VALUES

- Academic Freedom
- Integrity
- Inclusiveness
- Innovation
- Professionalism
- Social Responsibility

# DEPARTMENT OF

## MASTER OF COMPUTER APPLICATIONS

## VISION

To emerge as a department of eminence in the field of Computer Applications in serving the Information Technology Industry and the nation by empowering students with a high degree of technical, managerial and practical competence.

## MISSION

To strengthen the theoretical, practical and ethical aspects of the learning while inculcating a culture of research, innovation and practical applications amongst faculty and students.

To encourage long-term interactions between the department and the IT Industry through rich involvement of the Industry in the design of the curriculum and its hands-on implementation.

To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities.

## QUALITY POLICY

To provide services of the highest quality both curricular and co-curricular, so that our students can integrate their skills and serve the industry and society equally well at the global level.

## PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

**PEO1** Excel in the field of Computer Applications and contribute to academia, industry and research.

**PEO2** Deliver software solutions that are socially relevant and adapt quickly to emerging technologies.

**PEO3** Demonstrate professional behavior by understanding ethical and communication skills to engage in lifelong learning.

# PROGRAMME OUTCOMES (POs)

**PO1** **Computational Knowledge:** Apply computing knowledge, mathematical knowledge and domain knowledge to create and develop new models for real world applications.

**PO2** **Problem Analysis:** Identify, formulate, review research literature and analyze complex problems using principles of mathematics, computing sciences and relevant domains.

**PO3** **Design / Development of Solutions:** Design, implement, test and maintain solutions for systems, components or processes that meet specific needs with consideration for public health safety, societal and environmental issues.

**PO4** **Conduct investigations of complex Computing problems:** Use Research–based knowledge to analyze and interpret data to obtain viable conclusions.

**PO5** **Modern Tool Usage:** Use modern tools, techniques and skills to solve complex and critical computing problems with an understanding of their limitations.

**PO6** **Professional Ethics:** Understand and apply ethical principles, cyber regulations and commit to professional computing practice and responsibilities.

**PO7** **Life-long Learning:** Recognize the importance of self-learning for continual development as a computing professional.

**PO8** **Project management and finance:** Demonstrate the management principles for managing projects as an individual, as a member and as a leader in a team under multidisciplinary environments.

**PO9** **Communication Efficacy:** Recognize the importance of communication within the computing community and the society at large.

**PO10** **Societal and Environmental Concern:** Understand and assess the local and global influence of software solutions and responsibilities related to professional computing practice.

**PO11** **Individual and Team Work:** Deliver effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

**PO12** **Innovation and Entrepreneurship:** Adopt standardized computer application practices with innovative ideas to succeed as an employee or an entrepreneur.

# PROGRAM SPECIFIC OUTCOMES (PSOs)

**PSO1**

Acquire skills on computing technologies to analyze, design and develop industry-oriented real-time applications.

**PSO2**

Inculcate technical communication skills and ethics with professional practices to strengthen the research-gap, career growth and employability.

## PEO to Mission Statement Mapping

**Correlation:** 3- High, 2-Medium, 1-Low

| Mission Statements | PEO1 | PEO2 | PEO3 |
|---|---|---|---|
| To strengthen the theoretical, practical and ethical aspects of the learning while inculcating a culture of research, innovation and practical applications amongst faculty and students. | 3 | 3 | 3 |
| To encourage long-term interactions between the department and the IT Industry through rich involvement of the Industry in the design of the curriculum and its hands-on implementation. | 3 | 2 | 3 |
| To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co curricular and extracurricular activities. | 3 | 3 | 3 |

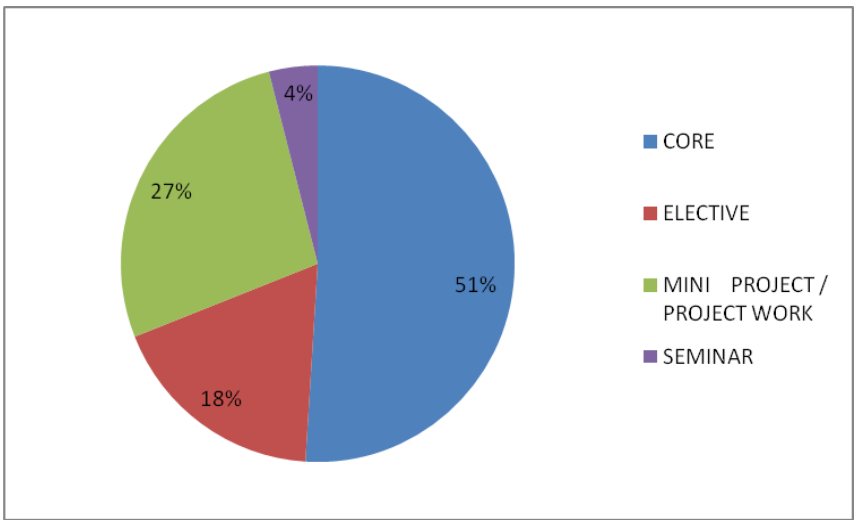
# Mapping of POs to PEOs

| PO's | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO09 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PEO1** | **3** | **3** | **3** | **3** | **3** | **2** | **1** | **3** | **2** | **2** | **3** | **3** |
| **PEO2** | **3** | **3** | **3** | **2** | **3** | **2** | **1** | **3** | **2** | **3** | **3** | **3** |
| **PEO3** | **2** | **2** | **3** | **2** | **2** | **3** | **3** | **2** | **2** | **3** | **2** | **2** |

**Correlation:** 3- High, 2-Medium, 1-Low

# DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS
# MCA DEGREE CURRICULUM – COURSE CREDIT STRUCTURE
# ACADEMIC YEAR 2023-2024: - NEP BATCH SEMESTER I TO IV

| SEMESTER | CORE | ELECTIVE | MINI PROJECT / PROJECT WORK | SEMINAR | TOTAL CREDITS |
|---|---|---|---|---|---|
| I | 25 | 0 | 0 | 0 | 25 |
| II | 17 | 6 | 2 | 0 | 25 |
| III | 9 | 6 | 8 | 2 | 25 |
| IV | 0 | 6 | 17 | 2 | 25 |
| **TOTAL** | 51 | 18 | 27 | 4 | 100 |
| **% of Distribution** | 51% | 18% | 27% | 4% | 100% |



# DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS
# SCHEME OF FIRST SEMESTER MCA PROGRAM
# AY 2023-24 NEP BATCH

| SNO | BOARD / COURSE | COURSE CODE | COURSE | BOS | CREDIT DISTRIBUTION | | | | OVERALL CREDITS | CONTACT HOURS WEEKLY (THEORY) | MARKS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | S | | | CIE | SEE | TOTAL |
| 1 | AS/BSC | 22MATC11 | COMPUTATIONAL MATHEMATICS | MCA | 3 | 1 | 0 | 0 | 4 | 5 | 50 | 50 | 100 |
| 2 | MCA/PCC | 22MCA12 | PROGRAMMING WITH JAVA | MCA | 4 | 0 | 0 | 0 | 4 | 4 | 50 | 50 | 100 |
| 3 | MCA/PCC | 22MCA13 | OPERATING SYSTEM WITH LINUX PROGRAMMING | MCA | 4 | 0 | 0 | 0 | 4 | 4 | 50 | 50 | 100 |
| 4 | MCA/IPCC | 22MCA14 | SOFTWARE ENGINEERING AND TESTING | MCA | 2 | 0 | 1 | 0 | 3 | 4 | 50 | 50 | 100 |
| 5 | MCA/IPCC | 22MCA15 | COMPUTER NETWORKS | MCA | 3 | 0 | 1 | 0 | 4 | 5 | 50 | 50 | 100 |
| 6 | MCA/PCCL | 22MCAL16 | JAVA LAB | MCA | 0 | 0 | 1.5 | 0 | 1.5 | 3 | 50 | 50 | 100 |
| 7 | MCA/PCCL | 22MCAL17 | LINUX PROGRAMMING LAB | MCA | 0 | 0 | 1.5 | 0 | 1.5 | 3 | 50 | 50 | 100 |
| 8 | MCA/MCC | 22MCA18 | RESEARCH METHODOLOGY AND IPR | MCA | 2 | 0 | 0 | 0 | 2 | 2 | 50 | 50 | 100 |
| 9 | LS/AEC | 22HSSC19 | LIFE SKILLS FOR PROFESSIONALS -1 | MCA | 1 | 0 | 0 | 0 | 1 | 2 | 50 | 50 | 100 |
| 10 | MCA/BC | 22MCA110 | PROGRAMMING LOGIC AND DESIGN* | MCA | 0 | - | - | 0 | - | 3 | 50 | 50 | 100 |
| TOTAL | | | | | 19 | 1 | 5 | 0 | 25 | 32 | 450 | 450 | 900 |

L -Lecture (1 hour), T- Tutorial/Skill Development Activities (2 hours), P-Practical (2 hours), S-Self Study (hours – Nil)
*Mandatory non-credit Bridge Course only for non-computer science students
*Selected online courses will be given as per BOS recommendation.
*PCC- Professional Core. IPCC-Integrated Professional Core Courses (No SEE for lab component only CIE), MCC- Mandatory Credit Course, AEC– Ability Enhancement Course.

*BoS recommended two certified online courses is offered in 4th semester

# DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS
# SCHEME OF SECOND SEMESTER MCA PROGRAM
# AY 2023-24 NEP BATCH

| S NO | BOARD/ COURSE | COURSE CODE | COURSE | BOS | CREDIT DISTRIBUTION | | | | OVERALL CREDITS | CONTACT HOURS WEEKLY (THEORY) | MARKS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | S | | | CIE | SEE | TOTAL |
| 1 | MCA/PCC | 22MCA21 | DATA STRUCTURES USING C++ | MCA | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | 100 |
| 2 | MCA/PCC | 22MCA22 | ADVANCED JAVA AND ENTERPRISE ARCHITECTURE | MCA | 3 | 0 | 0 | 0 | 3 | 3 | 50 | 50 | 100 |
| 3 | MCA/PCC | 22MCA23 | DESIGN AND ANALYSIS OF ALGORITHMS | MCA | 2 | 1 | 0 | 0 | 3 | 4 | 50 | 50 | 100 |
| 4 | MCA/IPCC | 22MCA24 | DATABASE MANAGEMENT SYSTEMS | MCA | 3 | 0 | 1 | 0 | 4 | 5 | 50 | 50 | 100 |
| 5 | MCA/PEC | 22MCA25X | PROFESSIONAL ELECTIVES-1 | MCA | 2 | 1 | 0 | 0 | 3 | 4 | 50 | 50 | 100 |
| 6 | MCA/PEC | 22MCA26X | PROFESSIONAL ELECTIVES-2 | MCA | 2 | 1 | 0 | 0 | 3 | 4 | 50 | 50 | 100 |
| 7 | MCA/PCCL | 22MCAL27 | DATA STRUCTURES AND ALGORITHMS LAB | MCA | 0 | 0 | 1.5 | 0 | 1.5 | 3 | 50 | 50 | 100 |
| 8 | MCA/PCCL | 22MCAL28 | ADVANCED JAVA LAB | MCA | 0 | 0 | 1.5 | 0 | 1.5 | 3 | 50 | 50 | 100 |
| 9 | MCA/MP | 22MCAL29 | MINI PROJECT USING JAVA AND DBMS | MCA | 0 | 0 | 2 | 0 | 2 | - | 50 | 50 | 100 |
| 10 | LS/AEC | 22HSSC210 | LIFE SKILLS FOR PROFESSIONALS -2 | MCA | 1 | 0 | 0 | 0 | 1 | 2 | 50 | 50 | 100 |
| TOTAL | | | | | 16 | 3 | 6 | 0 | 25 | 31 | 500 | 500 | 1000 |

L -Lecture (1 hour), T- Tutorial/ Skill Development Activities (2 hours), P-Practical (2 hours), S-Self Study (hours – Nil)
*Selected online courses MCA/PCC will be given as per BOS recommendation.

*PCC- Professional core. IPCC- Integrated Professional Core Courses (No SEE for lab component only CIE), MP- Mini Project, PEC- Professional Elective Courses.

*BoS recommended two certified online courses is offered in 4th semester

| PROFESSIONAL ELECTIVES-1 (BUSINESS ANALYTICS TRACK) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SNO | COURSE CODE | COURSE | BOS | CREDIT DISTRIBUTION | | | | TOTAL |
| | | | | L | T | P | S | |
| 1 | 22MCA251 | DATA WAREHOUSING AND DATA MINING | MCA | 2 | 1 | 0 | 0 | 3 |
| 2 | 22MCA252 | ROBOTIC PROCESS AUTOMATION | MCA | 2 | 1 | 0 | 0 | 3 |
| 3 | 22MCA253 | SOCIAL MEDIA ANALYTICS | MCA | 2 | 1 | 0 | 0 | 3 |
| 4 | 22MCA254 | BUSINESS INTELLIGENCE AND DATA ANALYTICS | MCA | 2 | 1 | 0 | 0 | 3 |
| 5 | 22MCA255 | SEARCH ENGINE OPTIMIZATION | MCA | 2 | 1 | 0 | 0 | 3 |

| PROFESSIONAL ELECTIVES-2 (NETWORK SECURITY TRACK) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SNO | COURSE CODE | COURSE | BOS | CREDIT DISTRIBUTION | | | | TOTAL |
| | | | | L | T | P | S | |
| 1 | 22MCA261 | CYBER SECURITY AND CYBER LAW | MCA | 2 | 1 | 0 | 0 | 3 |
| 2 | 22MCA262 | DIGITAL FORENSICS | MCA | 2 | 1 | 0 | 0 | 3 |
| 3 | 22MCA263 | CRYPTOGRAPHY AND NETWORK SECURITY | MCA | 2 | 1 | 0 | 0 | 3 |
| 4 | 22MCA264 | INFORMATION RETRIEVAL | MCA | 2 | 1 | 0 | 0 | 3 |
| 5 | 22MCA265 | WEB APPLICATION SECURITY | MCA | 2 | 1 | 0 | 0 | 3 |

# FIRST SEMESTER

# MCA SYLLABUS

# (2023-24)

## COMPUTATIONAL MATHEMATICS

| | | | |
|---|---|---|---|
| **Course Code** | **22MATC11** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:1:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **5** | **Total Marks** | **100** |
| **Credits** | **04** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MATC11.1 | Formulate, solve, apply, and interpret properties of linear systems. |
| 22MATC11.2 | Formulate physical problems as Partial Differential Equations and solve. |
| 22MATC11.3 | Apply numerical methods to obtain approximate solutions to mathematical problems. |
| 22MATC11.4 | Identify solution methods for the optimization problems studied and Apply Evolutionary Computation Methods to find solutions to complex problems. |
| 22MATC11.5 | Learn to present clear mathematical arguments. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MATC11.1 | 3 | 2 | 2 | - | 1 | - | - | - | - | - | 1 | - | - | 3 |
| 22MATC11.2 | 3 | 2 | 2 | - | 1 | - | - | - | - | - | 1 | - | - | 3 |
| 22MATC11.3 | 3 | 2 | 2 | - | 1 | - | - | - | - | - | 1 | - | - | 3 |
| 22MATC11.4 | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | 1 | - | - | 3 |
| 22MATC11.5 | 3 | 2 | 2 | 1 | 1 | - | - | - | - | - | 1 | - | - | 3 |

| | | | |
|---|---|---|---|
| **MODULE-1** | **MATHEMATICAL FOUNDATIONS** | **22MATC11.1** | **9 Hours** |

Differentiation- Product rule, Quotient rule, Chain rule and Applications of finding velocity and acceleration. Integration- Definite integration, Indefinite integration and Integration by parts. Vector Calculus: Gradient, Divergence and Curl problems. Matrices: Inverse of a matrix, Eigen values and Eigen Vectors, Matrix exponential and Quadratic forms.

| | |
|---|---|
| Text Book | Text Book 1: 1, 2 Text Book 3: 4 Text Book 3: 2 |

| | | | |
|---|---|---|---|
| **MODULE-2** | **ORDINARY DIFFERENTIAL EQUATIONS** | **22MATC11.2** | **9 Hours** |

First-order differential equations: Variable Separable method, Exact and Linear differential equations. Second and Higher order differential equations with constant coefficients: Finding Complement-ary function and particular Integral of 〖e〗 ^ax, Sin (ax+b),Cos (ax+b) and 〖ax〗 ^n. Partial Differential Equations: Solution of PDE by direct integration and by the method of separation of variables.

| | |
|---|---|
| Text Book | Text Book 1: 3, 4 |

| | | | |
|---|---|---|---|
| **MODULE-3** | **NUMERICAL ALGORITHMS** | **22MATC11.3** | **9 Hours** |

Roots of Nonlinear equations – Bisection, Newton's, Iteration methods. Numerical Integration- Trapezium Rule, Simpson's Rule. Computational Linear Algebra: System of Linear equations, Gauss elimination.

| | |
|---|---|
| Text Book | Text Book 1: 5, 6, 7 Text Book 2: 2, 8 |

| | | | |
|---|---|---|---|
| **MODULE-4** | **MATHEMATICAL OPTIMIZATION** | **22MATC11.4** | **9 Hours** |

Optimization- Formation of Linear Programming Problem, Simplex Methods, Finding maximum and minimum values of function of two variables and Gradient-based methods.

| | |
|---|---|
| Text Book | Text Book 1: 13, 14 Text Book 2: 12 |

| | | | |
|---|---|---|---|
| **MODULE-5** | **STOCHASTIC MODELS** | **22MATC11.5** | **9 Hours** |

Binomial, Poisson and Exponential and normal distributions. Data Modelling – Simple Mean and variance, Method of Least squares.

| | |
|---|---|
| Text Book | Text Book 1: 15, 16 |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | 5 | - |
| L2 | Understand | 5 | 5 | - |
| L3 | Apply | 10 | 5 | 10 |
| L4 | Analyze | 2.5 | - | - |
| L5 | Evaluate | 2.5 | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 10 |
| L3 | Apply | 20 |
| L4 | Analyze | 5 |
| L5 | Evaluate | 5 |
| L6 | Create | -- |

**Suggested Learning Resources:**

**Text Books:**


1) Xin-She Yang, Introduction to Computational Mathematics, World Scientific Publishing Co. Pte. Ltd., Second Edition, 2015, ISBN: 978-9814635776.
2) B.S.Grewal, Numerical Methods in Engineering and Science, Khanna Publishers, 11th Edition, 2013, ISBN: 978-81-7409-248-9.
3) David C. Lay, Steven R. Lay and Judi J. McDonald, Linear Algebra and its Applications, Pearson Education Limited, Fifth Edition, 2016, ISBN: 978-0321982384.


**Reference Books:**


1) G.I.; V.P. Dymnikov Marchuk**,** Problems of Computational Mathematics and Mathematical Modelling, MIR Publishers, First Edition, 1985, ISBN: 978-0828533744.
2) S. S. Rao, Engineering Optimization: Theory and Practice, John Wiley & Sons, Fourth Edition, 2009, ISBN: 978-0-470-18352-6.
3) M. K. Jain, S. R. K. Iyengar and R. K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International (P) Limited, Fifth Edition, 2007, ISBN: 8122420012.
4) S. M. Ross, Stochastic Processes, Wiley Publishers, Second Edition, 1995, ISBN: 978-0-471-12062-9
5) Xin-She Yang, Optimization Techniques and Applications with examples, John Wiley & Sons, First Edition, 2018, ISBN: 9781119490548.


