NEW HORIZON
COLLEGE OF ENGINEERING

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

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

First & Second Semester
Scheme & Syllabus
Academic Year 2021–22

MCA
2-YEAR PROGRAM

Department of Master of Computer Applications

First and Second Semester MCA
Scheme & Syllabus

ACADEMIC YEAR 2021-22

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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 the 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 the global level.

VALUES

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

DEPARTMENT OF MCA

VISION

To impart quality education and knowledge, necessary to transform students from novice to professional in the field of IT and ITES with a research-oriented approach.

MISSION

To mould our students into a holistic personality accomplished in emotional, moral intellectual, social and mental capabilities besides inculcating a capacity for critical and lateral thinking.

QUALITY POLICY

To impart excellence in the art of education both curricular and co-curricular, as a result of which our students learn to blend technical proficiency and humanity in serving the industry and society equally well at the global level.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To develop the ability to plan, analyze, design, code, test, implement and maintain the software product for real time systems.

PEO2: To excel in problem solving and programming skills in computing fields of IT industries.

PEO3: To practice effectively as individuals and as team members in multidisciplinary projects involving technical, managerial, economical and social constraints.

PEO4: To encourage students' capability to setup their own enterprise in various sectors of Computer Applications.

PEO5: To prepare the students to pursue higher studies in computing or related fields and to work in the fields of teaching and research.

PROGRAM SPECIFIC OUTCOME (PSOs)

PSO1: Understand and apply the computing techniques with mathematics and industrial concepts for solving real time industrial problems.

PSO2: Analyze, design, develop, test, and maintain the software applications with latest computing tools and technologies.

PEO to Mission Statement Mapping
Correlation: 3- High, 2-Medium, 1-Low

Mission Statements	PEO1	PEO2	PEO3	PEO4	PEO5
To nurture students with a holistic approach, to inculcate knowledge, expertise and attitude with the ability to think critically, rationally and innovatively.	3	3	3	2	2
To bring awareness in the latest trends in the Industry. To make the student to realize the positive transformations happening in them.	3	3	2	3	2
To impart excellence in the art of education both curricular and co-curricular, as a result of which our students learn to blend technical proficiency and humanity in serving the industry and society equally well at the global level.	3	2	3	3	3

Program Outcomes (PO) with Graduate Attributes

	Graduate Attributes	Program Outcomes POs)
1	Scholarship of Knowledge	**PO1:** Understand and apply the fundamental principles of mathematics, science, knowledge of computer science for solving complex problems.
2	Critical Thinking	**PO2:** Identify, analyze, and formulate the real world requirements in computing domain for solving problems.
3	Problem Solving	**PO3:** Design and estimate the computer system components, sub-systems and appropriate tools for developing solutions for complex problems.
4	Research Skill	**PO4:** Use latest tools and technique needed for hard computing practices.
5	Usage of modern tools	**PO5:** Use right platform on design and execution for performance.
6	Collaborative and Multidisciplinary work	**PO6:** Customize and fit software solutions to the society and environment.
7	Project Management and Finance	**PO7:** Work effectively as an individual as well as a member / leader in a team.

8	Communication	**PO8:** Understand and commit ethical, cyber regulations and management practices in computing field for managing software projects from diverse environments.
9	Life-long Learning	**PO9:** Understand the societal, environmental, health, legal, ethical issues and its impact with respect to computing and professional practice.
10	Ethical Practices and Social Responsibility	**PO10:** Discover openings and use novel thoughts for creating value and wealth for the betterment of the individual and society.
11	Independent and Reflective Learning	**PO11:** Design, execute and interpret the software with real time data and synthesis the information to reach suitable conclusions.

Mapping of POs to PEOs

PO's	1	2	3	4	5	6	7	8	9	10	11
PEO1	3	2	2	2	2	2	1	1	1	1	1
PEO2	3	3	3	3	2	2	1	2	2	1	3
PEO3	2	3	3	3	3	3	3	3	3	3	3
PEO4	3	3	3	2	3	3	3	3	3	2	1
PEO5	1	2	2	2	3	2	3	3	3	3	3

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

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS
MCA DEGREE CURRICULUM – CREDIT DISTRIBUTION TABLE
ACADEMIC YEAR 2021-2022: SEMESTER I TO IV

SEMESTER	CORE	ELECTIVES	MINI/ PROJECT WORKS	SEMINAR	TOTAL CREDITS
I	25	0	0	0	25
II	17	6	2	0	25
III	11	12	2	0	25
IV	0	2	21	2	25
TOTAL	53	20	25	2	100
% of Distribution	53%	20%	25%	2%	100%
% of Requirement	40-55	20-35	20-35	02-10	

% OF DISTRIBUTION

- PROFESSIONAL CORE
- PROFESSIONAL ELECTIVES
- MINI/PROJECT WORKS
- SEMINAR
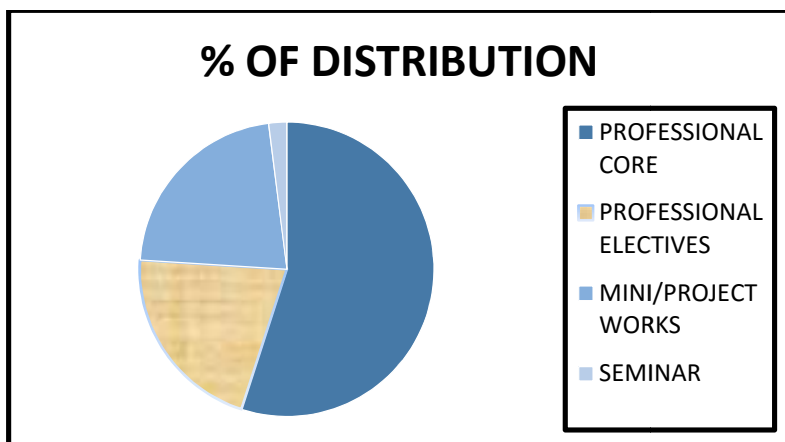
DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS
SCHEME OF FIRST SEMESTER MCA PROGRAM

S NO	COURSE CODE	COURSE	BOS	L	T	P	S	OVERALL CREDITS	CONTACT HOURS WEEKLY (THEORY)	CIE	SEE	TOTAL
				CREDIT DISTRIBUTION						MARKS		
1	20MCA11	PROGRAMMING WITH JAVA	MCA	4	0	0	0	4	4	50	50	100
2	20MATC12	COMPUTATIONAL MATHEMATICS	MAT	3	1	0	0	4	5	50	50	100
3	20MCA13	OPERATING SYSTEM WITH UNIX PROGRAMMING	MCA	4	0	0	0	4	4	50	50	100
4	20MCA14	COMPUTER NETWORKS	MCA	4	0	0	0	4	4	50	50	100
5	20MCA15	WEB PROGRAMMING	MCA	3	0	0	0	3	3	50	50	100
6	20MCA16*	PROGRAMMING LOGIC AND DESIGN	MCA	0	0	0	0	0	4	50	50	100
7	20MCAL17	JAVA LAB	MCA	0	0	1.5	0	1.5	3	25	25	50
8	20MCAL18	UNIX LAB	MCA	0	0	1.5	0	1.5	3	25	25	50
9	20MCAL19	COMPUTER NETWORKS LAB	MCA	0	0	1	0	1	2	25	25	50
10	20MCAL110	WEB PROGRAMMING LAB	MCA	0	0	1	0	1	2	25	25	50
11	20HSSC111A	LIFE SKILLS FOR PROFESSIONALS -1	HSS	1	0	0	0	1	2	25	25	50
		TOTAL		19	1	5	0	25	36	425	425	850

L -Lecture (1 hour), T- Tutorial (2 hours), P-Practical (2 hours)
*Mandatory non-credit Bridge Course only for non-computer science students

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS
SCHEME OF SECOND SEMESTER MCA PROGRAM

S NO	COURSE CODE	COURSE	B O S	CREDIT DISTRIBUTION				OVERALL CREDITS	CONTACT HOURS WEEKLY (THEORY)	MARKS		
				L	T	P	S			CIE	SEE	TOTAL
1	20MCA21	ADVANCED JAVA AND ENTERPRISE ARCHITECTURE	MCA	3	0	0	0	3	3	50	50	100
2	20MCA22	DATA STRUCTURES USING C++	MCA	2	1	0	0	3	4	50	50	100
3	20MCA23	SOFTWARE ENGINEERING AND TESTING	MCA	3	0	0	0	3	3	50	50	100
4	20MCA24	DATABASE SYSTEMS	MCA	3	0	0	0	3	3	50	50	100
5	20MCA25X	ELECTIVES-1	MCA	3	0	0	0	3	3	50	50	100
6	20MCA26X	ELECTIVES-2	MCA	3	0	0	0	3	3	50	50	100
7	20MCAL27	ADVANCED JAVA LAB	MCA	0	0	1.5	0	1.5	3	25	25	50
8	20MCAL28	DATA STRUCTURES USING C++ LAB	MCA	0	0	1.5	0	1.5	3	25	25	50
9	20MCAL29	SOFTWARE TESTING LAB	MCA	0	0	1	0	1	2	25	25	50
10	20MCAL210	DATABASE SYSTEMS LAB WITH MINI PROJECT	MCA	0	0	2	0	2	3	25	25	50
11	20HSSC211A	LIFE SKILLS FOR PROFESSIONALS -2	HSS	1	0	0	0	1	3	25	25	50
		TOTAL		18	1	6	0	25	33	425	425	850
L -Lecture (1 hour), T- Tutorial (2 hours), P-Practical (2 hours)												

