NEW HORIZON
COLLEGE OF ENGINEERING

Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade, Accredited by NBA

The Trust is a recipient of prestigious Rajyotsava State Award 2012 conferred by Government of Karnataka

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

MCA
2-YEAR PROGRAM

First & Second Semester
Scheme & Syllabus
Academic Year 2022-23

Department of Master of Computer Applications

**First and Second Semester MCA
Scheme & Syllabus**

ACADEMIC YEAR 2022-23

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 MCA

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 adopt quickly to emerging technologies.

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

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1

Ability to design, develop, implement computer programs and apply the knowledge in various domains to identify research gaps and to provide solutions to new ideas and innovations.

PSO2

Work and communicate effectively with professionals in various fields and pursue lifelong professional development in computing.

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 environ -mental dimensions by encouraging parti -cipation in co-curricular and extra -curricular activities.	3	3	3

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.

Mapping of POs to PEOs

PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO0	PO1	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

![New Horizon College of Engineering logo] **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
MCA DEGREE CURRICULUM – COURSE CREDIT STRUCTURE
ACADEMIC YEAR 2022-2023: - NEP BATCH SEMESTER I TO IV

SEMESTER	CORE	ELECTIVES	MINI PROJECT/ PROJECT WORK	SEMINAR	TOTAL CREDITS
I	25	0	0	0	25
II	17	6	2	0	25
III	10	6	9	0	25
IV	4	6	13	2	25
TOTAL	56	18	24	2	100
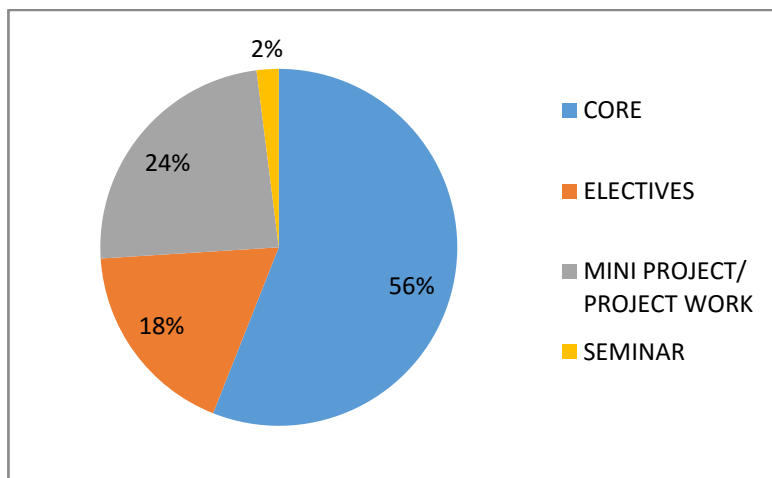
DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS
SCHEME OF FIRST SEMESTER MCA PROGRAM
AY 2022-23 NEP BATCH

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	AS/BSC	22MATC11	COMPUTATIONAL MATHEMATICS	MAC	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	HSS	1	0	0	0	1	2	50	50	100
10	MCA/BC	22MCA110*	PROGRAMMING LOGIC AND DESIGN*	MCA	-	-	-	-	-	3	50	50	100
			TOTAL		19	1	5	0	25	32	450	450	900

L -Lecture (1 hour), T- Tutorial (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.

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS
SCHEME OF SECOND SEMESTER MCA PROGRAM
AY 2022-23 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 (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.

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

2-YEAR PROGRAM (2022-23)

COMPUTATIONAL MATHEMATICS

Course Code	: 22MATC11	**Credits**	: 04
L:T:P:S	: 3:1:0:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Formulate, solve, apply, and interpret properties of linear systems.
CO2	Formulate physical problems as Partial Differential Equations and solve.
CO3	Apply numerical methods to obtain approximate solutions to mathematical problems.
CO4	Identify solution methods for the optimization problems studied and Apply Evolutionary Computation Methods to find solutions to complex problems.
CO5	Learn to present clear mathematical arguments.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	1	-	-	-	-	-	1	-	-	3
CO2	3	2	2	-	1	-	-	-	-	-	1	-	-	3
CO3	3	2	2	-	1	-	-	-	-	-	1	-	-	3
CO4	3	2	2	2	1	-	-	-	-	-	1	-	-	3
CO5	3	2	2	1	1	-	-	-	-	-	1	-	-	3

Correlation levels: 1-Slight (Low)   2-Moderate (Medium)   3-Substantial (High)

	SYLLABUS		
Module	**Contents of the Module**	**Hours**	**COs**
1	**Mathematical Foundations:** **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.	9	CO1
2	**Ordinary Differential Equations:** **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}, $\operatorname{Sin}(ax + b), \operatorname{Cos}(ax + b)$ and ax^n. **Partial Differential Equations:** Solution of PDE by direct integration and by the method of separation of variables.	9	CO2
3	**Numerical Algorithms:** 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.	9	CO3

4	**Mathematical Optimization:** Optimization- Formation of Linear Programming Problem, Simplex Methods, Finding maximum and minimum values of function of two variables and Gradient-based methods.	**9**	**CO4**
5	**Stochastic Models:** Binomial, Poisson and Exponential and normal distributions. Data Modelling – Simple Mean and variance, Method of Least squares.	**9**	**CO5**

Text Books:

1. Xin-She Yang, Introduction to Computational Mathematics, World Scientific Publishing Co. Pte. Ltd., Second Edition, 2015, ISBN: 978-9814635776.
2. Xin-She Yang, Optimization Techniques and Applications with examples, John Wiley & Sons, First Edition, 2018, ISBN: 9781119490548.
3. B.S.Grewal, Numerical Methods in Engineering and Science, Khanna Publishers, 11th Edition, 2013, ISBN: 978-81-7409-248-9.
4. G.I.; V.P. Dymnikov Marchuk, Problems of Computational Mathematics and Mathematical Modelling, MIR Publishers, First Edition, 1985, ISBN: 978-0828533744.

Reference Books:

1. David C. Lay, Steven R. Lay and Judi J. McDonald, Linear Algebra and its Applications, Pearson Education Limited, Sixth Edition, 2021, ISBN: 978-1292351216.
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, Sixth Edition, 2012, ISBN: 978-8122433234
4. S. M. Ross, Stochastic Processes, Wiley Publishers, Second Edition, 1995, ISBN: 978-0-471-12062-9.

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	5	-
Understand	5	5	-
Apply	10	5	10
Analyze	2.5	-	-
Evaluate	2.5	-	-
Create	-	-	-

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	–

****

PROGRAMMING WITH JAVA

Course Code	: 22MCA12	**Credits**	: 04
L:T:P:S	: 4:0:0:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand basic Java language syntax and semantics to write Java programs.
CO2	Analyze the importance of method overloading, recursion And string handling concepts.
CO3	Exemplify the usage of Inheritance, Interfaces and Packages for OO Programming.
CO4	Apply Multithreading and exception handling concepts in concurrent programming.
CO5	Implement generic class, collection framework, java applet and swing for real world applications.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	3	-	1	-	1	-	-	2	3	3
CO2	3	3	3	-	2	-	2	-	1	-	-	2	2	2
CO3	3	2	2	-	3	-	1	-	-	2	-	1	2	2
CO4	3	3	3	-	2	-	2	-	1	-	-	3	1	2
CO5	3	2	1	2	3	-	-	-	1	1	-	1	3	3

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	**An Overview of Java:** 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 Scope 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.	9	CO1
2	**Arrays String Handling:** The String Constructors, String methods and operations, StringBuffer and its methods, StringBuilder 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.	9	CO2

3	**Inheritance:** 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.	9	CO3
4	**Exception Handling:** 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().	9	CO4

