ARKA JAIN University
Jharkhand

Estd. Under Jharkhand State Private University Act

Syllabus of
Master of Computer Applications (MCA)
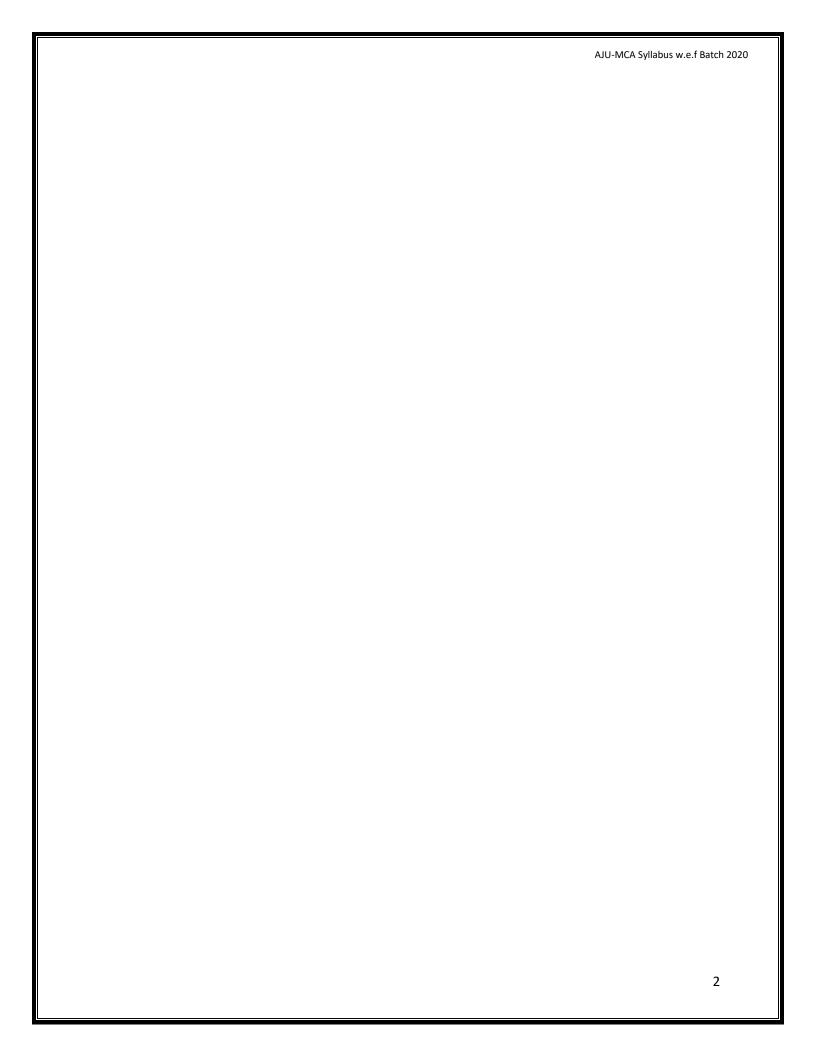Semester-I-II-III-IV
for w.e.f Batch 2020

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JGi ARKA JAIN University Jharkhand

Syllabus of
Master of Computer Applications
Semester-I

ARKA JAIN University, Jharkhand
School of Engineering & Information Technology
Department of Computer Science & Information Technology
Faculty – MCA
Scheme of Study (w.e.f Batch 2020)

SEMESTER -I

Sl. No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA *	Attendance
1	Basics of Programming Languages	PCC	4	4	100	70	20	5	5
2	Discrete Mathematics	PCC	4	4	100	70	20	5	5
3	Operating System with Linux	PCC	4	4	100	70	20	5	5
4	Object Oriented Programming with Java	PCC	4	4	100	70	20	5	5
5	Research Methodology & IPR	PCC	4	4	100	70	20	5	5
6	Professional Communication	SDA	4	4	100	70	20	5	5
	Practical								
7	Programming Language Lab	PCC	2	4	50	35	10	2.5	2.5
8	Linux Lab	PCC	2	4	50	35	10	2.5	2.5
9	Java Lab	PCC	2	4	50	35	10	2.5	2.5
	Total		**30**	**36**	**750**	**525**	**150**	**37.5**	**37.5**

SEMESTER –II

Sl. No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA *	Attendance
1	Data Structures	PCC	4	4	100	70	20	5	5
2	Computer Networks	PCC	4	4	100	70	20	5	5
3	Web Technologies	PCC	4	4	100	70	20	5	5
4	Database Management System	PCC	4	4	100	70	20	5	5
5	Software Engineering	PCC	4	4	100	70	20	5	5
6	Elective I	PEC	4	4	100	70	20	5	5
	Practical								
7	Data Structures Lab	PCC	2	4	50	35	10	2.5	2.5
8	Web Technologies Lab	PCC	2	4	50	35	10	2.5	2.5
9	DBMS Lab with Mini Project	PCC	2	4	50	35	10	2.5	2.5
	Total		**30**	**36**	**750**	**525**	**150**	**37.5**	**37.5**

SEMESTER –III

Sl. No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA *	Attendance
1	Advanced Java	PCC	4	4	100	70	20	5	5
2	Data Analytics using Python	PCC	4	4	100	70	20	5	5
3	Internet of Things	PCC	4	4	100	70	20	5	5
4	Design & Analysis of Algorithms	PCC	4	4	100	70	20	5	5
5	Elective II	PEC	4	4	100	70	20	5	5
	Practical								
7	Advanced Java Lab	PCC	2	4	50	35	10	2.5	2.5
8	Data Analytics Lab	PCC	2	4	50	35	10	2.5	2.5
9	IoT Lab with Mini Project	PCC	2	4	50	35	10	2.5	2.5
	Total		**26**	**32**	**650**	**455**	**130**	**32.5**	**32.5**

SEMESTER –IV

Sl. No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA *	Attendance
1	Mobile Application Programming	PCC	4	4	100	70	20	5	5
2	Elective III	PEC	4	4	100	70	20	5	5
	Practical								
3	Mobile Application Programming Lab	PCC	2	4	50	35	10	2.5	2.5
4	Project	PCC	16		300	200	100	0	0
	Total		**26**	**12**	**550**	**405**	**120**	**12.5**	**12.5**

Professional Elective Course (PEC)

Elective-I
(Select any ONE)
Cyber Security
Data Mining and Business Intelligence
Enterprise Resource Planning
Artificial Intelligence
Natural Language Processing

Elective-II
(Select any ONE)
Block Chain Technology
Cloud Computing
Digital Marketing
Software Testing
NOSQL

Elective-III
(Select any ONE)
Deep Learning
Big Data Analytics
Programming using C#
Software Project Management
Software Defined Networks

Distribution of Credit across 4 semesters:

Sl. No	Type of Paper	No. of Paper	Total Credit
1	Professional Core Course Paper	26	96
2	Professional Elective Course Paper	3	12
3	Skill Development Activities Paper	1	4
	Total	30	112

*CIA – Continuous Internal Assessment – Based on Projects / Assignment during the semester
PCC: Professional Core Course
PEC: Professional Elective Course
SDA: Skill Development Activities

ARKA JAIN University, Jharkhand
School of Engineering & Information Technology
Department of Computer Science & Information Technology
PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES
MCA – Semester–I

PROGRAMME EDUCATIONAL OBJECTIVES

[PEO.1]. To prepare post graduates with a professional skills in computer applications to cater the needs of industry, academia, government, entrepreneurship and consultancy abilities

[PEO.2]. To prepare post graduates to adapt themselves to ever changing IT requirements and need through self-learning techniques

[PEO.3]. To prepare post graduates to contribute to society as proven technologists

[PEO.4]. To prepare post graduates to succeed in industry / technical profession by applying current and innovative engineering technologies by lifelong learning.

PROGRAM OUTCOMES

After completing this post graduate program, a learner:

[PO.1]. Apply knowledge of computing specialization, mathematics and domain knowledge in solving computational problems

[PO.2]. Identify, understand, analyze and solve IT problems using knowledge, skills and expertise in different programming languages and tools

[PO.3]. An ability to design, develop and evaluate software solutions to meet social and environmental concerns

[PO.4]. Select and apply the techniques, skills, and modern Software tools for software development.

[PO.5]. Identify and analyze software application problems in multiple aspect including coding, testing and implementation in industrial applications.

[PO.6]. Ability to practice and follow professional ethics and cyber regulations

[PO.7]. Design, develop and verify software systems to meet desired needs within realistic constraints ensuring quality, reliability, security in addition to satisfying economical, ethical, social and environmental constraints.

[PO.8]. Apply Enterprise level application software for design of diverse software products.

[PO.9]. Communicate effectively in diverse groups and exhibit leadership qualities.

[PO.10]. Understanding of professional and ethical responsibility.

[PO.11]. Ability to work collaboratively as a member or leader in multidisciplinary teams.

[PO.12]. Identify potential business opportunities and innovate to create value to the society and seize that opportunity

Subject: Basics of Programming Languages

Code: CSC31166

Credit - 4 | Semester I

A. Introduction: The objective of the course is to provide complete knowledge of C & C++ languages from basic level. Students will be able to develop logical abilities, which will help them to create programs, applications using C & C++. The students will also develop an ability, which can easily help them switch to any other language inn future.

The main objectives of the course are as follows:

- Get knowledge about the basic concept of writing a program.
- Use of conditional statements and looping statements to solve problems associated with decision-making and repetitions.
- Concept of Array (1D, and 2D) and pointers dealing with memory management.
- Concept of Functions involving the idea of re-usability and modularity.
- Concept of object oriented programming language
- Used defined data type : Structures and unions through which can be derived from basic data type
- To make students familiar with Computer Programming like Array, Pointers, Functions & Exception handling.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Identify special features introduced in C++ when compared to C and illustrate the difference between structure and class using C++ program

[CO.2]. Apply the Concepts of inheritance, polymorphism for the given problem and develop C++ program.

[CO.3]. Implement the concept of overloading, default parameters, Constructors and destructors in a C++ program.

[CO.4]. Analyze the working of I/O operations with C++ files.

[CO.5]. Demonstrate the Exception handling and template for a given problem.

[CO.6]. Demonstrate the concepts of data abstraction, information hiding and encapsulation by writing C++ program

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

C Programming: decision making, control structures and arrays: Decision making with if statement, simple if statement, the if..else statement, nesting of if..else statements, the else..if ladder, the switch statement, the ?: operator, the goto statement, the break statement, programming examples. The while statement, the do...while statement, the for statement, nested loops, jumps in loops, the continue statement, programming examples. one dimensional and two dimensional arrays, declaration and initialization of arrays, reading , writing and manipulation of above types of arrays. **Structures:** Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, operations on individual members, array of structures, structures within structures, structures and functions, Unions, size of structures. **Pointers:** Pointers in C, Declaring and accessing pointers in C, pointers in C++, Pointer as function arguments, Dynamic Allocation Operators new and delete, Initializing Allocated Memory, Allocating Arrays, Allocating Objects. Overloading, overloading operators. **Classes & Objects:** Introduction, Class Specification, Class Objects, access members, defining member functions, data hiding, constructors, destructors, parameterized constructors, static data members, static member functions, scope resolution operator, Passing Objects to Functions, Returning Objects, Object Assignment. **Pointers and dynamic memory allocation:** Pointers, Pointer as function arguments, Dynamic Allocation Operators new and delete, Initializing Allocated Memory, Allocating Arrays, Allocating Objects. **Operator overloading:** Operator overloading as member functions and using friend functions. Overloading of binary operators like +, -, *.Creating Prefix and Postfix forms of ++, -- Operators, Operator Overloading Restrictions, Operator Overloading Using a Friend Function to Overload ++ or – –, Overloading ( ). **Inheritance:** Base Class, Inheritance & protected members, protected base class inheritance, inheriting multiple base classes, Constructors, Destructors & Inheritance. Passing parameters to base Class Constructors, Granting access, Virtual base classes. **Standard C++ I/O Classes:** Old vs. Modern C++ I/O, C++ Streams, The C++ Stream Classes, C++'s Predefined Streams, Formatted I/O, Formatting Using the ios Members, Setting the Format Flags, Clearing Format Flags, Overloading << and >>, manipulators. **Exception Handling:** Exception Handling, Fundamentals, Catching Class Types, Using Multiple catch Statements, Handling Derived- Class Exceptions, Exception Handling Options, Catching All Exceptions, Restricting Exceptions, Rethrowing an Exception, Understanding terminate( ) and unexpected( ), uncaught_exception( ) Function, The exception and bad_exception Classes, Applying Exception Handling.

E. TEXT BOOKS:

T1. E. Balaguruswamy, ANSI C, Tata McGraw Hill

T2. Object oriented programming with C++, E. Balaguruswamy, Tata McGraw Hill.

F. REFERENCE BOOKS:

R1. Yashwant P. Kanetkar, Let us C, BPB Publication

R2. Byron Gottfried, Programming with C, Tata McGraw Hill

R3. Herbert Schildt: C++ The Complete Reference, 4th Edition, Tata McGraw Hill, 2014.

R4. Brian W. Kernighan and Denis M. Ritchie, "C" Programming, PHI

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Identify special features introduced in C++ when compared to C and illustrate the difference between structure and class using C++ program	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Apply the Concepts of inheritance, polymorphism for the given problem and develop C++ program.	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Implement the concept of overloading, default parameters, Constructors and destructors in a C++ program.	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Analyze the working of I/O operations with C++ files.	1	2	2	1	-	1	-	-	-	2	-	-
CO5	Demonstrate the Exception handling and template for a given problem.	-	-	2	-	2	2	2	-	-	-	-	-
CO6	Demonstrate the concepts of data abstraction, information hiding and encapsulation by writing C++ program	-	-	-	2	-	-	2	1	-	-	-	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Discrete Mathematics
Code: CSC31167
Credit - 4 | Semester I

A. Introduction: The Objective of the discrete mathematics is the study of mathematical structures that are fundamentally discrete rather than continuous. In contrast to real numbers that have the property of varying "smoothly", the objects studied in discrete mathematics – such as integers, graphs, and statements in logic do not vary smoothly in this way, but have distinct, separated values. Discrete mathematics therefore excludes topics in "continuous mathematics" such as calculus and analysis. Discrete objects can often be enumerated by integers. More formally, discrete mathematics has been characterized as the branch of mathematics dealing with countable sets (sets that have the same cardinality as subsets of the natural numbers, including rational numbers but not real numbers).

The main objectives of the course are as follows:

- Use set notation, including the notations for subsets, unions, intersections, differences, complements, cross (Cartesian) products, and power sets.
- Define and use the terms function, domain, codomain, range, image, inverse image (preimage), and composition.
- Describe the connection between bijective functions and inverses. Be able to find the inverse of an invertible function.
- State the definitions of binary relation, reflexive, symmetric, transitive, equivalence relation, equivalence class, class representative, and partition.
- Understanding the relationships between abstract algebraic structures with familiar numbers systems such as the integers and real number.
- Apply the Addition Rule and the Principle of Inclusion and Exclusion.
- Present concepts and properties of various algebraic structures.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Apply the operations of sets and use Venn diagrams to solve applied problems; solve
Problems using the principle of inclusion-exclusion

[CO.2]. Apply rules of inference, proof by contradiction, proof by cases, and write proofs
Using symbolic logic and Boolean algebra

[CO.3]. Solve counting problems by applying elementary counting techniques using the
Product and sum rules, permutations, combinations, Course the pigeon-hole principle

[CO.4] Determine if a given graph is simple or a multigraph, directed or undirected, cyclic
or acyclic, and determine the connectivity of a graph.

[CO.5]. Understand the basic principles of sets and operations in sets.

[CO.6]. Demonstrate an understanding of relations and functions and be able to determine their
properties.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Sets, relations, and functions: Introduction, Combination of Sets, ordered pairs, proofs of general identities of sets, relations, operations on relations, properties of relations and functions, Hashing Functions, equivalence relations, compatibility relations, partial order relations. **Rings and Boolean algebra:** Rings, Subrings, Morphism of rings ideals and quotient rings. Euclidean domains, Integral domains and fields, Boolean algebra, Direct product morphisms, Boolean sub algebra, Boolean Rings, Application of Boolean algebra (Logic Implications, Logic Gates, Karnaugh map). **Combinatorial Mathematics:** Basic counting principles, Permutations and combinations, Inclusion and Exclusion, Principle Recurrence relations, Generating Function, Pigeon Hole Principle, Application. **Monoids and Groups:** Groups, Semigroups and monoids, Cyclic semigraphs and submonoids, Subgroups and Cosets. Congruence relations on semigroups. Morphisms. Normal subgroups. Dihedral groups. **Graph Theory:** Graph- Directed and undirected, Eulerian chains and cycles, Hamiltonian chains and cycles Trees, Chromatic number Connectivity, Graph coloring, Plane and connected graphs, Isomorphism and Homomorphism. Applications.