**Web links and Video Lectures (e-Resources):**

**MODULE-1:**

- https://youtu.be/5yfh5cf4-0w
- https://youtu.be/6WUjbJEeJwM
- https://youtu.be/Jt5R-Tm8cV8
- https://byjus.com/maths/differential-calculus/

**MODULE-2:**

- https://www.britannica.com/science/mathematics
- https://youtu.be/O3ahEHAX-KU
- https://youtu.be/HKvP2ESjJbA

**MODULE-3:**

- https://youtu.be/zadUB3NwFtQ
- https://youtu.be/LHsPJ2bQX1U

**MODULE-4:**

- https://youtu.be/xrGVe6gMRyk
- https://youtu.be/9YKLXFqCy6E

- https://youtu.be/Hg38kfK5w4E

**MODULE-5:**

- https://youtu.be/c06FZ2Yq9rk
- https://youtu.be/P8hT5nDai6A

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning:**

- Activity on Problem solving
- Group Based Practices Excise

****

## PROGRAMMING WITH JAVA

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA12** | **CIE Marks** | **50** |
| **L:T:P:S** | **4:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **4** | **Total Marks** | **100** |
| **Credits** | **04** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA12.1 | Understand basic Java language syntax and semantics to write Java programs. |
| 22MCA12.2 | Analyze the importance of method overloading, recursion And string handling concepts. |
| 22MCA12.3 | Exemplify the usage of Inheritance, Interfaces and Packages for Programming. |
| 22MCA12.4 | Apply Multithreading and exception handling concepts in concurrent programming. |
| 22MCA12.5 | Implement generic class, collection framework, java applet and swing for real world applications. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA12.1 | 3 | 3 | 2 | - | 3 | - | 1 | - | 1 | - | - | 2 | 3 | - |
| 22MCA12.2 | 3 | 3 | 3 | - | 2 | - | 2 | - | 1 | - | - | 2 | 3 | - |
| 22MCA12.3 | 3 | 2 | 2 | - | 3 | - | 1 | - | - | 2 | - | 1 | 3 | - |
| 22MCA12.4 | 3 | 3 | 3 | - | 2 | - | 2 | - | 1 | - | - | 3 | 3 | - |
| 22MCA12.5 | 3 | 2 | 1 | 2 | 3 | - | - | - | 1 | 1 | - | 1 | 3 | - |

| | | | |
|---|---|---|---|
| **MODULE-1** | **OVERVIEW OF JAVA** | **22MCA12.1** | **9 Hours** |

The Java Language, The Key Attributes of Object-Oriented Programming, The Java Development Kit, A First simple program. Data types, Variables and operators: The Java Keywords, Identifiers in Java, The Java Class Libraries, Java's Primitive Types, Literals, A Closer Look at Variables, The Scop and Lifetime of Variables, operators Using Cast, Operator Precedence, Expressions. Input characters from the Keyword, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do-while Loop, Use break, Use continue Nested Loops Introducing classes: Class fundamentals, declaring objects, Reference Variables and Assignment ,introducing methods, constructors, the this keyword, garbage collection, the finalize( ) method.

| | |
|---|---|
| Text Book | Text Book 1: 1, 2, 3, 4, 5 Text Book 2: 2, 3, 4, 5, 6, 7, 8 |

| | | | |
|---|---|---|---|
| **MODULE-2** | **ARRAYS STRING HANDLING** | **22MCA12.2** | **9 Hours** |

Arrays String Handling: The String Constructors, String methods and operations, String Buffer and its methods, String Builder and its methods. Methods and classes: Overloading methods, using objects as parameters, argument passing, returning objects, recursion, introducing access control, understanding static, introducing final, Nested and Inner Classes, Varargs- Variable-Length Arguments.

| | |
|---|---|
| Text Book | Text Book 1: 3, 6, 13 Text Book 2: 9 |

| | | | |
|---|---|---|---|
| **MODULE-3** | **INHERITANCE** | **22MCA12.3** | **9 Hours** |

Basics of Inheritance, using super, creating a multilevel hierarchy, constructors and inheritance, method overriding, dynamic method dispatch, using abstract classes, using final with inheritance, the object class. Interfaces and Packages: Creating an Interface, Implementing an Interface, Using Interface Reference, Implementing Multiple Interfaces, Nested Interfaces. Package Fundamentals, Packages and Member Access, Importing Packages, Interfaces.

| | |
|---|---|
| Self-study / Case Study / Applications | Create an interactive application which demonstrates the different types of Inheritance. |
| Text Book | Text Book 1, 2: 8, 9 |

| | | | |
|---|---|---|---|
| **MODULE-4** | **EXCEPTION HANDLING** | **22MCA12.4** | **9 Hours** |

Exception-Handling fundamentals, Exception types, Uncaught Exceptions, Using try and catch, Multiple catch clauses, Nested try statements, throw, throws, finally, Java's Built-in exceptions, Creation of Exception subclasses, Chained Exceptions, Using Exceptions .Multithreaded Programming: The Java Thread model, Multithreading fundamentals, The Thread Class and Runnable

Interface, The Main thread, Creating Multiple Threads, Thread Priorities, synchronization, using Synchronization Methods, The Synchronized Statement, Thread Communication using notify(), wait() and notify All().

| | |
|---|---|
| Self-study / Case Study / Applications | • Create an interactive multithreading application using various methods of Thread class.<br>• Develop an interactive application which uses user-defined exceptions. |
| Text Book | Text Book 1: 10, 11 |

| MODULE-5 | GENERICS AND COLLECTION OVERVIEW | 22MCA12.5 | 9 Hours |
|---|---|---|---|

What are Generics? A simple Generics Example, Generic Methods, Generic Constructors, Generic classes The Collection Interfaces. Introducing Java AWT & Swing: AWT basics, Components, Event-Delegation-Model, Listeners, Layouts, Individual Components, Label, Button, Check Box, Radio Button, Choice, List, Menu, Text Field and Text Area. The swing fundamentals, Components and containers, Layout managers, A first simple swing Example, Exploring Swing Controls and Event Handling.

| | |
|---|---|
| Text Book | Text Book 1: 12, 15, 19, 20, 26 |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | 3 | 2 |
| L2 | Understand | 5 | 4 | 2 |
| L3 | Apply | 10 | 4 | 3 |
| L4 | Analyze | 5 | 4 | 3 |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 10 |
| L3 | Apply | 20 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources:**

**Text Books:**

1) Herbert Schildt, Java The Complete Reference, 11th Edition, Tata McGraw Hill, 2020.
2) E Balagurusamy, Programming with Java A primer, 6th Edition, Tata McGraw Hill, 2019.

**Reference Books:**

1) Core Java Volume I – Fundamentals, Cay S. Horstmann, Prentice Hall, 11th Edition May 2018.
2) Java 6 Programming Black Book, Dreamtech Press, 2012.

**Web links and Video Lectures (e-Resources):**

- https://www.javatpoint.com/inheritance-in-java
- https://www.tutorialspoint.com/java/java_multithreading.htm
- https://www.w3schools.com/java/java_try_catch.asp
- https://www.programiz.com/java-programming/collections

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning:**

- Video demonstration of latest technologies in Java.
- For active participation of students, instruct the students to write and execute Java related program.
- Expert talk & Seminars

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## OPERATING SYSTEM WITH LINUX PROGRAMMING

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA13** | **CIE Marks** | **50** |
| **L:T:P:S** | **4:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **4** | **Total Marks** | **100** |
| **Credits** | **04** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA13.1 | Understand the basics and essentials of operating system. |
| 22MCA13.2 | Apply the concepts of Linux to solve computing problems. |
| 22MCA13.3 | Implement advance shell programming concepts. |
| 22MCA13.4 | Develop interactive scripts using regular expressions in simple and advanced filters. |
| 22MCA13.5 | Analyze the different memory allocation strategies. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA13.1 | - | - | - | - | - | - | 1 | - | - | - | - | - | 2 | - |
| 22MCA13.2 | - | - | - | - | 1 | - | 1 | - | - | - | 1 | - | 2 | - |
| 22MCA13.3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | - | - | - | 2 | - | 2 | - |
| 22MCA13.4 | 3 | 3 | 3 | 1 | 3 | 1 | 1 | - | - | - | - | 1 | 2 | - |
| 22MCA13.5 | 3 | 3 | - | 1 | 3 | 1 | 1 | - | - | - | - | - | 2 | - |

| **MODULE-1** | **INTRODUCTION TO OPERATING SYSTEM** | **22MCA13.1** | **9 Hours** |
|---|---|---|---|

Introduction, System Components, Open Source Operating Systems, Operating System Services, System Calls, System Programs Process Management- Process Structure, Process states, Types of Schedulers, Scheduling Criteria and Scheduling algorithms. Deadlock and Starvation- Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.

| Text Book | Text Book 1: 1.1-1.8, 2.1-2.4, 3.1-3.5, 5.1-5.3, 8.1-8.9 |
|---|---|

| **MODULE-2** | **INTRODUCTION TO LINUX** | **22MCA13.2** | **9 Hours** |
|---|---|---|---|

Introduction, Architecture, Experience the Linux Environment, Basic Commands – passwd, who, w, tty, lock, stty, script, clear, uname, date, cal, calendar, bc, echo. Linux File System- The file, what's in a filename? The parent-child relationship, pwd – the Home directory, absolute pathnames – using absolute pathnames for a command, cd, relative path names (.& ..), mkdir, rmdir, cp, rm, mv, cat. File Attributes: ls, Is –l, ls –d, File Permissions, chmod, Directory Permissions, Umask, file ownership, changing ownership and group using chown & chgrp, file modification and access times, touch, more file attributes: hard link, symbolic link, find.

| Self-study / Case Study / Applications | Installation of VMWare and Red Hat Linux. |
|---|---|
| Text Book | Text Book 1: 20.1, Text Book 2: 1, 5 |

| **MODULE-3** | **INTRODUCTION TO THE SHELL PROGRAMMING** | **22MCA13.3** | **9 Hours** |
|---|---|---|---|

Introduction to Shell Scripting, Shell Variables, Shell Scripts, Read, Positional Parameters, command line arguments, exit status of a command, the logical operators && and ||, exit, if, test and [ ], case conditions, expr, sleep and wait, while, until, for loop. Shell Programming: Assigning values to positional parameters using set, IFS variable, shift, here document, let, redirection, export, conditional parameter substitution, shell functions, eval, exec, set –x, trap.The Process in Linux: Shell process, ps, running jobs in background (& and nohup), introduction to signals, nice, at and batch, cron, time commands.

| Text Book | Text Book 2: 20, 21 |
|---|---|

| **MODULE-4** | **SIMPLE FILTERS** | **22MCA13.4** | **9 Hours** |
|---|---|---|---|

More, wc, od, pr, cmp, diff, comm, head, tail, cut, paste, sort, tr, uniq, spell and ispell commands. Filters Using Regular Expression: Filters using regular expressions: grep and sed, usage of *,. , ^, $, lin addressing, context addressing, editing text, substitution, types of regular expressions- IRE & TRE.Awk-Advanced Filters: Simple awk filtering, BEGIN and END sections, built-in variables, arrays, functions, control flow, looping.

| | | | |
|---|---|---|---|
| Self-study / Case Study / Applications | Developing new utilities using existing utilities in Linux. | | |
| Text Book | Text Book 3: 1, 2 | | |
| **MODULE-5** | **MEMORY MANAGEMENT** | **22MCA13.5** | **9 Hours** |

Swapping, Contiguous Memory Allocation, Paging, Segmentation, Virtual Memory, Page Replacement Algorithms- First In First Out, Least Recently Used, Optimal Page Replacement Algorithm. Secondary Storage - Disk Structure, Disk Scheduling, Disk Management.

| | |
|---|---|
| Text Book | Text Book 3: 9.1-9.5, 10.1- 10.5, 11.8, 12.2,12.3, 13.1, 13.3 |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | Quizzes |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | 3 | 3 |
| L2 | Understand | 10 | 4 | 3 |
| L3 | Apply | 5 | 4 | 2 |
| L4 | Analyze | 5 | 4 | 2 |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 10 |
| L3 | Apply | 20 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources:**

**Text Books:**


1) Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles – 10th Edition, John Wiley & Sons Inc., 2021.
2) John Smith, Mastering Linux: A Comprehensive Guide to Linux Administration and Beyond– Tech. Publications Inc., 2023.
3) Arnold Robbins, Effective Awk Programming, O'Reilly Media Inc., 2015.


**Reference Books:**


1) Barrett, Daniel J. Efficient Linux at the Command Line. " O'Reilly Media, Inc.", 2022.
2) Miller, Scott Alan. Linux Administration Best Practices. Packt Publishing, 2022.
3) Linux: The Complete Reference, Sixth Edition, 1 July 2017, Richard Petersen, Mc Graw Hill.


**Web links and Video Lectures (e-Resources):**

- https://nptel.ac.in/courses/117106113
- https://onlinecourses.nptel.ac.in/noc21_cs72

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning:**

- Team Activity- To compare performance of various process management and memory management algorithms.
- Hands-on: Development of new utilities in Linux using existing commands and utilities.

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## SOFTWARE ENGINEERING AND TESTING

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA14** | **CIE Marks** | **50** |
| **L:T:P:S** | **2:0:1:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **4** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA14.1 | Understand the basics of Software Engineering and process models for software development. |
| 22MCA14.2 | Architect and design a software application based on the requirements. |
| 22MCA14.3 | Describe the agile framework and the associated models to achieve software quality. |
| 22MCA14.4 | Acquire knowledge on the basics of software testing and the process of software automation. |
| 22MCA14.5 | Demonstrate the use of Selenium IDE and programming using Selenium Web Driver. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA14.1 | 2 | 2 | 1 | - | - | - | 2 | - | - | 2 | - | - | 3 | 2 |
| 22MCA14.2 | 2 | 2 | 1 | - | - | - | 2 | - | - | 2 | - | - | 3 | 2 |
| 22MCA14.3 | 2 | 2 | 1 | - | - | - | 2 | - | - | 2 | - | - | 3 | 2 |
| 22MCA14.4 | 2 | 2 | 1 | - | - | - | 2 | - | - | 2 | - | - | 3 | 2 |
| 22MCA14.5 | 2 | 2 | 1 | - | - | - | 2 | - | - | 2 | - | - | 3 | 2 |

| | | | |
|---|---|---|---|
| **MODULE-1** | **INTRODUCTION TO SOFTWARE ENGINEERING** | **22MCA14.1** | **8 Hours** |

The Nature of Software, the unique nature of Web Apps, Software Engineering, the Software Process, Software Engineering Practice, Software Myths, Software Development Life Cycle. Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, the Unified Process, Personal and Team Process Models, Process Technology, Product and Process.

| | |
|---|---|
| Self-study / Case Study / Applications | **HANDS ON:**<br>• Designing and Recording test cases using Selenium IDE.<br>• Designing and Recording test suites using Selenium IDE. |
| Text Book | Text Book 1: 1, 2 Text Book 2: 1, 2 |

| | | | |
|---|---|---|---|
| **MODULE-2** | **UNDERSTANDING REQUIREMENTS AND MAPPING TO DESIGN** | **22MCA14.2** | **8 Hours** |

Requirements Engineering, Establishing the groundwork, Eliciting Requirements, Developing use cases, Building the requirements model, Negotiating Requirements, Validating Requirements, Software Requirements Specification, Case Study. Design Concepts: Design within the context of software engineering, the Design Process, Design Concepts, and the Design Model Case Study for Design of any Application Project.

| | |
|---|---|
| Self-study / Case Study / Applications | **HANDS ON:**<br>• Installation of Selenium Web Driver.<br>• Automation program to login into a webpage. |
| Text Book | Text Book 1: 3, 5, 6 Text Book 2: 3 |

| | | | |
|---|---|---|---|
| **MODULE-3** | **AGILE DEVELOPMENT AND QUALITY CONCEPTS** | **22MCA14.3** | **8 Hours** |

What is Agility, Agile and the Cost of Change, What is an Agile Process , Agility Principles , The Politics of Agile Development , Human factors , Extreme Programming, Other Agile Process Models, Adaptive Software Development Scrum, DSDM, Crystal, FDD, LSD, Agile Modeling, Agile Unified Process - A Tool Set for the Agile Process – Case Study. Quality Concepts: What is Quality, Software Quality, Achieving Software Quality, Elements of Software Quality Assurance, Statistical Software Quality Assurance, Software Reliability, The ISO 9000 Quality Standards, The SQA Plan.

| | |
|---|---|
| Self-study / Case Study / Applications | **HANDS ON:**<br>• An automation program to test whether a test case has passed or failed.<br>• A program to read the contents of an excel file and printing the contents on the selenium output console using jxl. |

| Text Book | Text Book 1: 12 Text Book 3: 1, 2 | | |
|---|---|---|---|
| **MODULE-4** | **INTRODUCTION TO SOFTWARE TESTING AND SOFTWARE AUTOMATION** | **22MCA14.4** | **8 Hours** |
| Introduction and fundamentals of Testing, Testing Objectives, Software Testing Life Cycle (STLC), Test Planning, Manual Testing formats. Software Automation: Fundamentals of Test Automation, Design and Architecture for Automation, Challenges in Automation. | | | |
| Self-study / Case Study / Applications | **HANDS ON:**<br>• Program to count the total number of hyperlink objects present on a webpage.<br>• Program to count the total number of items in a list (or) a combo box. | | |
| Text Book | Text Book 1: 9 Text Book 3: 3 Text Book 4: 1, 2, 3 | | |
| **MODULE-5** | **SELENIUM IDE AND SELENIUM WEB DRIVER** | **22MCA14.5** | **8 Hours** |
| Selenium IDE installation, Recording and running test cases using Selenium IDE, Selenium Commands. Selenium Web Driver: Introduction to Web Driver, Architecture, Installation of Selenium Web Driver, Case Study – Apply testing concepts using Open Source tools. | | | |
| Self-study / Case Study / Applications | **HANDS ON:**<br>• Program to switch between web pages and performing certain actions using Mozilla web browser.<br>• A test program to automate the registration page of any e-commerce website. | | |
| Text Book | Text Book 2: 1, 2, 3 | | |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Assessment | Lab CIE |
| | | 25 | 5 | 20 |
| L1 | Remember | 5 | 2 | - |
| L2 | Understand | 10 | 3 | - |
| L3 | Apply | 5 | - | 20 |
| L4 | Analyze | 5 | - | - |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources:**

**Text Book:**


1) Hitesh, Mohapatra| Prof. Amiya Kumar. Fundamentals of Software Engineering. India, BPB Publications, 2020.
2) Sharma, Pallavi. Selenium with Java - A Beginner's Guide: Web Browser Automation for Testing Using Selenium with Java. India, BPB Publications, 2022.
3) Merkow, Mark. Secure, Resilient, and Agile Software Development. United States, CRC Press, 2019.
4) Baumgartner, Manfred, et al. Test Automation Fundamentals: A Study Guide for the Certified Test Automation Engineer Exam – Advanced Level Specialist – ISTQB® Compliant. Germany, dpunkt. verlag, 2022.


**Reference Books:**


1) Stephens, Rod. Beginning Software Engineering. United States, Wiley, 2022.
2) Bierig, Ralf, et al. Essentials of Software Testing. Singapore, Cambridge University Press, 2021.

| |
|---|
| **Web links and Video Lectures (e-Resources):**<br>• https://www.tutorialspoint.com/software_engineering/index.htm<br>• https://www.geeksforgeeks.org/software-engineering/<br>• https://www.javatpoint.com/software-testing-tutorial<br>• https://www.guru99.com/software-testing.html<br>• https://www.selenium.dev/selenium-ide/docs/en/introduction/getting-started<br>• https://github.com/SeleniumHQ/selenium-ide |
| **Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**<br>• Creating a Software Design Document (SDD) for a web application<br>• Student Seminar Presentations<br>• Using Selenium IDE for automated testing of a web application |

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## COMPUTER NETWORKS

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA15** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:1:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **5** | **Total Marks** | **100** |
| **Credits** | **04** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA15.1 | Understand the basic concepts of networks and reference models. |
| 22MCA15.2 | Apply error detection and correction techniques during data transmission. |
| 22MCA15.3 | Implement IP addressing and routing algorithms to find shortest paths for network layer packet delivery based on IPV4 and IPV6 headers |
| 22MCA15.4 | Illustrate the essential principles of a transport layer protocol. |
| 22MCA15.5 | Compose the frame format and functionalities of TCP and UDP and analyse the different functions of application layer protocols. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA15.1 | 1 | 1 | - | - | - | - | 2 | - | - | 2 | - | - | 2 | 1 |
| 22MCA15.2 | 1 | 1 | - | 2 | - | - | 2 | - | 1 | 2 | - | - | 2 | 1 |
| 22MCA15.3 | 3 | 3 | - | 2 | 2 | - | 2 | - | 1 | 2 | - | - | 2 | 1 |
| 22MCA15.4 | 3 | 3 | - | 2 | 2 | - | 3 | - | 1 | 2 | - | - | 2 | 1 |
| 22MCA15.5 | 3 | 3 | - | 2 | - | - | 3 | - | 1 | 2 | - | - | 2 | 1 |

| **MODULE-1** | **INTRODUCTION TO COMPUTER NETWORKS** | **22MCA15.1** | **9 Hours** |
|---|---|---|---|

Introduction, Applications, Requirements, connectivity, Network topology, modes, scale. Network Protocol Stack (TCP/IP and ISO-OSI).Physical Layer: Transmission media –guided and unguided media, Digital Modulation techniques (NRZ,NRZI ,Manchester ,4B/5B) and multiplexing (FDMA, TDMA, CDMA), Implementing Network Software, performance, mobile telephone systems (1G, 2G,3G and 4G).

| | |
|---|---|
| Self-study / Case Study / Applications | **HANDS ON:**<br>Using TCP/IP sockets, write a client-server program to make the client send the file name and to make the server send back the contents of the requested file if present. |
| Text Book | Text Book 1 : 1 , 2 Text Book 2 : 1.1, 1.2, 1.3 |

| **MODULE-2** | **DATA LINK LAYER** | **22MCA15.2** | **9 Hours** |
|---|---|---|---|

Data Link Layer Design issues, Services provided to Network Layer, Framing, Error Detection and Correction Codes, Data Link Protocols and Sliding window protocols elementary Data Link Protocol, unrestricted simplex Protocol, Simplex Stop-and-Wait Protocol, Simplex Protocol for a Noisy, ARQ, Go-back-n ARQ Method, Selective-repeat ARQ. **Medium Access Sublayer:** Multiple access protocols and Examples: ALOHA, Pure ALOHA, Slotted ALOHA Protocol, Ethernet: Carrier Sense Multiple Access (CSMA), Frame format of CSMA, Types of CSMA,CSMA with Collision Detection(CSMA/CD),Ethernet LAN (802.3) frame format, Wireless LAN, Bluetooth, spanning tree.