5	**Generics and collection overview:** 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.	9	CO5

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

Assessment Pattern
CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	3	2
Understand	5	3	2
Apply	5	3	2
Analyze	5	3	2
Evaluate	2	1	1
Create	3	2	1

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

****

OPERATING SYSTEM WITH LINUX PROGRAMMING

Course Code   : 22MCA13   **Credits : 04**

L:T:P:S   : 4:0:0:0   **CIE Marks : 50**

Exam Hours   : 3   **SEE Marks : 50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the basics and essentials of operating system.
CO2	Apply the concepts of Linux to solve computing problems.
CO3	Implement advance shell programming concepts.
CO4	Develop interactive scripts using regular expressions in simple and advanced filters.
CO5	Analyze the different memory allocation strategies.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	1	-	-	-	-	-	3	3
CO2	-	-	-	-	1	-	1	-	-	-	1	-	3	3
CO3	3	3	3	3	3	1	1	-	-	-	2	-	3	3
CO4	3	3	3	1	3	1	1	-	-	-	-	1	3	3
CO5	3	3	-	1	3	1	1	-	-	-	-	-	3	3

SYLLABUS			
Module	Contents of the Module	Hours	Cos
1	**Introduction to Operating System:** 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.	9	CO1
2	**Introduction to Linux:** 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, ls –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.	9	CO2

3	**Introduction to the Shell Programming**: 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.	9	CO3
4	**Simple Filters:** 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 *,. , ^, $, line 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.	9	CO4
5	**Memory Management**: 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.	9	CO5

Text Books:
1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles – 10th Edition, John Wiley & Sons Inc., 2021.
2. William Stallings, "Operating Systems – Internals and Design Principles" Pearson, 6th edition, 2012.
3. Evi Nerneth, "Unix and Linux Handbook", Pearson Education, Fifth Edition -2019

Reference Books:
1. Eric Foster –Johnson, John C Welch, Micah Anderson, "Beginning Shell Scripting", Wrox Publication, 2005.
2. Richard Peterson ,"The Complete Reference- Linux",Wiley Publication, Sixth Edition, 2017 .
3. Dhananjay M. Dhamdhere, "Operating Systems – A Concept – Based Approach", Tata McGraw – Hill, 3rd Edition, 2017.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	2	2
Understand	5	3	2
Apply	5	4	2
Analyze	5	2	2
Evaluate	3	2	1
Create	2	2	1

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

****

SOFTWARE ENGINEERING AND TESTING

Course Code	: 22MCA14	**Credits**	: 03
L:T:P:S	: 2:0:1:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the basics of Software Engineering and process models for software development.
CO2	Architect and design a software application based on the requirements.
CO3	Describe the agile framework and the associated models to achieve software quality.
CO4	Acquire knowledge on the basics of software testing and the process of software automation.
CO5	Demonstrate the use of Selenium IDE and programming using Selenium Web Driver.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	-	-	-	2	-	-	2	-	-	3	-
CO2	2	2	1	-	-	-	2	-	-	2	-	-	-	2
CO3	2	2	1	-	-	-	2	-	-	2	-	-	-	2
CO4	2	2	1	-	-	-	2	-	-	2	-	-	3	-
CO5	2	2	1	-	-	-	2	-	-	2	-	-	-	2

	SYLLABUS		
Module	**Contents of the Module**	**Hours**	**COs**
1	**Introduction To Software Engineering:** The Nature of Software, the unique nature of Webapps, 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. **HANDS ON:** • Designing and Recording test cases using Selenium IDE. • Designing and Recording test suites using Selenium IDE.	9	CO1
2	**Understanding Requirements and Mapping To Design:** 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. **HANDS ON:** • Installation of Selenium Web Driver. • Automation program to login into a webpage.	9	CO2

3	**Agile Development And Quality Concepts:** 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.
	HANDS ON:
	   • An automation program to test whether a test case has passed or failed.
	   • A program to read the contents of an excel file and printing the contents on the selenium output console using jxl.
		9	CO3

4	**Introduction to Software Testing and Software Automation:** 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.
	HANDS ON:
	   • Program to count the total number of hyperlink objects present on a webpage.
	   • Program to count the total number of items in a list (or) a combo box.
		9	CO4

5	**Selenium IDE and Selenium Web Driver:** 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. **HANDS ON:** • Program to switch between web pages and performing certain actions using Mozilla web browser. • A test program to automate the registration page of any e-commerce website.	9	CO5

Text Books:

1. Roger S. Pressman, "Software Engineering : A Practitioner's Approach", Eighth Edition, McGrawHill Publications, 2015.
2. Software Testing, A Craftsman's Approach, Second Edition, Paul C. Jorgensen, CRC Press, 2002.
3. Software Testing and Analysis: Process, Principles and Techniques, Mauro Pezze and Michael Young, John Wiley and Sons, 2007.
4. Software Testing : Principles and Practices, Srinivasan Desikan, Gopalaswamy, Ramesh, Pearson Publications, 2005.

Reference Books:

1. Software Testing and Quality Assurance, Kshirasagara Naik, Priyadarshi Tripathy, Wiley India, 2012.
2. Software Testing - Principles, Techniques and Tools, M.G. Limaye, McGraw Hill Publications, 2009.
3. The Craft of Software Testing, Brain Marick, Pearson Education India, 2008.

4. Software Testing, Ron Patton, 2ndEdition, Pearson   Education, India, 2013.
5. Software Automation testing tools for Beginners, Rahul Shende, Shroff Publishers and Distributors, 2012.
6. Selenium with Python: A Beginners Guide, Pallavi R Sharma, BPB Publications, 2020.
7. David Burns: Selenium 2 Testing Tools: Beginners guide, PACKT Publishing, 2012.

Assessment Pattern
CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Lab. Component
Marks	**25**	**25**
Remember	5	-
Understand	5	-
Apply	5	-
Analyze	5	-
Evaluate	3	12
Create	2	13

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

****

COMPUTER NETWORKS

Course Code	**: 22MCA15**	**Credits**	**: 04**
L:T:P:S	**: 3:0:1:0**	**CIE Marks**	**: 50**
Exam Hours	**: 3**	**SEE Marks**	**: 50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the basic concepts of networks and reference models.
CO2	Apply error detection and correction techniques during data transmission.
CO3	Implement IP addressing and routing algorithms to find shortest paths for network layer packet delivery based on IPV4 and IPV6 headers.
CO4	Illustrate the essential principles of a transport layer protocol.
CO5	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:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	-	-	-	2	-	-	2	-	-	3	3
CO2	1	1	-	2	-	-	2	-	1	2	-	-	3	3
CO3	3	3	-	2	2	-	2	-	1	2	-	-	3	3
CO4	3	3	-	2	2	-	3	-	1	2	-	-	3	3
CO5	3	3	-	2	-	-	3	-	1	2	-	-	3	3

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**Introduction to Computer Networks:** 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). **HANDS ON:** • 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.	9	**CO1**
2	**Data Link layer:** 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.	9	**CO2**

	HANDS ON: • Write a program for Hamming code generation for error detection and correction. • Write a program for distance vector algorithm to find suitable path for transmission.		
3	**Network Layer:** 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. **HANDS ON:** • Write a program for congestion control using leaky bucket algorithm.	9	CO3
4	**Introduction to NS2:** 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. **HANDS ON:** • Simulate a three node point-to-point network with duplex links between them. Set the queue	9	CO4

	size and vary the bandwidth to find the number of packets dropped. • Simulate to study transmission of packets over Ethernet LAN and determine the number of packets drop destination.			
5	**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. **HANDS ON:** • 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. • 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.	**9**	**CO5**