E. TEXT BOOKS:
T1. Discrete Mathematics, Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson, Tata McGraw Hill

F. REFERENCE BOOKS:

R1. Discrete Mathematics and its Applications, Kenneth H. Rosen, Tata McGraw Hill

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Apply the operations of sets and use Venn diagrams to solve applied problems; solve Problems using the principle of inclusion-exclusion	1				1	-	-	-	-		-	-
CO2	Apply rules of inference, proof by contradiction, proof by cases, and write proofs Using symbolic logic and Boolean algebra	1	1			-		-	-	-			-
CO3	Solve counting problems by applying elementary counting techniques using the Product and sum rules permutations, combinations, the pigeon-hole principle					1	-	-	-	1		1	
CO4	Determine if a given graph is simple or a multigraph, directed or undirected, cyclic or acyclic, and determine the connectivity of a graph	1			1	-		-	-	-		-	-
CO5	Understand the basic principles of sets and operations in sets.			1						1		1	
CO6	Demonstrate an understanding of relations and functions and be able to determine their	1									1	1	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Operating System with Linux
Code: CSC31168
Credit - 4 | Semester I

A. Introduction: Linux is one of the popular versions of UNIX operating system. It is open source as its source code is freely available. An operating system is an interface between computer user and computer hardware. An operating system is a software which performs all the basic tasks like file management, memory management, process management, handling input/output and controlling peripheral devices.

 The main objectives of the course are as follows:

- A successful student will be able to understand the basic components of a computer operating system.
- A successful student will be able to understand the interactions among the various components.
- The course will cover an introduction on the policies for scheduling, deadlocks, memory management, synchronization, system calls and the file systems.
- The students will implement solution via C/C++ programs and through NACHOS

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Apply the fundamental concepts of the operating systems (OS) for a given problem and discuss its performance issues.

[CO.2]. Apply graph theory concepts to model OS problem and give valid conclusions.

[CO.3]. Analyze the given problem and solve using OS management techniques.

[CO.4]. Design algorithms for the given problem & compare its performance with existing ones.

[CO.5]. Demonstrate the working of basic commands of Unix environment including file processing.

[CO.6]. Demonstrate the usage of different shell commands, variable and AWK filtering to the given Problem

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination.	

The allowance of 25% includes all types of leaves including medical leaves.

D. SYLLABUS

Introduction: Introduction to Operating Systems, System Structure What operating systems do; Computer System Organization; Computer System Architecture; Operating System Operations; Computing Environments; Operating System Services; System Calls; Types of System Calls; System Programs; Operating System Structure; Virtual Machines; System boot. Overview of Process Concept; Process Scheduling; Operations on Processes; Inter – Process Communication; Multi – Threaded Programming: Overview: Multithreading Models. **Process Management Process Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling. Process Synchronization: The Critical Section Problem: Peterson's Solution; Semaphores; Classical Problems of Synchronization. **Deadlocks:** System model; Deadlock Characterization, Methods for handling deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection and Recovery from deadlock. Memory Management Memory Management Strategies: Background, Swapping; Contiguous Memory Allocation; Paging; Segmentation; Virtual Memory Management ; Background; Demand Paging; Page Replacement; Allocation of Frames; Thrashing. **The File System:** The File, What's in a File name? The Parent-Child Relationship, The HOME Variable: The Home Directory, pwd, cd, mkdir, rmdir, Absolute Pathnames, Relative Pathnames, The Unix File System. The vi Editor: vi Basics, Input Mode, ex Mode and Command Mode. **Basic File Attributes:** ls options, File Ownership, File Permissions, chmod, Directory Permissions, Changing the File Ownership More File Attributes: File Systems and I nodes, Hard Links, Symbolic Links, The Directory, unmask, Modification and Access Times, find. **The Shell:** The Shell's Interpretive Cycle, Shell Offerings, Pattern Matching-The Wild- cards, Escaping and Quoting, Redirection: The Three Standard Files, Two Special Files:/dev/null and /dev/tty, pipes, tee: Creating a Tee, Command Substitution**. The Process:** Process Basics, ps: Process Status, System Processes, Mechanism of Process Creation, Internal and External Commands, Running Jobs in Background, Killing Processes with Signals, Job Control, at and batch, cron. **Essential Shell Programming:** Shell Variables, Environment Variables, Shell Scripts, read, Using Command Line Arguments, exit and exit status of command, 16 The Logical Operators, The if Conditional, using test and [] to Evaluate Expression, The case Conditional, expr, while: looping, for: looping with a list, set and shift, trap, Debugging Shell Scripts with set – x Laboratory Students shall implement programs which supplement the theory concepts.

E. TEXT BOOKS:

T1. Sumitabha Das: UNIX Concepts and Applications, 4th Edition, Tata McGraw Hill, 2006.

T2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating Systems Principles, 8th Edition, Wiley – India.

F. REFERENCE BOOKS:

R1. UNIX: The Complete Reference: Kenneth Roson et al, Osborne/McGraw Hill, 2000.

R2. Using UNIX: Steve Montsugu, 2ndEdition, Prentice Hall India, 1999.

R3. UNIX and Shell Programming: M G Venkateshmurthy, Pearson Education Asia, 2005
Behrouz A Forouzan and Richard F Gilberg

R4. D M Dhamdhere: Operating Systems – A Concept Based Approach, 2nd Edition, Tata McGraw
– Hill, 2002.

R5.P C P Bhatt: Operating Systems, 2ndEdition, PHI, 2006.

R6.Harvey M Deital: Operating Systems, 3rdEdition, Addison Wesley, 1990.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Apply the fundamental concepts of the operating systems (OS) for a given problem and discuss its performance issues.	1	2	2	3	2	-	-	-	2	2	-	-
CO2	Apply graph theory concepts to model OS problem and give valid conclusions.	2	2	2	2	-	2	-	1	-	2	-	-
CO3	Analyze the given problem and solve using OS management techniques.	3	1	2	1	-	-	-	-	-	3	-	1
CO4	Design algorithms for the given problem & compare its performance with existing ones.	2	2	-	1	-	1	-	-	-	2	-	-
CO5	Demonstrate the working of basic commands of Unix environment including file processing.	3	-	1	-	-	2	-	-	3	-	2	-
CO6	Demonstrate the usage of different shell commands, variable and AWK filtering to the given problem	1	-	-	-	3	-	-	2	1	2	-	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Object Oriented Programming with Java
Code: CSC31169
Credit - 4 | Semester I

A. Introduction: Object-oriented programming (OOP) is a computer programming model that organizes software design around data, or objects, rather than functions and logic. An object can be defined as a data field that has unique attributes and behavior. OOP focuses on the objects that developers want to manipulate rather than the logic required manipulating them. This approach to programming is well suited for programs that are large, complex and actively updated or maintained.

The main objectives of the course are as follows:

• To become familiar with object oriented programming and compare with the procedural programming.
• To make familiar with the basic concept and syntax of the language.
• Introduce to program using more advanced JAVA features such as composition of objects, operator overloading, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, templates etc.
• Make familiar to build JAVA classes using appropriate encapsulation and design principles.
• Improve the problem solving skills.
• Be able to apply object oriented or non-object oriented techniques to solve bigger Real World Computing problems.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Demonstrate the basic programming constructs of Java and OOP concepts to develop Java programs for a given scenario.

[CO.2]. Illustrate the concepts of generalization and run time polymorphism applications to develop reusable components.

[CO.3]. Exemplify the usage of Packages, Interfaces, Exceptions and Multithreading in building efficient applications.

[CO.4]. Apply Enumerations, Wrappers, Auto boxing, Collection framework and I/O operations for effective coding.

[CO.5]. Implement the concepts of Applets, and networking using Java network classes for distributed applications

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

D. SYLLABUS

Java Programming Fundamentals The Java Language, The Key Attributes of Object-Oriented Programming, The Java Development Kit, A First Simple Program, The Java Keywords, Identifies in Java, The Java Class Libraries. **Introducing Data Types and Operators** Java's Primitive Types, Literals, A Closer Look at Variables, The Scope and Lifetime of Variables, operators, Shorthand Assignments, Type conversion in Assignments, Using Cast. **Program Control Statements** 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, Objects and Methods** Class Fundamentals, How Objects are Created, Reference Variables and Assignment, Methods, Returning from a Method, Returning Value, Using Parameters, Constructors, Parameterized Constructors, The new operator Revisited, Garbage Collection and Finalizer, The this Keyword. **More Data Types and Operators** Arrays, Multidimensional Arrays, Alternative Array Declaration Syntax, Assigning Array References, Using the Length Member, The For-Each Style for Loop, Strings, **String Handling** String Fundamentals, The String Constructors, Three String-Related Language Features, The Length() Method, Obtaining the characters within a string, String comparison, using indexOf() and lastIndexOf(), Changing the case of characters within a string, String Buffer and String Builder. **A Closer Look at Methods and Classes:** Controlling Access to Class Members, Pass Objects to Methods, How Arguments are passed, Returning Objects, Method Overloading, Overloading Constructors, Recursion, Understanding Static, Introducing Nested and Inner Classes, Varargs: Variable-Length Arguments. **Inheritance:** Inheritance Basics, Member Access and Inheritance, Constructors and Inheritance, Using super to Call Superclass constructors, Using super to Access Superclass Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism, Why Overridden Methods, Using Abstract Classes, Using final, The Object Class. **Interfaces** Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Constants in Interfaces, Interfaces can be extended, Nested Interfaces, Final Thoughts on Interfaces. **Packages** Package Fundamentals, Packages and Member Access, Importing Packages, Static Import **Exception Handling** The Exception Hierarchy, Exception Handling Fundamentals, The Consequences of an Uncaught Exception, Exceptions Enable you to handle errors gracefully, using Multiple catch clauses, Catching subclass Exceptions, try blocks can be nested, Throwing an Exception, A Closer look at Throwable, using finally, using throws, Java's Built-in Exceptions, New Exception features added by JDK 7, Creating Exception Subclasses. **Multithreaded Programming** Multithreading fundamentals, The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Determining When a Thread Ends, Thread Priorities, Synchronization, using Synchronization Methods,The Synchronized Statement, Thread Communication using notify(), wait() and

notify All(), suspending, Resuming and stopping Threads. **Enumerations, Auto boxing and Annotations** Enumerations, Java Enumeration are class types, The Values() and Valueof() Methods, Constructors, methods, instance variables and enumerations, Auto boxing, Annotations (metadata). **Networking with Java.net Networking** fundamentals, The Networking classes and Interfaces, The Inet Address class, The Socket Class, The URL class, The URL Connection Class, The Http URL Connection Class. **The collections Framework:** Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working With Maps, Comparators, The Collection Algorithms, Why Generic Collections?, The legacy Classesand Interfaces, Parting Thoughts on Collections.

E. TEXT BOOKS:

T1. Java Fundamentals, A comprehensive Introduction by Herbert Schildt, Dale Skrien. Tata McGraw Hill Edition 2013. (Chapters:1,2,3,4,5,6,7,8,9,10,11,12,13,15,22,23,24,25,26)

T2. Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007. (Chapter 17)

F. REFERENCE BOOKS:

R1. Java Programming by Hari Mohan Pandey, Pearson Education, 2012.

R2. Java 6 Programming, Black Book, KoGenT, Dreamtech Press, 2012.

R3. Java 2 Essentials, Cay Hortsmann, second edition, Wiley

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Demonstrate the basic programming constructs of Java and OOP concepts to develop Java programs for a given scenario.	1	2	-	3	2	-	2	-	2	2	-	-
CO2	Illustrate the concepts of generalization and run time polymorphism applications to develop reusable components.	1	2	2	-	-	2	-	1	-	2	1	-
CO3	Exemplify the usage of Packages, Interfaces Exceptions and Multithreading in building efficient applications.	3	1	2	1	-	-	-	2	-	3	-	1
CO4	Apply Enumerations, Wrappers, Auto boxing, Collection framework and I/O operations for effective coding	1	2	-	1	-	3	-	1	-	2	-	-
CO5	Implement the concepts of Applets, and networking using Java network classes for distributed applications	3	-	2	-	-	2	1	-	-	-	2	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Research Methodology and IPR
Code: CSC31170
Credit - 4 | Semester I

A. Introduction: Research in simple terms refers to search for knowledge. It is a scientific and systematic search for information on a particular topic or issue. It is also known as the art of scientific investigation. Several social scientists have defined research in different ways. Research methods include all those techniques/methods that are adopted for conducting research. Thus, research techniques or methods are the methods that the researchers adopt for conducting the research studies.

The main objectives of the course are as follows:

- To give an overview of the research methodology and explain the technique of defining a research problem
- To explain the functions of the literature review in research.
- To explain carrying out a literature search, its review, developing theoretical and conceptual frameworks and writing a review.
- To explain various research designs and their characteristics.
- To explain the details of sampling designs, measurement and scaling techniques and also different methods of data collections.
- To explain several parametric tests of hypotheses and Chi-square test.
- To explain the art of interpretation and the art of writing research reports.
- To explain various forms of the intellectual property, its relevance and business impact in the changing global business environment.
- To discuss leading International Instruments concerning Intellectual Property Rights

B. **Course Outcomes: At the end of the course, students will be able to:**

[CO.1]. Identify the suitable research methods and articulate the research steps in a proper sequence for the given problem.

[CO.2]. Carry out literature survey, define the problem statement and suggest suitable solution for the given problem.

[CO.3]. Analyse the problem and conduct experimental design with the samplings.

[CO.4]. Perform the data collection from various sources segregate the primary and secondary data

[CO.5]. Apply some concepts/section of Copy Right Act /Patent Act /Cyber Law/ Trademark to the given case and develop –conclusions

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

D. SYLLABUS

Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India. **Defining the Research Problem**: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration. Reviewing the literature: Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed. **Research Design:** Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs.

Design of Sample Surveys: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs. **Data Collection:** Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout. Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports. **Intellectual Property (IP) Acts**: Introduction to IP: Introduction to Intellectual Property (IP), different types of IPs and its importance in the present scenario, Patent Acts: Indian patent acts 1970. Design Act: Industrial Design act 2000. Copy right acts: Copyright Act 1957. Trade Mark Act, 1999   .

E. TEXT BOOKS:

T1 Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg New Age International 4th Edition, 2018.

T2. Research Methodology a step-by- step guide for beginners. (For the topic Reviewing the literature

under module 2) Ranjit Kumar SAGE Publications Ltd 3rd Edition, 2011 Study Material.

T3. Intellectual property, Debirag E. Bouchoux, Cengage learning, 2013.

F. REFERENCE BOOKS:

R1. Research Methods: the concise knowledge base Trochim, Atomic Dog Publishing, 2005.

R2. Conducting Research Literature Reviews: From the Internet to Paper Fink A Sage Publications, 2009.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Identify the suitable research methods and articulate the research steps in a proper sequence for the given problem.	1	2	2	-	2	-	3	-	2	-	1	-
CO2	Carry out literature survey, define the problem statement and suggest suitable solution for the given problem.	2	1	2	-	-	3	-	1	-	2	1	-
CO3	Analyze the problem and conduct experimental design with the samplings.	3	1	2	1	-	-	-	2	-	3	-	1
CO4	Perform the data collection from various sources segregate the primary and secondary data	1	2	-	1	-	3	-	1	-	2	-	-
CO5	Apply some concepts/section of Copy Right Act /Patent Act /Cyber Law/ Trademark to the given case and develop –conclusions	3	-	2	-	-	2	1	-	-	-	2	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Professional Communication
Code: CSC31171
Credit - 4 | Semester 1

A. Introduction: Clear, precise, and effective communication has become a sine qua non in today's information-driven world given its interdependencies and seamless connectivity. Any aspiring professional cannot but master the key elements of such communication. The objective of this course is to equip students with the necessary skills to listen, read, write, and speak so as to comprehend and successfully convey any idea, technical or otherwise, as well as give them the necessary polish to become persuasive communicators.