ELECTIVES-1 (BUSINESS ANALYTICS TRACK)								
SNO	COURSE CODE	COURSE	BOS	CREDIT DISTRIBUTION				TOTAL
				L	T	P	S	
1	20MCA251	DATA WAREHOUSING AND DATA MINING	MCA	3	0	0	0	3
2	20MCA252	ROBOTIC PROCESS AUTOMATION	MCA	3	0	0	0	3
3	20MCA253	ENTERPRISE RESOURCE PLANNING	MCA	3	0	0	0	3
4	20MCA254	BUSINESS INTELLIGENCE AND DATA ANALYTICS	MCA	3	0	0	0	3
5	20MCA255	COMPUTATIONAL STATISTICS	MCA	3	0	0	0	3

ELECTIVES-2 (NETWORK SECURITY TRACK)								
SNO	COURSE CODE	COURSE	BOS	CREDIT DISTRIBUTION				TOTAL
				L	T	P	S	
1	20MCA261	CYBER SECURITY AND CYBER LAW	MCA	3	0	0	0	3
2	20MCA262	DIGITAL FORENSICS	MCA	3	0	0	0	3
3	20MCA263	CRYPTOGRAPHY AND NETWORK SECURITY	MCA	3	0	0	0	3
4	20MCA264	INFORMATION RETRIEVAL AND SECURITY	MCA	3	0	0	0	3
5	20MCA265	WIRELESS SENSOR NETWORKS	MCA	3	0	0	0	3

FIRST SEMESTER

MCA SYLLABUS

2-YEAR PROGRAM (2021-22)

PROGRAMMING WITH JAVA

Course Code   :20MCA11   **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	Learn fundamental features to set up Java JDK environment to create debug and run simple Java programs.
CO2	Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
CO3	Understand the usage of the Arrays and String Handling examples with Object Oriented concepts.
CO4	Learn object oriented concepts using programming examples and awareness of the important topics about inheritance, packages and Interfaces.
CO5	Have the ability to write programs relating to exception handling mechanism and threads.
CO6	To learn to write, test, and debug database programming using object oriented programming in java.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	3	-	2	2	-	3	1	-	-	3	-
CO2	2	-	3	-	2	2	-	3	1	-	-	-	3
CO3	-	3	3	-	2	2	3	3	1	-	-	-	3
CO4	-	3	3	3	2	2	-	3	1	-	2	3	-
CO5	-	3	3	3	2	2	3	3	1	-	2	-	3
CO6	-	3	3	3	2	2	-	3	1	-	2	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, References Variables and Assignment, introducing methods, constructors, the *this* keyword, garbage collection, the finalize( ) method.	9	CO1, CO2

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	CO3
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 References, Implementing Multiple Interfaces, Nested Interfaces. Package Fundamentals, Packages and Member Access, Importing Packages, Interfaces.	9	CO4

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	CO5
5	**Generics and collection overview:** What are Generics?, A simple Generics Example,Generic Methods, Generic Constructors, Generic classes The Collection Interfaces. **Introducing Java Applet & Swing:** Applet basics, Applet life cycle, Applet Programming, Event Handling, The swing fundamentals, Components and containers, Layout managers, A first simple swing Example, Exploring Swing Controls, Event Handling. JDBC connectivity. JDBC – connectivity.	9	CO6

Text Books:

1. Herbert Schildt, Java The Complete References, 7th Edition, Tata McGraw Hill, 2007.
2. Java 6 Programming Black Book, Dreamtech Press, 2012.

References Books:

1. First Java, Kathy Sierra & Bert Bates, Shroff/O'Reilly Publication, 2nd Edition.
2. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill, 4th Edition.
3. Core Java Volume I – Fundamentals, Cay S. Horstmann, Prentice Hall, 11th Edition.

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

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

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

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COMPUTATIONAL MATHEMATICS

Course Code	:20MATC12	**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 PDEs and solve.
CO3	Apply numerical methods to obtain approximate solutions to mathematical problems.
CO4	Identify solution methods for the optimization problems studied.
CO5	Learn to present clear mathematical arguments.
CO6	Apply Evolutionary Computation Methods to find solutions to complex problems.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	1	2	-	-	1	-	1	-	3
CO2	3	2	2	2	1	2	-	-	1	-	1	-	3
CO3	3	2	2	2	1	2	-	-	1	-	1	-	3
CO4	3	2	2	2	1	2	-	-	1	-	1	-	3
CO5	3	2	2	2	1	2	-	-	1	-	1	-	3
CO6	3	2	2	2	1	2	-	-	1	-	1	-	3

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**Mathematical Foundations:** The essence of an algorithm, Big-O notations, Differentiation and Integration, Vector and Vector Calculus, Matrices and Matrix decomposition, Determinant and Inverse, Matrix Exponential, Hermitian and Quadratic forms, Eigen values and Eigenvectors, Definiteness of Matrices, Hessian Matrix.	9	CO1
2	**Ordinary Differential Equations** (ODE) – First-order and Higher-order, Linear system, Sturm-Liouville equation, **Partial Differential Equations** (PDE) – First-Order and Second-Order.	9	CO2
3	**Numerical Algorithms:** Roots of Nonlinear equations – Bisection, Simple Iterations, Newton's, Iteration methods. **Numerical Integration:** Trapezium Rule, Simpson's Rule and Gaussian Integration. **Computational Linear Algebra:** System of Linear equations, Gauss elimination.	9	CO3
4	**Mathematical Optimization:** Optimization, Optimality Criteria, Unconstrained Optimization, Gradient-based methods. **Mathematical Programming:** Simplex Methods – Basic procedure, augmented form.	9	CO4
5	**Stochastic Models**: Binomial, Poisson and Gaussian Distribution. Data Modelling – Simple Mean and variance, Method of Least squares. Computational Intelligence – **Genetic Algorithms** – Basic Procedure, Choice of Parameters, Swarm Intelligence – Introduction and Algorithms.	9	CO5, CO6

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.

References Books:

1. David C. Lay, Steven R. Lay and Judi J. McDonald, Linear Algebra and its Applications, Pearson Education Limited, Fifth Edition, 2016, ISBN: 978-0321982384.
2. S. S. Rao, Engineering Optimization: Theory and Practice, John Wiley & Sons, Fourth Edition, 2009, ISBN: 978-0-470-18352-6.
3. M. K. Jain, S. R. K. Iyengar and R. K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International (P) Limited, Fifth Edition, 2007, ISBN: 8122420012.
4. S. M. Ross, Stochastic Processes, Wiley Publishers, Second Edition, 1995, ISBN: 978-0-471-12062-9.

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:

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

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OPERATING SYSTEM WITH UNIX PROGRAMMING

Course Code : **20MCA13**   **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 operating system components, system calls. Process states, scheduling algorithms and deadlock.
CO2	Understand memory allocation and analyze how files are stored in secondary storage.
CO3	Understand the basic Unix structure, commands and utilities of the UNIX operating system.
CO4	Analyze file and process related commands. Use conditional and looping statements to develop shell scripts.
CO5	Familiarize with file attributes and advanced shell programming.
CO6	Learn about the background process and also understand the importance of regular expression in simple and advanced filters.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	3	3	-	-	-	-	-	3	3
CO2	3	3	3	3	-	3	-	-	-	-	-	3	3
CO3	3	3	3	3	-	3	-	3	-	-	3	3	-
CO4	3	3	3	3	-	-	-	3	-	-	3	3	3
CO5	3	3	3	3	-	-	-	3	-	-	3	3	3
CO6	3	3	3	3	3	3	-	3	-	1	3	3	3

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**Introduction to Operating System:** introduction**,** System Components, open sources 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	**Memory Management** – Swapping, Contiguous Memory Allocation, Paging, Segmentation **Secondary Storage** – Disk Structure, Disk Scheduling, Disk Management **Introduction to UNIX:** Introduction, Architecture, Experience the Unix environment, Basic commands – passwd, who, w, tty, lock, stty, script, clear, uname, date, cal, calendar, bc, echo	9	CO2, CO3

3	**UNIX 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. **Introduction to the Shell**: 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.	9	CO4
4	**Advanced 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 **File Attributes:** ls, Is – l, ls –d, File Permissions, chmod, Directory Permissions, umask, File Ownership, Changing ownership and group – chown & chgrp, File Modification and Access Times, touch, More file attributes: hard link, symbolic link, find.	9	CO5

5	**The Process in Unix:** Shell process, ps, running jobs in background (& and nohup), introduction to signals, nice, at and batch, cron, time commands **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, Regular Expressions IRE & TRE **Awk-Advanced Filters:** Simple awk Filtering, BEGIN and END Sections, Built-in variables, Arrays, Functions, Control flow, Looping	9	CO6

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles – Sixth & Seventh Edition, John Wiley & Sons Inc.
2. William Stallings, "Operating Systems – Internals and Design Principles" Pearson, 6th edition 2012.
3. Sumitabha Das, "Your UNIX-The Ultimate Guide", 3rd Edition, Tata McGraw Hill, 2012

References Books:

1. Eric Foster –Johnson, John C Welch, Micah Anderson, "Beginning Shell Scripting", Wrox Publication, 2005.
2. Yashwant Kanetkar, "Unix Shell Programming", 1st edition, BPB Publication, 2003.
3. Dhananjay M. Dhamdhere, "Operating Systems – A Concept – Based Approach", Tata McGraw – Hill, 3rd Edition, 2012.