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.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Lab. Component
Marks	**25**	**25**
Remember	5	-
Understand	4	-
Apply	3	-
Analyze	5	-
Evaluate	3	12
Create	5	13

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

****

JAVA LAB

Course Code	: 22MCAL16	**Credits**	: 1.5
L:T:P:S	: 0:0:1.5:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Write basic java program using proper syntax and semantics.
CO2	Create an application using interfaces and packages.
CO3	Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.
CO4	Develop Applet programs and manipulate the IO streams.
CO5	Design and develop database applications.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	3	-	1	-	1	-	1	2	3	3
CO2	3	3	3	-	2	-	1	-	-	-	1	1	2	2
CO3	3	2	2	-	3	-	2	-	1	-	1	1	2	2
CO4	3	3	3	-	2	-	1	-	-	-	1	3	1	2
CO5	3	2	-	2	3	-	-	-	1	-	1	-	3	3

SL no	List of Programs	Hours	COs
1	Write a JAVA Program to implement class, object and method.		CO1
2	Write a Java program to sort for an element in a given list of elements using bubble sort.	9	CO1
3	Write a JAVA Program to demonstrate Constructor Overloading and Method Overloading.		CO1
4	Write a program in Java for String handling, the program must implement any five methods of String.		CO1
5	Write a JAVA Program to demonstrate Inheritance.	9	CO2
6	Simple Program on Java for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle.		CO2
7	Write a Java program to demonstrate the implementation of multithreading.		CO3
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	12	CO2
9	Write a JAVA applet program to implement AWT Components.		CO4
10	Write a JAVA Program to create a simple calculator which performs a basic mathematical operations using java swing.		CO4

Assessment Pattern

CIE- Continuous Internal Evaluation: Practical (50 Marks)

Bloom's Taxonomy	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	4
Evaluate	6
Create	10

SEE- Semester End Examination: Practical (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	4
Evaluate	6
Create	10

****

LINUX PROGRAMMING LAB

Course Code	: 22MCAL17	**Credits**	: 1.5
L:T:P:S	: 0:0:1.5:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Use filter commands to develop user applications.
CO2	Implement shell scripts to analyze user authentication and file properties.
CO3	Design shell scripts for pattern matching using regular expressions.
CO4	Implement shell scripts for non-interactive text processing.
CO5	Develop awk scripts to solve complex computing problems while understanding its limitations.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	1	1	1	-	1	-	-	-	3	3
CO2	3	3	3	-	1	1	1	-	1	-	-	1	3	3
CO3	3	3	3	-	1	1	1	-	1	-	-	1	3	3
CO4	3	3	3	-	1	1	1	-	1	-	-	1	3	3
CO5	3	3	3	-	1	1	1	-	1	-	-	1	3	3

	SYLLABUS		
Sl No.	List of Programs	**Hours**	**COs**
1	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		
2	Write a shell s cript which accepts valid log-in names as arguments and prints their corresponding home directories, if		
3	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)	**6**	**CO1**
4	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.		
5	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.		
6	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.	**9**	**CO2**
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.		

8	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, Note that		
9	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.		
10	Create a script file called file-properties that reads a file name entered and outputs it properties.		
11	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	3	CO3
12	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.		
13	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.		
14	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.	6	CO4
15	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. The input is to be supplied through a text file created by the user.		

16	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.		
17	Write an awk script to delete duplicated lines from a text file. The order of the original lines must remain unchanged.	6	CO5
18	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,		

Assessment Pattern

CIE- Continuous Internal Evaluation: Practical (50 Marks)

Bloom's Taxonomy	Tests
Marks	50
Remember	10
Understand	10
Apply	10
Analyze	4
Evaluate	6
Create	10

SEE- Semester End Examination: Practical (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	10
Apply	10
Analyze	4
Evaluate	6
Create	10

****

RESEARCH METHODOLOGY AND IPR

Course Code	: 22MCA18	**Credits**	: 02
L:T:P:S	: 2:0:0:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

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

CO1	Understand the Research Methodology (RM) types and their significances.
CO2	Define a research problem and its design.
CO3	Illustrate the criteria of sampling with relevant characteristics.
CO4	Investigate IPR with its infringement & remedies.
CO5	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:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	2	2	2	-	-	-	-	-	-	-	-	1	2
CO2	2	1	2	2	1	-	1	-	-	-	-	-	1	2
CO3	1	2	2	2	1	-	-	-	-	-	-	-	1	2
CO4	-	-	-	-	1	-	-	-	-	-	-	2	1	2
CO5	-	-	-	-	1	2	-	-	1	-	-	2	1	2

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**Research Methodology:** 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.	5	CO1
2	**Defining the research problem:** 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.	5	CO2
3	**Sampling design:** Census and Sample survey, Implications of a sample design, Steps in sampling design, Criteria of sampling procedure, characteristics, types of sample designs, Select a random sample.	5	CO3
4	**IPR:** Introduction, copyright and related rights – background and basic principles, Subsistence of copyright, Authorship and Ownership of copyright, Author's rights, Infringement and remedies.	5	CO4
5	**Copyright, Designs and Patents Act:** Defences to copyright infringement and the permitted acts, Copyright and the permitted acts, Copyright and computer software, Rights in performances.	5	CO5

Text Books:

1. Research Methodology Methods and techniques, C.R Kothari, Gaurav Garg, New Age, 2020,4th Edition, ISBN:978938669225.
2. Intellectual Property, David I Bainbridge, Pearson, 2010, 8th Edition, ISBN: 978-1-4082-2928-6.

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.

Assessment Pattern
CIE-Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	3	2
Understand	5	3	2
Apply	5	3	2
Analyze	5	3	2
Evaluate	3	3	2
Create	2	-	-

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

****

LIFE SKILLS FOR PROFESSIONALS - 1

Course Code	: 22HSSC19	Credits : 01
L:T:P:S	: 1:0:0:0	CIE Marks : 50
Exam Hours	: 2	SEE Marks : 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Recall the knowledge of English Grammar and Vocabulary for effective communication.
CO2	Demonstrate Professional Communication competencies.
CO3	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.
CO4	Analyze the importance of professional etiquette for corporate communication.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO2	-	1	-	-	-	-	-	-	3	-	-	-	-	-
CO3	-	2	-	-	-	-	-	2	3	-	-	-	-	-
CO4	-	1	-	-	-	-	-	1	3	-	-	-	-	-

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**Communication:** Significance of acquiring communication skills, namely Reading, Writing, Speaking and Listening. Reading comprehension. Speaking – Self introduction –Academics- achievements – talents.	4	CO2 CO3
2	**Professionalism in communication:** 4cs of 21st century skills with special emphasis on communication skills & collaboration. **Professional etiquette:** Language and phrases for Job Interviews/Meeting skills/office conversation skills.	4	CO2 CO4
3	**Grammar and Vocabulary:** Tenses (simple present & continuous, Simple past, past continuous & present perfect), Prepositions, Articles, Subject Verb Agreement, Synonyms & Antonyms. Common errors in the usage of Language. **Verbal ability training:** Tenses, Synonyms, Antonyms, Articles, Error detection.	4	CO1 CO3
4	**Oral communication Pronunciation:** Discussion and solutions on public Speaking Skills – to come out of comfort zone. **Activity: Speech practice** 1. Introduction self / topic. 2. Transitions and main points with examples. 3. Conclusions – call for action/ summary	5	CO2 CO3
5	**Corporate orientation and communication**: Email writing; CV writing, Paragraph writing, Presentation Skills.	5	CO2 CO4

Text 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.

Reference Books:

1. Wren, P.C.; Martin, H; Prasad Rao, N.D. V (1973-2010) High School English Grammar & Composition, NewDelhi: S. Chand. ISBN 81-219-2197-X.
2. The Skills of Communicating-Bill Scott-Jaico.