The main objectives of the course are as follows:

- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. The objective of the course is to help the students become the independent users of English language.

[CO.2]. Students will acquire basic proficiency in reading & listening, comprehension, writing and speaking skills.

[CO.3]. Students will be able to understand spoken and written English language, particularly the language of their chosen technical field.

[CO.4]. They will be able to converse fluently.

[CO.5]. They will be able to produce on their own clear and coherent texts.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Basics of Professional Communication: Functions of Communication- Internal & External Functions, Models-Shannon & Weaver's model of communication, Flow, Networks and importance, Barriers to Communication, Essential of effective communication (7C's and other principles), Non-verbal Communication. **Basic Professional Writing:** Paragraph writing (descriptive, Imaginative etc.), Precise writing, reading and comprehension, Letters– Format &various types. **Advanced Professional Writing:** Memos, Reports, E-Mails & Net etiquettes, Circulars, Press Release, Newsletters, Notices. Resume Writing, Technical Proposals, Research Papers, Dissertation and Thesis, Technical Reports, Instruction Manuals and Technical Descriptions, Creating Indexes, List of References and Bibliography. **Verbal Communication:** Presentation Techniques, Interviews, Group Discussions, Extempore, Meetings and Conferences. **Technical Communication:** MS-Word, Adobe Frame maker and ROBO Help* Lab Exercises based on Listening and Speaking skills

E. TEXT BOOKS:

   T1. Vandana R Singh, The Written Word, Oxford University Press, New Delhi.

   T2. K K Ramchandran, et al Business Communication, Macmillan, New Delhi.

   T3. Swati Samantaray, Business Communication and Communicative English, Sultan Chand, New

   Delhi.

F. REFERENCE BOOKS:

   R1. S.P. Dhanavel English and Communication Skills for Students of Science and Engineering (with

   audio CD).

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	The objective of the course is to help the students become the independent users of English language.	1	2	2	-	2	-	3	-	2	-	1	-
CO2	Students will acquire basic proficiency in reading & listening, comprehension, writing and speaking skills.	2	1	2	-	-	3	-	1	-	2	1	-
CO3	Students will be able to understand spoken and written English language, particularly the language of their chosen technical field.	3	1	2	1	-	-	-	2	-	3	-	1
CO4	They will be able to converse fluently.	1	2	-	1	-	3	-	1	-	2	-	-
CO5	They will be able to produce on their own clear and coherent texts.	3	-	2	-	-	2	1	-	-	-	2	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

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Subject: Programming Language Lab
Code: CSC31172
Credit - 2 | Semester I

A. Introduction: The objective of the course is to provide complete knowledge of C & C++ languages from basic level. Students will be able to develop logical abilities, which will help them to create programs, applications using C & C++. The students will also develop an ability, which can easily help them switch to any other language inn future.

The main objectives of the course are as follows:

- Get knowledge about the basic concept of writing a program.
- Use of conditional statements and looping statements to solve problems associated with decision-making and repetitions.
- Concept of Array (1D, and 2D) and pointers dealing with memory management.
- Concept of Functions involving the idea of re-usability and modularity.
- Concept of object oriented programming language
- Used defined data type : Structures and unions through which can be derived from basic data type
- To make students familiar with Computer Programming like Array, Pointers, Functions & Exception handling.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Identify special features introduced in C++ when compared to C and illustrate the difference between structure and class using C++ program

[CO.2]. Apply the Concepts of inheritance, polymorphism for the given problem and develop C++ program.

[CO.3]. Implement the concept of overloading, default parameters, Constructors and destructors in a C++ program.

[CO.4]. Analyze the working of I/O operations with C++ files.

[CO.5]. Demonstrate the Exception handling and template for a given problem.

[CO.6]. Demonstrate the concepts of data abstraction, information hiding and encapsulation by writing C++ program

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	10
	Assignment	2.5
	Attendance	2.5
End Term Exam (Summative)	End Term Examination	35
	Total	50
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

List of Practical:	
1	Basic Programs using C
2	Basic Programs using C++
3	Programs on Variables
4	Programs on Selection Structure
5	Programs on Loops
6	Programs on Series & Patterns
7	Programs on Strings
8	Programs on Arrays
9	Programs on Functions
10	Implementation of pass by value, pass by reference and return by reference.
11	Recursive Functions
12	Programming Assignments Using Classes and objects
13	Programming Assignments using Static members and Methods Programming Assignments using Constant members and Methods
14	Implementation of function overloading.
15	Implementation of default arguments.
16	Implementation of constructors.
17	Implementation of static and friend functions.
18	Implementation of operator overloading
19	Implementation of inheritance.
20	Pointers
21	Structures & Unions
22	File Handling

E. TEXT BOOKS:

T1. E. Balaguruswamy, ANSI C, Tata McGraw Hill

T2. Object oriented programming with C++, E. Balaguruswamy, Tata McGraw Hill.

F. REFERENCE BOOKS:

R1. Yashwant P. Kanetkar, Let us C, BPB Publication

R2. Byron Gottfried, Programming with C, Tata McGraw Hill

R3. Herbert Schildt: C++ The Complete Reference, 4th Edition, Tata McGraw Hill, 2014.

R4. Brian W. Kernighan and Denis M. Ritchie, "C" Programming, PHI

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Identify special features introduced in C++ when compared to C and illustrate the difference between structure and class using C++ program	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Apply the Concepts of inheritance, polymorphism for the given problem and develop C++ program.	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Implement the concept of overloading, default parameters, Constructors and destructors in a C++ program.	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Analyze the working of I/O operations with C++ files.	1	2	2	1	-	1	-	-	-	2	-	-
CO5	Demonstrate the Exception handling and template for a given problem.	3		1			2			3		2	
CO6	Demonstrate the concepts of data abstraction, information hiding and encapsulation by writing C++ program	1				3		1	2		2		3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Linux Lab
Code: CSC31173
Credit - 2 | Semester I

A. Introduction: The objective of the course is to provide complete knowledge of Linux operating system from basic level. Students will be able to write shell script programs to solve problems. They will also be able to implement some standard Linux utilities such as ls.cp etc using system calls.

The main objectives of the course are as follows:

- Get knowledge about the basic concept of writing Linux program.
- Use of Linux command
- Implementation of Linux command using C
- Implementation of CPU Scheduling algorithms

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Demonstrate the working of basic commands of Linux environment including file processing

[CO.2]. Apply Regular expression to perform pattern matching using utilities like grep,sed and awk.

[CO.3]. Implement Linux commands/ system calls to demonstrate process management

[CO.4] Demonstrate the usage of different shell commands, variable and AWK filtering to the given problem.

[CO.5]. Develop shell scripts for developing the simple applications to the given problem.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	10
	Assignment	2.5
	Attendance	2.5
End Term Exam (Summative)	End Term Examination	35
	Total	50
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

D. SYLLABUS

List of Practicals:
1a. Write a shell script that takes a valid directory name as a argument recursively descend all the sub-directors, find the maximum length of any file in that hierarchy and writ the maximum value to the standard output. 1b. 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 as mpc, then the command mpc a/b/c/d should create sub-directories a, a/b, a/b/c, a/b/c/d.
2a. Write a shell script that accepts two filenames as arguments, checks if the permissions for these files are identical and if the permissions are identical, output common permissions otherwise output each filename followed by its permissions. 2b. 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.
3a. Create a script file called file properties that reads a filename entered and outputs it properties. 3b. Write a shell script to implement terminal locking (Similar to the lock command). It should prompt for 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 the Script must be written to disregard BREAK, control-D. No time limit need be implemented for the lock duration.
4a. Write a shell script that accept one or more file names as argument and convert all of them to uppercase, provided they exists in current directory. 4b. 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 the current working directory. In either case, the starting directory as well as its subdirectories at all levels must be searched. The script need not include error checking.
5a. Write a shell script that accepts filename as argument and display its creation time if file exist and if does not send output error message. 5b. Write a shell script to display the calendar for the current month with current date replaced by * or ** depending whether the date is one digit or two digit.
6a. Write s a shell script to find a file/s that matches a pattern given as command line argument in the home directory, display the contents of the file and copy the file into the directory ~/mydir. 6b. 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).
7a. Write a shell script that gets executed and displays the message either "Good Morning" or "Good Afternoon" or "Good Evening" depending upon time at which the user logs in. 7b. Write a shell script that accepts 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.

8a. Write a shell script that determine the period for which as specified user is working on a system and display appropriate message.

8b. Write a shell script that reports the logging on of as specified user within one minute after he/she login. The script automatically terminates if specified user does not login during specified in period of time.

9a. Write a shell script that accepts the filename, starting and ending line number as an argument and display all the lines between the given line number.

9b. 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 processing is to be continued with the residue. The input is to be supplied through a text file created by the user.

10a. Write an awkscript that accepts date argument in the form of dd-mm-yy and display it in the form month, day and year. The script should check the validity of the argument and in the case of error, display a suitable message.

10b. Write an awkscript to delete duplicated line from a text file. The order of the original lines must remain unchanged.

11a. Write an awkscript 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
Civil	98
Mechanical	65
Computer Science	64

11b. Write an awkscript to compute gross salary of an employee accordingly to rule given below. If basic salary < 10000 then HRA=15% of basic & DA=45% of basic. If basic salary is >=1000 then HRA=20% of basic & DA=50% of basic.

E. TEXT BOOKS:

T1. E. Balaguruswamy, ANSI C, Tata McGraw Hill

T2. Object oriented programming with C++, E. Balaguruswamy, Tata McGraw Hill.

F. REFERENCE BOOKS:

R1. Yashwant P. Kanetkar, Let us C, BPB Publication

R2. Byron Gottfried, Programming with C, Tata McGraw Hill

R3. Herbert Schildt: C++ The Complete Reference, 4th Edition, Tata McGraw Hill, 2014.

R4. Brian W. Kernighan and Denis M. Ritchie, "C" Programming, PHI

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Demonstrate the working of basic commands of Unix environment including file	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Apply Regular expression to perform pattern matching using utilities like grep,sed and awk.	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Implement unix commands/ system calls to demonstrate process management	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Demonstrate the usage of different shell commands, variable and AWK filtering to the given problem.	1	2	2	1	-	1	-	-	-	2	-	-
CO5	Develop shell scripts for developing the simple applications to the given problem	3	2	2	1	-	1	-	-	-	3	-	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: JAVA Lab
Code: CSC31174
Credit - 2 | Semester I

A. A. Introduction: This course introduces the concept of Java programming language. Java is a must for students and working professionals to become a great Software Engineer specially when they are working in Software Development Domain. This course gives a complete understanding of Java. It will take simple and practical approaches while learning Java Programming language.

The main objectives of the course are as follows:

- The objective of this course is to make students understand the principles of Object-Oriented Programming in Java and implement object-oriented solutions to simple and complex problems.

- The students will learn application development using Java Components within an integrated development environment

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Demonstrate the fundamental data types and constructs of Java Programming by writing executable/interpretable programs

[CO.2]. Illustrate the object oriented principles with the help of java programs.

[CO.3]. Develop reusable and efficient applications using inheritance and multi-threading concepts of java

[CO.4]. Apply client-side programming and networking concepts to develop distributed applications.

[CO.5]. Write java programs to demonstrate the concepts of interfaces, inner classes and I/O streams.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	10
	Assignment	2.5
	Attendance	2.5
End Term Exam (Summative)	End Term Examination	35
	Total	50
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

D. SYLLABUS

List of Practicals:
1. Write a JAVA program to demonstrate Constructor Overloading and Method Overloading.
2. Write a JAVA program to implement Inner class and demonstrate its Access protection.

3. Write a program in Java for String handling which performs the following:
   a. Checks the capacity of String Buffer objects.
   b. Reverses the contents of a string given on console and converts the resultant string in upper case.
   c. Reads a string from console and appends it to the resultant string of (ii).

4. Write a JAVA program to demonstrate Inheritance. Simple Program on Java for the implementation of Multiple inheritance using interfaces to calculate the area of a rectangle and triangle.

5. Write a JAVA program which has:
   a. A Class called Account that creates account with Rs. 500 minimum balance, a deposit() method to deposit amount, a withdraw() method to withdraw amount and also throws LessBalanceException if an account holder tries to withdraw money which makes the balance become less than Rs. 500.
   b. A Class called Less_Balance_Exception, which returns the statement that, says withdraw amount (Rs.) is not valid.
   c. A Class that creates 2 accounts, both account deposit money and one account tries to withdraw more money which generates a Less Balance Exception take appropriate action for the same.

6. Write a JAVA program using Synchronized Threads, which demonstrates Producer Consumer concept.

7. Write a JAVA program to implement a Queue using user defined Exception Handling (also make use of throw, throws).
  - a. Complete the following:
  - b. Create a package named shape.
  - c. Create some classes in the package representing some common shapes like Square, Triangle, and Circle.
  - d. Import and compile these classes in other program.

8. Write a JAVA program to create an enumeration Day of Week with seven values SUNDAY through SATURDAY. Add a method isWorkday() to the DayofWeek class that returns true if the value on which it is called is MONDAY through FRIDAY. For example, the call DayOfWeek.SUNDAY.isWorkDay () returns false.

9. Write a JAVA program which has:
  - a. An Interface class for Stack Operations
  - b. A Class that implements the Stack Interface and creates a fixed length Stack.
  - c. A Class that implements the Stack Interface and creates a Dynamic length Stack.
  - d. A Class that uses both the above Stacks through Interface reference and does the Stack
  - e. operations that demonstrates the runtime binding.

10. Write a JAVA program which uses FileInputStream / FileOutPutStream Classes.

11. Write JAVA programs which demonstrate utilities of Linked List Class.

E. TEXT BOOKS:

T1. Progamming with Java - E. Balagurusmay, TMH

T2. The complete reference JAVA2, Herbert schildt. Tata McGraw Hil

F. REFERENCE BOOKS:

R-1. Core Java 8 for Beginners - Vaishali Shah, Sharnam Shah, SPD

R-2. Java Server Programming java EE6, Black book, Dreamtech press.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Demonstrate the fundamental data types and constructs of Java Programming by writing executable/interpretable programs	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Illustrate the object oriented principles with the help of java programs.	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Develop reusable and efficient applications using inheritance and multi-threading concepts of java	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Apply client-side programming and networking concepts to develop distributed applications.	1	2	2	1	-	1	-	-	-	2	-	-
CO5	Write java programs to demonstrate the concepts of interfaces, inner classes and I/O streams.	3	2	2	1	-	1	-	-	-	3	-	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Syllabus of
Master of Computer Applications
Semester-II

ARKA JAIN University, Jharkhand
School of Engineering & Information Technology
Department of Computer Science & Information Technology
Faculty – MCA
Scheme of Study (w.e.f Batch 2020)

SEMESTER -I

Sl. No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA *	Attendance
1	Basics of Programming Languages	PCC	4	4	100	70	20	5	5
2	Discrete Mathematics	PCC	4	4	100	70	20	5	5
3	Operating System with Linux	PCC	4	4	100	70	20	5	5
4	Object Oriented Programming with Java	PCC	4	4	100	70	20	5	5
5	Research Methodology & IPR	PCC	4	4	100	70	20	5	5
6	Professional Communication	SDA	4	4	100	70	20	5	5
	Practical								
7	Programming Language Lab	PCC	2	4	50	35	10	2.5	2.5
8	Linux Lab	PCC	2	4	50	35	10	2.5	2.5
9	Java Lab	PCC	2	4	50	35	10	2.5	2.5
	Total		**30**	**36**	**750**	**525**	**150**	**37.5**	**37.5**

SEMESTER –II

Sl. No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA *	Attendance
1	Data Structures	PCC	4	4	100	70	20	5	5
2	Computer Networks	PCC	4	4	100	70	20	5	5
3	Web Technologies	PCC	4	4	100	70	20	5	5
4	Database Management System	PCC	4	4	100	70	20	5	5
5	Software Engineering	PCC	4	4	100	70	20	5	5
6	Elective I	PEC	4	4	100	70	20	5	5
	Practical								
7	Data Structures Lab	PCC	2	4	50	35	10	2.5	2.5
8	Web Technologies Lab	PCC	2	4	50	35	10	2.5	2.5
9	DBMS Lab with Mini Project	PCC	2	4	50	35	10	2.5	2.5
	Total		**30**	**36**	**750**	**525**	**150**	**37.5**	**37.5**