| | |
|---|---|
| Self-study / Case Study / Applications | **HANDS ON:**<br>• Write a program for Hamming code generation for error detection and correction.<br>• Write a program for distance vector algorithm to find suitable path for transmission. |
| Text Book | Text Book 1 : 3 , 4 Text Book 2 : 2.2, 2.4, 2.5, 2.6 |

| **MODULE-3** | **NETWORK LAYER** | **22MCA15.3** | **9 Hours** |
|---|---|---|---|

Functions of network layer, Network Layer Design issues, Routing algorithms- Dijkstra algorithm, Bellman-ford algorithm, Flood-based routing algorithm, Multicasting routing, Routing among Mobile Devices, Congestion Control Algorithms, cause of congestion, congestion control methods : Open-Loop Congestion Control, Closed-Loop Congestion. Congestion avoidance mechanisms.
Quality of Service: leaky bucket, token bucket.
**Internetworking:** simple interworking and significance, Global IP addresses.

| | | | |
|---|---|---|---|
| Self-study / Case Study / Applications | **HANDS ON:**<br>Write a program for congestion control using leaky bucket algorithm. | | |
| Text Book | Text Book 1 : 5 Text Book 2 : 3 | | |
| **MODULE-4** | **INTRODUCTION TO NS2 & TRANSPORT LAYER** | **22MCA15.4** | **9 Hours** |
| Basics of NS2, Wired TCL script components and parameters .Quality of Service: tunnelling, Fragmentation versions of IP: IPv4 and Ipv6, ARP (Address Resolution Protocol), DHCP (Dynamic Host Configuration Protocol), ICMP (Internet of Control Message Protocol). The Transport Layer: Elements of transport protocols, connection establishment: Two-Way Handshake, connection and release. | | | |
| Self-study / Case Study / Applications | **HANDS ON:**<br>• Simulate a three node point-to-point network with duplex links between them. Set the queue size and vary the bandwidth to find the number of packets dropped.<br>• Simulate to study transmission of packets over Ethernet LAN and determine the number of packets drop destination. | | |
| Text Book | Text Book 1 : 6 Text Book 2 : 4.1.3, 4.4.2 | | |
| **MODULE-5** | **APPLICATION LAYER** | **22MCA15.5** | **9 Hours** |
| The Internet Transport Protocol: functionality of TCP and UDP, comparison between UDP and TCP. The Application Layer: DNS, structure of DNS, DNS message format. Examples: Email, WWW, WWW architecture, working of WWW, Streaming audio and Video and Content Delivery, FTP , TELNET. | | | |
| Self-study / Case Study / Applications | **HANDS ON:**<br>• Simulate the network with five nodes n0, n1, n2, n3, n4 forming a star topology. The node n4 is at the centre. Node n0 is a TCP source, which transmits packets to node n3 (a TCP sink) through the node n4. Node n1 is another traffic source, and sends UDP packets to node n2 through n4. The duration of the simulation time is 10 seconds.<br>• Simulate the different types of internet traffic such as FTP and TELNET over a wired network and analyze the packet drop and packet delivery ratio in the network. | | |
| Text Book | Text Book 1 : 7 Text Book 2 : 9 | | |

**CIE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Assessment | Lab CIE |
| | | 25 | 5 | 20 |
| L1 | Remember | 5 | 2 | - |
| L2 | Understand | 10 | 3 | - |
| L3 | Apply | 5 | - | 20 |
| L4 | Analyze | 5 | - | - |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern (50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources:**

**Text Books:**

1) "Computer Networks" 6th Edition,2021 by Andrew S Tanenbaum rije University, Amsterdam, The Netherlands Nick Feamster, University of Chicago David J. Wetherall, University of Washington
2) "Computer Networks A Systems Approach, Sixth Edition, 2021" Larry L Peterson

**Reference Books:**

1) Computer Networks Principles, Technologies and Protocols for Network Design, by Natala Olifer and Victor Olifer, 2010.
2) http://www.ietf.org/rfc.html relevant RFC document could be used to get more detailed information about any of the concepts prescribed in the syllabus like RFC 2460 can be referred to get detailed information about IPV6.

**Web links and Video Lectures (e-Resources):**

- https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm
- https://www.geeksforgeeks.org/computer-network-tutorials/https://archive.nptel.ac.in/courses/106/105/106105183/
- https://onlinecourses.swayam2.ac.in/cec23_cs07/preview

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning:**

- Demonstration of working of NS2 with TCL programs.
- Demonstration of encoding scheme.
- Demonstration of Error detection and correction methods.
- Video demonstration of latest technology in computer networks.
- Contents related activities (Activity-based discussions)
  - For active participation of students, instruct the students to write and execute networks related program.
  - Organizing Group wise discussions on various applications
  - Seminars

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## JAVA LAB

| | | | |
|---|---|---|---|
| **Course Code** | **22MCAL16** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:1.5:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **1.5** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCAL16.1 | Write basic java program using proper syntax and semantics. |
| 22MCAL16.2 | Create an application using interfaces and packages. |
| 22MCAL16.3 | Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes |
| 22MCAL16.4 | Develop Applet programs and manipulate the IO streams. |
| 22MCAL16.5 | Design and develop database applications. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCAL16.1 | 3 | 3 | 2 | - | 3 | - | 1 | - | 1 | - | 1 | 2 | 2 | 2 |
| 22MCAL16.2 | 3 | 3 | 3 | - | 2 | - | 1 | - | - | - | 1 | 1 | 2 | 2 |
| 22MCAL16.3 | 3 | 2 | 2 | - | 3 | - | 2 | - | 1 | - | 1 | 1 | 2 | 2 |
| 22MCAL16.4 | 3 | 3 | 3 | - | 2 | - | 1 | - | - | - | 1 | 3 | 2 | 2 |
| 22MCAL16.5 | 3 | 2 | - | 2 | 3 | - | - | - | 1 | - | 1 | - | 2 | 2 |

| Pgm. No. | List of Programs | Hours | COs |
|---|---|---|---|
| | **Prerequisite Programs / Demo** | | |
| | • Core JAVA Programming<br>• Basics of Core JAVA Programming | 3 | NA |
| | **PART-A** | | |
| 1 | Write a JAVA Program to implement class, object and method. | 3 | 22MCAL16.1 |
| 2 | Write a Java program to sort for an element in a given list of elements using bubble sort. | 3 | 22MCAL16.2 |
| 3 | Write a JAVA Program to demonstrate Constructor Overloading and Method Overloading | 3 | 22MCAL16.1 |
| 4 | Write a program in Java for String handling, the program must implement any five methods of String. | 3 | 22MCAL16.2 |
| 5 | Write a JAVA Program to demonstrate Inheritance. | 3 | 22MCAL16.3 |
| 6 | Simple Program on Java for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle. | 3 | 22MCAL16.3 |
| | **PART-B** | | |
| 7 | Write a Java program to demonstrate the implementation of multithreading. | 3 | 22MCAL16.4 |
| 8 | Write a JAVA program to create a package named shape, to create some classes in the package representing some common shapes like Square, Triangle, and Circle and import and compile these classes in other program. | 3 | 22MCAL16.4 |
| 9 | Write a program to demonstrate the implementation of exception handling in Java. | 3 | 22MCAL16.4 |
| 10 | Write a program to implement array list from Java collection. | 3 | 22MCAL16.5 |
| 11 | Write a JAVA applet program to implement AWT components. | 3 | 22MCAL16.5 |
| 12 | Write a JAVA Program to create a simple calculator which performs a basic mathematical operations using java swing. | 3 | 22MCAL16.5 |

**PART-C**

**Beyond Syllabus Virtual Lab Content**

**(To be done during Lab but not to be included for CIE or SEE)**

- https://java-iitd.vlabs.ac.in/exp/abstraction/
- https://java-iitd.vlabs.ac.in/exp/encapsulation/

**CIE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Test (s) | Weekly Assessment |
|---|---|---|---|
| | | 40 | 10 |
| L1 | Remember | 10 | - |
| L2 | Understand | 10 | 5 |
| L3 | Apply | 10 | 5 |
| L4 | Analyze | 10 | - |
| L5 | Evaluate | - | - |
| L6 | Create | - | - |

**SEE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 5 |
| L2 | Understand | 10 |
| L3 | Apply | 20 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | 5 |

**Suggested Learning Resources:**

**Reference Books:**


1) First Java, Kathy Sierra & Bert Bates, Shroff/O'Reilly Publication, 2nd Edition 2005.
2) Core Java Volume I – Fundamentals, Cay S. Horstmann, Prentice Hall, 11th Edition May 2018.
3) Java 6 Programming Black Book, Dreamtech Press, 2012.


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## LINUX PROGRAMMING LAB

| | | | |
|---|---|---|---|
| **Course Code** | **22MCAL17** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:1.5:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **1.5** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCAL17.1 | Use filter commands to develop user applications |
| 22MCAL17.2 | Implement shell scripts to analyze user authentication and file properties. |
| 22MCAL17.3 | Design shell scripts for pattern matching using regular expressions. |
| 22MCAL17.4 | Implement shell scripts for non-interactive text processing |
| 22MCAL17.5 | Develop awk scripts to solve complex computing problems while understanding its limitations. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCAL17.1 | 3 | 3 | 3 | - | 1 | 1 | 1 | - | 1 | - | - | - | 2 | 2 |
| 22MCAL17.2 | 3 | 3 | 3 | - | 1 | 1 | 1 | - | 1 | - | - | 1 | 2 | 2 |
| 22MCAL17.3 | 3 | 3 | 3 | - | 1 | 1 | 1 | - | 1 | - | - | 1 | 2 | 2 |
| 22MCAL17.4 | 3 | 3 | 3 | - | 1 | 1 | 1 | - | 1 | - | - | 1 | 2 | 2 |
| 22MCAL17.5 | 3 | 3 | 3 | | 1 | 1 | 1 | | 1 | - | - | 1 | 2 | 2 |

| Pgm. No. | List of Programs | Hours | Cos |
|---|---|---|---|
| | **Prerequisite Programs / Demo** | | |
| | • Installation of VM Ware<br>• Introduction to the LINUX environment<br>• Basic Commands of Linux and File Management Commands. | 3 | NA |
| | **PART-A** | | |
| 1 | Write a shell script that gets executed displays the message either "Good Morning" or "Good Afternoon" or "Good Evening" depending upon time at which the user logs in.<br>Write a shell script that accepts a path name and creates all the components in that path name as directories. For example, if the script is named mpc, then the command mpc a/b/c/d should create directories a, a/b, a/b/c, a/b/c/d. | 3 | 22MCAL17.1 |
| 2 | Write shell script to implement terminal locking (similar to the lock command). It should prompt the user for a password. After accepting the password entered by the user, it must prompt again for the matching password as confirmation and if match occurs, it must lock the keyword until a matching password is entered again by the user. | 3 | 22MCAL17.1 |
| 3 | Write a shell script that accept one or more filenames as argument and convert all of them to uppercase, provided they exist in current directory.<br>Create a script file called file-properties that reads a file name entered and outputs it properties. | 3 | 22MCAL17.2 |
| 4 | Write a shell script that accepts as filename as argument and display its creation time if file exist and if it does not send output error message.<br>Write a shell script to list all the files in a directory whose filename is at least 10 characters. (Use expr command to check the length). | 3 | 22MCAL17.2 |

| | | | |
|---|---|---|---|
| 5 | Write a shell script which accepts valid log-in names as arguments and prints their corresponding home directories, if no arguments are specified, print a suitable error message. | 3 | 22MCAL17.3 |
| 6 | Write a shell script that takes a valid directory name as an argument and recursively descend all the sub-directories, finds the maximum length of any file in that hierarchy and writes this maximum value to the standard output. | 3 | 22MCAL17.3 |
| **PART-B** | | | |
| 7 | Write a shell script that accepts two file names as arguments, checks if the permissions for these files are identical and if the permissions are identical, output common permissions and otherwise output each file name followed by its permissions.<br>Write a shell script that displays all the links to a file specified as the first argument to the script. The second argument, which is optional, can be used to specify in which the search is to begin. If this second argument is not present, the search is to begin in current working directory. In either case, the starting directory as well as all its subdirectories at all levels must be searched. The script need not include any error checking. | 3 | 22MCAL17.3 |
| 8 | Write a shell script that accept a list of filenames as its argument, count and report occurrence of each word that is present in the first argument file on other argument files.<br>Write a shell script to display the calendar for current month with current date replaced by * or ** depending on whether the date has one digit or two digits. | 3 | 22MCAL17.3 |
| 9 | Write a shell script that accept the file name, starting and ending line number as an argument and display all the lines between the given line number.<br>Write a shell script that folds long lines into 40 columns. Thus any line that exceeds 40 characters must be broken after 40th, a "\" is to be appended as the indication of folding and the processing is to be continued with the residue. The input is to be supplied through a text file created by the user. | 3 | 22MCAL17.4 |
| 10 | Write an awk script that accepts date argument in the form of dd-mm-yy and displays it in the form if month, day and year. The script should check the validity of the argument and in the case of error, display a suitable message. | 3 | 22MCAL17.5 |
| 11 | Write an awk script to delete duplicated lines from a text file. The order of the original lines must remain unchanged. | 3 | 22MCAL17.5 |
| 12 | Write an awk script to find out total number of books sold in each discipline as well as total book sold using associate array down table as given below: Electrical 34, Mechanical 67, Electrical 80, Computer Science 43, Mechanical 65, Civil 98, Computer Science 64. | 3 | 22MCAL17.5 |

**PART-C**

**Beyond Syllabus Virtual Lab Content**

**(To be done during Lab but not to be included for CIE or SEE)**

https://spoken-tutorial.org/watch/Linux/More+on+sed+command/English/

**CIE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Test (s) | Weekly Assessment |
|---|---|---|---|
| | | **40** | **10** |
| **L1** | **Remember** | **-** | 2 |
| **L2** | **Understand** | 10 | 2 |
| **L3** | **Apply** | 20 | 4 |
| **L4** | **Analyze** | 10 | 2 |
| **L5** | **Evaluate** | - | - |
| **L6** | **Create** | - | - |

**SEE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| **L1** | **Remember** | **-** |
| **L2** | **Understand** | **05** |
| **L3** | **Apply** | **20** |
| **L4** | **Analyze** | **20** |
| **L5** | **Evaluate** | **05** |
| **L6** | **Create** | **-** |

**Suggested Learning Resources**

**Reference Books:**


1) Barrett, Daniel J. Efficient Linux at the Command Line. " O'Reilly Media, Inc.", 2022.
2) Miller, Scott Alan. Linux Administration Best Practices. Packt Publishing, 2022.
3) Linux: The Complete Reference, Sixth Edition, 1 July 2017, Richard Petersen, Mc Graw Hill.


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## RESEARCH METHODOLOGY AND IPR

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA18** | **CIE Marks** | **50** |
| **L:T:P:S** | **2:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **2** | **Total Marks** | **100** |
| **Credits** | **02** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA18.1 | Understand the Research Methodology (RM) types and their significances. |
| 22MCA18.2 | Define a research problem and its design. |
| 22MCA18.3 | Illustrate the criteria of sampling with relevant characteristics. |
| 22MCA18.4 | Investigate IPR with its infringement & remedies. |
| 22MCA18.5 | Evaluate and protect author's work from theft or piracy and design a product or process to meet the products specification. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA18.1 | - | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | 3 |
| 22MCA18.2 | 2 | 1 | 2 | 2 | 1 | - | 1 | - | - | - | - | - | - | 3 |
| 22MCA18.3 | 1 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 3 |
| 22MCA18.4 | - | - | - | - | 1 | - | - | - | - | - | - | 2 | - | 3 |
| 22MCA18.5 | - | - | - | - | 1 | 2 | - | - | 1 | - | - | 2 | - | 3 |

| | | | |
|---|---|---|---|
| **MODULE-1** | **RESEARCH METHODOLOGY** | **22MCA18.1** | **5 Hours** |

An Introduction – Meaning, Objectives, Motivation, Types, Approaches, Significance, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing how research is done, Research process, Criteria of good research, Problems encountered by researchers

| | |
|---|---|
| Text Book | Text Book 1: 1.1 to 1.12 |

| | | | |
|---|---|---|---|
| **MODULE-2** | **DEFINING THE RESEARCH PROBLEM** | **22MCA18.2** | **5 Hours** |

Definition, Problem selection, Necessity of defining the problem, Techniques involved in defining a problem and illustration. **Research Design:** Meaning, Need, Features of a good design, Important concepts relating to research design, Different research designs.

| | |
|---|---|
| Self-study / Case Study / Applications | Case Studies for the following research questions:<br>• How do companies adapt to changing consumer preferences?<br>• How do organizations use social media for branding and marketing?<br>• What are the effects of the COVID-19 pandemic on the hospitality industry? |
| Text Book | Text Book 1: 2.1 to 2.3, 3.1 to 3.5 |

| | | | |
|---|---|---|---|
| **MODULE-3** | **SAMPLING DESIGN** | **22MCA18.3** | **5 Hours** |

Census and Sample survey, Implications of a sample design, Steps in sampling esign, Criteria of sampling procedure, characteristics, types of sample designs, Select a random sample.

| | |
|---|---|
| Text Book | Text Book 1: 4.1 to 4.7 |

| | | | |
|---|---|---|---|
| **MODULE-4** | **IPR** | **22MCA18.4** | **5 Hours** |

Introduction, copyright and related rights – background and basic principles, Subsistence of copyright, Authorship and Ownership of copyright, Author's rights, Infringement and remedies.

| | |
|---|---|
| Text Book | Text Book 2: 1.1 to 1.8 |

| | | | |
|---|---|---|---|
| **MODULE-5** | **COPYRIGHT, DESIGNS AND PATENTS ACT** | **22MCA18.4** | **5 Hours** |

Defences to copyright infringement and the permitted acts, Copyright and the permitted acts, Copyright and computer software, Rights in performances.

| | |
|---|---|
| Self-study / Case Study / Applications | Case Studies on Patents. Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, Case study of Basmati rice patent. |
| Text Book | Text Book 2: 2.1 to 2.6, 8.1 to 8.10, 9.1 to 9.5 |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | | |
|---|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's | Activities |
| | | 25 | 15 | 5 | 5 |
| L1 | Remember | 5 | 3 | 1 | - |
| L2 | Understand | 10 | 4 | 2 | - |
| L3 | Apply | 5 | 4 | 1 | - |
| L4 | Analyze | 5 | 4 | 1 | - |
| L5 | Evaluate | - | - | - | - |
| L6 | Create | - | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| 9L 4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources:**

**Text Books:**

1) Research Methodology Methods and techniques, C.R Kothari, Gaurav Garg, New Age, 2020,4th Edition, ISBN:978938669225.
2) Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September 2013

**Reference Books:**

1) Research Methodology – a step-by-step guide for beginners, Ranjit Kumar, SAGE, 2011, ISBN: 978-1-84920-300-5.
2) Essentials of Research Design and Methodology, Geoffrey Marczyk, David DeMatteo, David Festinger, John Wiley & Sons Inc., 2005.
3) Intellectual Property, David I Bainbridge, Pearson, 2010, 8th Edition, ISBN: 978-1-4082-2928-6

**Web links and Video Lectures (e-Resources):**

- https://www.youtube.com/watch?v=1vf8ZvADxfY
- https://www.youtube.com/watch?v=GSeeyJVD0JU
- https://www.youtube.com/watch?v=GKqOWCK71K4
- http://www.digimat.in/nptel/courses/video/109106128/L44.html

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning:**

- To demonstrate the preparation of research paper writing
- To demonstrate the process of filing a patent
- Seminars

****

## LIFE SKILLS FOR PROFESSIONALS – 1

| | | | |
|---|---|---|---|
| **Course Code** | **22HSSC19** | **CIE Marks** | **50** |
| **L:T:P:S** | **1:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **2** | **Total Marks** | **100** |
| **Credits** | **01** | **Exam Hours** | **01** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22HSSC19.1 | Recall the Knowledge of English Grammar and Vocabulary for Effective Communication. |
| 22HSSC19.2 | Demonstrate Professional Communication Competencies. |
| 22HSSC19.3 | Develop and Integrate the Use of the Four Language Skills i.e. Reading, Writing, Speaking and Listening Identify and Apply Communication Abilities to face Corporate Challenges |
| 22HSSC19.4 | Analyze the Importance of Professional Etiquette for Corporate Communication. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22HSSC19.1 | - | - | - | - | - | - | 3 | - | 3 | - | 2 | - | 2 | - |
| 22HSSC19.2 | - | - | - | - | - | - | 3 | - | 3 | - | 2 | - | 2 | - |
| 22HSSC19.3 | - | - | - | - | - | - | 3 | 3 | 3 | - | 2 | - | 2 | - |
| 22HSSC19.4 | - | - | - | - | - | 3 | 3 | - | 3 | - | 3 | - | 2 | - |

| | | | |
|---|---|---|---|
| **MODULE-1** | **IMPORTANCE OF COMMUNICATION** | **22HSSC19.1 22HSSC19.2 22HSSC19.3** | **3 Hours** |

Significance of Acquiring Communication Skills.
Types of Communication: Verbal. Non- Verbal; Listening Skills
Speaking – Self Introduction –Talking about Self, Ambition, Hobbies, Likes, Dislikes, Talents and Achievements.
Tenses (Simple Present & Continuous, Simple Past, Past Continuous & Present Perfect).

| | |
|---|---|
| Know classmates/ Role play | Understand Different ways of Self-Introduction; Learn about Others and Introduce them; Listen to others and list Common errors |

| | | | |
|---|---|---|---|
| **MODULE-2** | **PRESENTATION SKILLS** | **22HSSC19.1 22HSSC19.2 22HSSC19.3** | **3 Hours** |