Assessment Pattern
CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	10	-	-
Understand	5	-	-
Apply	5	5	5
Analyze	3	5	-
Evaluate	-	-	-
Create	2	5	5

SEE- Semester End Examination: Theory (50 Marks)

Scaled down to 25 Marks

Bloom's Category	Tests
Marks	**50**
Remember	5
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	5

****

PROGRAMMING LOGIC AND DESIGN

Course Code	**: 22MCA110***	**Credits : 0**
L:T:P:S	**: 0:0:0:0**	**CIE Marks : 50**
Exam Hours	**: 3**	**SEE Marks : 50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the fundamentals of digital computer with its basic operations.
CO2	Explore the types of algorithmic problem solving techniques with their implications.
CO3	Recognize the importance of key programming concepts and control structures.
CO4	Apply the fundamental logic of arrays and functions for a variety of software applications.
CO5	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:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	-	1	-	1	-	-	-	-	-	2	2
CO2	2	2	2	-	1	-	1	-	-	-	-	-	2	2
CO3	2	2	2	-	1	-	1	-	-	-	-	-	2	2
CO4	2	2	2	-	1	-	1	-	-	-	-	-	2	2
CO5	2	2	2	-	1	-	1	-	-	-	-	-	2	2

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	**Binary Systems and Digital Computer Fundamentals:** 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.	6	CO1
2	**Introduction to Computer Problem-Solving** Introduction, The Problem-Solving Aspect, Top-Down Design, Implementation of Algorithms, Program Verification, The efficiency of algorithms, The analysis of algorithms, Pseudo code, Structured English and Flowchart.	6	CO2
3	**Essential Programming Control Structures:** Data Types and Input/output Operators, Operators and Expressions, Control Statements: Decision making, Iteration and Jumping statements.	6	CO3
4	**Arrays and Functions:** **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.	6	CO4
5	**Complex data types to solve problems:** Structures, Union and User-defined data types: enum, typedef. **Pointers:** Declaring and initialization of pointer variables, accessing a variable through its pointer, pointer arithmetic. Introduction to FILE handling techniques.	6	CO5

Text Books:

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

Reference Books:

1. Peter Norton, "Introduction to Computers", 7th Edition, McGraw Hill Education, 2017, ISBN-10 : 9789387067028.
2. Carl Hamacher, Zvonko Vranesic Safwat Zaky, "Computer Organization", 5th edition, Tata McGraw-Hill, 2011, ISBN-10: 1259005275.
3. V Rajaraman: Computer Programming in C, PHI, 2019, ISBN: 9789388028332.

Assessment Pattern
CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	3	2
Understand	5	3	2
Apply	5	3	2
Analyze	5	3	2
Evaluate	-	-	-
Create	5	3	2

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	-
Create	10

****

SECOND SEMESTER

MCA SYLLABUS

2-YEAR PROGRAM (2022-23)

DATA STRUCTURES USING C++

Course Code	: 22MCA21	Credits : 03
L:T:P:S	: 3:0:0:0	CIE Marks : 50
Exam Hours	: 3	SEE Marks : 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the fundamental principles of Object-Oriented programming.
CO2	Apply the operational aspects of stacks to solve recursive applications.
CO3	Analyse various types of queues and linked lists with their operations for different applications.
CO4	Analyse various types of sorting and searching techniques and identify the optimal approach for a given scenario.
CO5	Construct different types of trees for visualizing the operations of non-linear data structures.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	1	-	-	-	2	1	3	3
CO2	2	-	-	-	1	-	1	1	-	-	2	1	3	3
CO3	2	3	-	-	1	1	1	1	-	-	3	1	3	3
CO4	2	3	-	1	2	1	1	1	1	1	3	1	3	3
CO5	2	3	-	1	2	1	1	1	1	1	3	1	3	3

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	**C++ Programming Concepts:** Overview of C, Object Oriented paradigm, Structured vs. Object Oriented Paradigm. Elements of Object Oriented Programming- Object, Classes, Encapsulation, data abstraction, Inheritance, Polymorphism etc., 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.	9	CO1
2	**Introduction to Data Structures:** Types of data structures and applications. **Stack:** 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. **Recursion:** Use of stack in recursion, Execution of Recursive Calls, Sample programs.	9	CO2
3	**Queues and lists:** Concept of Queues, Queue as Abstract Data Type, Linear Queue, Circular Queue, Double ended queue (Deque), Applications of Queues. **Lists:** 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.	9	CO3

4	**Sorting Types:** Sorting and Searching Selection Sort, Merge Sort Heap Sort, Shell Sort, Radix Sort. Searching Techniques- Linear and Binary Search, Indexed sequential search	9	CO4
5	**Trees:** Tree traversals, Binary Search Tree and Operations, AVL Tree and Operations, 2-3 Trees, Red-Black Tree, Threaded binary trees.	9	CO5

Text Books:

1. C++ The Complete Reference, 5th Edition, Herbert Schildt, McGraw-Hill Education, 2012, ISBN: 9780071634809.
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., 4th Edition, 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, 2nd Edition, 2011, ISBN-13 978-0-470-38327-8.

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	3	2
Understand	5	3	2
Apply	4	3	2
Analyze	4	2	2
Evaluate	3	2	2
Create	4	2	-

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

****

ADVANCED JAVA AND ENTERPRISE ARCHITECTURE

Course Code	: 22MCA22	Credits : 03
L:T:P:S	: 3:0:0:0	CIE Marks : 50
Exam Hours	: 3	SEE Marks : 50

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

CO1	Understand the fundamental elements in establishing a database connection.
CO2	Create dynamic web pages using Servlet, Java Server Pages and standard tag libraries.
CO3	Design and develop server side applications using Angular forms.
CO4	Develop a dynamic web application using Hibernate.
CO5	Analyze and evaluate live built-in applications.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	3	-	-	-	-	-	-	-	-	-	3	3
CO2	3	1	3	-	-	-	-	-	-	-	-	1	3	3
CO3	3	1	3	-	2	-	-	2	-	2	-	1	3	3
CO4	3	1	3	-	2	-	-	2	1	2	-	1	3	3
CO5	3	2	3	-	2	-	-	2	1	2	-	1	3	3

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	**JDBC Object:** 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.	9	CO1
2	**Servlets:** 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.	9	CO2
3	**Java Server Pages Standard Tag Library & Java Beans:** 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.	9	CO3

4	**ES6, TypeScript, Angular-CLI and Angular Components:** ES6, TypeScript, 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.	9	CO4
5	**Angular Forms:** Template-driven forms, Reactive forms, FormBuilder, 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.	9	CO5

Text Books:

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

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.
3. Advanced Java Programming, Prasanalakshmi B, 1st Edition, 2015, CBS Publishing, ISBN:9788123923833

Assessment Pattern
CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	2	2
Understand	5	3	2
Apply	5	4	2
Analyze	3	2	1
Evaluate	2	2	1
Create	5	2	2

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	10
Create	10

****

DESIGN AND ANALYSIS OF ALGORITHMS

Course Code	**: 22MCA23**	**Credits**	**: 03**
L:T:P:S	**: 2:1:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 3**	**SEE Marks**	**: 50**

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

CO1	Summarize the paradigms and approaches used to design and analyze algorithms by categorizing problems based on the popular domains.
CO2	Discuss Brute Force, Divide & conquer algorithms and measure their performance.
CO3	Classify the different Decrease and conquer algorithms and discuss space and time tradeoffs technique.
CO4	Characterize the features of various graphical problems with the help of a suitable technique.
CO5	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:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	-	-	-	-	-	-	-	-	-	3	3
CO2	2	3	3	2	-	-	2	-	-	-	2	-	3	3
CO3	2	3	3	2	-	-	2	-	-	-	2	-	3	3
CO4	2	3	3	2	-	-	2	-	-	-	2	-	3	3
CO5	2	3	3	-	-	-	-	-	-	-	2	-	3	3

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**Introduction:** 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.	9	CO1
2	**Brute Force:** 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.	9	CO2
3	**Decrease and Conquer:** 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.	9	CO3
4	**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.	9	CO4

5	**Limitations of algorithm power:** 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.	9	CO5

Text Books:

1. Algorithms: Design and Analysis, Sushil C. Dimri, Preeti Malik, Mangey Ram, De Gruyter Publications, 2021, ISBN: 9783110693751.
2. Introduction to the Design and Analysis of Algorithms, Anany Levitin, Pearson Education, 3rd Edition, 2012, ISBN: 978013231681.
3. Fundamentals of Computer Algorithms, Horowitz E., Sahani S., Rajasekharan S, Galgotia Publications, 2nd Edition, ISBN: 9788175152571.