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	2
Create	2	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

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COMPUTER NETWORKS

Course Code	: 20MCA14	**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 basic concepts of networking devices and layered protocol architecture.
CO2	Analyze the network design issues in the data link layer.
CO3	Understand the various error detection, correction and routing algorithms.
CO4	Evaluate various network QoS, transport and handshake protocols.
CO5	Categorize the differences between the behaviour of TCP and UDP.
CO6	Classify the various functions of application layer protocols.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	2	-	2	-	-	-	-	-	-	3
CO2	-	-	1	2	1	-	-	-	-	-	-	-	3
CO3	-	-	-	-	-	-	1	-	-	1	-	-	3
CO4	3	-	-	-	-	-	-	-	2	-	-	2	-
CO5	-	1	-	-	-	2	-	-	2	-	1	2	-
CO6	3	-	-	-	-	-	-	1	2	-	-	-	-

	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).	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

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.	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.	9	CO4
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.	9	CO5, CO6

Text Books:

1. "Computer Networks" by Andrew S Tanenbaum
2. "Computer Networks " by Larry L Peterson

References 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	Assignments	Quizzes
Marks	25	15	10
Remember	5	5	2
Understand	4	2	2
Apply	3	2	2
Analyze	5	2	2
Evaluate	3	2	2
Create	5	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

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WEB PROGRAMMING

Course Code	:20MCA15	**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	To understand concepts related to Web Technologies.
CO2	To understand the basic concept of web and creating web pages using HTML5.
CO3	Designing professional web pages with styles and to know about XML.
CO4	To Understand the concept of web pages with scripting.
CO5	To Understand the concept of DHTML and PHP.
CO6	Building Web applications with PHP.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	1	1	-	-	-	1	1	3	-
CO2	3	3	2	-	1	1	-	-	-	1	1	3	-
CO3	3	3	2	-	1	1	-	-	-	1	1	3	-
CO4	3	3	2	-	1	1	-	-	-	1	1	3	-
CO5	3	3	2	-	1	1	-	-	-	1	1	3	-
CO6	3	3	2	-	1	1	-	-	-	1	1	3	-

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	**Fundamentals of Web:** Web Browsers and Web Servers, URLs, MIME, HTTP. **Introduction to HTML 5:** Basic syntax, Standard structure, The DOCTYPE, HTML5 Elements, HTML5 Document, Basic text markup, Images, Hypertext Links. Lists, Tables, Media tags - Audio and Video, Forms, Iframes.	9	CO1
2	**Cascading Style Sheets:** Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms Font properties, List properties, Color, Alignment of text, The box model, Background images, The span and div tags, Conflict resolution. **Introduction to XML:** Introduction, Syntax, Document structure, Document type definitions, Namespaces.	9	CO2
3	**The Basics of JavaScript**: Overview of JavaScript, Object orientation and JavaScript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts, Examples. **JavaScript with HTML Documents:** The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, Handling Events from Body Elements, Handling Events from Text Box and password Elements, The navigator Object.	9	CO3

4	**Dynamic Documents with JavaScript:** Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Colors and Fonts, Dynamic Content, Stacking Elements Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements. **Introduction to PHP:** Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling.	9	CO4, CO6
5	**Building Web applications with PHP:** File handling, Tracking users, cookies, Session Tracking **Using MySQL with PHP:** DML & DDL commands, connecting to database, Selecting database and issuing command, Processing RSS Feeds, Handling XML.	9	CO5, CO6

Text Books:

1. Programming the World Wide Web, Robert W. Sebesta, 7th Edition, Pearson Education, 2015.

2. Web Programming Building Internet Applications, Chris Bates, 3rd Edition, Wiley India, 2015.

3. Internet & World Wide Web How to program, M. Deitel, P.J. Deitel, A. B. Goldberg, 3rd Edition, Pearson Education / PHI, 2011.

References Books:

1. The Web Warrior Guide to Web Programming, Xue Bai et al, Thomson, 2012.
2. PHP and MySQL, Joel Murach, First Edition, Mauch's Publications, 2012.

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

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

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

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PROGRAMMING LOGIC AND DESIGN

(Mandatory non-credit Bridge Course only for non-computer science students)

Course Code	: 20MCA16	**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 digital computer fundamentals and its basic operations.
CO2	Analyze the importance of algorithmic problem solving with examples.
CO3	Learn essential programming control structures
CO4	Apply factoring methods and data structures to a variety of software applications
CO5	Understand certain basic operations on essential data structures
CO6	Use complex data types to model the real-world problems

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	1	-	-	-	-	-	-	-	-	1	-
CO2	2	1	1	-	-	-	-	-	-	-	-	1	-
CO3	2	1	1	-	-	-	-	-	-	-	-	1	-
CO4	2	1	1	-	-	-	-	-	-	-	-	1	-
CO5	2	1	1	-	-	-	-	-	-	-	-	1	-
CO6	2	1	1	-	-	-	-	-	-	-	-	1	-

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, Registers, Binary Logic, Digital Logic Gates – basics. Basic Elements of Von-Neumann model, Processor Registers, Instruction Execution, Interrupts, The Memory Hierarchy, Cache Memory, I/O Communication Techniques, and Virtual Memory.	9	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. **Fundamental Algorithms** Factorial Computation – Generation of the Fibonacci sequence and much more illustrations.	9	CO2
3	**Essential Programming Control Structures:** Data Types and Input/output Operators, Operators and Expressions, Control Statements, Decision making and functions (pre-defined, user-defined).	9	CO3

4	**Problem Solving methods:** **Factoring Methods:** Factoring Methods - Finding the square root of a number - Generating prime numbers. **Array techniques:** Array order reversal - Finding the maximum number in a set - Removal of duplicates from an ordered array - Finding the kth smallest element. **Strings and Pointers.**	9	CO4, CO5
5	**Complex data types to solve problems:** structures, union and user-defined data types: enum, typedef and FILE handling applications.	9	CO6

Text Books:

1. M. Morris Mano, "Digital Logic and Computer Design", Pearson, 2012.
2. Programming Logic And Design, "Tony Gaddis", Pearson, 2016, ISBN: 978-0-13-3985078.
3. R.G. Dromey, "How to solve it by Computers", Pearson Publishers, New Delhi, 2007.
4. Joyce Farrell, Programming Logic & Design, CENGAGE learning, 9th Edition, 2018.

References Books:

1. Peter Norton, "Introduction to Computers", 4th Edition, TMH Ltd, New Delhi, 2001.

2. Carl Hamacher, Zvonko Vranesic Safwat Zaky, "Computer Organization", 5th edition, Tata McGraw-Hill, 2011.

3. V Rajaraman: Computer Programming in C, PHI, 2013.

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	5	3	2
Create	-	-	-

SEE- Semester End Examination: Theory (50 Marks)

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

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JAVA LAB

Course Code	: 20MCAL17	**Credits**	:1.5
L:T:P:S	:0:0:1.5:0	**CIE Marks**	:25
Exam Hours	: 3	**SEE Marks**	:25

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

CO1	Learn fundamental features to set up Java JDK environment to create debug and run simple Java programs.
CO2	Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
CO3	Understand the usage of the Arrays and String Handling examples with Object Oriented concepts.
CO4	Learn object oriented concepts using programming examples and awareness of the important topics about inheritance, packages and
CO5	Have the ability to write programs relating to exception handling mechanism and threads.
CO6	To learn to write, test, and debug database programming using object oriented programming in java.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	3	-	2	2	-	3	1	-	-	3	-
CO2	2	-	3	-	2	2	-	3	1	-	-	-	3
CO3	-	3	3	-	2	2	3	3	1	-	-	-	3
CO4	-	3	3	3	2	2	-	3	1	-	2	3	-
CO5	-	3	3	3	2	2	3	3	1	-	2	-	3
CO6	-	3	3	3	2	2	-	3	1	-	2	3	-

LIST OF PROGRAMS

At the end of the Course, the Student will be able to write the following programs.

1. Write a JAVA Program to implement class, object and method.

2. Write a Java program to sort for an element in a given list of elements using bubble sort.

3. Write a JAVA Program to demonstrate Constructor Overloading and Method Overloading

4. Write a program in Java for String handling, the program must implement any 5 methods of String and String Buffer classes.