Preparation, Practice and Delivery Overcoming Stage Fear Talking about the Routine of Self and Family Members with an Emphasis on "Do & Does".
Nonverbal Communication: Body Language: Kinesics, Oculesics, Facial Expression, Para Language.
Activity: Product Presentation, Interpreting Charts, Graphs and Tables Reporting on Work Completed and Work in Progress:
Verbal Ability: Cloze Exercise, Sentence Completion.

| | |
|---|---|
| Movie/ Book Review and Presentation | Understand the Part of Public Speaking and Coming out of your Comfort Zone. |

| | | | |
|---|---|---|---|
| **MODULE-3** | **GRAMMAR AND VOCABULARY** | **22HSSC19.1 22HSSC19.2** | **3 Hours** |

Prepositions, Articles, Subject Verb Agreement, Synonyms & Antonyms, Cohesive Devices.
Activity: Product Presentation, Interpreting charts, GEraphs and Tables Reporting on work Completed and work in Progress:
Verbal Ability: Verbal Analogy

| | |
|---|---|
| Quiz – synonyms and antonyms | Vocabulary Building and Sentence Structure |

| MODULE-4 | PROFESSIONALISM IN COMMUNICATION | 22HSSC19.2<br>22HSSC19.4 | 3 Hours |
|---|---|---|---|
| 4cs of 21st Century Skills with Special Emphasis on Communication Skills & Collaboration.<br>Organizational Communication: Relevance of communication & English in the Present Corporate Scenario.<br>Professional Etiquette: Language and Phrases for Job Interviews/Meeting Skills/Office Conversation Skills. | | | |
| Situational role play | Understand Situational Vocabulary and Etiquette | | |
| **MODULE-5** | **CORPORATE ORIENTATION AND COMMUNICATION** | **22HSSC19.2<br>22HSSC19.4** | **3 Hours** |
| Email writing; CV writing, Paragraph Writing, Error Detection Reading Comprehension | | | |
| Situational email writing, Resume writing | Understand Etiquettes of Professional writing | | |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | |
|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) |
| | | 25 | 25 |
| L1 | Remember | - | - |
| L2 | Understand | 7 | 6 |
| L3 | Apply | 8 | 7 |
| L4 | Analyze | 10 | 7 |
| L5 | Evaluate | - | 5 |
| L6 | Create | - | - |

**SEE Assessment Pattern(50 Marks – Viva- voce)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 10 |
| L3 | Apply | 20 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources:**

**Reference Books:**


1) Grammar Practice Activities- Penny Ur, Cambridge University Press.
2) Basic Business Communication: Skills for Empowering the Internet Generation-Flately and Lesikar, Tata Mc Graw Hill, 10th Edition, 2005.
3) Wren, P.C.; Martin, H; Prasad Rao, N.D. V (1973-2010) High School English Grammar & Composition, New Delhi: S. Chand. ISBN 81-219-2197-X.
4) The Skills of Communicating-Bill Scott-Jaico


**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Presentation
- Movie/ book review
- Resume writing
- Email writing

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| PROGRAMMING LOGIC AND DESIGN | | | | |
|---|---|---|---|---|
| **Course Code** | **22MCA110*** | | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:0:0** | | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | | **Total Marks** | **100** |
| **Credits** | **00** | | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA110.1 | Understand the fundamentals of digital computer with its basic operations. |
| 22MCA110.2 | Explore the types of algorithmic problem solving techniques with their implications. |
| 22MCA110.3 | Recognize the importance of key programming concepts and control structures. |
| 22MCA110.4 | Apply the fundamental logic of arrays and functions for a variety of software applications. |
| 22MCA110.5 | Use complex data types to model the real-world problems and examine the basic operations in file handling. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA110.1 | 2 | 2 | 2 | - | 1 | - | 1 | - | - | - | - | - | 1 | - |
| 22MCA110.2 | 2 | 2 | 2 | - | 1 | - | 1 | - | - | - | - | - | 1 | - |
| 22MCA110.3 | 2 | 2 | 2 | - | 1 | - | 1 | - | - | - | - | - | 1 | - |
| 22MCA110.4 | 2 | 2 | 2 | - | 1 | - | 1 | - | - | - | - | - | 1 | - |
| 22MCA110.5 | 2 | 2 | 2 | - | 1 | - | 1 | - | - | - | - | - | 1 | - |

| **MODULE-1** | **NUMBER SYSTEM** | **22MCA110.1** | **6 Hours** |
|---|---|---|---|
| Number Systems, Digital Computers and Digital Systems, Binary, Octal and Hexadecimal Numbers, Number Base Conversion, subtraction using r's and r-1 complements, Binary Code, Binary storage and Registers | | | |
| Text Book | Text Book 2: 1 Text Book 3: 1 | | |
| **MODULE-2** | **INTRODUCTION TO COMPUTER PROBLEM-SOLVING** | **22MCA110.2** | **6 Hours** |
| Introduction, Problem-Solving Aspect, Top-Down Design, Implementation of Algorithms, Program Verification, Efficiency of Algorithms, Analysis of Algorithms, Pseudo code, Structured English and Flowchart. | | | |
| Self-study / Case Study / Applications | Case study on solving problems using different approaches. | | |
| Text Book | Text Book 1: 1,2 Text Book 2: 1 | | |
| **MODULE-3** | **ESSENTIAL PROGRAMMING CONTROL STRUCTURES** | **22MCA110.3** | **6 Hours** |
| Types and Input/output Operators, Operators and Expressions, Control Statements: Decision making, Iteration and Jumping statements. | | | |
| Text Book | Text Book 1: 3, 4, 5, 6, 7 | | |
| **MODULE-4** | **ARRAYS AND FUNCTIONS** | **22MCA110.4** | **6 Hours** |
| Array techniques: One-dimensional and two-dimensional arrays, Declaration and initialization of arrays, Strings: string handling functions. Functions- Elements of user-defined functions, category of functions, Recursion, Call-by-value and call-by reference. | | | |
| Self-study / Case Study / Applications | Self-study on the usage of arrays in real time applications | | |
| Text Book | Text Book 1: 8, 9, 10 | | |
| **MODULE-5** | **COMPLEX DATA TYPES TO SOLVE PROBLEMS** | **22MCA110.5** | **6 Hours** |
| Structures, Union and User-defined data types: enum, typedef. Pointers: Declaring and utilization of pointer variables, accessing a variable through its pointer, pointer arithmetic. Introduction to FILE handling techniques. | | | |
| Text Book | Text Book 1: 11, 12, 13 | | |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 10 | 5 | 5 |
| L2 | Understand | 10 | 5 | 5 |
| L3 | Apply | 5 | 5 | - |
| L4 | Analyze | - | - | - |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 20 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | - |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources:**

**Text Book:**


1) E. Balaguruswamy, "Programming in ANSI C", McGrawHill Publishers, 8th Edition, 2019.
2) Joyce Farrell, Programming Logic & Design, CENGAGE learning, 9th Edition, 2018.
3) Programming Logic And Design, "Tony Gaddis", Pearson, 2016, ISBN: 978-0-13-3985078


**Reference Books:**


1) V Rajaraman: Computer Programming in C, PHI, 2019, ISBN: 9789388028332.
2) Peter Norton, "Introduction to Computers", 7th Edition, McGraw Hill Education, 2017, ISBN- 10 : 9789387067028.


**Web links and Video Lectures (e-Resources):**

- https://www.coursera.org/specializations/c-programming
- https://onlinecourses.nptel.ac.in/noc22_cs40/preview
- https://www.tutorialspoint.com/cprogramming/index.htm

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Organizing Group wise discussions on various topics
- Seminars

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# SECOND SEMESTER
# MCA SYLLABUS
# (2023-24)

## DATA STRUCTURES USING C++

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA21** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA21.1 | Understand the fundamental principles of Object-Oriented programming. |
| 22MCA21.2 | Apply the operational aspects of stacks to solve recursive applications. |
| 22MCA21.3 | Analyse various types of queues and linked lists with their operations for different applications. |
| 22MCA21.4 | Analyse various types of sorting and searching techniques and identify the optimal approach for a given scenario. |
| 22MCA21.5 | Construct different types of trees for visualizing the operations of non-linear data structures. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA21.1 | - | - | - | - | - | 1 | 1 | - | - | - | 2 | 1 | 3 | - |
| 22MCA21.2 | 2 | - | - | - | 1 | - | 1 | 1 | - | - | 2 | 1 | 3 | - |
| 22MCA21.3 | 2 | 3 | - | - | 1 | 1 | 1 | 1 | - | - | 3 | 1 | 3 | - |
| 22MCA21.4 | 2 | 3 | - | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 3 | - |
| 22MCA21.5 | 2 | 3 | - | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 3 | - |

| | | | |
|---|---|---|---|
| **MODULE-1** | **C++ PROGRAMMING CONCEPTS** | **22MCA21.1** | **8 Hours** |

Overview of C, Object Oriented Paradigm, Structured vs. Object Oriented Paradigm. Elements of Object Oriented Programming - Object, Classes, Encapsulation, Data Abstraction, Inheritance, Polymorphism, C++ Overview, Different Data Types, Operators, Expressions, Arrays and Strings. Classes and Objects - Access Members, Constructors, Destructors.
Modular Programming with Functions - Function Components, Argument Passing, Inline Functions, Function Overloading, Function Templates.

| | |
|---|---|
| Text Book | Text Book 1: 11 to 18 |

| | | | |
|---|---|---|---|
| **MODULE-2** | **STACK AND RECURSION** | **22MCA21.2** | **8 Hours** |

Types of Data Structures and Applications. Stack - Abstract Data Type, Representation of Stacks Using Sequential Organization (Arrays), Stack Operations, Applications - Expression Evaluation and Conversion, Processing of Function Calls, Reversing a String, Checking Correctness of Well-formed Parentheses.
Use of stack in Recursion, Execution of Recursive Calls, Sample Programs.

| | |
|---|---|
| Self-study / Case Study / Applications | Case studies for demonstrating the use of stacks in Recursive Applications. |
| Text Book | Text Book 2: 2, 3 |

| | | | |
|---|---|---|---|
| **MODULE-3** | **QUEUES AND LISTS** | **22MCA21.3** | **8 Hours** |

Concept of Queues, Queue as Abstract Data Type, Linear Queue, Circular Queue, Double Ended Queue (Deque), Applications of Queues.
Comparing Linked List over Arrays, Types-Singly Linked List - Inserting and Removing Nodes in a List, Circular Linked Lists, Doubly Linked List, Application of Linked List- Polynomial Manipulations.

| | |
|---|---|
| Self-study / Case Study / Applications | Case studies for demonstrating the use of queues and linked lists in real time applications. |
| Text Book | Text Book 2: 4.1, 4.2, 4.5, 4.6 |

| | | | |
|---|---|---|---|
| **MODULE-4** | **SORTING AND SEARCHING** | **22MCA21.4** | **8 Hours** |

Introduction to Sorting and Searching Techniques, Selection Sort, Merge Sort, Heap Sort, Shell Sort, Radix Sort. Searching Techniques- Linear and Binary Search, Indexed Sequential Search.

| | |
|---|---|
| Text Book | Text Book 2: 6, 7 |

| MODULE-5 | TREES | 22MCA21.5 | 8 Hours |
|---|---|---|---|
| Tree traversals, Binary Search Tree and Operations, AVL Tree and Operations, 2-3 Trees, Red-Black Tree, Threaded Binary Trees. | | | |
| Text Book | Text Book 2: 5 | | |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | 3 | 3 |
| L2 | Understand | 10 | 4 | 3 |
| L3 | Apply | 5 | 4 | 2 |
| L4 | Analyze | 5 | 4 | 2 |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources:**

**Text Books:**


1) C++, The Complete reference, 4thEdition, Herbert Schildt, McGraw Hill Education, 2017, ISBN: 978-0070532465.
2) Data Structures Using C and C++, by YedidyahLangsam, Moshe J. Augenstein, Aaron M. Tenenbaum, Pearson Education India; 2nd Edition, 2015, ISBN : 978-9332549319.


**Reference Books:**


1) Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., 4thEdition, 2014, ISBN: 978-0-13-2847377.
2) Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and David M.Mount, John Wiley and Sons, 2ndEdition, 2011, ISBN-13 978-0-470-38327-8.


**Web links and Video Lectures (e-Resources)**

- https://www.youtube.com/watch?v=ZzaPdXTrSb8
- https://www.youtube.com/watch?v=RBSGKlAvoiM
- https://www.youtube.com/watch?v=B31LgI4Y4DQ
- https://www.youtube.com/watch?v=jHZ6q_FCmbU
- https://www.youtube.com/playlist?list=PL2_aWCzGMAwI3W_JlcBbtYTwiQSsOTa6P

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Demonstration of sorting algorithms
- Demonstration of recursive algorithms
- Demonstration of queues and list operations
- Contents related activities (Activity-based discussions)
- Seminars

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## ADVANCED JAVA AND ENTERPRISE ARCHITECTURE

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA22** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA22.1 | Understand the fundamental elements in establishing a database connection. |
| 22MCA22.2 | Create dynamic web pages using Servlet, Java Server Pages and standard tag libraries. |
| 22MCA22.3 | Design and develop server side applications using Angular forms. |
| 22MCA22.4 | Develop a dynamic web application using Hibernate. |
| 22MCA22.5 | Analyze and evaluate live built-in applications. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA22.1 | 3 | 1 | 3 | - | - | - | - | - | - | - | - | - | 3 | - |
| 22MCA22.2 | 3 | 1 | 3 | - | - | - | - | - | - | - | - | 1 | 3 | - |
| 22MCA22.3 | 3 | 1 | 3 | - | 2 | - | - | 2 | - | 2 | - | 1 | 3 | - |
| 22MCA22.4 | 3 | 1 | 3 | - | 2 | - | - | 2 | 1 | 2 | - | 1 | 3 | - |
| 22MCA22.5 | 3 | 2 | 3 | - | 2 | - | - | 2 | 1 | 2 | - | 1 | 3 | - |

| | | | |
|---|---|---|---|
| **MODULE-1** | **JDBC** | **22MCA22.1** | **8 Hours** |

The Concept of JDBC, JDBC Driver Types, JDBC Packages, A Brief Overview of JDBC Process, Database Connection, Associating the JDBC/ODBC Bridge with the Database, Statement Objects, ResultSet, Transaction Processing, Metadata, Data Types, Exceptions. JDBC and Embedded SQL: Model Programs, Tables, Indexing, Inserting Data into Tables, Selecting Data from a Table, Metadata, Updating Tables, Deleting Data from a Table, Joining Tables, Calculating Data, Grouping and Ordering Data, Subqueries, VIEW.

| | |
|---|---|
| Text Book | Text Book 2: 3, 4, 5, 7 Text Book 5: 3, 4, 5, 6, 7 |

| | | | |
|---|---|---|---|
| **MODULE-2** | **SERVLETS** | **22MCA22.2** | **8 Hours** |

Introduction, Uses of Servlets, Servlet Architecture, Web Container, The Servlets Life Cycle, Servlet API, Handling HTTP GET Request, Handling HTTP POST Request, Servlet Config, Servlet Context, Cookies, Session Tracking.
Java Server Pages (JSP): Introduction, Advantages of JSP, JSP Architecture, JSP life Cycle, Developing First JSP, Implicit Objects, JSP Scripting Elements- (Directives, Declaratives, Scriplets, Expressions, Implicit Variables), Page Directives.

| | |
|---|---|
| Text Book | Text Book 1: 1, 2, 3, 4, 6, 7, 8 ,9 |

| | | | |
|---|---|---|---|
| **MODULE-3** | **JAVA SERVER PAGES, STANDARD TAG LIBRARY & JAVA BEANS** | **22MCA22.3** | **8 Hours** |

Why you should use the JSTL, JSTL Expression Language, Core Tags, custom tag Libraries: why custom Tags, Tag Library basics, how are tags being used, new and old custom tags, Tag library Descriptors (TLDs), simple JSP 2.0 custom tags. Java Beans: What is a Java Bean? Advantages of Java Beans, The Java Beans API. A Bean Example, JSP with Java Beans.

| | |
|---|---|
| Text Book | Text Book 1: 1, 10, 11, 13 |

| | | | |
|---|---|---|---|
| **MODULE-4** | **ES6, TYPE SCRIPT, ANGULAR-CLI AND ANGULAR COMPONENTS** | **22MCA22.4** | **8 Hours** |

ES6, Type Script, Angular-CLI & project structure, Angular Components. Angular Modules and directives - Angular Modules - Root Module vs. Feature Module, Module definition, Module configuration. Directives - Types of directives, Built-in directives, Writing your own directives.

| | |
|---|---|
| Self-study / Case Study / Applications | Installation of Angular frame work |
| Text Book | Text Book 3: 1, 2, 3, 4, 5 |

| MODULE-5 | ANGULAR FORMS | 22MCA22.5 | 8 Hours |
|---|---|---|---|

Template-driven forms, Reactive forms, Form Builder, Form validation, Custom validators, Async validators. Hibernate-ORM Fundamentals: Hibernate Fundamentals, Advantages and Disadvantages, Mapping Hibernate configuration files, Configure hibernate in a start-up project, Select, Delete, Update queries, Object States, Session Factory. Hibernate Query Support: Query Support through HQL, Native SQL and Criteria API, Transaction Management.

| | |
|---|---|
| Self-Study / Case Study / Applications | • Installation of Hibernate frame work<br>• Develop an interactive GUI application to demonstrate the angular forms |
| Text Book | Text Book 4: 2, 3, 5 |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | 3 | 2 |
| L2 | Understand | 5 | 4 | 2 |
| L3 | Apply | 10 | 4 | 3 |
| L4 | Analyze | 5 | 4 | 3 |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 10 |
| L3 | Apply | 20 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources:**

**Text Book:**


1) Core Servlets and Java Server Pages. Volume 1: Core Technologies, Marty Hall, Larry Brown, Prentice Hall, 2nd Edition, 2013.
2) Java 6 Programming Black Book, Dreamtech Press, 2012.
3) Pro Angular 9, Build Powerful and Dynamic Web Apps, Adam Freeman, 4th Edition 2020.
4) Hibernate in action, Bauer, Christian, and GavinKing. Vol.1, Manning, 2018. ISBN: 9781932394153
5) Expert Oracle JDBC Programming by R. M. Menon


**Reference Books:**


1) Developing Enterprise Java Components. Enterprise JavaBeans 3.1.O'reilly. Andrew Lee Rubinger, Bill Burke, O'Reilly Media, 2010.
2) EJB 3 Developer Guide, A practical guide for developers and architects to the Enterprise Java Beans Standard, Michael Sikora, Shroff Publishers & Distributors PVT LTD. July 2008.


**Web links and Video Lectures (e-Resources)**

- https://www.geeksforgeeks.org/introduction-java-servlets/
- https://www.javatpoint.com/java-jdbc
- https://www.tutorialspoint.com/jsp
- https://www.geeksforgeeks.org/introduction-to-hibernate-framework/

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Video demonstration of latest technologies in Java.
- For active participation of students, instruct the students to write and execute Java related program.
- Expert talk & Seminars

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## DESIGN AND ANALYSIS OF ALGORITHMS

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA23** | **CIE Marks** | **50** |
| **L:T:P:S** | **2:1:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **4** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA23.1 | Summarize the paradigms and approaches used to design and analyze algorithms by categorizing problems based on the popular domains. |
| 22MCA23.2 | Discuss Brute Force, Divide & conquer algorithms and measure their performance. |
| 22MCA23.3 | Classify the different Decrease and conquer algorithms and discuss space and time tradeoffs technique. |
| 22MCA23.4 | Characterize the features of various graphical problems with the help of a suitable technique. |
| 22MCA23.5 | Evaluate the limitations of algorithm by categorizing the problems such as P, NP or NP Complete and apply Backtracking and Branch & Bound techniques to solve problems. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA23.1 | 2 | 3 | 3 | - | - | - | - | - | - | - | - | - | 3 | - |
| 22MCA23.2 | 2 | 3 | 3 | 2 | - | - | 2 | - | - | - | 2 | - | 3 | - |
| 22MCA23.3 | 2 | 3 | 3 | 2 | - | - | 2 | - | - | - | 2 | - | 3 | - |
| 22MCA23.4 | 2 | 3 | 3 | 2 | - | - | 2 | - | - | - | 2 | - | 3 | - |
| 22MCA23.5 | 2 | 3 | 3 | - | - | - | - | - | - | - | 2 | - | 3 | - |

| | | | |
|---|---|---|---|
| **MODULE-1** | **INTRODUCTION AND ANALYSIS** | **22MCA23.1** | **8 Hours** |

Notion of Algorithm, Fundamental of Algorithmic Problem Solving, Important Problem Types, Basics of data structures. Fundamentals of the Analysis of Algorithm Efficiency: Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms, Examples.

| | |
|---|---|
| Text Book | Text Book 1: 1, 2 |

| | | | |
|---|---|---|---|
| **MODULE-2** | **BRUTE FORCE AND DIVIDE AND CONQUER** | **22MCA23.2** | **8 Hours** |

Selection Sort, Bubble sort, String Matching, Exhaustive Search. Divide and Conquer: Merge sort, Quick sort, Binary Search, Binary tree traversals and related properties, Multiplication of large integers.

| | |
|---|---|
| Text Book | Text Book 1: 3, 4 |

| | | | |
|---|---|---|---|
| **MODULE-3** | **DECREASE AND CONQUER AND SPACE AND TIME TRADEOFFS** | **22MCA23.3** | **8 Hours** |

Insertion Sort, Depth - First and Breadth-First Search, Topological sorting, Algorithms for Generating Combinatorial Objects, Decrease by a constant factor algorithms.
Space and Time Tradeoffs - Sorting by Counting, Input Enhancement in String Matching using Horspool's Algorithm, Hashing, B-Trees.

| | |
|---|---|
| Text Book | Text Book 1: 5, 7 |

| | | | |
|---|---|---|---|
| **MODULE-4** | **DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE** | **22MCA23.4** | **8 Hours** |

Dynamic Programming - Computing a binomial coefficient, Warshall's and Floyd's algorithms, Knapsack Problem.
Greedy Technique - Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees.

| | |
|---|---|
| Skill Development Activities | Real time algorithms to be designed in the field of computer networks by using Greedy Technique. |
| Text Book | Text Book 1: 8, 9 |

| | | | |
|---|---|---|---|
| **MODULE-5** | **LIMITATIONS AND COPING WITH THE LIMITATIONS OF ALGORITHM POWER** | **22MCA23.5** | **8 Hours** |

Introduction, Lower bound arguments, Decision trees, P, NP and NP-complete problems. Coping with the **limitations of algorithm power:** Backtracking, n-queens problem, Hamiltonian Circuit problem, Subset-Sum problem. Branch-and-Bound -Knapsack problem, Travelling Salesman Problem, Assignment problem.

| | |
|---|---|
| Skill Development Activities | Comparison analysis can be done based on both techniques by using real time applications. |
| Text Book | Text Book 1: 11, 12 |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | 5 | 5 |
| L2 | Understand | 10 | 5 | 5 |
| L3 | Apply | 5 | 3 | - |
| L4 | Analyze | 5 | 2 | - |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources:**

**Text Book:**


1) Introduction to the Design and Analysis of Algorithms, Anany Levitin, Pearson Education, 3rd Edition, 2021, ISBN: 9780137541133.