SEMESTER –III

Sl. No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA *	Attendance
1	Advanced Java	PCC	4	4	100	70	20	5	5
2	Data Analytics using Python	PCC	4	4	100	70	20	5	5
3	Internet of Things	PCC	4	4	100	70	20	5	5
4	Design & Analysis of Algorithms	PCC	4	4	100	70	20	5	5
5	Elective II	PEC	4	4	100	70	20	5	5
	Practical								
7	Advanced Java Lab	PCC	2	4	50	35	10	2.5	2.5
8	Data Analytics Lab	PCC	2	4	50	35	10	2.5	2.5
9	IoT Lab with Mini Project	PCC	2	4	50	35	10	2.5	2.5
	Total		**26**	**32**	**650**	**455**	**130**	**32.5**	**32.5**

SEMESTER –IV

Sl. No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA *	Attendance
1	Mobile Application Programming	PCC	4	4	100	70	20	5	5
2	Elective III	PEC	4	4	100	70	20	5	5
	Practical								
3	Mobile Application Programming Lab	PCC	2	4	50	35	10	2.5	2.5
4	Project	PCC	16		300	200	100	0	0
	Total		**26**	**12**	**550**	**405**	**120**	**12.5**	**12.5**

Professional Elective Course (PEC)

Elective-I
(Select any ONE)
Cyber Security
Data Mining and Business Intelligence
Enterprise Resource Planning
Artificial Intelligence
Natural Language Processing

Elective-II
(Select any ONE)
Block Chain Technology
Cloud Computing
Digital Marketing
Software Testing
NOSQL

Elective-III
(Select any ONE)
Deep Learning
Big Data Analytics
Programming using C#
Software Project Management
Software Defined Networks

Distribution of Credit across 4 semesters:

Sl. No	Type of Paper	No. of Paper	Total Credit
1	Professional Core Course Paper	26	96
2	Professional Elective Course Paper	3	12
3	Skill Development Activities Paper	1	4
	Total	30	112

*CIA – Continuous Internal Assessment – Based on Projects / Assignment during the semester
PCC: Professional Core Course
PEC: Professional Elective Course
SDA: Skill Development Activities

ARKA JAIN University, Jharkhand
School of Engineering & Information Technology
Department of Computer Science & Information Technology
PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES
MCA – Semester–II

PROGRAMME EDUCATIONAL OBJECTIVES

[PEO.1]. To prepare post graduates with a professional skills in computer applications to cater the needs of industry, academia, government, entrepreneurship and consultancy abilities

[PEO.2]. To prepare post graduates to adapt themselves to ever changing IT requirements and need through self-learning techniques

[PEO.3]. To prepare post graduates to contribute to society as proven technologists

[PEO.4]. To prepare post graduates to succeed in industry / technical profession by applying current and innovative engineering technologies by lifelong learning.

PROGRAM OUTCOMES

After completing this post graduate program, a learner:

[PO.1]. Apply knowledge of computing specialization, mathematics and domain knowledge in solving computational problems

[PO.2]. Identify, understand, analyze and solve IT problems using knowledge, skills and expertise in different programming languages and tools

[PO.3]. An ability to design, develop and evaluate software solutions to meet social and environmental concerns

[PO.4]. Select and apply the techniques, skills, and modern Software tools for software development.

[PO.5]. Identify and analyze software application problems in multiple aspect including coding, testing and implementation in industrial applications.

[PO.6]. Ability to practice and follow professional ethics and cyber regulations

[PO.7]. Design, develop and verify software systems to meet desired needs within realistic constraints ensuring quality, reliability, security in addition to satisfying economical, ethical, social and environmental constraints.

[PO.8]. Apply Enterprise level application software for design of diverse software products.

[PO.9]. Communicate effectively in diverse groups and exhibit leadership qualities.

[PO.10]. Understanding of professional and ethical responsibility.

[PO.11]. Ability to work collaboratively as a member or leader in multidisciplinary teams.

[PO.12]. Identify potential business opportunities and innovate to create value to the society and seize that opportunity

Subject: Data Structures
Code: CSC32175
Credit - 4 | Semester II

A. Introduction: This course introduces the concept of Data Structure with C programming language. The course identifies the most important and useful data structures in use in modern programming and each will be presented with exercises for building, visualizing, and manipulating that structure. Each exercise embeds a simple and intuitive application for the particular organization of data that we present. Through the course, you will be given a concrete understanding of data structures by writing your own programs to interact with the data structures.

The main objectives of the course are as follows:

- To introduce & practice advanced algorithms & programming techniques necessary for developing sophisticated computer application programs
- To get accustomed with various programming constructs such as divide-and-conquer, backtracking, & dynamic programming
- To learn new techniques for solving specific problems more efficiently & for analyzing space & time requirements

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Demonstrate different data structures, its operations using C programming.

[CO.2]. Analyze the performance of Stack, Queue, Lists, Trees, Hashing, Searching and Sorting techniques.

[CO.3]. Implement some applications of data structures in a high-level language such as C/C++

[CO.4]. Design and apply appropriate data structures for solving computing problems.

[CO.5]. Compute the efficiency of algorithms in terms of asymptotic notations for the given problem.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Classification of Data Structures: Primitive and Non- Primitive, Linear and Nonlinear; Data structure Operations, Stack: Definition, Representation, Operations and Applications: Polish and reverse polish expressions, Infix to postfix conversion, evaluation of postfix expression, infix to prefix, postfix to infix conversion. **Recursion** - Factorial, GCD, Fibonacci Sequence, Tower of Hanoi. Queue: Definition, Representation, Queue Variants: Circular Queue, Priority Queue, Double Ended Queue; Applications of Queues. Programming Examples. **Linked List:** Limitations of array implementation, Memory Management: Static (Stack) and Dynamic (Heap) Memory Allocation, Memory management functions. Definition, Representation, Operations: getnode() and Freenode() operations, Types: Singly Linked List. Linked list as a data Structure, Inserting and removing nodes from a list, Linked implementations of stacks, Header nodes, Array implementation of lists. **Introduction, Fundamentals of the Analysis of Algorithm** Efficiency Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms. **Brute Force:** Selection Sort and Bubble Sort, Sequential Search, Exhaustive search and String Matching. Divide-and-Conquer Mergesort, Quicksort, Binary Search, Binary tree Traversals and related properties. Decrease-and-Conquer Insertion Sort, Depth First and Breadth First Search, Topological sorting. Greedy Technique Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm.

E. TEXT BOOKS:

T1. Introduction to the Design and Analysis of Algorithms. AnanyLevitin, Pearson Education, 2nd Edition.

T2. Programming in ANSI C, Balaguruswamy, McGraw Hill Education.

T3. Data Structures Using C and C++ by Yedidyah Langsam and Moshe J. Augenstein and Aaron M Tenanbanum, 2nd Edition, Pearson Education Asia, 2002.

F. REFERENCE BOOKS:

R1. Introduction to Data Structure and Algorithms with C++ by Glenn W. Rowe.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Demonstrate different data structures, its operations using C programming.	1	2	2	-	2	-	3	-	2	-	1	-
CO2	Analyze the performance of Stack, Queue, Lists, Trees, Hashing, Searching and Sorting techniques.	2	1	2	-	-	3	-	1	-	2	1	-
CO3	Implement some applications of data structures in a high-level language such as C/C++.	3	1	2	1	-	-	-	2	-	3	-	1
CO4	Design and apply appropriate data structures for solving computing problems.	1	2	-	1	-	3	-	1	-	2	-	-
CO5	Compute the efficiency of algorithms in terms of asymptotic notations for the given problem.	3	-	2	-	-	2	1	-	-	-	2	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

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Subject: Computer Networks
Code: CSC32176
Credit - 4 | Semester II

A. Introduction: This course describes the conventional layered design of computer networks, how different protocols works at different layers and how different functions of different layers are carried out. Starting from how Ethernet and Wireless networks work in the physical layer, it describes how the frames are constructed, errors are corrected and detected, how flow is controlled at data link layer, the course also throws some light on how the CRC and Hamming code techniques are used for the same. The course has a special module to describe how data link and transport layer protocols are designed and work. How the packets are routed across networks is described in network layer processing description. Different routing algorithms like Link State and AODV are explained next. The transport layer description includes TCP functioning, how UDP provides connectionless communication and how SCTP provides the best of both the worlds is also described. The application layer description includes description of various application layer protocols like SMTP, FTP, HTTP and DNS.

The main objectives of the course are as follows:

- To learn about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks.
- To gain practical experience in installation, monitoring, and troubleshooting of current LAN systems.
- To introduce computer communication network design and its operations.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Apply the basic concepts of networking and to analyze different parameters such as bandwidth, delay, throughput of the networks for the given problem.

[CO.2]. Apply different techniques to ensure the reliable and secured communication in wired and wireless communication.

[CO.3]. Analyze the networking concepts of TCP/IP for wired and wireless components.

[CO.4]. Identify the issues of Transport layer to analyze the congestion control mechanism.

[CO.5]. Design network topology with different protocols and analyze the performance using NS2.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Applications, Requirements, Network Architecture, Implementing Network Software, Performance.
The Physical Layer: Wireless Transmission, Brief introduction about Bluetooth and WiMAX. Multiplexing: Frequency Division Multiplexing, Wavelength Division Multiplexing, Time Division Multiplexing; Switching: Circuit Switching, Message Switching, Packet Switching; Ethernet cabling, Manchester encoding, Differential Manchester Coding. Perspectives on Connecting, Encoding (NRZ, NRZI, Manchester, 4B/5B), Framing, Error Detection, Reliable Transmission, Ethernet and Multiple Access Networks (802.3), Wireless. **Data Link Layer:** Data Link layer design issues, Error Detection and Correction, Elementary Data Link protocols: Unrestricted simplex protocol, Simplex stop-and-wait protocol, Simplex protocol for a noisy channel; Sliding Window protocols: One-bit sliding window protocol, Protocol using Go back N, Example **Data link protocol:** Higher Level Data Link Control, Data link layer in the internet. Internetworking   and Advanced Internetworking Switching and Bridging, Basic Internetworking (IP), Routing, The Global Internet, Routing among Mobile Devices. The Network Layer: Network layer design issues, Routing Algorithms: Optimality principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing; Congestion Control Algorithms: Congestion Prevention Policies, Jitter Control, Techniques for achieving good quality of service, Congestion control for multicasting; Internetworking, The Network layer in the Internet. **The Transport Layer:** The Transport service, Elements of Transport protocols: Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, Multiplexing, Crash recovery; A simple Transport protocol, The Internet Transport protocols: UDP, TCP. **The Application Layer and Network Security :** Introduction to Application Layer, lossy and lossless compression techniques, Audio and Video Compression Techniques, Video on demand; Network Security: Cryptography: Introduction to cryptography, Substitution Ciphers, Transposition Ciphers, One-Time Pads, Fundamental Cryptographic Principles; Symmetric key encryption, Symmetric Key Algorithms: DES, Cipher Modes, Cryptanalysis; Public-Key Algorithms: Public-Key encryptions, RSA. Web Security: Threats, Secure Naming, Mobile Code Security.

E. TEXT BOOKS:

T1. Andrew S Tanenbaum ,Computer Networks, PHI publications, 5th Edition, 2012

T2. Forouzan, Behrouz A., Mosharraf Firouz., Computer Networks A Top-Down Approach, TaTa McGraw Hill publications, First Edition, 2012.

F. REFERENCE BOOKS:

R1. Stallings, William, Data & Computer Communications, Pearson Education Asia, 6th Edition, 2001.

R2. Prakash C. Gupta, Data communications and Computer Networks, 1st Edition, 5th Reprint, PHI, 2009

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Apply the basic concepts of networking and to analyze different parameters such as bandwidth, delay, throughput of the networks for the given problem.	1	2	2	-	2	-	3	-	2	-	1	-
CO2	Apply different techniques to ensure the reliable and secured communication in wired and wireless communication.	2	1	2	-	-	3	-	1	-	2	1	-
CO3	Analyze the networking concepts of TCP/IP for wired and wireless components.	3	1	2	1	-	-	-	2	-	3	-	1
CO4	Identify the issues of Transport layer to analyze the congestion control mechanism.	1	2	-	1	-	3	-	1	-	2	-	-
CO5	Design network topology with different protocols and analyze the performance using NS2.	3	-	2	-	-	2	1	-	-	-	2	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Web Technologies
Code: CSC32177
Credit - 4 | Semester II

A. Introduction: This course introduces the fundamental concept of Web Technologies. The objective of the course is to provide complete knowledge of Web Technology fundamentals. It will help the students getting started with web programming using HTML5, PHP and My SQL. They will learn how to build their own website, create dynamic content and user interface and integrating the front end and backend perspective of the application.

The main objectives of the course are as follows:

- To help the students getting started with web programming using HTML5, PHP and My SQL.
- To learn how to build own website
- To create dynamic content and user interface.
- Embed objects in a web page.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Apply the concept and usages of web-based programming techniques.

[CO.2]. Demonstrate the development of XHTML documents using JavaScript and CSS.

[CO.3]. Design and implement user interactive dynamic web-based applications.

[CO.4]. Demonstrate applications of Angular JS and jQuery for the given problem

[CO.5]. Create modern web applications using MEAN & FULL stack.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

D. SYLLABUS

OVERVIEW OF WEB TECHNOLOGIES, HTML5 and CSS: Web browsers, web servers, MIME,

URL, HTTP Introduction to XHTML5 tags, Basic syntax and structure, text markups, images, lists, tables, Media tags-audio and video, forms, frames. **CSS:** Introduction to CSS, Levels of CSS, Selectors, Font, color and Text Properties, BOX Model, Span and Div tags. Introduction to Javascript, controls statements, Arrays and functions, pattern matching, Element Access, Event Handling. **XML and AJAX:** XML AND AJAX XML-Documents and Vocabularies-Versions and Declaration -Namespaces JavaScript and XML: Ajax-DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data:XPATH-Template based Transformations: XSLT-Displaying XML Documents in Browsers - Evolution of AJAX -Web applications with AJAX -AJAX Framework. **CLIENT SIDE SCRIPTING:** JQuery: Introduction to JQuery, Syntax, selectors, events, JQuery HTML, JQuery Effects, JQuery CSS. Introduction to Angular JS, Directives, Expressions, Directives, Controllers, Filters, Services, Events, Forms, Validations, Examples. Bootstrap: Introduction to Bootstrap, First example, containers, Bootstrap elements: colors, tables, images, buttons, button groups, progress bars, Forms, utilities, Classes, alerts, custom forms, Grid System. **SERVER SIDE SCRIPTING:** Essentials of PHP-Installation of Web Server, XAMPP Configurations-PHP Forms- GET and POST method - Regular Expressions-Cookies- Sessions- Usage of Include and require statements- File:read and write from the file-PHP Filters-PHP XML Parser-Introduction to Node.js-Node.js Modules and filesystem-Node.js Events.   **MySQL and MEAN STACK:** PHP with MySQL- Performing basic database operation(DML) (Insert, Delete, Update, Select)-Prepared Statement- Uploading Image or File to MySQL- Retrieve Image or File from MySQL- Uploading Multiple Files to MySQL-Introduction to MEAN and FULL Stack-Real time example for modern web applications using MEAN-MEAN vs Full Stack

E. TEXT BOOKS:

T1. Web Programming By Chris Bates, Wiley Publications.

T2. HTML5 Black Book by Dreamtech.

F. REFERENCE BOOKS:

R1. Angular JS By Krishna Rungta

R2. Bootstrap essentials by Snig by Packt-open source

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Apply the concept and usages web-based programming techniques.	1	2	2	-	2	-	3	-	2	-	1	-
CO2	Demonstrate the development of XHTML documents using JavaScript and CSS.	2	1	2	-	-	3	-	1	-	2	1	-
CO3	Design and implement user interactive dynamic web-based applications.	3	1	2	1	-	-	-	2	-	3	-	1
CO4	Demonstrate applications of Angular JS and jQuery for the given problem	1	2	-	1	-	3	-	1	-	2	-	-
CO5	Create modern web applications using MEAN&FULL stack.	3	-	2	-	-	2	1	-	-	-	2	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Database Management System
Code: CSC32178
Credit - 4 | Semester II

A. Introduction: Databases are the backbone of almost all the digital services and e-governance solutions. Modern businesses and financial systems heavily depend on databases systems and transaction processing for their successful operation. This course introduces the students to the various theoretical and practical principles involved in the design and use of databases systems with the help of database management systems (DBMS) and the SQL Standard procedures.