5. Write a JAVA Program to demonstrate Inheritance.

6. Simple Program on Java for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle.

7. Write a Java program to demonstrate the implementation of multithreading.

8. Complete the following:

a. Create a package named shape.

b. Create some classes in the package representing some common shapes like Square, Triangle, and Circle.

c. Import and compile these classes in other program.

9. Write a JAVA program to implement a Queue using user defined Exception Handling (also make use of throw, throws).

10. Write a JAVA applet program, which handles keyboard event.

11. Write a JAVA Program to insert data into Student DATA BASE and retrieve information from DATA BASE.

Assessment Pattern

CIE- Continuous Internal Evaluation: Practical (25 Marks)

Bloom's Taxonomy	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

SEE- Semester End Examination: Practical (25 Marks)

Bloom's Category	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

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UNIX LAB

Course Code	: 20MCAL18	Credits :1.5
L:T:P:S	:0:0:1.5:0	CIE Marks :25
Exam Hours	: 3	SEE Marks :25

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

CO1	Understand the operating system components, system calls. Process states, scheduling algorithms and deadlock.
CO2	Understand memory allocation and analyze how files are stored in secondary storage.
CO3	Understand the basic Unix structure, commands and utilities of the UNIX operating system
CO4	Analyze file and process related commands. Use conditional and looping statements to develop shell scripts.
CO5	Familiarize with file attributes and advanced shell programming.
CO6	Learn about the background process and also understand the importance of regular expression in simple and advanced filters.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	3	3	-	-	-	-	-	3	3
CO2	3	3	3	3	-	3	-	-	-	-	-	3	3
CO3	3	3	3	3	-	3	-	3	-	-	3	3	-
CO4	3	3	3	3	-	-	-	3	-	-	3	3	3
CO5	3	3	3	3	-	-	-	3	-	-	3	3	3
CO6	3	3	3	3	3	3	-	3	-	1	3	3	3

LIST OF PROGRAMS

At the end of the Course, the Student will be able to write the following programs.

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 the standard output.

2. Write a shell script that accepts a path name and creates all the components in that path name as directories. For example, if the script is named mpc, then the command mpc a/b/c/d should create directories a, a/b, a/b/c, a/b/c/d.

3. 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.

4. Write a shell script which accepts valid log-in names as arguments and prints their corresponding home directories, if no arguments are specified, print a suitable error message.

5. 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 the script must be written to disregard BREAK, control-D. No time limit need be implemented for the lock duration.

6. 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)

7. 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.

8. 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.

9. 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.

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 second argument is not present, the search is to begin in current working directory. In either case, the starting directory as well as all its subdirectories at all levels must be searched. The script need not include any error checking.

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.

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 and the processing is to be continued with the residue. 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.
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, Computer Science 64.

Assessment Pattern

CIE- Continuous Internal Evaluation: Practical (25 Marks)

Bloom's Taxonomy	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

SEE- Semester End Examination: Practical (25 Marks)

Bloom's Category	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

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COMPUTER NETWORKS LAB

Course Code	: 20MCAL19	**Credits**	:01
L:T:P:S	:0:0:1:0	**CIE Marks**	:25
Exam Hours	: 3	**SEE Marks**	:25

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

CO1	Understand the basic concepts of networking devices and layered protocol architecture.
CO2	Analyze the network design issues in the data link layer.
CO3	Understand the various error detection, correction and routing algorithms.
CO4	Evaluate various network QoS, transport and handshake protocols.
CO5	Categorize the differences between the behaviour of TCP and UDP.
CO6	Classify the various functions of application layer protocols.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	3	3	-	-	-	-	-	3	3
CO2	3	3	3	3	-	3	-	-	-	-	-	3	3
CO3	3	3	3	3	-	3	-	3	-	-	3	3	-
CO4	3	3	3	3	-	-	-	3	-	-	3	3	3
CO5	3	3	3	3	-	-	-	3	-	-	3	3	3
CO6	3	3	3	3	3	3	-	3	-	1	3	3	3

LIST OF PROGRAMS

At the end of the Course, the Student will be able to write the following programs.

PART A
Implement the following Computer Networks concepts using C/C++

1. Write a program for distance vector algorithm to find suitable path for transmission.

2. 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.

3. Write a program for Hamming code generation for error detection and correction.

4. Write a program for congestion control using leaky bucket algorithm.

PART-B

(Simulate the following Computer Networks concepts using any network simulators)

1. Simulate a three nodes point — to — point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped.

2. Simulate the network with five nodes n0, n1, n2, n3, n4, forming a star topology. The node n4 is at the center. 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.

3. Simulate to study transmission of packets over Ethernet LAN and determine the number of packets drop destination.

4. Write a TCL Script to simulate working of multicasting routing protocol and analyze the throughput of the network.

5. 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.

6. 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.

Assessment Pattern

CIE- Continuous Internal Evaluation: Practical (25 Marks)

Bloom's Taxonomy	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

SEE- Semester End Examination: Practical (25 Marks)

Bloom's Category	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

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WEB PROGRAMMING LAB

Course Code	: 20MCAL110	**Credits**	:01
L:T:P:S	:0:0:1:0	**CIE Marks**	:25
Exam Hours	: 3	**SEE Marks**	:25

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

CO1	To understand concepts related to Web Technologies.
CO2	To understand the basic concept of web and creating web pages using HTML5.
CO3	Designing professional web pages with styles and to know about XML.
CO4	To Understand the concept of web pages with scripting.
CO5	To Understand the concept of DHTML and PHP.
CO6	Building Web applications with PHP.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	1	1	-	-	-	1	1	3	-
CO2	3	3	2	-	1	1	-	-	-	1	1	3	-
CO3	3	3	2	-	1	1	-	-	-	1	1	3	-
CO4	3	3	2	-	1	1	-	-	-	1	1	3	-
CO5	3	3	2	-	1	1	-	-	-	1	1	3	-
CO6	3	3	2	-	1	1	-	-	-	1	1	3	-

At the end of the Course, the Student will be able to write the following programs.

1. Create an HTML page to demonstrate the usage of:
   a. Text Formatting tags,
   b. Images
   c. Links

2. Create HTML page to display a table containing two columns – Country and Capital and add at least 5 rows to it. Also use various table attributes like cell spacing, border, caption, etc.

3. Develop a HTML page containing a course registration Form. The form must have fields like: name, password, course details, payment option, feedback, etc for accepting various information about the students.

4. Develop and demonstrate the usage of style sheet using CSS.

5. Develop and demonstrate a HTML file that includes JavaScript script for the following problem:
   Input: A number n obtained using prompt
   Output: The first n Fibonacci numbers

6. Develop and demonstrate using JavaScript, a HTML document that displays reverse of the given number. Use onclick() event handling.

7. Develop using JavaScript script, an HTML document that displays an image and a button. When you click on the button, flip the visibility of the image.

8. Write a PHP program to choose a random number and display its square root.

9. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.

10. Create a HTML form with Name, Address Line 1, Address Line 2, and E-mail text fields. On submitting, store the values in MySQL table.

Assessment Pattern

CIE- Continuous Internal Evaluation: Practical (25 Marks)

Bloom's Taxonomy	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

SEE- Semester End Examination: Practical (25 Marks)

Bloom's Category	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

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LIFE SKILLS FOR PROFESSIONALS - 1

Course Code	: 20HSSC111A	**Credits**	:01
L:T:P:S	: 1:0:0:0	**CIE Marks**	:25
Exam Hours	: 2	**SEE Marks**	:25

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	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	2	-	2	-	-
CO2	-	-	-	-	-	-	-	3	2	-	2	-	-
CO3	-	-	-	-	-	-	-	3	2	-	2	-	-
CO4	-	-	-	-	-	-	-	3	2	-	2	-	-

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.

References 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 (25 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks	10	10	5
Remember	1	--	--
Understand	2	--	--
Apply	3	5	--
Analyze	2	--	--
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

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SECOND SEMESTER

MCA SYLLABUS

2-YEAR PROGRAM (2021-22)

ADVANCED JAVA AND ENTERPRISE ARCHITECTURE

Course Code	: 20MCA21	**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 of J2EE architecture.
CO2	Design the Java Servlet programs to build multi-tier applications.
CO3	Create Java Server Pages and standard tag libraries.
CO4	Learn the fundamentals for creating dynamic web pages.
CO5	Design and develop the server side applications using Angular forms.
CO6	Develop the dynamic web application using Hibernate.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	3	-	-	-	-	3	-	-	-	3	-
CO2		-	3	-	-	-	-	3	-	-	-	3	-
CO3	-	3	3	-	2	-	-	3	-	-	-	3	-
CO4	-	3	3	3	-	2	-	3	-	-	-	-	2
CO5	-	3	3	3	2	2	-	3	-	-	-	-	2
CO6	-	3	3	3	-	-	-	3	-	-	-	-	2

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**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	CO1, CO2
2	**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. **ES6, TypeScript, Angular-CLI and Angular Components:** ES6, TypeScript, Angular-CLI & project structure, Angular Components.	9	CO3, CO4
3	**Providers, Dependency Injection, Observables:** Providers and Dependency Injection, Observables and RxJS, HttpClient. **Angular Router:** Setting up the router, Navigation, Child routes, Routing params, Lazy loading, Guards and hooks.	9	CO4

4	**Angular Modules, directives and Pipes: Angular Modules**: Root Module vs. Feature Module, Module definition, Module configuration. **Directives:** Types of directives, Built-in directives, Writing your own directives. **Pipes:** Sync and async Pipes, Built-in Pipes, Writing your own pipes. **Angular Forms:** Template-driven forms, Reactive forms, FormBuilder, Form validation, Custom validators, Async validators.	9	CO5
5	**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 Association Mappings:** One To One, One To Many, Many To One, Many To Many, Unidirectional and Bidirectional associations, Inheritance Mapping Strategies. **Hibernate Query Support:** Query Support through HQL, Native SQL and Criteria API, **Transaction Management.**	9	CO6

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.