**Reference Books:**


1) Design and Analysis of Algorithms, Sandeep Sen, Amit Kumar, Cambridge University Press, 2019, ISBN: 978110849682.
2) Design and Analysis of Algorithms, Parag H. Dave, Pearson Education,2007, ISBN: 9788177585957.
3) Introduction to Algorithms, Thomas H. Cormen, Charles E.Leiserson, Ronal L.Rivest, Clifford Stein, MIT Press, 2001, ISBN: 9780262032933.
4) Algorithms: Design and Analysis, Sushil C. Dimri, Preeti Malik, Mangey Ram, De Gruyter Publications, 2021, ISBN: 9783110693751.
5) Fundamentals of Computer Algorithms, Horowitz E., Sahani S., Rajasekharan S, Galgotia Publications, 2nd Edition, ISBN: 9788175152571.


**Web links and Video Lectures (e-Resources)**

- https://onlinecourses.nptel.ac.in/noc19_cs47/preview
- https://www.coursera.org/specializations/algorithms
- https://nptel.ac.in/courses/106101060
- https://ocw.mit.edu/courses/6-046j-design-and-analysis-of-algorithms-spring-2015

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Video demonstration of latest techniques
- Contents related activities
  - Organizing Group wise discussions
  - Presentations

****

## DATABASE MANAGEMENT SYSTEMS

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA24** | **CIE Marks** | **50** |
| **L:T:P:S** | **3:0:1:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **5** | **Total Marks** | **100** |
| **Credits** | **04** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA24.1 | Understand the basic architecture of database management system and database schema with constraints. |
| 22MCA24.2 | Design ER model and relational database schema for real world application and analyze Relational algebra expressions to check performance of data models with respect to design and manipulation. |
| 22MCA24.3 | Describe the basics of SQL and construct queries using SQL. |
| 22MCA24.4 | Understand the concepts of normalization and design database. |
| 22MCA24.5 | Formulate and implement queries using RDBMS package. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA24.1 | 2 | 2 | 3 | - | 1 | - | 2 | - | 1 | - | - | 2 | 3 | 2 |
| 22MCA24.2 | 2 | 3 | 3 | - | 1 | - | 2 | - | 1 | - | - | 2 | 3 | 2 |
| 22MCA24.3 | 3 | 3 | 3 | 1 | 3 | - | 2 | - | - | - | 1 | 3 | 3 | 2 |
| 22MCA24.4 | 3 | 3 | 3 | 2 | 3 | - | 2 | - | 1 | 2 | 1 | 2 | 3 | 2 |
| 22MCA24.5 | 3 | 3 | 3 | - | 3 | - | 2 | - | 1 | 2 | 1 | 1 | 3 | 2 |

| | | | |
|---|---|---|---|
| **MODULE-1** | **JDBC OBJECT** | **22MCA24.1** | **9 Hours** |

Characteristics of Database approach; Actors on the scene; Workers behind the scene; Advantages of using DBMS approach; A Brief History of Database Applications, When Not to Use a DBMS. Database System Concepts and Architecture - Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment-DBMS Component Modules, classification of Database Management Systems. The Relational Data Model and Relational Database Constraints: Relational Model Concepts-Domains, Attributes, Tuples, and Relations, Characteristics of Relations.

| | |
|---|---|
| Self-study / Case Study / Applications | **HANDS ON:**<br>• Installation of MySQL |
| Text Book | Text Book 1:1 , Text Book 2:1 |

| | | | |
|---|---|---|---|
| **MODULE-2** | **RELATIONAL MODEL CONSTRAINTS AND RELATIONAL DATABASE SCHEMAS** | **22MCA24.2** | **9 Hours** |

Domain Constraints, Key Constraints and Constraints on NULL Values, Relational Databases and Relational Database Schemas, Integrity, Referential Integrity and Foreign Keys, Update Operations, Transaction and Dealing with Constraint Violations. Data Modeling Using the Entity-Relationship (ER) Model: A Sample Database Application, Entity Types, Entity Sets, Attributes, and Keys, Entity Types, Entity Sets, Keys, and Value Sets. Initial Conceptual Design of the Company Database: Relationship Types, Relationship Sets, Roles, and Structural Constraints, Constraints on Binary Relationship Types, Attributes of Relationship Types, Weak Entity Types, ER Diagrams, Naming Conventions and Design Issues, Relationship Types of Degree Higher than Two. Relational Database Design Using ER- to-Relational Mapping.

| | |
|---|---|
| Self-study / Case Study / Applications | **HANDS ON:**<br>• Draw an ER diagram for Employee Management System using drawing tools<br>• Draw an ER diagram for Library Management System using drawing tools |
| Text Book | Text Book 1:2, Text Book 2:2 |

| | | | |
|---|---|---|---|
| **MODULE-3** | **UNARY RELATIONAL OPERATIONS** | **22MCA24.3** | **9 Hours** |

SELECT and PROJECT Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION Additional Relational Operations, Aggregate functions and grouping; Examples of Queries in relational Algebra. SQL- SQL Data Definition and Data Types, The CREATE TABLE Command in SQL, Attribute Data Types and Domains in SQL, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE and UPDATE Statements in SQL, Ambiguous Attribute Names, Aliasing, Renaming and

<table>
<tr><td colspan="4">Tuple Variables, Unspecified WHERE Clause and Use of the Asterisk. Substring Pattern Matching and Arithmetic Operators.</td></tr>
<tr><td>Self-study / Case Study / Applications</td><td colspan="3">HANDS ON:<ul><li>Creating a table student with following information - Name of table: student, columns and data types - rollno number(6), name varchar(20), branch varchar(20)<ul><li>Inserting data into the student table</li><li>Altering table by adding new column class varchar(20) Deleting a row from the table</li><li>Drop column branch</li><li>Alter table by changing the data type of rollno to number(8)</li><li>Delete all the data from student table</li><li>Delete the table</li></ul></li><li>Create Sales table with the following fields( Sales No, Sales name, Branch, Sales amount, DOB)<ul><li>Insert five records</li><li>Calculate total Sales amount in each branch</li><li>Calculate average Sales amount in each branch</li><li>Display all the salesmen, DOB who are born in the month of December as day in character format</li></ul></li></ul></td></tr>
<tr><td>Text Book</td><td colspan="3">Text Book 1 :3, 4 Text Book 2:3, 4</td></tr>
<tr><td>MODULE-4</td><td>MORE COMPLEX SQL QUERIES</td><td>22MCA24.4</td><td>9 Hours</td></tr>
<tr><td colspan="4">Nested Queries, Tuples, and Set/Multiset comparisons, Correlated nested queries, UNIQUE function in SQL, Joined tables in SQL and Outer Joins. Aggregate functions in SQL, Grouping, Views in SQL.<br>Database Design - Informal Design Guidelines for Relation Schemas; Functional Dependencies 1NF, 2NF, 3NF and Boyce-Codd Normal Form.</td></tr>
<tr><td>Self-study / Case Study / Applications</td><td colspan="3">HANDS ON:<br>An Enterprise wishes to maintain a database to automate its operations. Enterprise is divided into certain departments and each department consists of employees<ul><li>Update the employee salary by 15%, whose experience is greater than 10 years</li><li>Delete the employees, who completed 30 years of service</li><li>Display the manager who is having maximum number of employees working under him</li><li>Create a view, which contain employee names and their manager</li></ul></td></tr>
<tr><td>Text Book</td><td colspan="3">Text Book 1: 3, 4 Text Book 2: 5</td></tr>
<tr><td>MODULE-5</td><td>INTRODUCTION TO PL/SQL</td><td>22MCA24.5</td><td>9 Hours</td></tr>
<tr><td colspan="4">Basics of PL/SQL- Identifiers, Delimiters, Comments, Data types, basic syntax, control statements, loops- Labeling a PL/SQL Loop, Loop Control Statements, Cursors- Implicit cursor, explicit cursors- Declaring the Cursor, Opening the cursor, Fetching the cursor, Closing the cursor. Procedures- Creating a Procedure, Executing a Standalone Procedure, Deleting a Standalone Procedure, Parameter Modes in PL/SQL Subprograms, Functions-Creating a Function, Calling a Function, PL/SQL Recursive Functions, exceptions- Syntax for Exception Handling, Raising Exceptions, User-defined Exceptions, Pre-defined Exceptions, triggers-Benefits of Triggers, Creating Triggers, Triggering a Trigger.</td></tr>
<tr><td>Self-study / Case Study / Applications</td><td colspan="3">HANDS ON:<ul><li>Write a PL/SQL program to demonstrate Cursors</li><li>Write PL/SQL queries to create Procedures</li><li>Write a PL/SQL program to demonstrate Functions</li></ul></td></tr>
<tr><td>Text Book</td><td colspan="3">Text Book 1: 3, 4</td></tr>
</table>

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Assessment | Lab CIE |
| | | 25 | 5 | 20 |
| L1 | Remember | 5 | 2 | - |
| L2 | Understand | 10 | 3 | - |
| L3 | Apply | 5 | - | 20 |
| L4 | Analyze | 5 | - | - |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources**

**Text Book:**


1) Abraham Silberschatz, Henry F Korth and S. Sudarshan: Database System Concepts, 7th Edition, McGraw- Hill, 2021.
2) Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database systems" , Sixth Edition, Pearson / Addison – Wesley, 2017.


**Reference Books:**


1) Niraj Gupta, "SQL-PLSQL", Createspace Independent Pub, 2015.
2) Coronel, Morris ,"Database Principles Fundamentals of Design, Implementation and Management ", Rob- Cengage Learning, 2013.


**Web links and Video Lectures (e-Resources):**

- https://handoutset.com/wp-content/uploads/2022/05/Database-System-Concepts-etc..pdf
- https://onlinecourses.nptel.ac.in/noc22_cs91/preview
- https://www.coursera.org/learn/database-structures-and-management-with-mysql

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Designing a Database Management System for a web application
- Implementing Exception handling using PL/SQL for a management system

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## PROFESSIONAL ELECTIVES -1 (BUSINESS ANALYTICS TRACK)
## DATA WAREHOUSING AND DATA MINING

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA251** | **CIE Marks** | **50** |
| **L:T:P:S** | **2:1:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA251.1 | Understand the fundamentals of Data collection and the different pre-processing techniques. |
| 22MCA251.2 | Distinguish the different Data warehouse models and their implementations. |
| 22MCA251.3 | Analyze the various pattern mining algorithms and their applications. |
| 22MCA251.4 | Examine the performance accuracies of the various classifiers. |
| 22MCA251.5 | Evaluate the different clustering techniques in real-time scenario and formulate the different Outlier Detection Methods. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA251.1 | 3 | 2 | 2 | 2 | - | - | - | - | - | 1 | - | - | - | 3 |
| 22MCA251.2 | 3 | 2 | 2 | 2 | - | - | - | - | - | 1 | - | - | - | 3 |
| 22MCA251.3 | 3 | 3 | 3 | 2 | - | - | 1 | - | - | 1 | 1 | - | - | 3 |
| 22MCA251.4 | 3 | 3 | 3 | 2 | - | - | 1 | - | - | 1 | 1 | - | - | 3 |
| 22MCA251.5 | 3 | 3 | 3 | 2 | - | - | 1 | - | - | 1 | 1 | - | - | 3 |

| | | | |
|---|---|---|---|
| **MODULE-1** | **INTRODUCTION, GETTING TO KNOW YOUR DATA, DATA PRE-PROCESSING** | **22MCA251.1** | **8 Hours** |

Data Mining an Overview, Kinds of data mined, Kinds of Patterns mined, Technologies used, Kinds of Applications Targeted, Major issues in data mining.
Getting to know your Data - Data Objects and Attribute Types, Basic Statistical Descriptions of Data.
Data Pre-processing - An overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

| | |
|---|---|
| Text Book | Text Book 1: 1,2 |

| | | | |
|---|---|---|---|
| **MODULE-2** | **DATA WAREHOUSING AND ONLINE ANALYTICAL PROCESSING** | **22MCA251.2** | **8 Hours** |

Data Warehouse: Basic concepts, Data Warehouse Modelling - Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementations.

| | |
|---|---|
| Text Book | Text Book 1: 3 |

| | | | |
|---|---|---|---|
| **MODULE-3** | **MINING FREQUENT PATTERNS, ASSOCIATIONS AND CORRELATIONS** | **22MCA251.3** | **8 Hours** |

Basic Concepts and Methods, Advanced Pattern Mining - Frequent Patterns Basic Concepts, Frequent Itemset Mining Methods, Pattern Evaluation Methods. Advanced Pattern Mining: Pattern Mining in Multilevel, Multidimensional Space, Constraint Based Frequent Pattern Mining, Pattern Exploration and Application.

| | |
|---|---|
| Text Book | Text Book 1: 4, 5 |

| | | | |
|---|---|---|---|
| **MODULE-4** | **CLASSIFICATION: BASIC CONCEPTS** | **22MCA251.4** | **8 Hours** |

Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy.

| | |
|---|---|
| Skill Development Activities | Self-study on Mining Medical Images for classifying patient records into COVID-19 infected or normal. |
| Text Book | Text Book 1: 6 |

| | | | |
|---|---|---|---|
| **MODULE-5** | **CLUSTERING ANALYSIS** | **22MCA251.5** | **8 Hours** |

Basic Concepts and Methods, and Outlier Detection: Cluster Analysis, Partitioning Methods, Hierarchical Methods - Agglomerative versus Divisive Hierarchical Clustering, Density-Based Methods-DBSCAN, Evaluation of Clustering. Outlier Detection: Outliers and Outlier Analysis, Outlier Detection Methods,

| | |
|---|---|
| Clustering - Based Approaches, Classification-Based Approaches. | |
| Skill Development Activities | **HANDS ON:**<br>• Using tools for visualization of clustering approaches |
| Text Book | Text Book 1: 8, 11 |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | 5 | 5 |
| L2 | Understand | 10 | 5 | 5 |
| L3 | Apply | 5 | 2 | - |
| L4 | Analyze | 5 | 3 | - |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources**

**Text Book:**

1) Han, Jiawei., Pei, Jian., Tong, Hanghang. Data Mining: Concepts and Techniques. Netherlands: Elsevier Science, 2022.

**Reference Books:**

1) Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson Publication, Second Edition, 2021, ISBN-10:9354491049
2) Arun K Pujari: Data Mining Techniques University Press, 2nd Edition, 2019, ISBN-10:8173716722.
3) G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2018, ISBN-10 : 8120350022.

**Web links and Video Lectures (e-Resources)**

- https://www.youtube.com/watch?v=9JJIGOiGbAs
- https://www.youtube.com/watch?v=CHYPF7jxlik
- https://www.javatpoint.com/data-warehouse
- https://www.investopedia.com/terms/d/datamining.asp
- https://www.youtube.com/watch?v=lokv-h480YI
- https://intellipaat.com/blog/classification-in-data-mining/

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Literature Review on Recent Classification, Clustering and Outlier Detection Mechanisms
- Student Seminar Presentations

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## ROBOTIC PROCESS AUTOMATION

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA252** | **CIE Marks** | **50** |
| **L:T:P:S** | **2:1:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **4** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA252.1 | Understanding the automation potential and realizing the value in RPA. |
| 22MCA252.2 | Demonstrate good understanding RPA Platform Architecture and Components. |
| 22MCA252.3 | Demonstrate good understanding of Recorders, Editor, and various essential Commands to build simple tasks / Bots for automating simple processes and Automating tasks. |
| 22MCA252.4 | Independently develop solution for automating the tasks. |
| 22MCA252.5 | Demonstrate good understanding of RPA and its use cases. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA252.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | 3 |
| 22MCA252.2 | 2 | 2 | - | - | 2 | - | - | - | - | - | - | - | - | 3 |
| 22MCA252.3 | 1 | 1 | - | - | 2 | - | - | 1 | - | - | - | - | - | 3 |
| 22MCA252.4 | 3 | 3 | 1 | - | 2 | - | - | 1 | - | 1 | 1 | - | - | 3 |
| 22MCA252.5 | 3 | 3 | 1 | - | 2 | - | - | 1 | - | 1 | 1 | - | - | 3 |

| | | | |
|---|---|---|---|
| **MODULE-1** | **INTRODUCTION TO RPA** | **22MCA252.1** | **8 Hours** |

Understanding Enterprise Processes Robotic Process Automation, Areas Ripe for Automation, Seeking an RPA Solution, Seeing the Value in RPA, Attended and Unattended Automation, RPA improvement cycle, Introduction to RPA, Automation Anywhere Enterprise Tool – An introduction.

| | |
|---|---|
| Text Book | Text Book 2: 1 Text Book 1: 2, 3, 4 |

| | | | |
|---|---|---|---|
| **MODULE-2** | **PLATFORM ARCHITECTURE AND COMPONENTS** | **22MCA252.2** | **8 Hours** |

Installing Automation Anywhere Enterprise A2019, Setting up a cloud-enabled deployment model for enterprise, AA Control Room Control Room Settings License Settings All Menus Theory, demonstration and hands on practice and experience on the system.

| | |
|---|---|
| Text Book | Text Book 1: 5, 6 |

| | | | |
|---|---|---|---|
| **MODULE-3** | **BUILDING BEST PRACTICE AUTOMATIONS** | **22MCA252.3** | **8 Hours** |

Recorder versus Design-based.
Recorders - Web Recorder, Screen Recorder, Smart Recorder. AA Commands Read from CSV/Text, Excel Database Files/Folder.

| | |
|---|---|
| Skill Development Activities | **HANDS ON:**<br>• Screen recorder<br>• Simple web recorder<br>• Web recorder with database automation |
| Text Book | Text Book 1: 4 |

| | | | |
|---|---|---|---|
| **MODULE-4** | **BUILDING BEST PRACTICE AUTOMATIONS** | **22MCA252.4** | **8 Hours** |

Error Handling String Operation Variables Variable Operation PDF Integration Email Automation, OCR Web Recorder Properties, Workflow, Tips & Tricks.

| | |
|---|---|
| Skill Development Activities | **HANDS ON:**<br>• Email Automation<br>• FTP automation and PDF integration<br>• String operation<br>• Web recorder & send email<br>• Smart recorder |
| Text Book | Text Book 1: 5 |

| | | | |
|---|---|---|---|
| **MODULE-5** | **GETTING SMARTER THROUGH COGNITIVE AUTOMATION** | **22MCA252.5** | **8 Hours** |

What AI brings, Automated customer engagement – Chat bots, Voice bots, Virtual agent, Automated mails, Dynamic interactive voice response, Visual IVR.

| | |
|---|---|
| Skill Development Activities | **HANDS ON:**<br>• **Advanced**<br>➢ Smart Recorder with Excel automation and database automation<br>➢ Web recorder with files and folder<br>• **Masters**<br>➢ Xml automation.<br>➢ Web recorder to excel automation |
| Text Book | Text Book 1:6 |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | 5 | 5 |
| L2 | Understand | 10 | 5 | 5 |
| L3 | Apply | 5 | 2 | - |
| L4 | Analyze | 5 | 3 | - |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources**

**Text Book:**

1) Robotic Process Automation for dummies, NICE special edition, NICE RPA team with Steve Kaelble, ISBN: 978-1-119-45774-9, 2018.
2) Groover M.P., "Industrial Robotics -Technology Programming and Applications", McGraw Hill, 2012.