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.

Assessment Pattern

CIE-Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	5	5
Understand	5	5	3
Apply	5	3	2
Analyze	5	2	-
Evaluate	2	-	-
Create	3	-	-

SEE - Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

****

DATABASE MANAGEMENT SYSTEMS

Course Code	**: 22MCA24**	**Credits**	**: 04**
L:T:P:S	**: 3:0:1:0**	**CIE Marks**	**: 50**
Exam Hours	**: 3**	**SEE Marks**	**: 50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the basic architecture of database management system and database schema with constraints.
CO2	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.
CO3	Describe the basics of SQL and construct queries using SQL.
CO4	Understand the concepts of normalization and design database.
CO5	Formulate and implement queries using RDBMS package.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	-	1	-	2	-	1	-	-	2	3	3
CO2	2	3	3	-	1	-	2	-	1	-	-	2	3	3
CO3	3	3	3	1	3	-	2	-	-	-	1	3	3	3
CO4	3	3	3	2	3	-	2	-	1	2	1	2	3	3
CO5	3	3	3	-	3	-	2	-	1	2	1	1	3	3

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**Cos**
1	**Introduction:** 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. **HANDS ON:** • Installation of MySQL	9	CO1
2	**Relational Model Constraints and Relational Database Schemas:** 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,	9	CO2

	ER Diagrams, Naming Conventions and Design Issues, Relationship Types of Degree Higher than Two. Relational Database Design Using ER- to-Relational Mapping. **HANDS ON:** • Draw an ER diagram for Employee Management System using drawing tools • Draw an ER diagram for Library Management System using drawing tools		
3	**Unary Relational Operations**: 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 Tuple Variables, Unspecified WHERE Clause and Use of the Asterisk. Substring Pattern Matching and Arithmetic Operators. **HANDS ON:** Creating a table student with following information:Name of table: student, columns and data types: rollno number(6), name varchar(20), branch varchar(20); • Inserting data into the student table • Altering table by adding new column class varchar(20)	**9**	**CO3**

	• Deleting a row from the table • Drop column branch • Alter table by changing the data type of rollno to number(8). • Delete all the data from student table. • Delete the table. **HANDS ON:** Create Sales table with the following fields(Sales No, Salesname, Branch, Salesamount, DOB) • Insert five records • Calculate total salesamount in each branch • Calculate average salesamount in each branch . • Display all the salesmen, DOB who are born in the month of December as day in character format		
4	**More Complex SQL Queries-**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. **Database Design:** Informal Design Guidelines for Relation Schemas; Functional Dependencies;1NF,2NF,3NF and Boyce-Codd Normal Form. **HANDS ON:** An Enterprise wishes to maintain a database to automate its operations. Enterprise is divided into certain departments and each department consists of employees. • Update the employee salary by 15%, whose experience is greater than 10 years.	9	CO4

	• Delete the employees, who completed 30 years of service. • Display the manager who is having maximum number of employees working under him? • Create a view, which contain employee names and their manager		
5	**Introduction to PL/SQL:** 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. **HANDS ON:** • Write a PL/SQL program to demonstrate Cursors. • Write PL/SQL queries to create Procedures. • Write a PL/SQL program to demonstrate Functions.	**9**	**CO5**

Text Books:

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.
3. Raghu Ramakrishnan, "Database Management Systems", Third Edition, McGraw Hill, 2013.

Assessment Pattern
CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Lab. Component
Marks	**25**	**25**
Remember	5	-
Understand	5	-
Apply	4	-
Analyze	4	-
Evaluate	4	12
Create	3	13

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	20
Apply	05
Analyze	05
Evaluate	-
Create	10

****

PROFESSIONAL ELECTIVES -1 (BUSINESS ANALYTICS TRACK)

DATA WAREHOUSING AND DATA MINING

Course Code	: 22MCA251	**Credits**	: 03
L:T:P:S	: 2:1:0:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the fundamentals of Data collection and the different pre-processing techniques.
CO2	Distinguish the different Data warehouse models and their implementations.
CO3	Analyze the various pattern mining algorithms and their applications.
CO4	Examine the performance accuracies of the various classifiers.
CO5	Evaluate the different clustering techniques in real-time scenario and formulate the different Outlier Detection Methods.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	-	-	-	-	1	-	-	3	3
CO2	3	2	2	2	-	-	-	-	-	1	-	-	3	3
CO3	3	3	3	2	-	-	1	-	-	1	1	-	3	3
CO4	3	3	3	2	-	-	1	-	-	1	1	-	3	3
CO5	3	3	3	2	-	-	1	-	-	1	1	-	3	3

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	**Introduction, Getting to know your Data, Data Pre-processing:** Introduction: 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.	9	CO1
2	**Data warehousing and Online Analytical Processing:** Data Warehouse: Basic concepts, Data Warehouse Modelling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementations.	9	CO2
3	**Mining Frequent Patterns, Associations and Correlations: 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.	9	CO3

4	**Classification: Basic Concepts:** Basic Concepts, Decision Tree Induction, Bayes' Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy.	**9**	**CO4**
5	**Clustering Analysis: 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. **HANDS ON:** • Using tools for visualization of clustering approaches.	**9**	**CO5**

Text Books:

1. Jiawei Han, Micheline Kamber and Jian Pei: Data Mining - Concepts and Techniques, 3rd Edition, Morgan Kaufmann Publisher, 2018, ISBN-10 : 9780123814791 .

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.

Assessment Pattern
CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	3	2
Understand	5	3	2
Apply	5	3	2
Analyze	5	3	2
Evaluate	3	1	1
Create	2	2	1

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

****

ROBOTIC PROCESS AUTOMATION

Course Code	: 22MCA252	**Credits**	: 03
L:T:P:S	: 2:1:0:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understanding the automation potential and realizing the value in RPA.
CO2	Demonstrate good understanding RPA Platform Architecture and Components.
CO3	Demonstrate good understanding of Recorders, Editor, and various essential Commands to build simple tasks / Bots for automating simple processes and Automating tasks.
CO4	Independently develop solution for automating the tasks.
CO5	Demonstrate good understanding of RPA and its use cases.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	3	3
CO2	2	2	-	-	2	-	-	-	-	-	-	-	3	3
CO3	1	1	-	-	2	-	-	1	-	-	-	-	3	3
CO4	3	3	1	-	2	-	-	1	-	1	1	-	3	3
CO5	3	3	1	-	2	-	-	1	-	1	1	-	3	3

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**Introduction to RPA:** 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.	9	CO1
2	**Platform Architecture and Components:** 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.	9	CO2
3	**Building best practice automations:** Recorder versus Design-based. **Recorders:** Web Recorder, Screen Recorder, Smart Recorder. AA Commands Read from CSV/Text, Excel Database Files/Folder. **HANDS ON:** • Screen recorder • Simple web recorder • Web recorder with database automation	9	CO3

4	**Building best practice automations:** Error Handling String Operation Variables Variable Operation PDF Integration Email Automation, OCR Web Recorder Properties, Workflow, Tips & Tricks. **HANDS ON:** • Email Automation • FTP automation and PDF integration • String operation • Web recorder & send email • Smart recorder	9	CO4

5	**Getting smarter through Cognitive Automation:** What AI brings, Automated customer engagement – Chat bots, Voice bots, Virtual agent, Automated mails, Dynamic interactive voice response, Visual IVR.
	