References 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.

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	5	2	2
Create	-	-	-

SEE- Semester End Examination:

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

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DATA STRUCTURES USING C++

Course Code	: 20MCA22	**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 in object-oriented design for small/medium scale problems using C++ programming paradigm.
CO2	Study the concepts of stack data structure operations and its applications.
CO3	Analyze various types of queues and linked lists with their implementation.
CO4	Implement various kinds of searching and sorting techniques.
CO5	Understand different types of tree data structure constructions and its traversals
CO6	Understand the Graph data structure with its applications.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	2	2	-	1	1	-	2	3	3
CO2	3	3	3	2	2	2	-	1	1	-	2	3	3
CO3	3	3	3	2	2	2	-	1	1	-	2	3	3
CO4	3	3	3	2	2	2	-	1	1	-	2	3	3
CO5	3	3	3	2	2	2	-	1	1	-	2	3	3
CO6	3	3	3	2	2	2	-	1	1	-	2	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:** 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, circular linked lists, Doubly Linked List, Application of Linked List- Polynomial Manipulations.	9	CO3

4	**Sorting Types:** Bubble sort, Quick sort, Selection sort, Heap Sort, Insertion sort, Shell Sort, Merge and Radix Sort. **Searching:** Search Techniques- Sequential searching, Binary search, Indexed sequential search, Hashed search.	9	CO4
5	**Trees:** Tree traversals, Binary Search Tree and Operations, AVL Tree and Operations, Red-Black Tree, Threaded binary trees. **Graphs:** Introduction, Representation of Graphs, Graph Traversal, Spanning trees- Prim's algorithm, Kruskal's algorithm, Finding shortest Path- Dijkstra's algorithm.	9	CO5, CO6

Text Books:

1. C++ The Complete Reference, Herbert Schildt, 4th Edition, Tata McGraw Hill, 2007.
2. Data Structures using C++, Varsha H. Patil, OUP India, 2012.

References Books:

1. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., fourth Edition.

2. Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and .Mount, Wiley student edition, John Wiley and Sons.

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**

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SOFTWARE ENGINEERING AND TESTING

Course Code	: 20MCA23	**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 Software Development Life Cycle and use appropriate process models to develop software.
CO2	Architect and design a software application based on the requirements
CO3	The importance of metrics while measuring the quality of an application
CO4	Understand the basic testing techniques and the test life cycle.
CO5	Acquire knowledge on the test automation process, and using selenium to test web applications
CO6	Discussion-oriented lectures, laboratory exercises, and invited workshops by experts from the industry.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	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
CO6	2	2	1	-	-	-	2	-	-	2	-	3	

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**INTRODUCTION TO SOFTWARE PROCESS AND MODELLING:** Software Development Life Cycle - Process Models – Prescriptive Process Models - Specialized Process Models – The Unified Process - Personal and Team Process Models–Agile Process Models – Adaptive Software Development – Scrum - Understanding Software Requirements and Specification – Case Study of an SRS.	9	**CO1, CO2**
2	**SOFTWARE ARCHITECTURE AND DESIGN CONCEPTS:** Software Architecture – Architectural Styles – The Design Process – Design Concepts – The Design model– Case Study for Design of any Application Project.	9	**CO3**
3	**SOFTWARE METRICS AND MAINTENANCE:** Software Measurement – Metrics for Software Quality – Integrating metrics within the software process – Metrics for small organizations - Establishing a software metrics program - Software Maintenance – Business Process Reengineering – Reverse Engineering – Software metrics/maintenance case study.	9	**CO4**
4	**INTRODUCTION TO SOFTWARE TESTING AND SELENIUM:** Introduction and fundamentals of Testing - Testing Objectives - Software Testing Life Cycle (STLC) - Test Planning - Manual Testing formats - Equivalence Partitioning and Boundary Values. Selenium IDE installation - Recording and running test cases using Selenium IDE - Selenium Commands.	9	**CO5**

5	**TEST AUTOMATION, SELENIUM IDE AND WEB DRIVER:** Fundamentals of Test Automation - Design and Architecture for Automation - Challenges in Automation. Selenium IDE installation - Recording and running test cases using Selenium IDE - Selenium Commands. Introduction to Web Driver – Architecture - Installation of Selenium Web Driver.	9	CO6

Text Books:

1. RogerS. Pressman, "SoftwareEngineering : APractitionerApproach", Seventhedition, McGrawHill, 2010.

2. Software Testing, A Craftsman's Approach, Second Edition, Paul C. Jorgensen

3. Software Testing and Analysis: Process, Principles and Techniques, Mauro Pezze and Michael Young, John Wiley and Sons

4. Software Testing : Principles and Practices, Srinivasan Desikan, Gopalaswamy, Ramesh, Pearson Publications.

References 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, 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.

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	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

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DATABASE SYSTEMS

Course Code	: 20MCA24	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	To learn the fundamental concepts of DBMS
CO2	Understand relational schema and designing Entity Relationship diagram
CO3	Analyze and apply Relational algebra expressions
CO4	Apply the concepts of SQL to query the database and apply Normalization and Dependencies to refine databases
CO5	Develop PL/SQL queries in real-time applications.
CO6	Build NOSQL databases

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	2	-
CO3	3	3	3	1	2	-	-	-	-	-	-	2	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	-	2	-	-	-	-	-	-	-	3
CO6	3	-	-	-	-	-	1	-	-	1	1	-	-

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.	9	CO1, CO2

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, ER Diagrams, Naming Conventions and Design Issues, Relationship Types of Degree Higher than Two. Relational Database Design Using ER- to-Relational Mapping.	9	CO3

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.	9	CO4
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.	9	CO5

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. **NOSQL Databases:** What is NoSQL?, Need of NoSQL, Features of NoSQL, CAP Theorem, ACID v/s BASE, Advantages & Disadvantages of NoSQL, Types of NoSQL: Key-Value database Document-based database- Column-based database- Graph based database.	9	CO6

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems, 7th Edition, Pearson Education, 2016.

2. Bill Pribyl, Steven Feuerstein: Oracle PL/SQL Programming, 6th Edition, O'Reilly Media, February 2014.

3. Pramod J. Sadalage, Martin Fowler: NoSQL Distilled, Pearson education Inc, Nov 2014

References Books:

1. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd edition, McGraw- Hill, 1996.

2. Database Principles Fundamentals of Design, Implementation and Management by Coronel, Morris, Rob- Cengage Learning, 2013.

3. Silberschatz, Korth and Sudharshan: Data base System Concepts, 6th Edition, Mc-GrawHill, 2010.

4. Shashank Tiwari, " Professional NoSQL", John Wiley & Sons, Inc, 2011.

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	3
Apply	4	3	2
Analyze	4	2	2
Evaluate	4	2	-
Create	3	2	-

SEE- Semester End Examination: Theory (50 Marks)

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

ELECTIVES -1

DATA WAREHOUSING AND DATA MINING

Course Code	: 20MCA251	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	Get an overview of Data Mining and Analyze different types of data and different pre-processing techniques.
CO2	Learn the concept of Data warehousing and OLAP and Understand storage and retrieval techniques of data from DATA CUBE.
CO3	Evaluate various Association algorithms, its applications and the Advanced Pattern Mining Rules and its Applications.
CO4	Apply different Classification technique and Evaluate different types of classifiers.
CO5	Analyze different clustering techniques and their applications.
CO6	Analyze different Outlier Detection Methods and their statistical approaches.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	-	-	-	1	-	-	2	2	3	
CO2	3	3	3	-	-	-	1	-	-	2	2		3
CO3	3	3	3	-	-	-	1	-	-	2	2		3
CO4	3	3	3	-	-	-	1	-	-	2	2	3	
CO5	3	3	3	-	-	-	1	-	-	2	2		3
CO6	3	3	3	-	-	-	1	-	-	2	2	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.	9	CO5, CO6

Text Books:

1. Jiawei Han, Micheline Kamber and Jian Pei: Data Mining - Concepts and Techniques, 3rd Edition, Morgan Kaufmann Publisher, 2012.