**Reference Books:**

1) The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems, Tom Taulli, ISBN: 978-1-4842-5728-9, 2020.

**Web links and Video Lectures (e-Resources):**

- https://youtu.be/n6nxTBB16ag
- https://www.youtube.com/live/G0gVfi7ri7w?si=TOVleP7QeSeGO5oF
- https://www.automationanywhere.com/rpa/robotic-process-automation

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- A write up on the usage of Remote Process Automation in varied real life scenario.
- Class Room based discussions on videos given in Web links and Video Lectures.

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## SOCIAL MEDIA ANALYTICS

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA253** | **CIE Marks** | **50** |
| **L:T:P:S** | **2:1:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **4** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA253.1 | Identify the subset of available data to focus on analysis. |
| 22MCA253.2 | Demonstrate the activities that assist in transforming raw data into insights. |
| 22MCA253.3 | Analyze various perspectives of insights to derive higher accuracy. |
| 22MCA253.4 | Evaluate the information interpretation as a social analytic process. |
| 22MCA253.5 | Organize information gathered from consumer to filter & find right data and formulate the common visualization techniques |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA253.1 | 3 | 3 | - | - | 2 | 1 | - | - | - | 2 | 2 | - | - | 3 |
| 22MCA253.2 | 3 | 3 | - | - | 2 | 1 | - | - | - | 2 | 2 | - | - | 3 |
| 22MCA253.3 | 3 | 3 | 1 | - | 2 | 1 | - | - | - | 2 | 2 | 2 | - | 3 |
| 22MCA253.4 | 3 | 3 | 1 | - | 2 | 1 | - | - | - | 2 | 2 | 2 | - | 3 |
| 22MCA253.5 | 3 | 3 | 1 | - | 2 | 1 | - | - | - | 2 | 2 | 2 | - | 3 |

| | | | |
|---|---|---|---|
| **MODULE-1** | **DATA IDENTIFICATION** | **22MCA253.1** | **8 Hours** |

Data, Subset of content, Attributes of data, Regular expressions and right subset of people, Predictive versus Descriptive, Sentiment, Structured data versus Unstructured data, Big data and Identifying data in social media outlets.

| | |
|---|---|
| Text Book | Text book 1: 1, Text book 2: 1: 5 |

| | | | |
|---|---|---|---|
| **MODULE-2** | **DATA ANALYSIS - I** | **22MCA253.2** | **8 Hours** |

Four dimensions of analysis taxonomy, Domain of analysis, Velocity of data, Validating the hypothesis, Discovering themes and topics, Using iterative methods. Stream computing, IBM Infosphere streams, SPL applications, Directed graphs, SSM examples, Value derived from a conference using real-time analytics.

| | |
|---|---|
| Text Book | Text book 2: 1: 8 |

| | | | |
|---|---|---|---|
| **MODULE-3** | **DATA ANALYSIS - II** | **22MCA253.3** | **8 Hours** |

Ad-Hoc analysis, Example of Ad-Hoc analysis, Data Integrity, Responding to leads identified in social media, Support for deep analysis in analytics software.
Enterprise Social Network - Social collaboration, Memory of organization, Enterprise graph and details of implementation.

| | |
|---|---|
| Skill Development Activities | A Case Study Analysis on Enterprise Social Networks |
| Text Book | Text book 2: 9 : 11 |

| | | | |
|---|---|---|---|
| **MODULE-4** | **INFORMATION INTERPRETATION** | **22MCA253.4** | **8 Hours** |

Finding the right data, Communication, Choosing filter words, Customizing and Modifying tools, Using right tools, Analyzing consumer reaction during hurricane study.

| | |
|---|---|
| Text Book | Text book 2: 12 |

| | | | |
|---|---|---|---|
| **MODULE-5** | **VISUALIZATION AS AN AID TO ANALYTICS** | **22MCA253.5** | **8 Hours** |

Common visualizations – Pie, Bar, Line, Scatter plots. Common pitfalls – Information overload, Unintended consequences of using 3D, Using colour, Visually representing unstructured data.

| | |
|---|---|
| Skill Development Activities | Case study on IBM Amplify - Data Identification, Data Analysis and Information Interpretation and conclusions. |
| Text Book | Text book 2:13 |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | 3 | 3 |
| L2 | Understand | 10 | 4 | 3 |
| L3 | Apply | 5 | 4 | 2 |
| L4 | Analyze | 5 | 4 | 2 |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources**

**Text Books:**


1) Creating Value With Social Media Analytics, Gohar F. Khan, Create Space Independent Publishing Platform, 2018, ISBN: 9781977543974.
2) Social Media Analytics, Mathew Ganis, Avinash Kohirkar, IBM Press, 2016, ISBN: 978-0-13-389256-7.


**Reference Books:**


1) Learning Social Media Analytics with R, Raghav Bali, Dipanjan Sarkar, Tushar Sharma, Packt Publishing, 2017, ISBN: 9781787127524.
2) Social Media Analytics, Marshall Sponder, Mc-Graw Hill Publishers, 2011, ISBN: 9780071768627.
3) Seven Layers of Social Media Analytics: Mining Business Insights from Social Media Text, Actions, Networks, Hyperlinks, Apps, Search Engine and Location Data, Gohar F. Khan, Amazon Digital Services, 2015, ISBN: 978- 1507823300.


**Web links and Video Lectures (e-Resources)**

- https://www.ibm.com/topics/social-media-analytics
- https://blog.hubspot.com/marketing/social-media-analytics
- https://www.youtube.com/watch?v=Z1KJ-16Rfs0

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Organizing Group wise discussions
- Presentations

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## BUSINESS INTELLIGENCE AND DATA ANALYTICS

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA254** | **CIE Marks** | **50** |
| **L:T:P:S** | **2:1:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **4** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA254.1 | Describe the fundamental BI visualizations. |
| 22MCA254.2 | Examine advanced BI visualizations across different dimensions. |
| 22MCA254.3 | Investigate on Table calculations and data densification. |
| 22MCA254.4 | Adding value to visualizations through deep analysis. |
| 22MCA245.5 | Dealing with data structure issues and mapping techniques in visualizations and constructing data stories through presentations. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA254.1 | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - | 3 |
| 22MCA254.2 | 3 | 3 | - | 3 | 2 | - | - | - | - | - | 1 | 1 | - | 3 |
| 22MCA254.3 | 3 | 3 | - | 3 | 2 | - | - | - | - | - | 1 | 1 | - | 3 |
| 22MCA254.4 | 3 | 3 | 2 | 3 | 2 | - | - | - | 2 | - | 1 | 1 | - | 3 |
| 22MCA245.5 | 3 | 3 | 2 | 3 | 2 | - | - | - | 1 | - | 1 | 1 | - | 3 |

| | | | |
|---|---|---|---|
| **MODULE-1** | **CREATING VISUALIZATIONS AND DASHBOARD** | **22MCA254.1** | **8 Hours** |

Connections to data, Foundations for building visualizations, Visualizing data, Creating charts, Creating geographic visualizations.
Working with Data: Connecting to data, Managing data source metadata, Working with extracts instead of live connections, File types, Joins and blends, Filtering data

| | |
|---|---|
| Text Book | Text Book 1: 1, 2, 3 Text Book 2: 1,2 |

| | | | |
|---|---|---|---|
| **MODULE-2** | **MOVING FROM FOUNDATIONAL TO ADVANCED VISUALIZATIONS** | **22MCA254.2** | **8 Hours** |

Comparing values across different dimensions, visualizing dates and times, Relating parts of the data to the whole, Visualizing distributions, Visualizing multiple axes to compare different measures. Using Row-level, Aggregate a Level of detail calculations.

| | |
|---|---|
| Skill Development Activities | Case study to compare visualization methods for different amounts of data points. |
| Text Book | Text Book 1: 4, 5 |

| | | | |
|---|---|---|---|
| **MODULE-3** | **TABLE CALCULATIONS** | **22MCA254.3** | **8 Hours** |

Creating and editing table calculations, quick table calculations, Relative versus fixed Scope and direction, Addressing and partitioning, Custom table calculations, Practical examples, Data densification.

| | |
|---|---|
| Text Book | Text Book 1: 6, 7 |

| | | | |
|---|---|---|---|
| **MODULE-4** | **FORMATTING VISUALIZATION** | **22MCA254.4** | **8 Hours** |

Formatting, Adding value to visualizations. Data story with Dashboards: Building views, creating the dashboard framework, Implementing actions, Designing different displays and devices.
Deep analysis - Trending, Clustering, Distributions, Forecasting.

| | |
|---|---|
| Text Book | Text Book 1: 7,8,9 |

| | | | |
|---|---|---|---|
| **MODULE-5** | **MAKING DATA WORKS** | **22MCA254.5** | **8 Hours** |

Structuring data, Techniques for dealing with data structure issues, Advanced visualizations, Advanced mapping techniques, Using background images, Sharing data story through Presentations, Printing, Exporting and Publishing.

| | |
|---|---|
| Skill Development Activities | Self study on the usage of advanced visualization techniques in real life scenario. |
| Text Book | Text Book 1: 13, 14, 15 |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | 5 | 5 |
| L2 | Understand | 10 | 5 | 5 |
| L3 | Apply | 5 | 2 | - |
| L4 | Analyze | 5 | 3 | - |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources:**

**Text Book:**


1) Learning Tableaue 10, Business Intelligence and data visualization that brings your business into focus, By Joshua N. Milligan, 2016, Packt Publishing, Second edition. ISBN: 978-1-78646-635-8.
2) Laursen, G.H. and Thorlund, J., 2016. Business analytics for managers: Taking business intelligence beyond reporting. John Wiley & Sons.


**Reference Books:**


1) Business Intelligence Guidebook: From Data Integration to Analytics 1st Edition, by Rick Sherman, 2014, Morgan Kaufmann Publisher, ISBN: 978


**Web links and Video Lectures (e-Resources):**

- https://youtu.be/YfE9jBq002s
- https://www.youtube.com/live/Hg8zBJ1DhLQ?si=d1cnUdjt6MptovC1

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Brain-storming on choice of appropriate techniques for various real time scenario
- Expert talk on the subject related to relevance in the field of competitive management.

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## SEARCH ENGINE OPTIMIZATION

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA255** | **CIE Marks** | **50** |
| **L:T:P:S** | **2:1:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **4** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA255.1 | Impart the knowledge on fundamentals of search engine optimization. |
| 22MCA255.2 | Understand how to plan for a powerful search engine and how to make your site useful and visible |
| 22MCA255.3 | Understand the role of keywords creating pages. |
| 22MCA255.4 | Understand the role of designing SEO friendly web pages. |
| 22MCA255.5 | Creating content for your web pages and linking strategies for your web page. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA255.1 | 3 | 3 | - | - | - | - | - | 2 | 2 | 2 | - | - | - | 3 |
| 22MCA255.2 | 3 | 3 | - | - | - | - | - | 2 | 2 | 2 | - | 2 | - | 3 |
| 22MCA255.3 | 3 | 3 | - | 2 | - | - | - | 2 | 2 | 2 | - | 2 | - | 3 |
| 22MCA255.4 | 3 | 3 | - | 2 | - | - | - | 2 | 2 | 2 | - | 2 | - | 3 |
| 22MCA255.5 | 3 | 3 | 2 | 2 | 3 | 2 | - | 2 | 2 | 2 | - | 2 | - | 3 |

| **MODULE-1** | **HOW SEARCH ENGINES WORK - PUTTING SEARCH ENGINES IN CONTEXT** | **22MCA255.1** | **8 Hours** |
|---|---|---|---|

Identifying Search Engine Users, Figuring out Why People Use Search Engines, Discovering the Necessary Elements for Getting High Keyword Rankings, Understanding the Search Engines: They're a Community, Meeting the Search Engines: Finding the Common Threads among the Engines, Getting to Know the Major Engines, Checking Out the Rest of the Field: AOL and Ask com, Finding Your Niche: Vertical Engines, Discovering Internal Site Search, Understanding Metasearch Engines, Recognizing and Reading Search Results: Reading the Search Engine Results Page Understanding How People Look at Search Results, Identifying Mobile Users' Search Patterns, Discovering the Features of a Search Results Page.

**HANDS ON:**

- Seeking Traffic
- Avoiding Spam
- Analysing Personalized Search's Impaction Ranking,
- Using News, Images, Books, and other Search Verticals to Rank.

| Text Book | Text Book 1: 1, 2 |
|---|---|

| **MODULE-2** | **KEYWORD STRATEGY** | **22MCA255.2** | **8 Hours** |
|---|---|---|---|

Employing Keyword Research Techniques and Tools: Discovering Your Site Theme, Brainstorming for keywords, Building a subject outline, Choosing theme-related keywords, Doing Your Industry and Competitor Research, Researching Client Niche Keywords, Checking Out Seasonal Keyword Trends, Evaluating Keyword Research, Selecting Keywords: Selecting the Proper Keyword Phrases, Reinforcing versus Diluting Your Theme, Picking Keywords Based on Subject Categories, Understanding Keyword-Based Search versus Semantic Search, Assigning Keywords to Pages: Understanding What a Search Engine Sees as Keywords, Planning Subject Theme Categories, Choosing Landing Pages for Subject Categories, Organizing Your Primary and Secondary Subjects, Understanding Siloing "Under the Hood" , Consolidating Themes to Help Search Engines See Your Relevance

**HANDS ON:**

- Adjusting Keywords
- Updating Keywords
- Using Tools to Aid Keyword Placement

| Text Book | Text Book 1: 4 |
|---|---|

| MODULE-3 | SEO WEB DESIGN | 22MCA255.3 | 8 Hours |
|---|---|---|---|
| The Basics of SEO Web Design, Deciding on the Type of Content for Your Site, Making a User-Focused Website, Choosing Keywords, Using Keywords in the Heading Tags, Keeping the Code Clean, Organizing Your Assets, Naming Your Files, Keeping Design Simple, Making a Site Dynamic, Making Your Site Mobile Friendly, Developing a Design Procedure, Building an SEO-Friendly Site: Preplanning and Organizing Your Site, Designing Spider-Friendly Code, Creating a Theme and Style, Writing Rich Text Content, Planning Your Navigation Elements, Implementing a Site Search, Page Experience Update: Mobile Usability, Security Issues<br>**HANDS ON:**<br>Enriching Your Site with Rich Snippets | | | |
| Skill Development Activities | Optimizing HTML Constructs for Search Engines | | |
| Text Book | Text Book 1: 5, 6 | | |
| **MODULE-4** | **CREATING CONTENT** | **22MCA255.4** | **8 Hours** |
| Selecting a Style for Your Audience: Knowing Your Demographic, Creating a Dynamic Tone, Choosing a Content Style, Developing a Blog, Using Personas to Define Your Audience Creating personas Using personas to define your audience, Establishing Content Depth and Page Length: Building Enough Content to Rank well, Developing Ideas for Content, Using Various Types of Content, Optimizing Images, Mixing in Video, Making the Text Readable, Allowing User Input, Creating User Engagement, Writing a Call to Action.<br>**HANDS ON:**<br>• Optimizing the Content for Local Searches<br>• Sources of Duplicate Content and How to Resolve Them | | | |
| Skill Development Activities | Developing Content Using Your Keywords | | |
| Text Book | Text Book 1: 5, 6, 7,8 | | |
| **MODULE-5** | **LINKING** | **22MCA255.5** | **8 Hours** |
| Employing Linking Strategies: Theming Your Site by Subject Implementing Clear Subject Themes, Siloing, Making the Most of Outbound Links Obtaining Inbound Links Structuring Internal Links: Subject Theming Structure, Optimizing Link Equity, Creating and Maintaining Silos, Obtaining Links: Understanding the Benefits and Risks of Link Building, Identifying Quality Links, Attracting Links, Generating link magnets Spreading the word through social media and press releases Guest posting Fostering relationships Soliciting paid links for advertising How Not to Obtain Links<br>**HANDS ON:**<br>• Identifying Inbound Links<br>• Avoiding Poor-Quality Links<br>• Promoting Media on Social Networking Sites<br>• Optimizing Social Media. | | | |
| Text Book | Text Book 1: 9, 10, 12, 13 | | |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | 5 | 5 |
| L2 | Understand | 10 | 5 | 5 |
| L3 | Apply | 5 | 2 | - |
| L4 | Analyze | 5 | 3 | - |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources**

**Text Book:**

1) Search Engine Optimization All-in-One For Dummies, Bruce Clay, 4th Edition, John Wiley & Sons, 2022, ISBN 978-1-119-83749-7.

**Reference Book:**

1) SEO for Dummies, Peter Kent, Wiley Publication, 7th Edition, 2022, ISBN: 978-1-119-57960-1.
2) The Art of SEO Mastering Search Engine Optimization by Eric Enge Stephan Spencer, and Jessie C. Stricchiola, 3rd Edition, O'Really, 2015, ISBN: 9781491948965.

**Web links and Video Lectures (e-Resources):**

- http://www.dummies.com/web-design-development/search-engine-optimization/how-to-read-search-engine-results-pages/
- https://moz.com/beginners-guide-to-seo
- https://www.wordstream.com/seo
- https://developers.google.com/search/docs/fundamentals/seo-starter-guide
- https://neilpatel.com/what-is-seo/
- https://www.oberlo.com/blog/seo-tools
- https://www.searchenginejournal.com/top-free-seo-tools/302553/
- https://www.wordstream.com/keywords

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Video links mentioned may be discussed in groups for applications in real time
- Student presentations on related topics.

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## PROFESSIONAL ELECTIVES – 2 (NETWORK SECURITY TRACK)
## CYBER SECURITY AND CYBER LAW

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA261** | **CIE Marks** | **50** |
| **L:T:P:S** | **2:1:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **4** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA261.1 | Understand the various cybercrimes in a real time scenario. |
| 22MCA261.2 | Identify the security challenges in mobile and wireless devices. |
| 22MCA261.3 | Apply the appropriate tools and methods to address cyber security threats. |
| 22MCA261.4 | Analyze the cyber laws in Indian and global perspective. |
| 22MCA261.5 | Apply the forensics tools and techniques to evaluate the evidences while investigating cyber crimes. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA261.1 | 3 | - | - | - | | - | 3 | - | - | 3 | - | - | - | 3 |
| 22MCA261.2 | 3 | - | - | - | 3 | - | 3 | - | - | 3 | 3 | 2 | - | 3 |
| 22MCA261.3 | 3 | 2 | 2 | 2 | 3 | - | 3 | - | - | 3 | 3 | 2 | - | 3 |
| 22MCA261.4 | 3 | 2 | - | - | - | 3 | 3 | - | 1 | 3 | 3 | - | - | 3 |
| 22MCA261.5 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 1 | - | 3 | 3 | 2 | - | 3 |

| | | | |
|---|---|---|---|
| **MODULE-1** | **INTRODUCTION TO CYBERCRIME** | **22MCA261.1** | **8 Hours** |

Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes
Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals Plan the Attacks, Social Engineering Cyberstalking, Cybercafe and Cybercrime, Botnets, The Fuel for Cybercrime, Attack Vector, Cloud Computing.

| | |
|---|---|
| Text Book | Text Book 1: 1, 2 |

| | | | |
|---|---|---|---|
| **MODULE-2** | **CYBERCRIME MOBILE AND WIRELESS DEVICES** | **22MCA261.2** | **8 Hours** |

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Device Registry, Settings for Mobile Devices, Authentication Service.
Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

| | |
|---|---|
| Text Book | Text Book 1: 3 |

| | | | |
|---|---|---|---|
| **MODULE-3** | **TOOLS AND METHODS USED IN CYBERCRIME** | **22MCA261.3** | **8 Hours** |

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.
Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).

| | |
|---|---|
| Skill Development Activities | Case study on Steganography |
| Text Book | Text Book 1: 4,5.1,5.2,5.3 |

| | | | |
|---|---|---|---|
| **MODULE-4** | **CYBERCRIMES AND CYBERSECURITY** | **22MCA261.4** | **8 Hours** |

The Legal Perspectives Introduction, Cybercrime and the Legal Landscape around the World, Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario.

| | |
|---|---|
| Text Book | Text Book 1: 6 |

| MODULE-5 | COMPUTER FORENSICS | 22MCA261.5 | 8 Hours |
|---|---|---|---|

Understanding Computer Forensics Introduction, Historical Background of Cyberforensics, Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics.

Forensics and Social Networking Sites - The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Antiforensics.

| | |
|---|---|
| Skill Development Activities | Hands on session on Digital Forensic and Antiforensic tools. |
| Text Book | Text Book 1: 7 |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | 5 | 5 |
| L2 | Understand | 10 | 5 | 5 |
| L3 | Apply | 5 | 2 | - |
| L4 | Analyze | 5 | 3 | - |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources**

**Text Book:**

1) Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives – Nina Godbole, Sunit Belapure, Wiley : April 2011 India Publications Released.

**Reference Books:**

1) Cyber security fundamentals, Rajesh Kumar goutam, BPB, May 2021, ISBN: 9789390684731
2) Internet Forensics: Using Digital Evidence to Solve Computer Crime- Robert Jones, O'Reilly Media, Released: October 2005.
3) Windows Forensics: The field guide for conducting corporate computer investigations - Chad Steel, Wiley, December 2006 India Publications.