The main objectives of the course are as follows:

- To help the students getting started with Basic Terms in Database Design.
- To learn data abstraction and database languages.
- To create database design process.
- To create database schema and instances.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Apply the basic concepts of database management in designing the database for the given problem.

[CO.2]. Design entity-relationship diagrams to the given problem to develop database application with appropriate fields and validations.

[CO.3]. Implement a database schema for a given problem domain.

[CO.4]. Formulate SQL queries in Oracle to the given problem.

[CO.5]. Apply normalization techniques to improve the database design to the given problem.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Characteristics of Database approach, Actors on the Scene, Workers behind the scene, Advantages of using DBMS approach, A Brief History of Database Applications, Data models, schemas and instances, Three-schema architecture and data independence, Database languages and interfaces, the database system environment, Centralized and client-server architectures, Classification of Database Management systems. Structure of Relational Databases, Database Schema, Keys, Relational Query Languages, Relational Operations. **Entity-Relationship Model:** Conceptual Database using high level conceptual data models for Database Design, A Sample Database Application, Entity types, Entity sets Attributes and Keys Relationship types, **Relationship Sets Functional Dependencies**, Normal Forms based on Primary SQL data definition and data types, specifying constraints in SQL, basic retrieval queries in SQL, Insert, update and delete statements in SQL, aggregate functions in SQL, group by and having clauses. Introduction to triggers in SQL, views in SQL, schema change statements in   SQL, stored procedures and functions. Introduction to transaction processing, transaction and system concepts, desirable properties of transactions, transaction support in SQL. **Concurrency control techniques:** two-phase locking techniques, concurrency control based on timestamp ordering, multiversion concurrency control techniques, validation concurrency control techniques. Recovery techniques: recovery concepts, recovery in multidatabase systems, database backup and recovery from catastrophic failures.

E. TEXT BOOKS:

T1. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Addison -Wesley, 2011.

T2. Silberschatz, Korth and Sudharshan Data base System Concepts, 6th Edition, Tata McGraw Hill, 2011.

F. REFERENCE BOOKS:

R1. C.J. Date, A. Kannan, S. Swamynatham: An Introduction to Database Systems, 8th Edition, Pearson education, 2009.

R2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Apply the basic concepts of database management in designing the database for the given problem.	1	2	2	-	2	-	3	-	2	-	1	-
CO2	Design entity-relationship diagrams to the given problem to develop database application with appropriate fields and validations.	2	1	2	-	-	3	-	1	-	2	1	-
CO3	Implement a database schema for a given problem domain.	3	1	2	1	-	-	-	2	-	3	-	1
CO4	Formulate SQL queries in Oracle to the given problem.	1	2	-	1	-	3	-	1	-	2	-	-
CO5	Apply normalization techniques to improve the database design to the given problem.	3	-	2	-	-	2	1	-	-	-	2	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

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Subject: Software Engineering
Code: CSC32179
Credit - 4 | Semester II

A. Introduction: This course provides a general introduction to software engineering. It introduces concepts such as software processes and agile methods, and essential software development activities, from initial specification through to system maintenance. Formalisms and tools to assist in software development are also presented, including common design patterns and UML notation. There is a focus on software testing, from unit testing to the testing of software releases. Project management and professional software engineering practice will also be covered. Case studies provide practical examples for many of these concepts.

The main objectives of the course are as follows:

- To explain the issues of producing quality software.
- To develop a system design using UML notation.
- To explain human issues in the software engineering profession: ethics and professional practice.
- To discuss the different aspects of project management in producing secure quality software.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Identify and define different requirements for the given problem and present in the IEEE format.

[CO.2]. Use modern tool to create UML diagrams to create the design for the given problem.

[CO.3]. Draw class diagram, analyze the different types of association that exists as per the given problem and represent them using UML notations.

[CO.4]. Analyze the given system to identify actors, use cases to design use case diagrams for the given problem using RSA/open source tool.

[CO.5]. Design the static/dynamic models to meet application requirements of the given system.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Introduction: Professional Software Development Attributes of good software, software engineering diversity, IEEE/ACM code of software engineering ethics, case studies. Software Process and Agile Software Development Software Process models: waterfall, incremental development, reuses oriented, Process activities; coping with change, The Rational Unified Process. Agile Methods, Plan-Driven and Agile Development, Extreme Programming, Agile Project Management, scaling agile methods. **Requirement Engineering:** Functional and non-functional requirements, The Software requirements document, Requirements specification, Requirements engineering processes, Requirement elicitation and analysis, Requirement validation, Requirement management. **Object Orientation Concepts:** What is object orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modelling history, modeling as design Technique: Modelling; abstraction; the three models. Object and class concepts; Link and associations concepts; **Generalization and inheritance**; A sample class model; Navigation of class models; Practical tips. Advanced objects and class concepts; Associations ends; N-array association; Aggregation, Abstract class; Multiple inheritance; Metadata; Reification; Constraints; Derived data; packages; practical tips. State modelling: Events, States, Transitions and Conditions; State Diagram; State diagram behavior; Practical tips. Advanced State Modeling: Nested state diagram; Nested states; Signal generalization; Concurrency; A sample state model, Relation of class and state models; practical. Interaction modelling: Use Case models, Sequence models, Activity models, Use case relationships; Procedural sequence models, special constructs for activity models. **Project Design and planning:** Process planning, Effort estimation, project scheduling and staffing, Software configuration Management plan, Quality plan, Risk Management, Project Monitoring plan Design: Design concepts, Function oriented design, detailed design, verification, matrix.

E. TEXT BOOKS:

T1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education Ltd, 2011

T2. Pankaj Jalote, Software Engineering, Wiley India Pvt Ltd (2010) Paul C Jorgensen Software Testing A CraftMan's Approach, 2nd edition, CRC Press.

T3. MichelBlaha, James Rumbaugh: Object-Oriented Modelling and Design with UML, 2nd edition, Pearson, 2007.

F. REFERENCE BOOKS:

R1. Stephan R. Schach, "Object oriented software engineering", Tata McGraw Hill, 2008

R2. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Identify and define different requirements for the given problem and present in the IEEE format.	1	2	2	-	2	-	3	-	2	-	1	-
CO2	Use modern tool to create UML diagrams to create the design for the given problem.	2	1	2	-	-	3	-	1	-	2	1	-
CO3	Draw class diagram, analyze the different types of association that exists as per the given problem and represent them using UML notations.	3	1	2	1	-	-	-	2	-	3	-	1
CO4	Analyze the given system to identify actors, use cases to design use case diagrams for the given problem using RSA/open source tool.	1	2	-	1	-	3	-	1	-	2	-	-
CO5	Design the static/dynamic models to meet application requirements of the given system.	3	-	2	-	-	2	1	-	-	-	2	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Elective-I

Subject: CYBER SECURITY
Code: CSC32180
Credit - 4 | Semester II

A. Introduction: This course covers all the aspects of cyber security, ethical hacking, data encryption and hacking prevention in complete detail. It includes subjects like Digital Security, Cryptography, Digital Forensics, Malware Functionality, etc.

The main objectives of the course are as follows:

- Understand the basic concept of Cyber security in designing the system.
- Understand the basic cyber laws against cyber theft and hacking.
- Understand the concept of cyber security tools used in cyber crime.
- Understand the concept of network defense tools and block chain technology.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1] Apply IT ACT (Cyber law) to the given case/problem and infer from the given case and analyze the gap if exists**.**
.
[CO.2]. Analyze the working of cyber security principles in designing the system.

[CO.3]. Analyze the given problem (cybercrime, vulnerability, threat), develop a strategy (physical, logical or administrative controls) to mitigate the problem and articulate consequences on Society and National Economy.

[CO.4]. Examine relevant network defence / web application tool to solve given cyber security problem evaluate its suitability.

[CO.5]. Investigate the influence of Block chain technology for the cyber security problem and evaluate its role.

[CO.6]. Evaluate provisions available in Indian cyber law to handle infringement of intellectual property rights that happens on the cyber platform.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Introduction to Cybercrime and Laws: Introduction, Cybercrime: Definition and Origins of the word, Cybercrime and information Security, Who are Cybercriminals? Classifications of Cybercrimes. How Criminals Plan Them – Introduction, How Criminals Plan the Attacks, Cybercafé and Cybercrimes, Botnets, Attack Vector, The Indian IT ACT 2000 and amendments. **Tools and Methods used in Cybercrime:** Introduction, Proxy Server and Anonymizers, Password Cracking, Key loggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack. **Phishing and Identity Theft :** Introduction, Phishing – Methods of Phishing, Phishing Techniques, Phishing Toolkits and Spy Phishing. Identity Theft – PII, Types of Identity Theft, Techniques of ID Theft. Digital Forensics Science, Need for Computer Cyber forensics and Digital Evidence, Digital Forensics Life Cycle. **Operating System Concept:** Unix Command Lines, Backtrack Linux, Mac Ports, Cygwin, Windows Power Shell, NetCat Commands, Net Cat Uses, SSH, Data Pipe, F pipe. **Network Defense tools and block chain technology :** Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Intrusion Detection System, introduction to block chain technology (definition, tools used for implementation) and its applications.

E. TEXT BOOKS:

T1. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication McGraw Hill.

T2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and Sunit Belpure, Publication Wiley
.

F. REFERENCE BOOKS:

R1. Marjie T. Britz - Computer Forensics and Cyber Crime: An Introduction –Pearson

R2.Chwan-Hwa (John) Wu,J. David Irwin - Introduction to Computer Networks and Cyber security - CRC Press

R3. Bill Nelson, Amelia Phillips, Christopher Steuart - Guide to Computer Forensics and Investigations - Cengage Learning

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Apply IT ACT (Cyber law) to the given case/problem and infer from the given case and analyze the gap if exists.	1	2	2	-	2	-	3	-	2	-	1	-
CO2	Analyze the working of cyber security principles in designing the system.	2	1	2	-	-	3	-	1	-	2	1	-
CO3	Analyze the given problem (cybercrime, vulnerability, threat), develop a strategy (physical, logical or administrative controls) to mitigate the problem and articulate consequences on Society and National Economy.	3	1	2	1	-	-	-	2	-	3	-	1
CO4	Examine relevant network defence / web application tool to solve given cyber security problem evaluate its suitability.	1	2	-	1	-	3	-	1	-	2	-	-
CO5	Investigate the influence of Block chain technology for the cyber security problem and evaluate its role.	3	-	2	-	-	2	1	-	-	-	2	-
CO6	Evaluate provisions available in Indian cyber law to handle infringement of intellectual property rights that happens on the cyber platform.	1	2	-	1	-	3	-	1	-	2	-	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Data Mining with Business Intelligence
Code: CSC32181
Credit - 4 | Semester II

A. Introduction: This course is about mining knowledge from data in order to gain useful insights and predictions. From theory to practice, we investigate all stages of the knowledge discovery process, which includes data understanding in order to rapidly evaluate data of interest, data preprocessing/wrangling in order to get an informative, manageable dataset etc.

The main objectives of the course are as follows:

- Understand the basic concept of Data mining and Data warehousing.
- Understand the concept of Data warehousing with Business Intelligence.
- Understand the concept of Market Analysis with the help of Association rule Mining.
- Understand the concept of OLAP and OLTP in Business Intelligence.
- Understand the use of Data mining in BI applications.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Analyze the concept of data warehouse, Business Intelligence and OLAP**.**
.
[CO.2]. Demonstrate data pre-processing techniques and application of association rule mining algorithms.

[CO.3]. Apply various classification algorithms and evaluation of classifiers for the given problem.

[CO.4]. Analyze data mining for various business intelligence applications for the given problem.

[CO.5]. Apply classification and regression techniques for the given problem.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

D. SYLLABUS

Overview and concepts Data Warehousing and Business Intelligence: Why reporting and Analysing data, Raw data to valuable information-Lifecycle of Data - What is Business Intelligence - BI and DW in today's perspective - What is data warehousing - The building Blocks: Defining Features - Data warehouses and data 1marts- Overview of the components - Metadata in the data warehouse - Need for data warehousing - Basic elements of data warehousing - trends in data warehousing. **The Architecture of BI and DW:-**BI and DW architectures and its types - Relation between BI and DW - OLAP (Online analytical processing) definitions - Difference between OLAP and OLTP - Dimensional analysis - What are cubes? Drill-down and roll-up - slice and dice or rotation - OLAP models - ROLAP versus MOLAP - defining schemas: Stars, snowflakes and fact constellations. **Introduction to data mining (DM):** Motivation for Data Mining - Data Mining-Definition and Functionalities – Classification of DM Systems - DM task primitives - Integration of a Data Mining system with a Database or a Data Warehouse - Issues in DM – KDD Process Data Pre-processing: Why to pre-process data? - Data cleaning: Missing Values, Noisy Data - Data Integration and transformation - Data Reduction: Data cube aggregation, Dimensionality reduction - Data Compression - Numerosity Reduction - Data Mining Primitives - Languages and System Architectures: Task relevant data - Kind of Knowledge to be mined - Discretization and Concept Hierarchy. **Concept Description and Association Rule Mining:** What is concept description? - Data Generalization and summarization-based characterization - Attribute relevance - class comparisons Association Rule Mining: Market basket analysis - basic concepts - Finding frequent item sets: Apriori algorithm-generating generating rules – Improved Apriori algorithm – Incremental ARM – Associative Classification – Rule Mining. **Classification and prediction:** What is classification and prediction? – Issues regarding Classification and prediction: Classification methods: Decision tree, Bayesian Classification, Rule based, CART, Neural Network Prediction methods: Linear and nonlinear regression, Logistic Regression. Introduction of tools such as DB Miner /WEKA/DTREG DM Tools. **Data Mining for Business Intelligence Applications:** Data mining for business Applications like Balanced Scorecard, Fraud Detection, Clickstream Mining, Market Segmentation, retail industry, telecommunications industry, banking & finance and CRM etc., Data Analytics Life Cycle: Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders.

E. TEXT BOOKS:

T1. J. Han, M. Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann

T2. M. Kantardzic, "Data mining: Concepts, models, methods and algorithms, John Wiley &Sons Inc.

T3. Paulraj Ponnian, "Data Warehousing Fundamentals", John Willey

F. REFERENCE BOOKS:
R1. M. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education.

R2. G. Shmueli, N.R. Patel, P.C. Bruce, "Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner", Wiley India

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Analyze the concept of data warehouse, Business Intelligence and OLAP.	1	2	2	-	2	-	3	-	2	-	1	-
CO2	Demonstrate data pre-processing techniques and application of association rule mining algorithms.	2	1	2	-	-	3	-	1	-	2	1	-
CO3	Apply various classification algorithms and evaluation of classifiers for the given problem.	3	1	2	1	-	-	-	2	-	3	-	1
CO4	Analyze data mining for various business intelligence applications for the given problem.	1	2	-	1	-	3	-	1	-	2	-	-
CO5	Apply classification and regression techniques for the given problem.	3	-	2	-	-	2	1	-	-	-	2	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Enterprise Resource Planning
Code: CSC32182
Credit - 4 | Semester II

A. Introduction: The objective of this course is to make students study technical aspects of Enterprise Resource Planning (ERP) with its lifecycle. This course will help students identify the functionality in an ERP system. It will also help students to understand tools and methodology used for designing ERP for an Enterprise.

The main objectives of the course are as follows:

- Conceptualize the basic structure of ERP
- Identify implementation strategy used for ERP
- Apply design principles for various business module in ERP
- Apply different emerging technologies for implementation of ERP

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Analyze the important concept of Enterprise Resource Planning and its functionality**.**

[CO.2]. Demonstrate the basic structure and lifecycle of ERP.

[CO.3]. Apply various ERP Technologies to understand the concept of ERP system.

[CO.4]. Analyze the ERP Manufacturing Perspective for planning and management of different processes.