	HANDS ON:
	
	• **Advanced**
	   a. Smart Recorder with Excel automation and database automation
	   b. Web recorder with files and folder
	• **Masters**
	   c. Xml automation
	   d. Web recorder to excel automation
		9	CO5

Text Books:

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.

Assessment Pattern
CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	3	3
Understand	5	3	2
Apply	5	3	2
Analyze	5	2	-
Evaluate	-	2	-
Create	5	2	3

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	50
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

****

SOCIAL MEDIA ANALYTICS

Course Code	: 22MCA253	**Credits**	: 03
L:T:P:S	: 2:1:0:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

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

CO1	Identify the subset of available data to focus on analysis.
CO2	Demonstrate the activities that assist in transforming raw data into insights.
CO3	Analyze various perspectives of insights to derive higher accuracy.
CO4	Evaluate the information interpretation as a social analytic process.
CO5	Organize information gathered from consumer to filter & find right data and formulate the common visualization techniques

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	2	1	-	-	-	2	2	-	1	1
CO2	3	3	-	-	2	1	-	-	-	2	2	-	1	1
CO3	3	3	1	-	2	1	-	-	-	2	2	2	1	1
CO4	3	3	1	-	2	1	-	-	-	2	2	2	1	1
CO5	3	3	1	-	2	1	-	-	-	2	2	2	1	1

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	**Data Identification:** 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.	9	CO1
2	**Data Analysis - I:** 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.	9	CO2
3	**Data Analysis - II:** 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.	9	CO3
4	**Information Interpretation:** Finding the right data, Communication, Choosing filter words, Customizing and Modifying tools, Using right tools, Analyzing consumer reaction during hurricane study.	9	CO4

5	**Visualization as an aid to analytics**: Common visualizations – Pie, Bar, Line, Scatter plots. Common pitfalls – Information overload, Unintended consequences of using 3D, Using colour, Visually representing unstructured data. **Case study:** IBM Amplify - Data Identification, Data Analysis and Information Interpretation and conclusions.	9	CO5

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.
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.

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.

Assessment Pattern
CIE – Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	3	3
Understand	5	2	3
Apply	5	3	2
Analyze	5	2	2
Evaluate	2	3	-
Create	3	2	-

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

****

BUSINESS INTELLIGENCE AND DATA ANALYTICS

Course Code	: 22MCA254	**Credits**	: 03
L:T:P:S	: 2:1:0:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Describe the fundamental BI visualizations.
CO2	Examine advanced BI visualizations across different dimensions.
CO3	Investigate on Table calculations and data densification.
CO4	Adding value to visualizations through deep analysis.
CO5	Dealing with data structure issues and mapping techniques in visualizations and constructing data stories through presentations.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO2	3	3	-	3	2	-	-	-	-	-	1	1	3	3
CO3	3	3	-	3	2	-	-	-	-	-	1	1	3	3
CO4	3	3	2	3	2	-	-	-	2	-	1	1	3	3
CO5	3	3	2	3	2	-	-	-	1	-	1	1	3	3

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**Creating Visualizations and Dashboard:** 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.	9	CO1
2	**Moving from foundational to advanced visualizations:** 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.	9	CO2
3	**Table Calculations:** Creating and editing table calculations, quick table calculations, Relative versus fixed, Scope and direction, Addressing and partitioning, Custom table calculations, Practical examples, Data densification.	9	CO3
4	**Formatting Visualization:** 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.	9	CO4
5	**Making Data Works:** 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.	9	CO5

Text Books:

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.

Reference Books:

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

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	2	2
Understand	5	5	2
Apply	5	4	2
Analyze	5	2	2
Evaluate	3	1	1
Create	2	1	1

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

****

SEARCH ENGINE OPTIMIZATION

Course Code	: 22MCA255	**Credits**	: 03
L:T:P:S	: 2:1:0:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Impart the knowledge on fundamentals of search engine optimization.
CO2	Understand how to plan for a powerful search engine and how to make your site useful.
CO3	Understand the role of keywords creating pages.
CO4	Understand the role of designing SEO friendly web pages.
CO5	Creating content for your web pages and linking strategies for your web page.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	2	2	2	-	-	3	3
CO2	3	3	-	-	-	-	-	2	2	2	-	2	3	3
CO3	3	3	-	2	-	-	-	2	2	2	-	2	3	3
CO4	3	3	-	2	-	-	-	2	2	2	-	2	3	3
CO5	3	3	2	2	3	2	-	2	2	2	-	2	3	3

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**How Search Engines Work:** Putting Search Engines in Context**:** 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 Impact on Ranking, • Using News, Images, Books, and other Search Verticals to Rank.	9	CO1

2	**Keyword Strategy:** 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	9	CO2

3	**Seo Web Design:** 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 **HANDS ON:** • Optimizing HTML Constructs for Search Engines • Enriching Your Site with Rich Snippets • Using Clean Code Making Your Site WC-Compliant Choosing the Right Navigation.	9	CO3
4	**Creating Content:** 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.	9	CO4

	HANDS ON: • Developing Content Using Your Keywords • Optimizing the Content for Local Searches • Sources of Duplicate Content and How to Resolve Them		
5	**Linking :** 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 **HANDS ON:** • Identifying Inbound Links • Avoiding Poor-Quality Links • Promoting Media on Social Networking Sites • Optimizing Social Media.	**9**	**CO5**

Text Books:
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.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	2	2
Understand	5	5	2
Apply	5	4	2
Analyze	5	2	2
Evaluate	3	1	1
Create	2	1	1

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

****

PROFESSIONAL ELECTIVES – 2 (NETWORK SECURITY TRACK)

CYBER SECURITY AND CYBER LAW

Course Code	: 22MCA261	**Credits**	: 03
L:T:P:S	: 2:1:0:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the various cybercrimes in a real time scenario.
CO2	Identify the security challenges in mobile and wireless devices.
CO3	Apply the appropriate tools and methods to address cyber security threats.
CO4	Analyze the cyber laws in Indian and global perspective.
CO5	Apply the forensics tools and techniques to evaluate the evidences while investigating cyber crimes.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-		-	3	-	-	3	-	-	3	3
CO2	3	-	-	-	3	-	3	-	-	3	3	2	3	3
CO3	3	2	2	2	3	-	3	-	-	3	3	2	3	3
CO4	3	2	-	-	-	3	3	-	1	3	3	-	3	3
CO5	3	2	2	2	3	3	3	1	-	3	3	2	3	3

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**Introduction to Cybercrime:** 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.	9	CO1
2	**Cybercrime: Mobile and Wireless Devices:** 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.	9	CO2

3	**Tools and Methods Used in Cybercrime:** 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).	9	CO3
4	**Cybercrimes and Cybersecurity: The Legal Perspectives** Intro, Cybercrime and the Legal Landscape around the World, Why Do We Need Cyberlaws: 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.	9	CO4
5	**Computer Forensics:** 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.	9	CO5

	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. Hands on session on Digital Forensic and Antiforensic tools.		