**Web links and Video Lectures (e-Resources):**

- https://onlinecourses.swayam2.ac.in/cec20_cs15/preview
- https://sgp.fas.org/crs/misc/R43831.pdf
- http://localhost:8080/xmlui/handle/123456789/18121

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Seminars
- Video demonstration on cyber crimes in real time scenario
- Case Study on latest tools for cyber security
- Hands-on Sessions

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## DIGITAL FORENSICS

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA262** | **CIE Marks** | **50** |
| **L:T:P:S** | **2:1:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **4** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA262.1 | Understand the process of digital forensics analysis. |
| 22MCA262.2 | Study about the regulations of digital forensics analysis. |
| 22MCA262.3 | Describe the representation and organization of data and metadata of forensics analysis in enterprises. |
| 22MCA262.4 | Investigate the digital evidence management. |
| 22MCA262.5 | Create, recover and extract hidden information and develop. Effective solutions. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA262.1 | 3 | - | 3 | 3 | | - | 3 | - | - | 3 | - | - | - | 3 |
| 22MCA262.2 | 3 | - | 3 | 3 | 3 | - | 3 | - | 1 | 3 | 3 | 2 | - | 3 |
| 22MCA262.3 | 3 | 2 | 3 | 2 | 3 | - | 3 | - | 1 | 3 | 3 | 2 | - | 3 |
| 22MCA262.4 | 3 | 2 | - | - | - | 3 | 3 | - | 1 | 3 | 3 | - | - | 3 |
| 22MCA262.5 | 3 | - | - | - | - | 3 | 3 | - | - | 3 | 3 | - | - | 3 |

| | | | |
|---|---|---|---|
| **MODULE-1** | **INTRODUCTION TO DIGITAL FORENSICS** | **22MCA262.1** | **8 Hours** |

A brief history of forensics technology, Evolutionary cycle of digital forensics, Technical and Scientific working groups, SWGDE, Principles of Digital Forensics.
Investigative Process - Existing Process Model, Mapping out process models, The process methodology workflow.

| | |
|---|---|
| Text Book | Text Book 1: 1, 2 Text Book 2: 1 |

| | | | |
|---|---|---|---|
| **MODULE-2** | **EDUCATION, TRAINING AND AWARENESS** | **22MCA262.2** | **8 Hours** |

Organizational Roles and Responsibilities, Types of training and awareness, Specializations, Educational Roadmap, Nontechnical Knowledge. Laws, Standards and Regulations: The role of technology in crime, types of laws, Good Practices for computer-based electronic evidence, legal precedence, Search Warrants, Subpoenas and Jurisdiction.

| | |
|---|---|
| Text Book | Text Book 1: 2, 3 Text Book 2: 1 |

| | | | |
|---|---|---|---|
| **MODULE-3** | **ETHICS AND PROFESSIONAL CONDUCT** | **22MCA262.3** | **8 Hours** |

Importance of ethics, Principles of Ethics, Ethics in Digital Forensics, Certification and Accreditations. Business of Digital Forensics - Role of digital forensics in enterprise, Maintaining a digital forensic Program, Challenges and Strategies, Industry regulation and Political Influences. Controlling Mobile Devices: Persistent Threats and Challenges, Mobile Device Governance, Enterprise Management Strategies, Device Management Methodology, Capabilities, Mobile device process methodology and legal considerations.

| | |
|---|---|
| Skill Development Activities | Code of Ethics : Malware , Abusive workplace behavior |
| Text Book | Text Book 1: 4, 5 |

| | | | |
|---|---|---|---|
| **MODULE-4** | **COMBATTING ANTIFORENSICS** | **22MCA262.4** | **8 Hours** |

What is antiforensics? Traditional techniques, Detection methods, Strategic Countermeasures. Digital idence Management: Types of digital evidence, Evidence gathering considerations, Cause and effect, Data security requirements, Preservation strategies, Enterprise log management. Digital Forensic readiness: Forensic readiness, Cost versus benefit, Ten steps to forensic readiness, Achieving forensic readiness.

| | |
|---|---|
| Text Book | Text Book 1: 9 |

| | | | |
|---|---|---|---|
| **MODULE-5** | **INCIDENT MANAGEMENT AND RESPONSE** | **22MCA262.5** | **8 Hours** |

Understanding the Incident Response Workflow, The Incident Response Team (IRT), What to expect during an incident, Investigative techniques, Reverse Engineering Malware, Timeline analysis.
Electronic Discovery and Litigation : What is eDiscovery? Understanding the workflow, Managing litigation discovery, discovering electronically stored information.

| | |
|---|---|
| Information Security and Cyber security: Information security v.s. Cyber security, Digital Forensics and enterprise security, security investigations. | |
| Skill Development Activities | Incident management case study : Human Vaccine facility, Bausch & Lomp |
| Text Book | Text Book 1:12, 13 |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | 5 | 5 |
| L2 | Understand | 10 | 5 | 5 |
| L3 | Apply | 5 | 2 | - |
| L4 | Analyze | 5 | 3 | - |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources:**

**Text Book:**

1) Digital Forensics and Investigations: People, Process, and Technologies Jason Sachowski, CRC Press, 2018, ISBN: 978-1-138-72093, 2018.
2) A Practical Guide to Computer Forensics Investigations (2nd Edition). By Darren R. Hayes, 2019.

**Reference Books:**

1) Practical Cyber Forensics: An Incident-Based Approach to Forensic Investigations, Niranjan Reddy, A PRESS, 2019, ISBN: 978-1-4842-4459-3.

**Web links and Video Lectures (e-Resources):**

- https://onlinecourses.swayam2.ac.in/cec20_lb06/preview
- https://www.coursera.org/learn/digital-forensics-concepts
- https://www.geeksforgeeks.org/digital-forensics-in-information-security/
- https://www.youtube.com/watch?v=_GDI8eGHLhk

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Video demonstration of latest technology in Digital Forensic.
- Contents related activities (Activity-based discussions)
  - For active participation of students, instruct the students to do various case studies
  - Organizing Group wise discussions on various applications
- Seminars

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## CRYPTOGRAPHY AND NETWORK SECURITY

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA263** | **CIE Marks** | **50** |
| **L:T:P:S** | **2:1:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **4** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA263.1 | To study various security methods and procedures. |
| 22MCA263.2 | To brief about different cryptographic algorithms. |
| 22MCA263.3 | To learn hardware perspectives and optimization of wireless security. |
| 22MCA263.4 | To show how the public keys are distributed using Diffie Hellman method. |
| 22MCA263.5 | To discuss about interception and vulnerability of wireless systems and formulate common techniques for implementing security models. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA263.1 | 3 | - | 3 | 3 | | - | 3 | - | - | 3 | - | - | - | 3 |
| 22MCA263.2 | 3 | - | 3 | 3 | 3 | - | 3 | - | 1 | 3 | 3 | 2 | - | 3 |
| 22MCA263.3 | 3 | 2 | 3 | 2 | 3 | - | 3 | - | 1 | 3 | 3 | 2 | - | 3 |
| 22MCA263.4 | 3 | 2 | - | - | - | 3 | 3 | - | 1 | 3 | 3 | - | - | 3 |
| 22MCA263.5 | 3 | - | - | - | - | 3 | 3 | - | - | 3 | 3 | - | - | 3 |

| | | | |
|---|---|---|---|
| **MODULE-1** | **CLASSICAL CRYPTOSYSTEM** | **22MCA263.1** | **8 Hours** |

Security trends, Security Attacks and services, Symmetric cipher model- Classical Encryption Techniques , LFSR sequences, Basic Number theory, Congruence's, Chinese Remainder theorem, Modular exponentiation, Fermat and Euler's theorem, Legendre and Jacobi symbols, Finite Field, Galois Field.

| | |
|---|---|
| Skill Development Activities | **HANDS ON:**<br>• The program implementation of Caesar cipher algorithm<br>• The program implementation of Transposition cipher algorithm |
| Text Book | Text Book : 1, 2, 8 |

| | | | |
|---|---|---|---|
| **MODULE-2** | **BLOCK CIPHER** | **22MCA263.2** | **8 Hours** |

Simple DES, DES, Modes of operation, Triple DES, AES, RC4, RSA, Attacks, Primality test, factoring.

| | |
|---|---|
| Skill Development Activities | **HANDS ON:**<br>Simple program implementation of DES algorithm |
| Text Book | Text Book : 3, 9 |

| | | | |
|---|---|---|---|
| **MODULE-3** | **MESSAGE AUTHENTICATION** | **22MCA263.3** | **8 Hours** |

Discrete Logarithms, Computing discrete logs, Diffie-Hellman key exchange, ElGamal Public key cryptosystems, Hash functions, Secure Hash, Birthday attacks, MD5, Digital signatures, RSA, ElGamalm, DSA.

| | |
|---|---|
| Text Book | Text Book : 12, 13 |

| | | | |
|---|---|---|---|
| **MODULE-4** | **APPLICATION SECURITY** | **22MCA263.4** | **8 Hours** |

Kerberos, X.509, PKI, Electronic Mail security, PGP, IP security, Web Security, SSL, TLS, SET.

| | |
|---|---|
| Text Book | Text Book : 18, 19 |

| | | | |
|---|---|---|---|
| **MODULE-5** | **WIRELESS NETWORK SECURITY** | **22MCA263.5** | **8 Hours** |

Wireless Network Security- IEEE 802.11 Wireless LANs - Protocol Overview and Security - Wireless Application Protocol (WAP) - Protocol Overview - Wireless Transport Layer Security (WTLS).

| | |
|---|---|
| Text Book | Text Book : 17 |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | 5 | 5 |
| L2 | Understand | 10 | 5 | 5 |
| L3 | Apply | 5 | 2 | - |
| L4 | Analyze | 5 | 3 | - |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources**

**Text Book:**


1) William Stallings, "Cryptography and Network security Principles and Practices", Pearson/PHI,8th edition, 2023.
2) Wade Trappe, Lawrence C Washington, "Introduction to Cryptography with coding theory", 2nd ed, Pearson, 2007.


**Reference Books:**


1) W. Mao, "Modern Cryptography – Theory and Practice", Pearson Education, Second Edition, 2007.
2) Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in computing", Third Edition – Prentice Hall of India, 2006.
3) Douglas R. Stinson. "Cryptography, theory and practice", Second edition, CRS Press.


**Web links and Video Lectures (e-Resources):**

- https://www.tutorialspoint.com/cryptography/index.htm
- https://www.mygreatlearning.com/blog/cryptography-tutorial/
- https://onlinecourses.nptel.ac.in/noc22_cs90/preview
- https://onlinecourses.swayam2.ac.in/cec22_cs15/preview

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Demonstration of working of classical encryption techniques
- Demonstration of RSA, DES algorithms
- Demonstration on Message Authentication methods like D-H key exchange, Digital signature
- Video demonstration of latest technology on web security
- Contents related activities (Activity-based discussions)
  - For active participation of students, instruct the students to analyze various encryption techniques
  - Organizing Group wise discussions on various issues on network security
  - Seminars

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## INFORMATION RETRIEVAL

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA264** | **CIE Marks** | **50** |
| **L:T:P:S** | **2:1:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **4** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA264.1 | Learn the information retrieval models and Be familiar with Web Search Engine. |
| 22MCA264.2 | Be exposed to Link Analysis. |
| 22MCA264.3 | Understand Hadoop and Map Reduce. |
| 22MCA264.4 | Learn document text mining techniques. |
| 22MCA264.5 | Understand document text mining. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA264.1 | 3 | 3 | - | - | - | - | - | - | - | 1 | - | 1 | - | 3 |
| 22MCA264.2 | 3 | 3 | - | 2 | - | - | - | - | - | 1 | - | 1 | - | 3 |
| 22MCA264.3 | 3 | 3 | - | 2 | 3 | - | - | 2 | 1 | 2 | 1 | 1 | - | 3 |
| 22MCA264.4 | 3 | 3 | - | 2 | 2 | 1 | - | 2 | 1 | 2 | 1 | 1 | - | 3 |
| 22MCA264.5 | 3 | 3 | - | 2 | 2 | 1 | - | 2 | 1 | 2 | 1 | 1 | - | 3 |

| | | | |
|---|---|---|---|
| **MODULE-1** | **INTRODUCTION** | **22MCA264.1** | **8 Hours** |

Introduction -History of IR- Components of IR, Issues, pen source Search engine Frameworks, The impact of the web on IR, The role of artificial intelligence (AI) in IR, IR Versus Web Search, Components of a Search engine- Characterizing the web.

| | |
|---|---|
| Text Book | Text Book 3: 1 |

| | | | |
|---|---|---|---|
| **MODULE-2** | **INFORMATION RETRIEVAL** | **22MCA264.2** | **8 Hours** |

Boolean and vector-space retrieval models- Term weighting, TF-IDF weighting- cosine similarity, Pre-processing, Inverted indices, efficient processing with sparse vectors, Language Model based IR, Probabilistic IR, Latent Semantic Indexing, Relevance feedback and query expansion.

| | |
|---|---|
| Text Book | Text Book 1: 1, 6, 9, 12 Text Book 2: 2, 5 |

| | | | |
|---|---|---|---|
| **MODULE-3** | **WEB SEARCH ENGINE – INTRODUCTION AND CRAWLING** | **22MCA264.3** | **8 Hours** |

Web search overview, web structure, the user, paid placement, search engine optimization/ spam. Web size measurement, search engine optimization/spam, Web Search Architectures, crawling, meta-crawlers-Focused Crawling, web indexes, Near-duplicate detection, Index Compression – XML retrieval.

| | |
|---|---|
| Text Book | Text Book 1: 5, 10, 19 |

| | | | |
|---|---|---|---|
| **MODULE-4** | **WEB SEARCH – LINK ANALYSIS AND SPECIALIZED SEARCH** | **22MCA264.4** | **8 Hours** |

Link Analysis, hubs and authorities, Page Rank and HITS algorithms Searching and Ranking Relevance Scoring and ranking for Web Similarity, Hadoop & Map Reduce Evaluation Personalized search Collaborative filtering and content-based recommendation of documents and products handling "invisible" Web – Snippet generation, Summarization, Question Answering, Cross- Lingual Retrieval.

| | |
|---|---|
| Skill Development Activities | Case studies on library data base |
| Text Book | Text Book 1, 4: 21 Text Book 4: 6 |

| | | | |
|---|---|---|---|
| **MODULE-5** | **DOCUMENT TEXT MINING** | **22MCA264.5** | **8 Hours** |

Information filtering organization and relevance feedback Text Mining Text classification and clustering Categorization algorithms: naive Bayes decision trees and nearest neighbor Clustering algorithms: agglomerative clustering k-means expectation maximization (EM).

| | |
|---|---|
| Skill Development Activities | • Case study for the implementation of clustering algorithms<br>• Case study on document classification |
| Text Book | Text Book 1: 13 Text Book 2: 9 |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | 5 | 5 |
| L2 | Understand | 10 | 5 | 5 |
| L3 | Apply | 5 | 2 | - |
| L4 | Analyze | 5 | 3 | - |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources**

**Text Book:**


1) C. Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval , Cambridge University Press, 2008.
2) Ricardo Baeza -Yates and Berthier Ribeiro – Neto, Modern Information Retrieval: The Concepts and Technology behind Search 2nd Edition, ACM Press Books 2011.
3) Bruce Croft, Donald Metzler and Trevor Strohman, Search Engines: Information Retrieval in Practice, 1st Edition Addison Wesley, 2009.
4) Mark Levene, An Introduction to Search Engines and Web Navigation, 2nd Edition Wiley, 2010.


**Reference Books:**


1) Stefan Buettcher, Charles L. A. Clarke, Gordon V. Cormack, Information Retrieval: Ophir Frieder "Information Retrieval: Algorithms and Heuristics: The Information Retrieval Series", Implementing and Evaluating Search Engines, The MIT Press, 2010. 2nd Edition, Springer, 2004.
2) Manu Konchady, "Building Search Applications: Lucene, Ling Pipe", and First Edition, Gate Mustru Publishing, 2008. iz


**Web links and Video Lectures (e-Resources):**

- https://nlp.stanford.edu/IR-book/pdf/irbookonlinereading.pdf
- https://ciir.cs.umass.edu/downloads/SEIRiP.pdf
- https://srikarthiks.files.wordpress.com/2016/07/t4-an-introduction-to-search-engines-and-web-navigation-2nd.pdf
- https://www.youtube.com/watch?v=U6KgqeJkhU0

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Seminars
- Hands-on Sessions

****

## WEB APPLICATION SECURITY

| | | | |
|---|---|---|---|
| **Course Code** | **22MCA265** | **CIE Marks** | **50** |
| **L:T:P:S** | **2:1:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **03** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCA265.1 | Understand Web Application Security in a broader Way. |
| 22MCA265.2 | To analyze HTML injection and content spoofing. |
| 22MCA265.3 | To analyze SQL injection server-side request forgery. |
| 22MCA265.4 | To understand file upload vulnerability. |
| 22MCA265.5 | To implement secure coding practices. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCA265.1 | 3 | 3 | - | - | - | 2 | 1 | - | 2 | 1 | - | - | - | 3 |
| 22MCA265.2 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | - | 2 | 1 | 2 | - | - | 3 |
| 22MCA265.3 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | - | 2 | 1 | 2 | - | - | 3 |
| 22MCA265.4 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | - | 2 | 1 | 2 | - | - | 3 |
| 22MCA265.5 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | - | 2 | 1 | 2 | - | - | 3 |

| | | | |
|---|---|---|---|
| **MODULE-1** | **BUG BOUNTY BASICS** | **22MCA265.1** | **8 Hours** |

Introduction, Vulnerabilities and Bug Bounties, Client and Server, What Happens When You Visit a Website, HTTP Requests, HTTP Parameter Pollution, Server-Side HPP, Client-Side HPP, HackerOne Social Sharing Buttons, Twitter Unsubscribe Notifications, Twitter Web Intents. Cross-Site Request Forgery, Authentication, CSRF with GET Requests, CSRF with POST Requests, Defenses Against CSRF Attacks, Shopify Twitter Disconnect, Change Users Instacart Zones, Badoo Full Account.

| | |
|---|---|
| Text Book | Text Book 1: 1.1 to 1.4, 3.1 to 3.5, 4.1 to 4.7 |

| | | | |
|---|---|---|---|
| **MODULE-2** | **HTML INJECTION AND CONTENT SPOOFING** | **22MCA265.2** | **8 Hours** |

Coinbase Comment Injection Through Character Encoding, HackerOne Unintended HTML Inclusion, HackerOne Unintended HTML Include Fix Bypass, Within Security Content Spoofing. Carriage return line feed Injection - HTTP Request Smuggling, Response Splitting , Cross-Site scripting basics

| | |
|---|---|
| Text Book | Text Book 1: 5.1 to 5.4, 6.1 to 6.3, 7.1 |

| | | | |
|---|---|---|---|
| **MODULE-3** | **SQL INJECTION & SERVER-SIDE REQUEST FORGERY** | **22MCA265.3** | **8 Hours** |

SQL Databases, Countermeasures Against SQLi, Yahoo! Sports Blind SQLi, Uber Blind SQLi, Drupal SQLi. Server-Side Request Forgery: Demonstrating the Impact of Server-Side Request Forgery Invoking GET vs. POST Requests, Performing Blind SSRFs, Attacking Users with SSRF Responses ESEA SSRF and Querying AWS Metadata, Google Internal DNS SSRF, Internal Port Scanning Using Webhooks.

| | |
|---|---|
| Skill Development Activities | Case Study on SSRF Vulnerability |
| Text Book | Text Book 1: 9.1 to 9.5, 10.2 to 10.7 |

| | | | |
|---|---|---|---|
| **MODULE-4** | **FILE UPLOAD VULNERABILITY** | **22MCA265.4** | **8 Hours** |

LFI, RFI, securing a file inclusion vulnerability. Request forgery vulnerability: Server-side request forgery, Client-side request forgery. Cross-site scripting attacks: Reflected XSS, Stored XSS, securing against XSS attacks.

| | |
|---|---|
| Text Book | Text Book 2: 20.1, 21.1 to 21.4 |

| | | | |
|---|---|---|---|
| **MODULE-5** | **SECURE WEBSITE DESIGN** | **22MCA265.5** | **8 Hours** |

Architecture and Design Issues for Web Applications, Deployment Considerations Input Validation, Authentication, Authorization, Configuration Management, Sensitive Data, Session Management, Cryptography, Parameter Manipulation, Exception Management, Auditing and Logging, Design Guidelines, Forms and validity, Technical implementation Secure coding practices - blacklisting, whitelisting, user input validation, automated testing, sanitizing HTML.

| | |
|---|---|
| Skill Development Activities | Self-Study on Secure Coding Practices |

| Text Book | Text Book 2: 22.1, 23.2, 24.1, 25.1 to 25.2, 26.1 to 26.3 |
|---|---|

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | 25 | 15 | 10 |
| L1 | Remember | 5 | 5 | 5 |
| L2 | Understand | 10 | 5 | 5 |
| L3 | Apply | 5 | 2 | - |
| L4 | Analyze | 5 | 3 | - |
| L5 | Evaluate | - | - | - |
| L6 | Create | - | - | - |

**SEE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 20 |
| L3 | Apply | 10 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources**

**Text Book:**


1) Peter Yaworski, "Real-World Bug Hunting: A Field Guide to Web Hacking" , No Starch Press, 2019, ISBN-10: 1-59327-861-6
2) Andrew Hoffman, "Web Application Security Exploitation and Countermeasures for Modern Web Applications", O'Reilly Media, Inc., 2020, ISBN: 978-1-492-08796-0.