[CO.5]. Analyze the benefits of ERP by using some kind of ERP Tools.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Introduction to Enterprise Resource Planning (ERP): Information System and Its Components, Value Chain Framework, Organizational Functional Units, Evolution of ERP Systems, Role of ERP in Organization, Three-Tier Architecture of ERP system. **ERP Implementation Lifecycle:** Project Preparation, Initial Costing, Requirement Engineering, ERP Solution Selection, Technical Planning, Change Management and Training Plan, Implementation and Deployment Planning, Configuration, Custom Coding, Final Preparation, Go-live. **ERP and Related Technologies:** Business Processing Reengineering (BPR), Data Warehousing, Data Mining, On-line Analytical Processing (OLAP), Supply Chain Management (SCM), Customer Relationship Management (CRM), Electronic Data Interchange (EDI). **ERP Manufacturing Perspective:** MRP - Material Requirement Planning, BOM - Bill Of Material, MRP - Manufacturing Resource Planning, DRP -Distributed Requirement Planning, PDM - Product Data Management **ERP Modules:** Finance, Plant Maintenance, Quality Management, Materials Management. **Benefits of ERP:** Reduction of Lead-Time, On-time Shipment, Reduction in Cycle Time, Improved Resource Utilization, Better Customer Satisfaction, Improved Supplier Performance, Increased Flexibility, Reduced Quality, Costs, Improved Information Accuracy and Design-making Capability **Introduction to ERP tools :**Open ERP JD Edwards-Enterprise One Microsoft Dynamics-CRM Module SAP.

E. TEXT BOOKS:

T1. Enterprise Resource Planning - Alexis Leon, Tata McGraw Hill

T2. Enterprise Resource Planning – Diversified by Alexis Leon, TMH.

F. REFERENCE BOOKS:

R1. Enterprise Resource Planning - Ravi Shankar & S. Jaiswal, Galgotia

R2. Enterprise Resource Planning: Concepts and Practices by Vinod Kumar Garg, N. K. Venkitakrishnan

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Analyze the important concept of Enterprise Resource Planning and its functionality.	1	2	2	-	2	-	3	-	2	-	1	-
CO2	Demonstrate the basic structure and lifecycle of ERP.	2	1	2	-	-	3	-	1	-	2	1	-
CO3	Apply various ERP Technologies to understand the concept of ERP system.	3	1	2	1	-	-	-	2	-	3	-	1
CO4	Analyze the ERP Manufacturing Perspective for planning and management of different processes.	1	2	-	1	-	3	-	1	-	2	-	-
CO5	Analyze the benefits of ERP by using some kind of ERP Tools.	3	-	2	-	-	2	1	-	-	-	2	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: ARTIFICIAL INTELLIGENCE
Code: CSC32183
Credit - 4 | Semester II

A. Introduction: The objective of this course is to introduce basic theory and practical techniques in Artificial Intelligence. This course would provide emphasis to the principles and applications of Artificial Intelligence

The main objectives of the course are as follows:

- Understand what Artificial Intelligence mean and the foundations of it.
- Understand those elements constituting problems and learn to solve it by various uninformed and informed (heuristics based) searching techniques.
- Understand the formal method for representing the knowledge and the process of inference to derive new representations of the knowledge to deduce what to do.
- Understand the notion of Planning, Game playing and NLP in AI and basic techniques in the classical systems.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Analyze the foundation and basic concept of Artificial Intelligence.

[CO.2]. Apply various problem solving methodology to develop AI enabled system.

[CO.3]. Analyze the concept of representing the knowledge and the process of inference to derive new representations of the knowledge.

[CO.4]. Apply the concept of soft computing notion for Planning, Game playing and NLP in AI and basic techniques in the classical systems.

[CO.5]. Analyze the concept of Fuzzy Logic.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS:

INTRODUCTION TO AI: Artificial Intelligence- Role of AI in engineering, AI in daily life, Intelligence and Artificial Intelligence, Different task domains of AI, Programming methods, Limitations of AI, Intelligent Agent: Agent, Performance Evaluation, Task environment of agent, Agent classification, Agent architecture. **PROBLEM SOLVING:** Problems, problem spaces and search: Define the problem as a state space search, Production systems, Problem characteristics, Production system characteristic, Issues in design of search program, Search Techniques: DFS, BFS, Hill Climbing. **KNOWLEDGE REPRESENTATION & SOFT COMPUTING: Knowledge Representation**: Need to represent knowledge, Knowledge representation with mapping scheme, Properties of good knowledge-based system, Knowledge representation issues, AND-OR graph, Types of knowledge, **Soft Computing:** Hard computing Vs Soft Computing, Soft computing constituents – ANN, Fuzzy Logic, GA Applications of Soft Computing. **NEURAL NETWORK: Artificial Neural Network:** Introduction, Fundamental Concept, Artificial Neural Network, Brain vs. Computer - Comparison Between Biological Neuron and Artificial Neuron, Basic Models of Artificial Neural Network, Supervised Learning Network-Linear Separability, Perceptron Networks, Adaptive Linear Neuron (Adaline), Multiple Adaptive Linear Neurons, Back-Propagation Network, Unsupervised Learning Networks- MaxNet. **FUZZY LOGIC:** Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets: Introduction to Fuzzy Logic, Classical Sets (Crisp Sets), Fuzzy Sets, Classical Relations and Fuzzy Relations: Introduction, Cartesian Product of Relation, Classical Relation, Fuzzy Relations, Defuzzification: Introduction, Lambda-Cuts for Fuzzy Sets (Alpha-Cuts), Lambda-Cuts for Fuzzy Relations, Defuzzification Methods.

E. TEXT BOOKS:

T1. Artificial Intelligence, Elaine Rich, Kevin Knight, S.B. Nair, Tata McGraw Hill.

T2. Artificial Intelligence and Soft Computing for Beginners, Anandita Das, Shroff Publication.

F. REFERENCE BOOKS:

R1. S. Rajsekaran & G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India

R2. Kumar Satish, "Neural Networks" Tata McGraw Hill

R3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.

A. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Analyze the foundation and basic concept of Artificial Intelligence.	1	2	2	-	2	-	3	-	2	-	1	-
CO2	Apply various problem solving methodology to develop AI enabled system.	2	1	2	-	-	3	-	1	-	2	1	-
CO3	Analyze the concept of representing the knowledge and the process of inference to derive new representations of the knowledge.	3	1	2	1	-	-	-	2	-	3	-	1
CO4	Apply the concept of soft computing notion for Planning, Game playing and NLP in AI and basic techniques in the classical systems	1	2	-	1	-	3	-	1	-	2	-	-
CO5	Analyze the concept of Fuzzy Logic.	3	-	2	-	-	2	1	-	-	-	2	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Natural Language Processing
Code: CSC32184
Credit - 4 | Semester II

A. Introduction: The objective of this course is to introduce basic theory and practical techniques in Artificial Intelligence. This course would provide emphasis to the principles and applications of Artificial Intelligence

The main objectives of the course are as follows:

- To understand the need for morphological processing and their representation.
- To know about the various techniques used for speech synthesis and recognition.
- To appreciate the syntax analysis and parsing that is essential for natural language processing.
- To learn about the various representations of semantics and discourse.
- To have knowledge about the applications of natural language processing.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Understand approaches to syntax and semantics in NLP.

[CO.2]. Understand approaches to discourse, generation, dialogue and summarization within NLP.

[CO.3]. Understand current methods for statistical approaches to machine translation.

[CO.4]. Understand machine learning techniques used in NLP, including hidden Markov models and probabilistic context-free grammars, clustering and unsupervised methods, log-linear and discriminative models, and the EM algorithm as applied within NLP.

[CO.5]. Apply parsing technique to the given problem, verify the output, and give valid conclusions.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Introduction, Morphology: Knowledge in Speech & Lang Processing, Ambiguity, Models & Algorithms, Language, Thought & Understanding, Some Brief History, The State of the Art & Near-Term Future, Summary Morphology and Finite State Transducers: Survey of English Morphology, Finite state Morphological Parsing, Lexicon-Free FST: The Porter Stemmer, Human Morphological Parsing, Summary, Combining FST Lexicon and Rules . **N-Grams:** Counting Words in Corpora, Simple N-Grams, Smoothing, Back off, Deleted Interpolation, N-Grams for Spelling and Pronunciation, Entropy, Summary. Word Classes and Part-of- Speech Tagging: English Word Classes, Tag sets for English, Part- of-Speech Tagging. Context-Free Grammars and Predicate Calculus for English: Constituency, **Context-Free Rules and Trees**: Sentence Level Constructions, Coordination, Agreement, The Verb Phrase Sub Categorization, Auxiliaries, Spoken Language Syntax, Grammar Equivalence and Normal Form, Finite –State and Context-Free Grammars, Grammars and Human Processing, The Early Algorithm, Finite-State Parsing Method, Summary Representing Meaning. **Semantic Analysis:** Syntax-Driven Semantic Analysis, Attachments for a Fragment of English, Integrating Semantic Analysis into the Earley Parser, Idioms and Compositionality, Robust Semantic Analysis, Summary. Lexical Semantics: Relations Among Lexemes and Their Senses, WordNet: A Database of Lexical Relations, The Internal Structure of Words, Creativity and the Lexicon, Summary Word Sense Disambiguation and Information. Retrieval: Selection Restriction Based Disambiguation, Robust Word Sense Disambiguation, Information. **Retrieval :** Other Retrieval Tasks, and Summary. Case Study of Simple Text Recognition or Content Based Text Extraction System. Evolving Explanatory Novel Patterns for Semantically-Based Text Mining: Related Work, A Semantically Guided Model for Effective Text Mining

E. TEXT BOOKS:

T1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", 2nd Edition, Prentice Hall, 2009

T2. Christopher D.Manning and Hinrich Schutze, "Foundations of Statistical Natural Language Processing", MIT Press, 1999.

F. REFERENCE BOOKS:

R1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press,2008

R2. AnneKao and Stephen R. Poteet (Eds), "Natural Language Processing and Text Mining", Springer Verlag London Limited 2007.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Understand approaches to syntax and semantics in NLP.	1	2	2	-	2	-	3	-	2	-	1	-
CO2	Understand approaches to discourse, generation, dialogue and summarization within NLP.	2	1	2	-	-	3	-	1	-	2	1	-
CO3	Understand current methods for statistical approaches to machine translation.	3	1	2	1	-	-	-	2	-	3	-	1
CO4	Understand machine learning techniques used in NLP, including hidden Markov models and probabilistic context-free grammars, clustering and unsupervised methods, log-linear and discriminative models, and the EM algorithm as applied within NLP.	1	2	-	1	-	3	-	1	-	2	-	-
CO5	Apply parsing technique to the given problem and verify the output and give valid conclusions	3	-	2	-	-	2	1	-	-	-	2	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

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Subject: Data Structures Lab
Code: CSC32185
Credit - 2 | Semester II

A. Introduction: This course introduces the concept of Data Structure with C programming language. The course identifies the most important and useful data structures in use in modern programming and each will be presented with exercises for building, visualising, and manipulating that structure. Each exercise embeds a simple and intuitive application for the particular organisation of data that we present. Through the course, you will be given a concrete understanding of data structures by writing your own programs to interact with the data structures

The main objectives of the course are as follows:

- To introduce & practice advanced algorithms & programming techniques necessary for developing sophisticated computer application programs

- To get accustomed with various programming constructs such as divide-and-conquer, backtracking, & dynamic programming

- To learn new techniques for solving specific problems more efficiently & for analyzing space & time requirements

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Algorithmic techniques such as brute force, greedy, & divide & conquer.

[CO.2]. Application of advanced abstract data type (ADT) & data structures in solving real world problems.

[CO.3]. Effectively combine fundamental data structures and algorithmic techniques in building a complete algorithmic solution to a given problem

[CO.4]. Ability to describe stack, queue and linked list operation.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	10
	Assignment	2.5
	Attendance	2.5
End Term Exam (Summative)	End Term Examination	35
	Total	50
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

List of Practical:	
1.	1. Program to Maintain a Linked List.
	2. Program to Add a New Node to the Ascending Order Linked List.
	3. Program to Maintain a Doubly Linked List.
	4. Program to Implement Stack as an Array.
	5. Program to Implement Stack as a Linked List.
	6. Program to Convert an a.E. from Infix Form to Postfix Form.
	7. Program to Evaluate an Expression Entered in Postfix Form.
	8. Program to Implement Non-Recursive Function for Factorial of a Number.
	9. Program to Implement Recursive Function for Factorial of a Number.
2.	**Elementary Data Structure**
	a) Implement linked lists and some operations on linked lists.
	b) Implement Stacks.
	i. Program to Implement a Stack as an Array.
	ii. Program to Implement a Stack as a Linked List.
	c) Implement Queues.
	i. Program to Implement a Queue as an Array.
	ii. Program to Implement a Queue as a Linked List.
	iii. Program to Implement a Circular Queue as an Array.
	iv. Program to Implement a Circular Queue as a Linked List.
	v. Program to Implement a Dequeue Using an Array.
	d) AVL Trees (insertion, deletion)
3.	**Sorting & Searching**
	a) Implement sequential search and binary search techniques.
	i. Program to Implement Linear Search in an Unsorted Array.
	ii. Program to Implement Binary Search in a Sorted Array.
	b) Implement Selection sort.
	c) Implement Insertion sort.
	d) Implement Bubble Sort.
	e) Implement Quick sort.
	f) Implement Merge sort for array.
4.	**Algorithm**
	a) String matching algorithms
	b) Dijkstra algorithm
	c) Depth first search
	d) Breadth first search
	e) N queens problem

E. TEXT BOOKS:

T1. *"*Data Structure A Pseudocode Approach with C" - Richard F Gilberg Behrouz A   Forouzan -
     Second edition

 T2. Introduction to ALGORITHMS - Thomas H. Cormen, Charles E. Leiserson, Ronald L.   Rivest,
        Clifford Stein - PHI, India Second Edition.

F. REFERENCE BOOKS:

R1. Shaum's Outlines Data Structure - Seymour Lipschutz – TMH

R2. Data Structures and Algorithms in C++- Michael T.Goodrich - Wiley Publications

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Algorithmic techniques such as brute force, greedy, & divide & conquer	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Application of advanced abstract data type (ADT) & data structures in solving real world problems.	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Effectively combine fundamental data structures and algorithmic techniques in building a complete algorithmic solution to a given problem	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Ability to describe stack, queue and linked list operation.	1	2	2	1	-	1	-	-	-	2	-	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Web Technologies Lab
Code: CSC32186
Credit - 2 | Semester II

A. Introduction: The key objective is to describe how a given web server responds to an HTTP request for a dynamic resource. Discuss the strength and weakness of the program centric and markup-centric approaches to server side development

Course Objectives:

- Get knowledge about the basic concept of writing a program.
- Use of conditional statements and looping statements to solve problems associated with decision-making and repetitions.
- Concept of Array and pointers dealing with memory management.
- Concept of Functions involving the idea string

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Apply the concept and usages web based programming techniques.

[CO.2]. Demonstrate the development of XHTML documents using JavaScript and CSS.

[CO.3]. Design and implement user interactive dynamic web based applications.

[CO.4]. Demonstrate applications of Angular JS and JQuery for the given problem

[CO.5]. Create modern web applications using MEAN & FULL stack

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	10
	Assignment	2.5
	Attendance	2.5
End Term Exam (Summative)	End Term Examination	35
	Total	50
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

1. Develop static pages for a given scenario using HTML
2. Creating Web Animation with audio using HTML5 & CSS3
3. Demonstrate Geolocation and Canvas using HTML5
4. Write an XML file and validate the file using Document Type Definition (DTD)
5. Demonstrate DOM parser
6. Demonstrate SAX parser
7. Write a JavaScript program to demonstrate Form Validation and Event Handling
8. Create a web application using AngularJS with Forms.
9. Implement web application using AJAX with JSON
10. Demonstrate to fetch the information from an XML file with AJAX
11. Demonstrate Node.js file system module
12. Design a simple online test web page in PHP
13. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings
14. Implement MySQL with PHP
15. Demonstrate to fetch information from an XML file using PHP
16. Installation of MongoDB and Express.JS

E. TEXT BOOKS:
T1. Web Design: The Complete Reference Thomas Powell Tata McGraw-Hill
T2. PHP 5.1 for Beginners Ivan Bayross, Sharanam Shah SPD
T3. JavaScript 2.0: The Complete Reference Thomas Powell and Fritz Schneider Tata McGraw Hill

F. REFERENCE BOOKS:
R1. HTML5 Step by Step Faithe Wempen Microsoft Press
R2. PHP Project for Beginners Sharanam Shah, Vaishali Shah SPD

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Apply the concept and usages web based programming techniques	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Demonstrate the development of XHTML documents using JavaScript and CSS	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Design and implement user interactive dynamic web based applications	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Demonstrate applications of Angular JS and JQuery for the given problem	1	2	2	1	-	1	-	-	-	2	-	-
CO5	Create modern web applications using MEAN & FULL stack	3	2	2	1	-	1	-	-	-	3	-	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

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Subject: DBMS Lab with Mini Project
Code: CSC32187
Credit - 2 | Semester II

A. Introduction: The objective of the course is to provide complete knowledge of Relational Database Management System. Students will be able to develop logical abilities, which will help them to create programs, applications using SQL concept. The students will also develop an ability, which can easily help them organize, maintain and retrieve information from a DBMS.