Text Books:

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

Reference Books:

1. Cybersecurity 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.

Assessment Pattern
CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	2	2
Understand	5	2	2
Apply	5	2	2
Analyze	5	3	2
Evaluate	2	3	1
Create	3	3	1

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

****

DIGITAL FORENSICS

Course Code	: 22MCA262	**Credits**	: 03
L:T:P:S	: 2:1:0:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the process of digital forensics analysis.
CO2	Study about the regulations of digital forensics analysis.
CO3	Describe the representation and organization of data and metadata of forensics analysis in enterprises.
CO4	Investigate the digital evidence management.
CO5	Create, recover and extract hidden information and develop.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	3	3		-	3	-	-	3	-	-	3	3
CO2	3	-	3	3	3	-	3	-	1	3	3	2	3	3
CO3	3	2	3	2	3	-	3	-	1	3	3	2	3	3
CO4	3	2	-	-	-	3	3	-	1	3	3	-	3	3
CO5	3	-	-	-	-	3	3	-	-	3	3	-	3	3

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**Introduction to Digital Forensics:** 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.	**9**	**CO1**
2	**Education, Training and Awareness:** 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.	**9**	**CO2**
3	**Ethics and Professional Conduct:** 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.	**9**	**CO3**

4	**Combatting Antiforensics:** What is antiforensics? Traditional techniques, Detection methods, Strategic Countermeasures. **Digital Evidence 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.	9	CO4
5	**Incident Management and Response:** 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.	9	CO5

Text Books:

1. Digital Forensics and Investigations: People, Process, and Technologies Jason Sachowski, CRC Press, 2018, ISBN: 978-1-138-72093, 2018.

Reference Books:

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

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	4	2
Understand	5	3	2
Apply	5	2	2
Analyze	4	2	2
Evaluate	4	2	1
Create	2	2	1

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

****

CRYPTOGRAPHY AND NETWORK SECURITY

Course Code	: 22MCA263	**Credits**	: 03
L:T:P:S	: 2:1:0:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	To study various security methods and procedures.
CO2	To brief about different cryptographic algorithms.
CO3	To learn hardware perspectives and optimization of wireless.
CO4	To show how the public keys are distributed using Diffie Hellman.
CO5	To discuss about interception and vulnerability of wireless systems and formulate common techniques for implementing security models.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	3	3		-	3	-	-	3	-	-	3	3
CO2	3	-	3	3	3	-	3	-	1	3	3	2	3	3
CO3	3	2	3	2	3	-	3	-	1	3	3	2	3	3
CO4	3	2	-	-	-	3	3	-	1	3	3	-	3	3
CO5	3	-	-	-	-	3	3	-	-	3	3	-	3	3

Module	Contents of the Module	Hours	COs
1	**Classical Cryptosystem:** 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.	9	CO1
2	**Block Cipher:** Simple DES, DES, Modes of operation, Triple DES, AES, RC4, RSA, Attacks, Primality test, factoring.	9	CO2
3	**Message Authentication:** 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	9	CO3
4	**Application Security:** Kerberos, X.509, PKI, Electronic Mail security, PGP, IP security, Web Security, SSL, TLS, SET.	9	CO4
5	**Wireless Network Security:** Wireless Network Security- IEEE 802.11 Wireless LANs - Protocol Overview and Security - Wireless Application Protocol (WAP) - Protocol Overview - Wireless Transport Layer Security (WTLS).	9	CO5

Text Books:

1. William Stallings, "Cryptography and Network security Principles and Practices", Pearson/PHI, 5th ed, 2006.

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.

Assessment Pattern
CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	3	2
Understand	5	2	2
Apply	5	3	2
Analyze	5	2	2
Evaluate	3	3	1
Create	2	2	1

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

****

INFORMATION RETRIEVAL

Course Code	: 22MCA264	**Credits**	: 03
L:T:P:S	: 2:1:0:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Learn the information retrieval models and Be familiar with Web Search Engine.
CO2	Be exposed to Link Analysis.
CO3	Understand Hadoop and Map Reduce.
CO4	Learn document text mining techniques.
CO5	Understand document text mining.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	1	-	1	3	3
CO2	3	3	-	2	-	-	-	-	-	1	-	1	3	3
CO3	3	3	-	2	3	-	-	2	1	2	1	1	3	3
CO4	3	3	-	2	2	1	-	2	1	2	1	1	3	3
CO5	3	3	-	2	2	1	-	2	1	2	1	1	3	3

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**Introduction:** 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.	9	CO1
2	**Information Retrieval:** 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.	9	CO2
3	**Web Search Engine – Introduction And Crawling:** 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.	9	CO3
4	**Web Search – Link Analysis And Specialized Search:** Link Analysis, hubs and authorities, Page Rank and HITS algorithms Searching and Ranking Relevance Scoring and ranking for WebSimilarity, Hadoop & Map Reduce Evaluation Personalized search Collaborative filtering and content-based recommendation of documents and products handling "invisible"	9	CO4

	Summarization, Question Answering, Cross-Lingual Retrieval.			
5	**Document Text Mining:** 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).	**9**	**CO5**	

Text Books:

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: Implementing and Evaluating Search Engines, The MIT Press, 2010.
2. Ophir Frieder "Information Retrieval: Algorithms and Heuristics: The Information Retrieval Series", 2nd Edition, Springer, 2004.
3. Manu Konchady, "Building Search Applications: Lucene, Ling Pipe", and First Edition, Gate Mustru Publishing, 2008.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	3	2
Understand	5	2	2
Apply	5	3	2
Analyze	5	2	2
Evaluate	3	3	1
Create	2	2	1

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	5

****

WEB APPLICATION SECURITY

Course Code	: 22MCA265	**Credits**	: 03
L:T:P:S	: 2:1:0:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand Web Application Security in a broader Way.
CO2	To analyze HTML injection and content spoofing.
CO3	To analyze SQL injection server-side request forgery.
CO4	To understand file upload vulnerability.
CO5	To implement secure coding practices.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	2	1	-	2	1	-	-	3	3
CO2	3	3	2	2	2	2	1	-	2	1	2	-	3	3
CO3	3	3	2	2	2	2	1	-	2	1	2	-	3	3
CO4	3	3	2	2	2	2	1	-	2	1	2	-	3	3
CO5	3	3	2	2	2	2	1	-	2	1	2	-	3	3

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**Bug Bounty Basics:** 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.	9	CO1
2	**HTML Injection and Content Spoofing:** 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.	9	CO2
3	**SQL Injection & Server-Side Request Forgery:** 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.	9	CO3

4	**File Upload Vulnerability:** 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.	9	CO4
5	**Secure Website Design:** Architecture and Design Issues for Web Applications, Deployment Considerations Input Validation, Authentication, Authorization, Configuration Management, Sensitive Data, Session Management, Cryptography, Parameter Manipulation, Exception Manage- ment, Auditing and Logging, Design Guidelines, Forms and validity, Technical implementation Secure coding practices - blacklisting, whitelisting, user input validation, automated testing, sanitizing HTML.	9	CO5

Text Books:

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

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	10	5	3
Understand	5	5	3
Apply	5	3	2
Analyze	5	2	2
Evaluate	-	-	-
Create	-	-	-

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	20
Understand	10
Apply	10
Analyze	10
Evaluate	-
Create	-