**Reference Books:**


1) Michal Zalewski, "The Tangled Web: A Guide to Securing Modern Web Applications" , No Starch Press, 2011, ISBN: 9781593273880
2) Sullivan, Bryan, and Vincent Liu. Web Application Security, A Beginner's Guide. McGraw Hill Professional, 2012, ISBN: 978-0-07-177612-7


**Web links and Video Lectures (e-Resources)**

- https://www.youtube.com/live/8Vsyl5KJFZw
- https://youtu.be/Dp019cWu1cg

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- To learn the basics of ethical hacking and implementing it on a local Web Server

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## DATA STRUCTURES AND ALGORITHMS LAB

| | | | |
|---|---|---|---|
| **Course Code** | **22MCAL27** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:1.5:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **1.5** | **Exam Hours** | **03** |

**Course outcomes:**

At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCAL27.1 | Implement string and array operations.. |
| 22MCAL27.2 | Analyse the functional aspects of stack in recursion. |
| 22MCAL27.3 | Analyse the operational aspects of queue and Linked lists data structures. |
| 22MCAL27.4 | Construct a tree data structure to execute various types of traversal techniques. |
| 22MCAL27.5 | Select an appropriate data structure for a specified application. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCAL27.1 | - | - | - | - | - | - | 1 | - | - | - | 2 | 1 | - | 3 |
| 22MCAL27.2 | 2 | 2 | - | - | 1 | - | 1 | 1 | - | - | 2 | 1 | - | 3 |
| 22MCAL27.3 | 2 | 2 | - | - | 1 | 1 | 1 | 1 | - | - | 3 | 1 | - | 3 |
| 22MCAL27.4 | 2 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | - | 3 |
| 22MCAL27.5 | 2 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | - | 3 |

| Exp. No. / Pgm. No. | List of Experiments / Programs | Hours | COs |
|---|---|---|---|
| | **Prerequisite Experiments / Programs / Demo** | | |
| | • Data types and Operators in C++<br>• Control Statements in C++<br>• Conditional and Logical Operations<br>• Writing Functions and Function Calls | 3 | NA |
| | **PART-A** | | |
| 1 | Example programs on arrays:<br>a) Write a C++ program to find the largest element of a given array of integers.<br>b) C++ program to sort an array in Ascending Order.<br>c) C++ Program to Add Two Matrices using multi-dimensional arrays. | 3 | 22MCAL27.1 |
| 2 | Write a C++ program on String operations. | 3 | 22MCAL27.1 |
| 3 | Define a STUDENT class with USN, Name, and Marks in 3 tests of a subject. Declare an array of 10 STUDENT objects. Using appropriate functions, find the average of the two better marks for each student. Print the USN, Name and the average marks of all the students. | | 22MCAL27.1 |
| 4 | Write a C++ program that uses stack operations to convert a given infix expression into its postfix equivalent, Implement the stack using an array. | 3 | 22MCAL27.2 |
| 5 | Simulating the working of linear queue. | 3 | 22MCAL27.3 |
| 6 | Simulating the working of circular queue. | 3 | 22MCAL27.3 |
| | **PART-B** | | |
| 7 | Write a C++ program that uses functions to perform the following<br>• Create a singly linked list of integers.<br>• Delete a given integer from the above linked list.<br>• Display the contents of the above list after deletion. | 3 | 22MCAL27.3 |

| | | | |
|---|---|---|---|
| 8 | Write a C++ program that uses functions to perform the following<br>• Create a doubly linked list of elements.<br>• Delete a given element from the above doubly linked list.<br>• Display the contents of the above list after deletion. | 3 | 22MCAL27.3 |
| 9 | Implement Linear and Binary search techniques. | 3 | 22MCAL27.5 |
| 10 | Implement Heap sort Technique. | 3 | 22MCAL27.5 |
| 11 | Write a C++ program that uses functions to perform the following<br>• Create a binary search tree of integers.<br>• Traverse the tree in in-order, pre-order and post-order. | 3 | 22MCAL27.4 |

## PART-C
## Beyond Syllabus Virtual Lab Content

1. To gain a basic understanding of stacks as an abstract data type, understand operations on stack with their applications. Students to complete the learning objectives using virtual laboratory link: https://ds1-iiith.vlabs.ac.in/exp/stacks-queues/index.html.

2. To demonstrate understanding of the concepts of sorting a single dimensional array using any one of the sorting algorithms. Students to complete the learning objectives using virtual laboratory link: https://ds1-iiith.vlabs.ac.in/exp/bubble-sort/index.html.

**CIE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Test (s) | Weekly Assessment |
|---|---|---|---|
| | | 40 | 10 |
| L1 | Remember | - | - |
| L2 | Understand | 10 | 2 |
| L3 | Apply | 20 | 4 |
| L4 | Analyze | 10 | 2 |
| L5 | Evaluate | - | 2 |
| L6 | Create | - | - |

**SEE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | - |
| L2 | Understand | 5 |
| L3 | Apply | 20 |
| L4 | Analyze | 20 |
| L5 | Evaluate | 5 |
| L6 | Create | - |

**Suggested Learning Resources:**

**Reference Books:**


1) Data Structures Through C++, 4th Edition, Yashavant Kanetkar, BPB Publications, 2022, ISBN: 978-9355511881.
2) Data Structure and Algorithms Using C++: A Practical Implementation, Wiley-Scrivener, 1st Edition, 2021, ISBN: 978-1119750543.


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## ADVANCED JAVA LAB

| | | | |
|---|---|---|---|
| **Course Code** | **22MCAL28** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:1.5:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **3** | **Total Marks** | **100** |
| **Credits** | **1.5** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCAL16.1 | Develop programs to implement database operations using JDBC. |
| 22MCAL16.2 | Create dynamic web pages using Servlet, Java Server Pages and standard tag libraries. |
| 22MCAL16.3 | Design and develop dynamic web pages using Java beans. |
| 22MCAL16.4 | Develop a dynamic web application using Angular and Hibernate. |
| 22MCAL16.5 | Analyze and evaluate live built-in applications. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCAL16.1 | 3 | 1 | 3 | - | - | - | - | - | - | - | - | - | - | 3 |
| 22MCAL16.2 | 3 | 1 | 3 | - | - | - | - | - | - | - | - | 1 | - | 3 |
| 22MCAL16.3 | 3 | 1 | 3 | - | 2 | - | - | 2 | - | 2 | - | 1 | - | 3 |
| 22MCAL16.4 | 3 | 1 | 3 | - | 2 | - | - | 2 | 1 | 2 | - | 1 | - | 3 |
| 22MCAL16.5 | 3 | 1 | 3 | - | 2 | - | - | 2 | 1 | 2 | - | 1 | - | 3 |

| Exp. No. / Pgm. No. | List of Experiments / Programs | Hours | COs |
|---|---|---|---|
| | **Prerequisite Experiments / Programs / Demo** | | |
| | • Basics of Object Oriented Programming<br>• Core Java Programming | 2 | NA |
| | **PART-A** | | |
| 1 | Write a JAVA Program to insert data into Student DATA BASE and retrieve info based on particular queries. | 3 | 22MCAL16.1 |
| 2 | Write a JAVA Servlet Program to implement a dynamic HTML using Servlet (user name and password should be accepted using HTML and displayed using a Servlet). | 3 | 22MCAL16.2 |
| 3 | Write a JAVA Servelet Program to implement get and post method | | 22MCAL16.2 |
| 4 | Write a JAVA Servelet Program to implement verification of a particular user login and display a welcome page. | 3 | 22MCAL16.2 |
| 5 | Write a JAVA Servlet Program using cookies to remember user Reference. | 3 | 22MCAL16.2 |
| | **PART-B** | | |
| 6 | a) Write a JAVA JSP Program to print 10 even and 10 odd number.<br>b) Write a JAVA JSP Program to the given number is prime or not | 3 | 22MCAL16.3 |
| 7 | Write a JAVA JSP Program to implement verification of a particular user login and display a welcome page. | 3 | 22MCAL16.3 |
| 8 | Write a JAVA JSP Program which uses jsp: include and jsp: forward action to display a Webpage. | 3 | 22MCAL16.3 |
| 9 | Write a JAVA JSP Program to get student information through a HTML and create a JAVA Bean Class, populate Bean and display the same information through another JSP. | 3 | 22MCAL16.3 |
| 10 | Write a JAVA Servlet Program to implement sessions (Using HTTP Session Interface). | 3 | 22MCAL16.2 |

| | | | |
|---|---|---|---|
| 11 | Write a JAVA Servlet Program to implement Request Dispatcher object (use include() and forward() methods). | 3 | 22MCAL16.2 |
| 12 | Develop a small dynamic web application using Angular and Hibernate. | 3 | 22MCAL16.4<br>22MCAL16.5 |

**PART-C**

**Beyond Syllabus Virtual Lab Content**

**(To be done during Lab but not to be included for CIE or SEE)**

https://www.geeksforgeeks.org/starting-first-servlet-application/

https://www.educba.com/jsp-in-java/

**CIE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Test (s) | Weekly Assessment |
|---|---|---|---|
| | | **40** | **10** |
| **L1** | **Remember** | 10 | - |
| **L2** | **Understand** | 10 | 5 |
| **L3** | **Apply** | 10 | 5 |
| **L4** | **Analyze** | 10 | - |
| **L5** | **Evaluate** | - | - |
| **L6** | **Create** | - | - |

**SEE Assessment Pattern (50 Marks – Lab)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| **L1** | **Remember** | **5** |
| **L2** | **Understand** | **10** |
| **L3** | **Apply** | **20** |
| **L4** | **Analyze** | **10** |
| **L5** | **Evaluate** | **-** |
| **L6** | **Create** | **5** |

**Suggested Learning Resources**

**Reference Books:**


1) Developing Enterprise Java Components. Enterprise Java Beans 3.1.O'reilly. Andrew Lee Rubinger, Bill Burke, O'Reilly Media, 2010.
2) EJB 3 Developer Guide, A practical guide for developers and architects to the Enterprise Java Beans Standard, Michael Sikora, Shroff Publishers & Distributors PVT LTD. July 2008.
3) Advanced Java Programming, Prasanalakshmi B, 1st Edition, 2015, CBS Publishing, ISBN:9788123923833


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## MINI PROJECT USING JAVA AND DBMS

| | | | |
|---|---|---|---|
| **Course Code** | **22MCAL29** | **CIE Marks** | **50** |
| **L:T:P:S** | **0:0:2:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **-** | **Total Marks** | **100** |
| **Credits** | **2** | **Exam Hours** | **03** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22MCAL29.1 | Recall the concepts learnt in data base management system course. |
| 22MCAL29.2 | Apply the required tools and techniques for software development. |
| 22MCAL29.3 | Examine the requirements and transform them to a software module. |
| 22MCAL29.4 | Assess the valid arguments in case study against the software module developed. |
| 22MCAL29.5 | Formulate the test cases and strategies for the software module developed. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22MCAL29.1 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 |
| 22MCAL29.2 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 1 | 2 | 2 |
| 22MCAL29.3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 3 | 3 | 1 | 3 | 2 | 2 | 2 |
| 22MCAL29.4 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 2 |
| 22MCAL29.5 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 2 |

The Mini Project is based on implementation of concepts and theory learnt in programming languages and DBMS. The sample project titles are listed as follows.

1. Barcode Generation
2. Bank software with ATM
3. Load shedding in mobile systems with Mobiqual
4. File security system
5. Project planning management
6. Library members information system
7. College Enrolment system
8. Resilient online coverage for surveillance applications
9. Employee information and payroll system
10. Harmful mail scanning
11. Online shopping catalogue system
12. Mobile tracking

**Guidelines**

- Project must be done individually.
- Final evaluation will be done through project demonstration.
- The marks of the mini project would be given on the basis of performance in CIE and SEE.

**Evaluation:**
During project work, the evaluation process will be divided into number of phases to assess the continuous progress (Minimum three phases).

- The project guides and project coordinator follows rubrics, which is set by the Department for evaluation and then submitted to the head of department.
- Each internal guide will verify the statement of project and literature of works and implementation details. The department will encourage students to make publications in standard conferences/journals.

**Rubrics for Mini Project Evaluation CIE& SEE:**

| Review # | Agenda | Assessment | Review Assessment Weightage | Overall Weightage |
|---|---|---|---|---|
| **Review 1** | Project Synopsis Evaluation | Rubrics1 | 25 | 25 (Avg of R1, R2, R3) |
| **Review 2** | Mid-Term Project Evaluation | Rubrics2 | 25 | |
| **Review 3** | Final Internal Project Evaluation | Rubrics3 | 25 | |
| **Final Project Viva-Voce** | End-Semester Project Evaluation | | 25 | 25 |
| **Total** | | | | 50 |

**CIE Assessment Pattern(50 Marks – Lab)**

| RBT Levels | | Marks Distribution | | |
|---|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) | MCQ's |
| | | **50** | | |
| **L1** | **Remember** | - | - | - |
| **L2** | **Understand** | - | - | - |
| **L3** | **Apply** | 20 | - | - |
| **L4** | **Analyze** | 10 | - | - |
| **L5** | **Evaluate** | 10 | - | - |
| **L6** | **Create** | 10 | - | - |

**SEE Assessment Pattern(50 Marks – Lab)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| **L1** | **Remember** | - |
| **L2** | **Understand** | - |
| **L3** | **Apply** | 20 |
| **L4** | **Analyze** | 10 |
| **L5** | **Evaluate** | 10 |
| **L6** | **Create** | 10 |

**Suggested Learning Resources:**

**Web links:**

- https://www.youtube.com/watch?v=-GwBNwZOPUs
- https://www.youtube.com/watch?v=9PgZCJNzY9M

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## LIFE SKILLS FOR PROFESSIONALS – 2

| | | | |
|---|---|---|---|
| **Course Code** | **22HSSC210** | **CIE Marks** | **50** |
| **L:T:P:S** | **1:0:0:0** | **SEE Marks** | **50** |
| **Hrs / Week** | **2** | **Total Marks** | **100** |
| **Credits** | **1** | **Exam Hours** | **01** |

**Course outcomes:**
At the end of the course, the student will be able to:

| | |
|---|---|
| 22HSSC210.1 | Relate "SMART GOALS" to Personal and Professional Life. |
| 22HSSC210.2 | Articulate and Communicate Ideas and Thoughts with Clarity and Focus. |
| 22HSSC210.3 | Interpret and manage one's emotions in work and life. |
| 22HSSC210.4 | Develop critical and creative thinking skills for problem solving and decision making for leadership. |
| 22HSSC210.5 | Analyze the importance of personality development and grooming in corporate life. |

**Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22HSSC210.1 | - | - | - | - | - | 2 | 3 | 2 | 3 | - | - | - | - | - |
| 22HSSC210.2 | - | - | - | - | - | 2 | 2 | 1 | 3 | - | 2 | - | - | - |
| 22HSSC210.3 | - | - | - | - | - | 1 | 3 | - | 1 | - | 2 | - | - | - |
| 22HSSC210.4 | - | - | - | - | - | 2 | 3 | 1 | - | - | 1 | 1 | - | - |
| 22HSSC210.5 | - | - | - | - | - | 2 | 3 | - | - | - | - | - | - | - |

| | | | |
|---|---|---|---|
| **MODULE-1** | **GOAL SETTING** | **22HSSC210.1** | **3 Hours** |
| Importance of Goals; Creating SMART goals, Mind Maps, and Job Satisfaction. | | | |
| Research on industry expectations | Understand Industry Expectations, Evaluate Self and Set Goals. | | |
| **MODULE-2** | **SELF-AWARENESS** | **22HSSC210.2** | **3 Hours** |
| Self-Awareness: Emotional Intelligence, SWOT Analysis, Johari Windows, Self-Management: Time and Stress Management | | | |
| Self- study | Understand Self and Others Around to Practice Empathy and to Develop Weaknesses into Strengths | | |
| **MODULE-3** | **PERSONALITY DEVELOPMENT & GROOMING** | **22HSSC210.5** | **3 Hours** |
| Expectations from the Industry, Basics of Professional Grooming; Email and Telephone Etiquette, Asking Relevant Questions to the Interviewer, and Building Confidence. | | | |
| Self–study, Email writing | Understand Industry Expectations and Professional Etiquette | | |
| **MODULE-4** | **THINKING SKILLS AND GROUP DYNAMICS** | **22HSSC210.4** | **3 Hours** |
| Creative Thinking, Critical Thinking, 6 Thinking Hats, Working in a Team, Leadership, Problem Solving Skills. | | | |
| Case study, Creative activity | Understand Thinking Skills for Problem-Solving and Decision-Making. | | |
| **MODULE-5** | **ARTICULATION AND GROUP DISCUSSION** | **22HSSC210.2** | **3 Hours** |
| Idea Generation, Stepping Out of Comfort Zone, Group Discussion Techniques. | | | |
| JAM Session, Group Discussion, Expansion of Proverbs | Understand Idea Generation and Speak with Confidence | | |

**CIE Assessment Pattern(50 Marks – Theory)**

| RBT Levels | | Marks Distribution | |
|---|---|---|---|
| | | Test (s) | Qualitative Assessment (s) |
| | | 25 | 15 |
| L1 | Remember | - | - |
| L2 | Understand | 7 | 6 |
| L3 | Apply | 8 | 7 |
| L4 | Analyze | 10 | 7 |
| L5 | Evaluate | - | 5 |
| L6 | Create | - | - |

**SEE Assessment Pattern(50 Marks – Viva-Voce)**

| RBT Levels | | Exam Marks Distribution (50) |
|---|---|---|
| L1 | Remember | 10 |
| L2 | Understand | 10 |
| L3 | Apply | 20 |
| L4 | Analyze | 10 |
| L5 | Evaluate | - |
| L6 | Create | - |

**Suggested Learning Resources**

**Text Book:**


1) The 7 – Habits of Highly Effective People, Stephen R Covey, Neha Publishers.
2) Seven Habits of Highly Effective Teens, Convey Sean, New York, Fireside Publishers, 1998.
3) Emotional Intelligence, Daniel Coleman, Bantam Book, 2006.
4) How to win friends and influence people, Dale Carnegie.


**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Interviewing industry experts
- Job market survey
- Mind maps
- Role play
- Creative activity

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# APPENDICES

# APPENDIX A

## Outcome Based Education

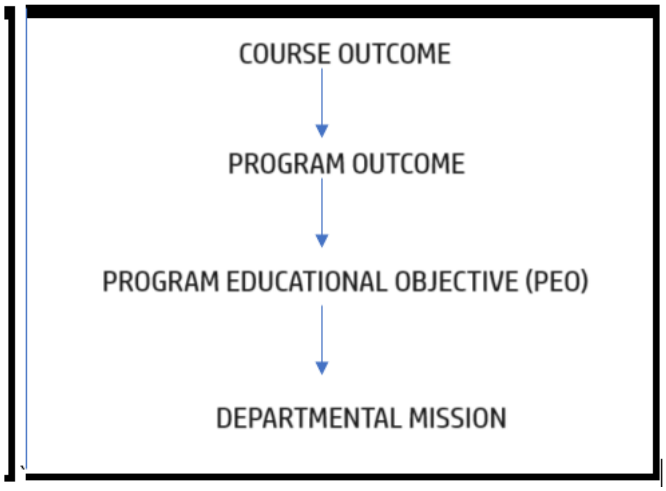
*Outcome-based education (OBE) is an educational theory that bases each part of an educational system around goals (outcomes). By the end of the educational experience, each student should have achieved the goal. There is no specified style of teaching or assessment in OBE; instead, classes, opportunities, and assessments should all help students achieve the specified outcomes.*

There are three educational outcomes as defined by the National Board of Accreditation: Program Educational Objectives: The Educational Objectives of the Computer Applications program are the statements that describe the expected achievements of graduate in their career and in particular, what the graduates are expected to perform and achieve during the first few years after graduation. [nbaindia.org]

***Program Outcomes: What the student would demonstrate upon graduation. Graduate attributes are separately listed in Appendix B***

**Course Outcome:** The specific outcome/s of each course/subject that is a part of the program curriculum. Each subject/course is expected to have a set of Course Outcomes.

**Mapping of Outcome:**



# APPENDIX B

## The Graduate Attributes of NBA

**PO1** **Computational Knowledge:** Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

**PO2** **Problem Analysis:** Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

**PO3** **Design /Development of Solutions:** Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

**PO4** **Conduct Investigations of Complex Computing Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5** **Modern Tool Usage:** Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

**PO6** **Professional Ethics:** Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

**PO7** **Life-long Learning:** Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

**PO8** **Project management and finance:** Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO9** **Communication Efficacy:** Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

**PO10** **Societal and Environmental Concern:** Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

**PO11** **Individual and Team Work:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

**PO12** **Innovation and Entrepreneurship:** Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

# APPENDIX C

## BLOOM'S TAXONOMY

Bloom's taxonomy is a classification system used to define and distinguish different levels of human cognition—i.e., thinking, learning, and understanding. Educators have typically used Bloom's taxonomy to inform or guide the development of assessments (tests and other evaluations of student learning), curriculum (units, lessons, projects, and other learning activities), and instructional methods such as questioning strategies.