The main objectives of the course are as follows:

- To help students to understand the strong foundation for database application design and development by introducing fundamentals of database technology to the students.
- To emphasis on the basic concepts to organize, maintain and retrieve information from a DBMS.
- To understand the principles of database systems and recognize how they are used in developing data-intensive applications.
- To help the students to study an effective and efficient database system with the help of the rising trends of parallel and distributed databases

B. Course Outcomes: At the end of the course, students will be able to:

 [CO.1]. Design entity-relationship diagrams to solve simple database applications
 [CO.2]. Implement a database schema for a given problem domain.
 [CO.3]. Formulate SQL queries in Oracle
 [CO.4]. Apply normalization techniques to improve the database design
 [CO.5]. Build database for any given problem

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	10
	Assignment	2.5
	Attendance	2.5
End Term Exam (Summative)	End Term Examination	35
	Total	50
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Instructions for the Exercises:
1. Draw ER diagram based on given scenario with various Constraints.
2. Create Relational Database Schema based on the scenario using Mapping Rules.
3. Perform the given queries using any RDBMS Environment.
4. Suitable tuples have to be entered so that queries are executed correctly.
5. The results of the queries may be displayed directly.

1. Create the following tables with properly specifying Primary keys, Foreign keys and solve the following queries.
BRANCH (Branchid, Branchname, HOD) STUDENT (USN, Name, Address, Branchid, sem)
BOOK (Bookid, Bookname, Authorid, Publisher, Branchid)
AUTHOR (Authorid, Authorname, Country, age)
BORROW (USN, Bookid, Borrowed_Date)
Execute the following Queries:
i.List the details of Students who are all studying in 2nd sem MCA.
ii.List the students who are not borrowed any books.
iii.Display the USN, Student name, Branch_name, Book_name, Author_name, Books_Borrowed_Date of 2nd sem MCA Students who borrowed books.
iv.Display the number of books written by each Author.
v.Display the student details who borrowed more than two books.
vi.Display the student details who borrowed books of more than one Author.
vii.Display the Book names in descending order of their names.
viii.List the details of students who borrowed the books which are all published by the same publisher.

2. Consider the following schema:
STUDENT (USN, name, date_of_birth, branch, mark1, mark2, mark3, total, GPA)
Execute the following queries:
i. Update the column total by adding the columns mark1, mark2, mark3.
ii. Find the GPA score of all the students.
iii. Find the students who born on a particular year of birth from the date_of_birth column.
iv. List the students who are studying in a particular branch of study.
v. Find the maximum GPA score of the student branch-wise.
vi. Find the students whose name starts with the alphabet "S".
vii. Find the students whose name ends with the alphabets "AR".
viii. Delete the student details whose USN is given as 1001.

3. Design an ER-diagram for the following scenario, Convert the same into a relational model and then solve the following queries.

Consider a Cricket Tournament "JPL CUP" organized by an organization. In the tournament there are many teams are contesting each having a Teamid, Team_Name, City, a coach. Each team is uniquely identified by using Teamid. A team can have many Players and a captain. Each player is uniquely identified by Playerid, having a Name, and multiple phone numbers,age. A player represents only one team. There are many Stadiums to conduct matches. Each stadium is identified using Stadiumid, having a stadium_name, Address (involves city,area_name,pincode). A team can play many matches. Each match played between the two teams in the scheduled date and time in the predefined Stadium. Each match is identified uniquely by using Matchid. Each match won by any of the one team that also wants to record in the database. For each match man_of_the match award given to a player.

Execute the following Queries:

i. Display the youngest player (in terms of age) Name, Team name, age in which he belongs of the tournament.

ii. List the details of the stadium where the maximum number of matches were played.

iii. List the details of the player who is not a captain but got the man_of _match award at least in two matches.

iv. Display the Team details who won the maximum matches.

v. Display the team name where all its won matches played in the same stadium.

Mini - Project

A group of two students has to develop a mini-project where they need to implement SQL queries for inserting, deleting and searching the required record.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Design entity-relationship diagrams to solve simple database applications	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Implement a database schema for a given problem domain	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Formulate SQL queries in Oracle	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Apply normalization techniques to improve the database design.	1	2	2	1	-	1	-	-	-	2	-	-
CO5	Build database for any given problem	3	2	2	1	-	1	-	-	-	3	-	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Syllabus of
Master of Computer Applications
Semester-III

ARKA JAIN University, Jharkhand
School of Engineering & Information Technology
Department of Computer Science & Information Technology
Faculty – MCA
Scheme of Study (w.e.f Batch 2020)

SEMESTER -I

Sl. No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA *	Attendance
1	Basics of Programming Languages	PCC	4	4	100	70	20	5	5
2	Discrete Mathematics	PCC	4	4	100	70	20	5	5
3	Operating System with Linux	PCC	4	4	100	70	20	5	5
4	Object Oriented Programming with Java	PCC	4	4	100	70	20	5	5
5	Research Methodology & IPR	PCC	4	4	100	70	20	5	5
6	Professional Communication	SDA	4	4	100	70	20	5	5
	Practical								
7	Programming Language Lab	PCC	2	4	50	35	10	2.5	2.5
8	Linux Lab	PCC	2	4	50	35	10	2.5	2.5
9	Java Lab	PCC	2	4	50	35	10	2.5	2.5
	Total		**30**	**36**	**750**	**525**	**150**	**37.5**	**37.5**

SEMESTER –II

Sl. No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA *	Attendance
1	Data Structures	PCC	4	4	100	70	20	5	5
2	Computer Networks	PCC	4	4	100	70	20	5	5
3	Web Technologies	PCC	4	4	100	70	20	5	5
4	Database Management System	PCC	4	4	100	70	20	5	5
5	Software Engineering	PCC	4	4	100	70	20	5	5
6	Elective I	PEC	4	4	100	70	20	5	5
	Practical								
7	Data Structures Lab	PCC	2	4	50	35	10	2.5	2.5
8	Web Technologies Lab	PCC	2	4	50	35	10	2.5	2.5
9	DBMS Lab with Mini Project	PCC	2	4	50	35	10	2.5	2.5
	Total		**30**	**36**	**750**	**525**	**150**	**37.5**	**37.5**

SEMESTER –III

Sl. No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA *	Attendance
1	Advanced Java	PCC	4	4	100	70	20	5	5
2	Data Analytics using Python	PCC	4	4	100	70	20	5	5
3	Internet of Things	PCC	4	4	100	70	20	5	5
4	Design & Analysis of Algorithms	PCC	4	4	100	70	20	5	5
5	Elective II	PEC	4	4	100	70	20	5	5
	Practical								
7	Advanced Java Lab	PCC	2	4	50	35	10	2.5	2.5
8	Data Analytics Lab	PCC	2	4	50	35	10	2.5	2.5
9	IoT Lab with Mini Project	PCC	2	4	50	35	10	2.5	2.5
	Total		**26**	**32**	**650**	**455**	**130**	**32.5**	**32.5**

SEMESTER –IV

Sl. No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA *	Attendance
1	Mobile Application Programming	PCC	4	4	100	70	20	5	5
2	Elective III	PEC	4	4	100	70	20	5	5
	Practical								
3	Mobile Application Programming Lab	PCC	2	4	50	35	10	2.5	2.5
4	Project	PCC	16		300	200	100	0	0
	Total		**26**	**12**	**550**	**405**	**120**	**12.5**	**12.5**

Professional Elective Course (PEC)

Elective-I
(Select any ONE)
Cyber Security
Data Mining and Business Intelligence
Enterprise Resource Planning
Artificial Intelligence
Natural Language Processing

Elective-II
(Select any ONE)
Block Chain Technology
Cloud Computing
Digital Marketing
Software Testing
NOSQL

Elective-III
(Select any ONE)
Deep Learning
Big Data Analytics
Programming using C#
Software Project Management
Software Defined Networks

Distribution of Credit across 4 semesters:

Sl. No	Type of Paper	No. of Paper	Total Credit
1	Professional Core Course Paper	26	96
2	Professional Elective Course Paper	3	12
3	Skill Development Activities Paper	1	4
	Total	30	112

*CIA – Continuous Internal Assessment – Based on Projects / Assignment during the semester
PCC: Professional Core Course
PEC: Professional Elective Course
SDA: Skill Development Activities

ARKA JAIN University, Jharkhand
School of Engineering & Information Technology
Department of Computer Science & Information Technology
PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES
MCA – Semester–III

PROGRAMME EDUCATIONAL OBJECTIVES

[PEO.1]. To prepare post graduates with a professional skills in computer applications to cater the needs of industry, academia, government, entrepreneurship and consultancy abilities

[PEO.2]. To prepare post graduates to adapt themselves to ever changing IT requirements and need through self-learning techniques

[PEO.3]. To prepare post graduates to contribute to society as proven technologists

[PEO.4]. To prepare post graduates to succeed in industry / technical profession by applying current and innovative engineering technologies by lifelong learning.

PROGRAM OUTCOMES

After completing this post graduate program, a learner:

[PO.1]. Apply knowledge of computing specialization, mathematics and domain knowledge in solving computational problems

[PO.2]. Identify, understand, analyze and solve IT problems using knowledge, skills and expertise in different programming languages and tools

[PO.3]. An ability to design, develop and evaluate software solutions to meet social and environmental concerns

[PO.4]. Select and apply the techniques, skills, and modern Software tools for software development.

[PO.5]. Identify and analyze software application problems in multiple aspect including coding, testing and implementation in industrial applications.

[PO.6]. Ability to practice and follow professional ethics and cyber regulations

[PO.7]. Design, develop and verify software systems to meet desired needs within realistic constraints ensuring quality, reliability, security in addition to satisfying economical, ethical, social and environmental constraints.

[PO.8]. Apply Enterprise level application software for design of diverse software products.

[PO.9]. Communicate effectively in diverse groups and exhibit leadership qualities.

[PO.10]. Understanding of professional and ethical responsibility.

[PO.11]. Ability to work collaboratively as a member or leader in multidisciplinary teams.

[PO.12]. Identify potential business opportunities and innovate to create value to the society and seize that opportunity

Subject: Advanced Java
Code: CSC33188
Credit - 4 | Semester III

A. Introduction: The objective of the course is to provide complete knowledge of Java language from basic level. Students will be able to develop logical abilities, which will help them to create programs, applications using Java. The students will also develop an ability, which can easily help them switch to any other language in future.

The main objectives of the course are as follows:

- Get knowledge about the basic concept of writing a program.
- Use of conditional statements and looping statements to solve problems associated with decision-making and repetitions.
- Concept of object oriented programming language
- Used defined data type : Structures and unions through which can be derived from basic data type
- To make students familiar with Computer Programming.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Apply the concept of Servlet and its life cycle to create web application.

[CO.2]. Apply JSP tags and its services to web application..

[CO.3]. Create packages and interfaces in the web application context.

[CO.4]. Build Database connection for the web applications.

[CO.5]. Develop enterprise applications using Java Beans concepts for the given problem.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Servlet: Servlet Structure, Servlet packaging, HTML Building utilities, Lifecycle, Single Thread Model Interface, Handling Client request: Form Data, HTTP Request Headers. Generating Server Response: HTTP Status Codes, HTTP Response Headers, Handling Cookies, Session Tracking. **Introduction to JSP:** Overview of JSP: JSP Technology, Need of JSP, Benefits of JSP, Advantages of JSP, Basic Syntax, Invoking Java code with JSP Scripting Elements, Creating Template Text, Invoking Java Code form JSP, Limiting Java Code in JSP, Using JSP Expressions, Comparing Servlets And JSP, Writing Scriptlets. For Example: Using Scriplets to make parts of JSP Conditional, Using declarations, Declaration Examples. **Controlling the structure**: Structure of generated Servlets and Java Beans, Controlling the structure of generated Servlets: The JSP Page directive, Import Attribute, Session Attribute, isElignore attribute, Buffer and Autoflush Attribute, Info Attribute, errorPage, and iserrorPage Attributes, isThreadSafe Attribute, extends Attribute, language Attribute, Including Files and Applets in JSP Pages using Java Beans components in JSP documents.JAR File, Manifest file, Working with Java Beans. Introspection, Customizers, Bean Properties: Simple properties, Design pattern events, Creating bound properties, Bean Methods, Bean info class, Persistence. **Annotations and JDBC:** Annotations: Built-in Annotations with examples, Custom Annotation. Talking to Database, Immediate Solutions, Essentials JDBC program, using prepared statement object, and Interactive SQL tool. JDBC in Action Result sets, Batch updates, Mapping, Basic JDBC data types, Advanced JDBC data types, immediate solutions EJB and Server Side Components Models **Introduction to EJB:** The Problem domain, Breakup responsibilities, Code Smart not hard, the Enterprise Java Beans specification, Components Types. Server Side Component Types: session Beans, MessageDriven Beans, Entity Beans, The Java Persistence Model. Container services: Dependency Injection, Concurrency, Instance pooling n caching, Transactions, security, Timers, Naming and object stores, Interoperability, Life Cycle Callbacks, Interceptors, platform integration. Developing your first EJB, Models: The Stateless Session Bean, The Stateful Session Bean, the Singleton Session Bean, Message-Driven Beans. EJB and Persistence. Persistence Entity Manager Mapping persistence objects, Entity Relationships

E. TEXT BOOKS:
T1. Marty Hall, Larry Brown Core Servlets and Java server pages. Vol 1: Core Technologies. 2nd Edition.
T2. Andrew Lee, Rubinger, Bill Burke, Java 6 Programming Black Book, Dreamtech press 2012
T3. Development Enterprise Java Components. Enterprise JavaBeans 3.1. O'reilly

F. REFERENCE BOOKS:
R1. Michel Siklora, EJB 3 Developer Guide, A Practical Guide For Developers And Architects to the Enterprise Java Beans Standard, Shroff Publishers and Distributers Private Limited
R2. Herbert Schildt, The Java Complete Reference, 8th Edition, Comprehensive coverage of the Java Language, Tata McGraw Hill Edition

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Apply the concept of Servlet and its life cycle to create web application	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Apply JSP tags and its services to web application.	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Create packages and interfaces in the web application context.	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Build Database connection for the web applications.	1	2	2	1	-	1	-	-	-	2	-	-
CO5	Develop enterprise applications using Java Beans concepts for the given problem.	3		1			2			3		2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Data Analytics using Python

Code: CSC33189
Credit - 4 | Semester III

A. Introduction: The objective of the course is to provide complete knowledge of Data Analytics from basic level. Students will be able to develop logical abilities, which will help them to create programs, applications using Python. The students will also develop an ability, which can easily help them switch to any other language inn future.

The main objectives of the course are as follows:

- Get knowledge about the basic concept of data analytics.
- Use of conditional statements and looping statements to solve problems associated with decision-making and repetitions.
- Concept of Inheritance & overloading.
- Concepts of learning and decision trees for a given problem.
- To make students familiar with Computer Programming like Functions &Exception handling.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Demonstrate basic data analytics principles and techniques

[CO.2]. Apply control structures to the given problems

[CO.3]. Apply the concepts of inheritance and overloading for a given problem.

[CO.4]. Demonstrate the concepts of learning and decision trees for a given problem.