References Books:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson Publication, 2006
2. Arun K Pujari: Data Mining Techniques University Press, 2nd Edition, 2009.
3. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.

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	5	3	2
Create	-	-	

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**

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ROBOTIC PROCESS AUTOMATION

Course Code	: 20MCA252	**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	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.
CO4	Automating Tasks through office automation packages.
CO5	Independently develop solution for automating the tasks.
CO6	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	PSO1	PSO2
CO1	3	3	3	3	3	3	2	1	2	3	3	3	3
CO2	3	3	3	3	3	3	2	1	2	3	3	3	3
CO3	3	3	3	3	3	3	2	1	2	3	3	3	3
CO4	3	3	3	3	3	3	2	1	2	3	3	3	3
CO5	3	3	3	3	3	3	2	1	2	3	3	3	3
CO6	3	3	3	3	3	3	2	1	2	3	3	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. **Practice Exercises:** 1. Screen recorder 2. Simple web recorder 3. Web recorder with database automation	9	**CO3, CO4**

4	**Building best practice automations:** Error Handling String Operation Variables Variable Operation PDF Integration Email Automation, OCR Web Recorder Properties, Workflow, Tips & Tricks. **Practice Exercises:** 1. Email Automation 2. FTP automation and PDF integration 3. String operation 4. Web recorder & send email 5. Smart recorder	9	CO5

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.
	
	USE-CASES:
	
	1. **Advanced**
	    a. Smart Recorder with Excel automation and database automation
	    b. Web recorder with files and folder
	2. **Masters**
	    a. Xml automation
	    b. Web recorder to excel automation
		9	CO6

Text Books:

1. Robotic Process Automation for dummies, NICE special edition, NICE RPA team with Steve Kaelble, ISBN: 978-1-119-45774-9 (pbk); ISBN: 978-1-119-45773-2 (ebk), 2018.
2. Automation Anywhere Enterprise Exercise Handbook.

References 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

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ENTERPRISE RESOURCE PLANNING

Course Code	: 20MCA253	**Credits**	:03
L:T:P:S	: 3:0:0:0	**CIE Marks**	:50
Exam Hours	: 03	**SEE Marks**	:50

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

CO1	To understand the significance of ERP and their impact on organizational growth.
CO2	To learn ERP and related technology in terms of integrated data modelling.
CO3	To analyze ERP from the manufacturing perspective.
CO4	To understand the different type of ERP modules and their information flow.
CO5	To enable students to understand the ERP implementation life cycle.
CO6	Highlight the benefits of different ERP modules and Differentiate ERP modules with their information flow.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	-	-	2	-	-	-	-	2	2	2	
CO2	3	3	-	-	2	-	-	-	-	2	2	2	
CO3	3	3	-	-	2	-	-	-	-	2	2		2
CO4	3	3	-	-	2	-	-	-	-	2	2	2	
CO5	3	3	-	-	2	-	-	-	-	2	2		2
CO6	3	3	-	-	2	-	-	-	-	2	2	2	

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**Introduction to ERP:** Introduction, Evolution of ERP, What is ERP?, Reasons for the growth of the ERP market, The advantages of ERP, Why do Man ERP Implementations Fail? Why are ERP packages Being used Now? **Enterprise – An Overview:** Introduction, Integrated Management Information, Business modelling, Integrated Data Model.	9	CO1
2	**ERP and Related Technologies:** Introduction, Business Process Reengineering, Management Information System, Decision Support System, Executive Information Systems, Data Warehousing, Data Mining, On-line Analytical Processing, Supply Chain Management.	9	CO5
3	**ERP - Manufacturing Perspective:** Introduction, ERP. CAD/CAM, Materials Requirements Planning, Bill of Material, Closed Loop MRP. Manufacturing Resource Planning, Distribution Requirements Planning, JIT and Kanban, Product Data Management, Benefits of PDM, Make-to-order, and Make-to Stock, Assemble to order, Engineer to order, Configure-to order.	9	CO2, CO3

4	**ERP Modules:** Introduction, Finance, Plant Maintenance, Quality Management, Materials Management. **Benefits of ERP:** Introduction, Reduction of Lead time, On-time shipment, Reduction in Cycle Time, Improved Resource Utilization, Better Customer Satisfaction, Improved Suppler Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Decision – making capability.	9	CO4
5	**ERP Implementation Life Cycle:** Pre-evaluations Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation of Team Training, Testing, Going Live, End user Training, Post implementation **Vendor, Consultants and Users:** Introduction, In-house implementation – Pros and Cons, Vendors, Consultants, End-users.	9	CO6

Text Books:

1. Enterprise Resource Planning, Alexis Leon, Tata Mc Graw Hill Publishing Company Ltd -2002.
2. Enterprise Resource Planning Concept and Practice, Vinod Kumar Garg and Venkitakrishnan, Prentice Hall, India - 2nd Edition, 2004.

References Books:

1. Manufacturing Planning & Controls, Thomas Volloman, et,al.

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	5	2	2
Create	-	-	-

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

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BUSINESS INTELLIGENCE AND DATA ANALYTICS

Course Code   : 20MCA254   **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	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.
CO6	Constructing data stories through presentations and publishing.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	1	1	2	1	2	1	1	2	1	1	2	3
CO2	3	1	1	2	1	2	1	1	2	1	1	2	3
CO3	3	1	1	2	1	2	1	1	2	1	1	2	3
CO4	3	1	1	2	1	2	1	1	2	1	1	2	3
CO5	3	1	1	2	1	2	1	1	2	1	1	2	3
CO6	3	1	1	2	1	2	1	1	2	1	1	2	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, CO6

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.

References 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	5	2	2
Create	-	-	-

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

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COMPUTATIONAL STATISTICS

Course Code	**: 20MCA255**	**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	Understanding Supervised Learning methods and statistical decision theory for machine learning.
CO2	Comparing various linear methods and regressions for classifications.
CO3	Solving basic expansions and regularization.
CO4	Understanding Model assessment, selection and Model Inferences.
CO5	Identifying the generalized additive models for machine learning.
CO6	Using the Boosting and additive trees for machine learning use case.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	2	2	2	3	3	2	3	3	2
CO2	3	3	2	2	2	2	2	3	3	2	3	3	2
CO3	3	3	2	2	2	2	2	3	3	2	3	3	2
CO4	3	3	2	2	2	2	2	3	3	2	3	3	2
CO5	3	3	2	2	2	2	2	3	3	2	3	3	2
CO6	3	3	2	2	2	2	2	3	3	2	3	3	2

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**Overview of supervised learning**: Introduction, Variable types and terminology, Two simple approaches to prediction: Least Squares and Nearest Neighbours, Statistical Decision Theory, Local Methods in High Dimensions, Statistical Models, supervised learning and function approximation, Structured Regression Models, Classes of Restricted Estimators, Model Selection and the Bias Variance Trade-off.	9	CO1
2	**Linear Methods and Regression**: Introduction, Linear Regression Models and Least Squares, Subset Selection, Shrinkage Methods, Methods using derived input directions, A comparison of the selection and shrinkage methods, Multiple Outcome Shrinkage and Selection, More on the Lasso and related Path algorithms, Computational considerations. **Linear Methods for classification:** Linear Regression of an Indicator Matrix, Linear Discriminant Analysis, Logistic Regression, Separating Hyperplanes.	9	CO2
3	**Basic Expansions and Regularization:** Piecewise Polynomials and Splines, Filtering and Feature Extraction, Smoothing Splines, Automatic Selection of smoothing Parameters, Nonparametric Logistic Regression, Multidimensional Splines. **Kernel smoothing methods:** One-dimensional kernel smoothers.	9	CO3

4	**Model Assessment and selection:** Introduction, Bias, Variance and Model complexity, The Bias-Variance decomposition, Optimism of the training error rate. **Model Inference and Averaging:** Bootstrap and Maximum likelihood methods, Bayesian methods, EM algorithm, MCMC for sampling from the posterior.	9	CO4
5	**Additive Models, Trees, and Related Methods:** Generalized additive models, Tree-Based Methods. **Boosting and additive trees**: – Boosting Methods.	9	CO5, CO6

Text Books:

1. The Elements of Statistical Learning Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer Series in Statistics, 2017.