****

DATA STRUCTURES AND ALGORITHMS LAB

Course Code   : **22MCAL27**   **Credits : 1.5**

L:T:P:S   : **0:0:1.5:0**   **CIE Marks : 50**

Exam Hours   : **3**   **SEE Marks : 50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Implement string and array operations.
CO2	Analyse the functional aspects of stack in recursion.
CO3	Analyse the operational aspects of queue and Linked lists data structures.
CO4	Construct a tree data structure to execute various types of traversal techniques.
CO5	Select an appropriate data structure for a specified application.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	1	-	-	-	2	1	3	3
CO2	2	2	-	-	1	-	1	1	-	-	2	1	3	3
CO3	2	2	-	-	1	1	1	1	-	-	3	1	3	3
CO4	2	2	2	1	2	1	1	1	1	1	3	1	3	3
CO5	2	2	2	1	2	1	1	1	1	1	3	1	3	3

SYLLABUS			
SL No.	**At the end of the course, the student will be able to write the following programs.**	**Hours**	**COs**
1	Example programs on arrays: a) Write a C++ program to find the largest element of a given array of integers. b) C++ program to sort an array in Ascending Order. c) C++ Program to Add Two Matrices using multi-dimensional arrays.	6	CO1
2	Write a C++ program on String operations.		
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		
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	CO2
5	Simulating the working of linear queue.		
6	Simulating the working of circular queue.		
7	Write a C++ program that uses functions to perform the following: a) Create a singly linked list of integers. b) Delete a given integer from the above linked list. c) Display the contents of the above list after deletion.	15	CO3

8	Write a template-based C++ program that uses functions to perform the following:
	     a) Create a doubly linked list of elements.
	     b) Delete a given element from the above doubly linked list.
	     c) Display the contents of the above list after deletion.		

9	Implement linear and Binary search techniques.	3	CO5
10	Implement Heap sort Technique.		

11	Write a C++ program that uses functions to perform the following:
	    a) Create a binary search tree of integers.
	    b) Traverse the tree in in-order, pre-order and post-order.
		3	CO4

Assessment Pattern

CIE- Continuous Internal Evaluation: PRACTICAL (50Marks)

Bloom's Taxonomy	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	4
Evaluate	6
Create	10

SEE- Semester End Examination: PRACTICAL (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	4
Evaluate	6
Create	10

*****

ADVANCED JAVA LAB

Course Code	: 22MCAL28	**Credits**	: 1.5
L:T:P:S	: 0:0:1.5:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Develop programs to implement database operations using JDBC.
CO2	Create dynamic web pages using Servlet, Java Server Pages and standard tag libraries.
CO3	Design and develop dynamic web pages using Java beans.
CO4	Develop a dynamic web application using Angular and Hibernate.
CO5	Analyze and evaluate live built-in applications.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	3	-	-	-	-	-	-	-	-	-	3	3
CO2	3	1	3	-	-	-	-	-	-	-	-	1	3	3
CO3	3	1	3	-	2	-	-	2	-	2	-	1	3	3
CO4	3	1	3	-	2	-	-	2	1	2	-	1	3	3
CO5	3	1	3	-	2	-	-	2	1	2	-	1	3	3

SL No.	At the end of the course, the student will be able to write the following programs.	Hours	COs
1	Write a JAVA Program to insert data into Student DATA BASE and retrieve info based on particular queries.		CO1
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).	7	CO2
3	Write a JAVA Servelet Program to implement verification of a particular user login and display a welcome page.		CO2
4	Write a JAVA Servlet Program using cookies to remember user pReference.	3	CO2
5	a) Write a JAVA JSP Program to print 10 even and 10 odd number. b) Write a JAVA JSP Program to the given number is prime or not.		CO3
6	Write a JAVA JSP Program to implement verification of a particular user login and display a welcome page.	10	CO3
7	Write a JAVA JSP Program which uses jsp: include and jsp: forward action to display a Webpage.		CO3
8	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.		CO3
9	Write a JAVA Servlet Program to implement sessions (Using HTTP Session Interface).	5	CO2
10	Write a JAVA Servlet Program to implement Request Dispatcher object (use include() and forward() methods).		

11	Develop a small dynamic web application using Angular and Hibernate.	5	CO4, CO5

Assessment Pattern
CIE- Continuous Internal Evaluation: PRACTICAL (50 Marks)

Bloom's Taxonomy	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	4
Evaluate	6
Create	10

SEE- Semester End Examination: PRACTICAL (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	10
Analyze	4
Evaluate	6
Create	10

****

MINI PROJECT USING JAVA AND DBMS

Course Code	: 22MCAL29	**Credits**	: 02
L:T:P:S	: 0:0:2:0	**CIE Marks**	: 50
Exam Hours	: 3	**SEE Marks**	: 50

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

CO1	Recall the concepts learnt in data base management system course.
CO2	Apply the required tools and techniques for software development.
CO3	Examine the requirements and transform them to a software module.
CO4	Assess the valid arguments in case study against the software module developed.
CO5	Formulate the test cases and strategies for the software module developed.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	1	2	2	2	1	2	1	3	3
CO2	3	3	3	2	3	2	2	3	3	2	3	1	3	3
CO3	3	3	3	2	2	1	2	3	3	1	3	2	3	3
CO4	3	3	3	2	3	2	2	3	3	2	3	2	3	3
CO5	3	3	3	2	3	2	2	3	3	2	3	2	3	3

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

Mini Project 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.

Assessment Pattern

CIE- Continuous Internal Evaluation: Practical Demonstration (50 Marks)

Bloom's Taxonomy	Tests
Marks	**50**
Remember	-
Understand	-
Apply	20
Analyze	10
Evaluate	10
Create	10

SEE-Semester End Examination: Practical (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	-
Understand	-
Apply	20
Analyze	10
Evaluate	10
Create	10

Mini Project Work 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

****

LIFE SKILLS FOR PROFESSIONALS – 2

Course Code	: 22HSSC210	**Credits**	: 01
L:T:P:S	: 1:0:0:0	**CIE Marks**	: 50
Exam Hours	: 2	**SEE Marks**	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Relate "SMART GOALS" to personal and professional life.
CO2	Articulate and communicate ideas and thoughts with clarity and focus.
CO3	Interpret and manage one's emotions in work and life.
CO4	Develop critical and creative thinking skills for problem solving and decision making for leadership.
CO5	Analyze the importance of personality development and grooming in corporate life.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	2	2	2	3	-	-	-	-	-
CO2	-	-	-	-	-	3	2	3	3	2	-	-	-	-
CO3	-	-	-	-	-	-	-	1	3	-	3	-	-	-
CO4	-	3	3	-	-	-	3	2	3	-	-	-	-	-
CO5	-	-	-	-	-	3	3	3	3	2	-	-	-	-

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**Goal setting:** Importance of Goals; Creating SMART goals.	**4**	**CO1**
2	**Self-Awareness:** Emotional Intelligence, SWOT Analysis, Johari Windows, Self-Management: Time and Stress Management.	**6**	**CO3**
3	**Personality Development & Grooming:** Expectations from the industry, Basics of professional grooming; Email and Telephone etiquettes.	**4**	**CO5**
4	**Thinking Skills and Group Dynamics:** Creative Thinking, Critical Thinking, Mind Maps, 6 Thinking Hats, Working in a team, Leadership, Problem Solving skills.	**6**	**CO4**
5	**Articulation and Group Discussion:** Ideas generation, Stepping out of Comfort Zone, Group Discussion techniques.	**4**	**CO2**

Reference Books:

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.

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	-	-	-
Understand	-	-	-
Apply	10	5	5
Analyze	10	5	5
Evaluate	-	-	-
Create	5	5	-

SEE- Semester End Examination: Theory (50 Marks)

Bloom's Category	Tests
Marks	**50**
Remember	-
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	10

NOTE: Being a Life skills course we felt it would be suitable to do the final assessment through a structured group discussion which will provide an opportunity to test students in all levels of Bloom's Taxonomy.

****