References Books:

1. Statistics for Machine Learning, by Pratap Dangeti, Packt Publishing, July 2017, ISBN: 9781788295758.
2. Introducing Statistics - A Graphic Guide (English, Paperback, Magnello Eileen), ISBN: 9781848310568, 1848310560

Assessment Pattern

CIE- Continuous Internal Evaluation: Theory (50 Marks)

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

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ELECTIVES - 2

CYBER SECURITY AND CYBER LAW

Course Code	: 20MCA261	**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 about Cybercrime and cyber offenses.
CO2	Identify the security challenges on mobile devices.
CO3	Analyze the Tools and Methods Used in Cybercrime.
CO4	Learn the Cyber Law and Cyber security issues.
CO5	Interpret the strengths and weaknesses of Indian IT Act.
CO6	Understand the Cyber Forensics reports and evidences.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3						3	3			3	
CO2	3	3		3				3	3			3	3
CO3	3	3	2	3			3	3	3			3	3
CO4	3	3				3		3	3	2	2	3	3
CO5	3	3						3	3				
CO6	3	2	2	3	1	3	3	3	3			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, CO5
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. 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.	9	CO6

Text Books:

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

References Books:

1. Internet Forensics: Using Digital Evidence to Solve Computer Crime- Robert Jones, O'Reilly Media, Released: October 2005.
2. 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
Understand	5	3	2
Apply	5	3	2
Analyze	5	3	2
Evaluate	5	3	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

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DIGITAL FORENSICS

Course Code	: 20MCA262	**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 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.
CO6	Encourage and define research problems and develop effective solutions.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3						3	3			3	
CO2	3	3		3				3	3			3	3
CO3	3	3	2	3			3	3	3			3	3
CO4	3	3				3		3	3	2	2	3	3
CO5	3	3						3	3				
CO6	3	2	2	3	1	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, CO6

Text Books:

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

References 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	3
Understand	5	3	3
Apply	5	2	2
Analyze	4	2	2
Evaluate	4	2	-
Create	2	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

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CRYPTOGRAPHY AND NETWORK SECURITY

Course Code	: 20MCA263	**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	To study various security methods and procedures.
CO2	To brief about different cryptographic algorithms.
CO3	To learn hardware perspectives and optimization of wireless security
CO4	To Show how the public keys are distributed using Diffie Hellman method.
CO5	To Discuss about interception and vulnerability of wireless systems
CO6	To Formulate common techniques for implementing security modules

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	1	3	1	2	2	2	1	2	1	3	
CO2	2	2	1	3	1	2	2	2	1	2	1		2
CO3	2	2	1	3	1	2	2	2	1	2	1		2
CO4	2	2	1	3	1	2	2	2	1	2	1	3	
CO5	2	2	1	3	1	2	2	2	1	2	1		2
CO6	2	2	1	3	1	2	2	2	1	2	1	3	

SYLLABUS			
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 – ElGamal – DSA	9	CO3
4	**NETWORK 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, CO6

Text Books:

1. William Stallings, "Crpyptography and Network security Principles and Practices", Pearson/PHI, 5th ed, 2006. [Unit I,II, IV, V]
2. Wade Trappe, Lawrence C Washington, "Introduction to Cryptography with coding theory", 2nd ed, Pearson, 2007. [Unit III]

References 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	5	3
Understand	5	5	3
Apply	5	3	2
Analyze	5	2	2
Evaluate	5	-	-
Create	-	-	-

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

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INFORMATION RETRIEVAL AND SECURITY

Course Code	: 20MCA264	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	Learn the information retrieval models.
CO2	Be familiar with Web Search Engine.
CO3	Be exposed to Link Analysis.
CO4	Understand Hadoop and Map Reduce.
CO5	Learn document text mining techniques.
CO6	Understand DOCUMENT TEXT MINING.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	1	3	1	2	2	2	1	2	1	3	
CO2	2	2	1	3	1	2	2	2	1	2	1		2
CO3	2	2	1	3	1	2	2	2	1	2	1		2
CO4	2	2	1	3	1	2	2	2	1	2	1	3	
CO5	2	2	1	3	1	2	2	2	1	2	1		2
CO6	2	2	1	3	1	2	2	2	1	2	1	3	

SYLLABUS			
Module	**Contents of the Module**	**Hours**	**COs**
1	**INTRODUCTION:** Introduction -History of IR- Components of IR – Issues –Open 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, CO2
2	**INFORMATION RETRIEVAL: B**oolean 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	CO3
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	CO4
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 Web –Similarity – Hadoop & Map Reduce – Evaluation – Personalized search – Collaborative filtering and content-based recommendation of documents and products – handling "invisible" Web – Snippet generation, Summarization, Question Answering, Cross- Lingual Retrieval.	9	CO5

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	CO6

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.

References 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	5	3
Understand	5	5	3
Apply	5	3	2
Analyze	5	2	2
Evaluate	5	-	-
Create	-	-	-

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

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WIRELESS SENSOR NETWORKS

Course Code	: 20MCA265	**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 working of wireless sensor networks.
CO2	Understand wide range of applications such as disaster management, military and security.
CO3	Necessitate the development of resource conscious protocols and management
CO4	Provide a broad coverage of challenges and latest research results related to the design
CO5	Creating pervasive environment that would have profound influence on the society.
CO6	Facilitate exchanging information in regard to the development of technologies. Applications and experiences with focus on large deployable applications.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	-	2	2	-	-	-	-	2	2	2	2
CO2	3	3	-	2	2	-	-	-	-	2	2	2	2
CO3	3	3	-	2	2	-	-	-	-	2	2	2	2
CO4	3	3	-	2	2	-	-	-	-	2	2	2	2
CO5	3	3	-	2	2	-	-	-	-	2	2	2	2
CO6	3	3	-	2	2	-	-	-	-	2	2	2	2

SYLLABUS			
Module	Contents of the Module	Hours	COs
1	**Overview of Wireless sensor Networks** Introduction, Brief Historical Survey of Sensor Networks, and Background of Sensor Network Technology, Ah-Hoc Networks. **Applications of Wireless Sensor Networks**: Sensor and Robots, Reconfigurable Sensor Networks, Highway Monitoring, Military Applications, Civil and Environmental Engineering Applications, Wildfire Instrumentation, Habitat Monitoring, Nanoscopic Sensor Applications, Another Taxonomy of WSN Technology, Basic Sensor Network Architectural Elements, Home Control, Medical Applications. **Basic Wireless Sensor Technology** : Introduction, Sensor Node Technology Sensor Taxonomy, WN Operating Environment, WN Trends, Wireless Network Standards: IEEE 802.15.4, ZigBee, IEE 1451.	9	CO1, CO2
2	**Medium Access Control Protocols for Wireless Sensor Networks** : Introduction, Background, Fundamentals of MAC Protocols, MAC Protocols for WSNs: Schedule-Based Protocols, Random Access-Based Protocols, Coordination, Schedule Synchronization, Adaptive Listening, **Access Control and Data Exchange** (B-MAC,Box-MAC, Bit-MAC, H-MAC, I MAC, O-MAC, S-MAC. Ri-MAC, T-MAC, Q-MAC (Query MAC), Q-MAC (Qo MAC), X-MAC).	9	CO3

3	**Routing Protocols for Wireless Sensor Networks** Introduction, Data Dissemination and Gathering, Routing Challenges and Design Issues in Wireless Sensor Networks Network Scale and Time-Varying Characteristics, Resource Constraints, Sensor Applications Data Models, **Routing Strategies in Wireless Sensor Networks**: WSN Routing Techniques, Flooding and Its Variants, Sensor Protocols for Information v Negotiation, Low-Energy Adaptive Clustering Hierarchy, Power-Efficiency Gathering in Sensor Information Systems, Directed Diffusion, Geographic Routing.	9	CO4
4	**Traditional Transport Control Protocols:** TCP (RFC 793), UDP (RFC 768), MobileIP, Introduction, WSN Middleware Principles. **Middleware Architecture**: Existing Middleware: MiLAN (Middleware Linking Applications and Networks), IrisNet (Internet-Scale Resource- Intensive Sensor Networks Services)	9	CO5
5	**Operating Systems for Wireless Sensor Networks** Introduction, Examples of Operating Systems. **Applications:** TinyOS,Mate, MagnetOS.	9	CO6

Text Books:

1. Wireless Sensor Network, KazemSohraby, Daniel Minoli, TaiebZnati Pub: Wiley.
2. Wireless Sensor Networks Signal Processing and Communications, Ananthram Swami, Qing Zhao, Yao-Win Hong, Lang Tong Pub, John Wiley & Sons.
3. Ad Hoc Wireless Networks: Architectures And Protocols, Murthy Pub,Pearson Education.

References Books:

1. Wireless sensor networks Edited, C. S. Raghavendra Pub, Springer.
2. Fundamentals of Sensor Network Programming: Applications and Technology, Sridhar S. Iyengar, NandanParameshwaran, Vir V. Phoha, N. Balakrishnan, Chuka D. Okoye, Wiley.

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	5	2	2
Create	-	-	-

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

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ADVANCED JAVA LAB

Course Code	: 20MCAL27	Credits :1.5
L:T:P:S	: 0:0:1.5:0	CIE Marks :25
Exam Hours	: 3	SEE Marks :25

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

CO1	Understanding the fundamental elements of J2EE architecture.
CO2	Designing the Java Servlet programs to build multi-tier applications.
CO3	Creating Java Server Pages and standard tag libraries.
CO4	Learning the fundamentals of Angular
CO5	Design and develop the server side applications using Angular forms.
CO6	Develop the dynamic web application using Hibernate

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	3	-	-	-	-	3	-	-	-	3	-
CO2		-	3	-	-	-	-	3	-	-	-	3	-
CO3	-	3	3	-	2	-	-	3	-	-	-	3	-
CO4	-	3	3	3	-	2	-	3	-	-	-	-	2
CO5	-	3	3	3	2	2	-	3	-	-	-	-	2
CO6	-	3	3	3	-	-	-	3	-	-	-	-	2

List of Experiments

Part-A:

1. 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).

2. Write a JAVA Servlet Program using cookies to remember user preferences.

3. JSP Programs:

   a) Write a JAVA JSP Program to print 10 even and 10 odd numbers.

   b) Write a JAVA JSP Program to implement verification of a particular user login and display a welcome page.

4. Write a JAVA JSP Program which uses jsp: include and jsp: forward action to display a Webpage.

5. 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.

6. Write a JAVA Servlet Program to implement sessions (Using HTTP Session Interface).

Part-B:

1. Develop the dynamic web application using Angular and Hibernate.

Assessment Pattern

CIE- Continuous Internal Evaluation: PRACTICAL (25 Marks)

Bloom's Taxonomy	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

SEE- Semester End Examination: PRACTICAL (25 Marks)

Bloom's Category	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

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DATA STRUCTURES USING C++ LAB

Course Code	: 20MCAL28	**Credits**	:1.5
L:T:P:S	: 0:0:1.5:0	**CIE Marks**	:25
Exam Hours	: 3	**SEE Marks**	:25

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

CO1	Impart the knowledge in object-oriented design for small/medium scale problems using C++ programming paradigm.
CO2	Study the concepts of stack data structure operations and its applications expressions with their conversions
CO3	Analyze various types of queues and linked lists with their implementation.
CO4	Implement various kinds of searching and sorting techniques.
CO5	Understand different types of tree data structure constructions and its traversals
CO6	Understand the Graph data structure with its applications

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	2	2	-	1	1	-	2	3	3
CO2	3	3	3	2	2	2	-	1	1	-	2	3	3
CO3	3	3	3	2	2	2	-	1	1	-	2	3	3
CO4	3	3	3	2	2	2	-	1	1	-	2	3	3
CO5	3	3	3	2	2	2	-	1	1	-	2	3	3
CO6	3	3	3	2	2	2	-	1	1	-	2	3	3

List of Experiments

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 Matrix Using Multi-dimensional Arrays

2.   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 of all the students.

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.

5. Using recursion,

a.   Solving Towers of Hanoi Problem

b.   Finding factorial of a given number

c.   Calculation of GCD and LCM of 3 integer Numbers

6. Simulating the working of linear queue.

7. Simulating the working of circular queue.

8. 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.

9. 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

10. Implement the techniques of Selection Sort, Insertion Sort, quick sort, Heap sort

11. Write a C++ program that uses function templates to perform the following:
a) Search for a key element in a list of elements using linear search.
b) Search for a key element in a list of sorted elements using binary search.
12. Write a C++ program that uses functions to perform the following:
a) Create a binary search tree of integers.
b) Traverse the above Binary search tree in inorder, preorder and postorder
13. Find the shortest path in a given graph using Dijkstra's algorithm.

Assessment Pattern
CIE- Continuous Internal Evaluation: PRACTICAL (25Marks)

Bloom's Taxonomy	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

SEE- Semester End Examination: PRACTICAL (25 Marks)

Bloom's Category	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

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SOFTWARE TESTING LAB

Course Code	: 20MCAL29	Credits :01
L:T:P:S	**: 0:0:1:0**	**CIE Marks :25**
Exam Hours	**: 3**	**SEE Marks :25**

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

CO1	Understand the Software Development Life Cycle and use appropriate process models to develop software.
CO2	Architect and design a software application based on the requirements
CO3	The importance of metrics while measuring the quality of an application
CO4	Understand the basic testing techniques and the test life cycle
CO5	Acquire knowledge on the test automation process, and using selenium to test web applications
CO6	Discussion-oriented lectures, laboratory exercises, and invited workshops by experts from the industry.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	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
CO6	2	2	1	-	-	-	2	-	-	2	-	3	

List of Experiments

1. Designing Test Cases using Selenium IDE.

2. **Designing Test Suites using Selenium IDE.**

3. Write an automated selenium script to login into a web page.

4. Write a program to test whether a test case has passed or failed.

5. Write a java program to update the records of 10 students in a student table.

6. Write a test program to list the total number of objects present on a web page.

7. Write a test program to list the number of items in a list or a combo box.

8. Write a test program to automate drop-down choosing in any website.

9. Write a test program to automate the registration page of any website.

Assessment Pattern

CIE- Continuous Internal Evaluation: PRACTICAL (25 Marks)

Bloom's Taxonomy	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

SEE- Semester End Examination: PRACTICAL (25Marks)

Bloom's Category	Tests
Marks	**25**
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

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DATABASE SYSTEMS LAB WITH MINI PROJECT

Course Code	: 20MCAL210	**Credits**	:02
L:T:P:S	: 0:0:2:0	**CIE Marks**	:25
Exam Hours	: 3	**SEE Marks**	:25

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

CO1	To learn the fundamental concepts of DBMS
CO2	Understand relational schema and designing Entity Relationship diagram
CO3	Analyze and apply Relational algebra expressions
CO4	Apply the concepts of SQL to query the database and apply Normalization
CO5	Develop PL/SQL queries in real-time applications.
CO6	Build NOSQL databases

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	2	-
CO3	3	3	3	1	2	-	-	-	-	-	-	2	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	-	2	-	-	-	-	-	-	-	3
CO6	3	-	-	-	-	-	1	-	-	1	1	-	-

1. Consider the following relations:

Student (*snum:* integer, *sname:* string, *major:* string, *level:* string, *age:* integer)

Class (c*name:* string, *meets at:* string, *room:* string, *fid:* integer)

Enrolled (*snum:* integer, *cname:* string)

Faculty (fi*d*: integer, *fname:* string, *deptid:* integer)

Write the following queries in SQL. No duplicates should be printed in any of the answers.

  i.   Find the names of all Juniors (level = JR) who are enrolled in a class taught by Prof. Harshith

  ii.   Find the names of all classes that either meet in room R128 or have five or more Students enrolled.

  iii. Find the names of faculty members who teach in every room in which some class is taught.

  iv.   Find the names of faculty members for whom the combined enrollment of the courses that they teach is less than five.

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2. **The following relations keep track of airline flight information:**

Flights (no: integer, from: string, to: string, distance: integer, Departs: time, arrives: time, price: real)

Aircraft (aid: integer, aname: string, cruisingrange: integer)

Certified (eid: integer, aid: integer)

Employees (eid: integer, ename: string, salary: integer)

   Write the following queries in SQL. No duplicates should be printed in any of the answers.

  i.   Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80,000.

  ii.   Find the names of pilots whose salary is less than the price of the cheapest route from Bengaluru to Frankfurt.

  iii. Find the names of pilots certified for some Boeing aircraft.

  iv.   Find the aids of all aircraft that can be used on routes from Bengaluru to New Delhi.

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3. SALESMAN (Salesman_id, Name, City, Commission)
 CUSTOMER (Customer_id, Cust_Name, City, Grade, Salesman_id)
 ORDERS (Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)
 Write the following queries in SQL. No duplicates should be printed in any of the answers.

i.   Count the customers with grades above Bangalore's average.
    ii.   Find the name and numbers of all salesmen who have more than one customer.
   iii.   Create a view that finds the salesman who has the customer with the highest order of a city.
   iv.   Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted. (Use ON DELETE CASCADE at the end of foreign key definitions while creating child table)

4. Create a PL/SQL cursor program for electricity bill calculation
5. Write a PL/SQL procedure to find the number of students ranging from 100-70%,69-60%,59-50% & below 49% in each course from the student_course table given by the procedure as parameter.
6. Write a routine to perform the CRUD operations using MongoDB.
PART-B
This mini project is based on subject Java and DBMS in semester II. Simple projects such as 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 13. Online banking system 14. Controlling network usage in multi homed environment 15. Hotel reservation system

Assessment Pattern

CIE- Continuous Internal Evaluation: PRACTICAL (25 Marks)

Bloom's Taxonomy	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

SEE- Semester End Examination: PRACTICAL (25 Marks)

Bloom's Category	Tests
Marks	25
Remember	5
Understand	5
Apply	5
Analyze	2
Evaluate	3
Create	5

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LIFE SKILLS FOR PROFESSIONALS– 2

Course Code	: 20HSSC211A	**Credits**	:01
L:T:P:S	: 1:0:0:0	**CIE Marks**	:25
Exam Hours	: 2	**SEE Marks**	:25

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	PSO1	PSO2
CO1	-	-	-	-	-	2	2	2	3	-	-	-	-
CO2	-	-	-	-	-	3	2	3	3	3	-	-	-
CO3	-	-	-	-	-	-	-	1	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 (25 Marks)

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

SEE- Semester End Examination: Theory (25 Marks)

Bloom's Category	Tests
Marks	25
Remember	-
Understand	5
Apply	5
Analyze	5
Evaluate	5
Create	5

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.

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