[CO.5]. Demonstrate the concepts of neural networks and genetic algorithms for a given problem.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Python Basic Concepts and Programming: Interpreter – Program Execution – Statements – Expressions – Flow Controls – Functions - Numeric Types – Sequences - Strings, Parts of Python Programming Language, Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, The type( ) Function and Is Operator, Control Flow Statements, The if Decision Control Flow Statement, The if…else Decision Control Flow Statement, The if…elif…else Decision Control Statement, Nested if Statement, The while Loop, The for Loop, The continue and break Statements, Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments. **Python Collection Objects, Classes:** Strings- Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings, Lists-Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods. Sets, Tuples and Dictionaries. Files: reading and writing files. Class Definition – Constructors – Inheritance –Overloading **Data Pre-processing and Data Wrangling:** Acquiring Data with Python: Loading from CSV files, Accessing SQL databases. Cleansing Data with Python: Stripping out extraneous information, Normalizing data AND Formatting data. Combining and Merging Data Sets – Reshaping and Pivoting – Data Transformation – String Manipulation, RegularExpressions. **Web Scraping And Numerical Analysis:** Data Acquisition by Scraping web applications –Submitting a form - Fetching web pages – Downloading web pages through form submission – CSS Selectors. NumPy Essentials:The NumPy array, N-dimensional array operations and manipulations, Memory mapped files. **Data Visualization with NumPy Arrays, Matplotlib, and Seaborn:** Data Visualization: Matplotlib package – Plotting Graphs – Controlling Graph – Adding Text – More Graph Types – Getting and setting values – Patches. Advanced data visualization with Seaborn.- Time series analysis with Pandas.

E. TEXT BOOKS:
T1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016

T2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd.,2011.

T3. Jake Vander plas, "Python Data Science Handbook: Essential tools for working with data", O'Reilly Publishers, I Edition.

F. REFERENCE BOOKS:
R1. Mark Lutz, "Programming Python", O'Reilly Media, 4th edition,2010.

R2. Tim Hall and J-P Stacey, "Python 3 for Absolute Beginners", Apress, 1st edition,2009

R3. Magnus Lie Hetland, "Beginning Python: From Novice to Professional", Apress, Second Edition,2005.

R4. Shai Vaingast, "Beginning Python Visualization Crafting Visual Transformation Scripts", Apress, 2nd edition, 2014. 6. Wes Mc Kinney, "Python for Data Analysis", O'Reilly Media,2012

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Demonstrate basic data analytics principles and techniques	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Apply control structures to the given problems	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Apply the concepts of inheritance and overloading for a given problem.	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Demonstrate the concepts of learning and decision trees for a given problem.	1	2	2	1	-	1	-	-	-	2	-	-
CO5	Demonstrate the concepts of neural networks and genetic algorithms for a given problem	3		1			2			3		2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

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Subject: Internet of Things
Code: CSC33190
Credit - 4 | Semester III

A. Introduction: The objective of the course is to provide complete knowledge of IoT from basic level. Students will be able to develop logical abilities, which will help them to create programs, applications using IoT. The students will also develop an ability, which can easily help them switch to any other technology in future.

The main objectives of the course are as follows:

- Get knowledge about the basic concept of IoT.
- Use of conditional statements and looping statements to solve problems associated with decision-making and repetitions.
- Concept of Array (1D, and 2D) to deal with display on LCDs.
- To make students familiar with Computer Programming like Embedded C.
- To make students familiar with different IoT enabled Technologies.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Identify the use of IoT from a global context.

[CO.2]. Design application using IoT.

[CO.3]. Analyze the IoT enabling Technologies.

[CO.4]. Determine the real world problems and challenges in IoT.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

M2M to IoT : M2M to IoT – The Vision , Introduction: Machine to Machine (M2M) ,IoT From M2M to IoT, M2M towards IoT – the global context, Differing characteristics, M2M value chains, IoT value chains, An emerging industrial structure for IoT, The international-driven global value chain and global information monopolies, M2M to IoT – An Architectural Overview-,Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, Standards considerations. **IoT Architecture** – State of the Art – Introduction, Architecture Reference Model, Reference model and architecture, IoT reference model, IoT Reference Architecture, Functional view, Information view, Deployment and operational view, Other relevant architectural views. **IoT Enabling Technologies** -- Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems. **Open – Source Prototyping Platforms for IoT**- Basic Arduino Programming, Extended Arduino Libraries, Arduino – Based Internet Communication, Raspberry PI, Sensors and Interfacing. **Business Process in IoT**: IoT Analytics, Creative Thinking Techniques, Modification, Combination Scenarios, Decentralized and Interoperable, Approaches, Object – Information Distribution, Architecture, Object Naming Service (ONS), Service Oriented Architecture, Network of Information, Etc.

E. TEXT BOOKS:
T1. From Machine-to-Machine to the Internet of Things: Introduction to a New Ageof Intelligence, Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle, Academic Press

T2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT,2014

F. REFERENCE BOOKS:
R1. The Internet of Things: Connecting Objects by Hakima Chaouchi

R2. Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications,2013

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Identify the use of IoT from a global context.	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Design application using IoT.	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Analyze the IoT enabling Technologies	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Determine the real world problems and challenges in IoT	1	2	2	1	-	1	-	-	-	2	-	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Design & Analysis of Algorithms
Code: CSC33191
Credit - 4 | Semester III

A. Introduction: The objective of the course is to provide complete knowledge of algorithms from basic level. Students will be able to develop logical abilities, which will help them to create programs, applications using analysis of algorithm. The students will also develop an ability, which can easily help them switch to any other language in future.

The main objectives of the course are as follows:

- Get knowledge about the basic concept of algorithm.
- To make students capable to develop Algorithms using iterative/recursive approach.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Categorize problems based on their characteristics and practical importance.

[CO.2]. Develop Algorithms using iterative/recursive approach.

[CO.3]. Design algorithm using an appropriate design paradigm for solving a given problem.

[CO.4]. Classify problems as P, NP or NP Complete.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Algorithms: Analyzing algorithms, order arithmetic, Time and space complexity of an algorithm, comparing the performance of different algorithms for the same problem. Different orders of growth. Asymptotic notation. Polynomial vs. Exponential running time. Principles of Algorithm Design. Mathematical analysis of Recursive and Non-recursive algorithms. **Basic Algorithm Design**

Techniques: Divide-and-conquer, Greedy approach, Randomization and dynamic programming. **Example problems on Backtracking:** n-Queens problem, Hamiltonian Circuit Problem, Subset – Sum Problem. Branch-and- Bound: Assignment Problem, Knapsack Problem, Traveling Salesperson Problem. **Sorting and searching:** Insertion and selection sort, Binary search in an ordered array. Sorting algorithms such as Merge sort, Quick sort, Heap sort, Radix Sort, and Bubble sort with analysis of their running times. Lower bound on sorting. Exhaustive search and String Matching. **Graphs and NP-completeness:** Graph traversal: Breadth-First Search (BFS) and Depth-First Search (DFS). Applications of BFS and DFS. Shortest paths in graphs: Dijkstra algorithm. Definition of class NP, P, NP- hard and NP-complete problems.

E. TEXT BOOKS:
T1. Horowitz E., Sahani S., Rajasekharan S.: Computer Algorithms, Galgotia Publication
T2. A.V.Aho, J.E.Hopcroft, and J.D.Ullman, The Design and Analysis of Computer Algorithms, Pearson Education India.
T3 J.Kleinberg and E.Tardos, Algorithm Design by, Pearson Education India
T4 CoremenT.H.,Leiserson C.E.,and Rivest R. L.: Introduction to Algorithms, PHI

F. REFERENCE BOOKS:
R1. Anany Levitin: Introduction to the Design and Analysis of Algorithms, Pearson Education, 2nd Edition
R2. Michael T Goodrich and Roberto Tamassia : Algorithm Design, Wiley India

R3. R C T Lee, S S Tseng, R C Chang, Y T Tsai : Introduction to Design and Analysis of Algorithms: A Strategic Approach, Tata McGraw Hill

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Categorize problems based on their characteristics and practical importance	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Develop Algorithms using iterative/recursive approach	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Design algorithm using an appropriate design paradigm for solving a given problem	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Classify problems as P, NP or NP Complete.	1	2	2	1	-	1	-	-	-	2	-	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Elective-II

Subject: Block Chain Technology
Code: CSC33192
Credit - 4 | Semester III

A. Introduction: Decentralized block chain-based systems, such as Bitcoin and Ethereum, are successful beyond all expectations. Although still in their infancy, they promise to revolutionize how we think of financial, information, and other infrastructures. This course covers the technical aspects of public distributed ledgers, block chain systems, cryptocurrencies, and smart contracts. Students will learn how these systems are built, how to interact with them, how to design and build secure distributed applications.

B. Course Outcomes : At the end of the course, students will be able to:

[CO1]: Demonstrate the basics of Block chain concepts using modern tools/technologies.
[CO2]: Analyze the role of block chain applications in different domains including cyber security.
[CO3]: Evaluate the usage of Block chain implementation/features for the given problem.
[CO4]: Exemplify the usage of bitcoins and its impact on the economy.
[CO5]: Analyze the application of specific block chain architecture for a given problem

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

D. SYLLABUS

Introduction to Blockchain, How Blockchain works, Blockchain vs Bitcoin, Practical applications, public and private key basics, pros and cons of Blockchain, Myths about Bitcoin. Blockchain: Architecture, versions, variants, use cases, Life use cases of blockchain, Blockchain vs shared Database, Introduction to cryptocurrencies, Types, Applications. Concept of Double Spending, Hashing, Mining, Proof of work. Introduction to Merkel tree, Privacy, payment verification, Resolving Conflicts, Creation of Blocks. Introduction to Bitcoin, key concepts of Bitcoin, Merits and De Merits Fork and Segwits, Sending and Receiving bitcoins, choosing bitcoin wallet, Converting Bitcoins to Fiat Currency. Introduction to Ethereum, Advantages and Disadvantages, Ethereum vs Bitcoin, Introduction to Smart contracts, usage, application, working principle, Law and Regulations. Case Study.

E. TEXT BOOKS:
  T1. Beginning Blockchain: A Beginner's Guide to Building Blockchain Solutions by Arshdeep
       Bikramaditya Signal, Gautam Dhameja (Priyansu Sekhar Panda., APress.
  T2. Blockchain Applications: A Hands-On Approach by Bahga, Vijay Madisetti
  T3. Blockchain by Melanie Swan, OReilly

F. REFERENCE BOOKS:
  R1. Bitcoin and Cryptocurrency Technologies by Aravind Narayan. Joseph Bonneau, princton
  R2. Bitcoin and Blockchain Basics: A non-technical introduction for beginners by Arthu.T
       Books.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Demonstrate the basics of Block chain concepts using modern tools/technologies.	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Analyze the role of block chain applications in different domains including cyber security.	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Evaluate the usage of Block chain implementation/features for the given problem.	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Demonstrate the Exception handling and Exemplify the usage of bitcoins and its impact on the economy.	3		1			2			3		2	
CO5	Analyze the application of specific block chain architecture for a given problem	1				3		1	2		2		3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: CLOUD COMPUTING

Code: CSC33193
Credit - 4 | Semester III

A. Introduction: Cloud computing has become a great solution for providing a flexible, on-demand, and dynamically scalable computing infrastructure for many applications. Cloud computing presents a significant technology trend. The course aims at familiarizing with the basic concepts of cloud computing and its applications.

B. Course Outcomes : At the end of the course, students will be able to:

[CO1]: Understand the common terms and definitions of virtualization and cloud computing and be able to give examples.

[CO2]: Comprehend the technical capabilities and business benefits of virtualization and cloud computing.

[CO3]: Describe the landscape of different types of virtualization and understand the different types of clouds.

[CO4]: Illustrate how key application features can be delivered more easily on virtual infrastructures.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

CLOUD COMPUTING BASICS: Cloud computing Definition, Types of cloud, Cloud services: Benefits and challenges of cloud computing, Evolution of Cloud Computing, Applications cloud computing, Business models around Cloud, Major Players in Cloud Computing, Issues in Cloud - Eucalyptus - Nimbus - Open Nebula, CloudSim. **CLOUD MODELS:** Cluster Computing, Grid Computing, Grid Computing Versus Cloud Computing, Key Characteristics of Cloud Computing. Cloud Models: Benefits of Cloud Models, Public Cloud, Private Cloud, Hybrid Cloud, Community Cloud, Shared Private Cloud, Dedicated Private Cloud, and Dynamic Private Cloud. **CLOUD SERVICES AND FILE SYSTEM:** Types of Cloud services: Software as a Service, Platform as a Service – Infrastructure as a Service, Database as a Service, Monitoring as a Service, Communication as services. Service providers- Google App Engine, Amazon

EC2, Microsoft Azure, Sales force. **VIRTUALIZATION:** Basics of Virtualization, Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtual Clusters and Resource management, Virtualization for Data-center Automation, Introduction to MapReduce, GFS, HDFS, Hadoop, Framework. **SECURITY IN THE CLOUD:** Security Overview, Cloud Security Challenges and Risks. Software-as-a-Service Security, Security Monitoring, Security Architecture Design, Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control, Autonomic Security

E. TEXT BOOKS:
T1. Cloud Computing "A Practical Approach", Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, McGraw-Hill.
T2. "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Morgan Kaufmann Publishers, 2012.

F. REFERENCE BOOKS:
R1. "Cloud Computing: Implementation, Management, and Security", John W.Rittinghouse and James F.Ransome, CRC Press, 2010.
R2. "Cloud Computing, A Practical Approach", Toby Velte, Anthony Velte, Robert Elsenpeter, TMH, 2009.
R3. " Cloud Computing – insights into New -Era Infrastructure", Kumar Saurabh, Wiley India,2011.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Understand the common terms and definitions of virtualization, cloud computing, and be able to give examples.	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Comprehend the technical capabilities and business benefits of virtualization and cloud computing.	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Describe the landscape of different types of virtualization and understand the different types of clouds.	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Illustrate how key application features can be delivered more easily on virtual infrastructures.	1	2	2	1	-	1	-	-	-	2	-	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: DIGITAL MARKETING
Code: CSC33194
Credit - 4 | Semester III

A. Introduction: The primary objective of this module is to examine and explore the role and importance of digital marketing in today's rapidly changing business environment. It also focuses on how digital marketing can be utilized by organizations and how its effectiveness can measured.

B. Course Outcomes : At the end of the course, students will be able to:

[CO1]: Demonstrate the key concepts related to e-marketing for the given case.
[CO2]: Demonstrate the use of different electronic media for designing marketing activities.
[CO3]: Analyze the role of search engine in improving digital marketing.
[CO4]: Analyze role of social media marketing for the given problem
[CO5]: Analyze technical solutions to overcome social media threats

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

D. SYLLABUS

CLOUD COMPUTING BASICS: Cloud computing Definition, Types of cloud, Cloud services: Benefits and challenges of cloud computing, Evolution of Cloud Computing, Applications cloud computing, Business models around Cloud, Major Players in Cloud Computing, Issues in Cloud - Eucalyptus - Nimbus - Open Nebula, CloudSim. **CLOUD MODELS:** Cluster Computing, Grid Computing, Grid Computing Versus Cloud Computing, Key Characteristics of Cloud Computing. Cloud Models: Benefits of Cloud Models, Public Cloud, Private Cloud, Hybrid Cloud, Community Cloud, Shared Private Cloud, Dedicated Private Cloud, and Dynamic Private Cloud. **CLOUD SERVICES AND FILE SYSTEM:** Types of Cloud services: Software as a Service, Platform as a Service – Infrastructure as a Service, Database as a Service, Monitoring as a Service,

Communication as services. Service providers- Google App Engine, Amazon EC2, Microsoft Azure, Sales force. **VIRTUALIZATION:** Basics of Virtualization, Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtual Clusters and Resource management, Virtualization for Data-center Automation, Introduction to MapReduce, GFS, HDFS, Hadoop, Framework. **SECURITY IN THE CLOUD:** Security Overview, Cloud Security Challenges and Risks. Software-as-a-Service Security, Security Monitoring, Security Architecture Design, Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control, Autonomic Security

E. TEXT BOOKS:
T1. Cloud Computing "A Practical Approach", Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, McGraw-Hill.
T2. "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Morgan Kaufmann Publishers, 2012.

F. REFERENCE BOOKS:
R1. "Cloud Computing: Implementation, Management, and Security", John W.Rittinghouse and James F.Ransome, CRC Press, 2010.
R2. "Cloud Computing, A Practical Approach", Toby Velte, Anthony Velte, Robert Elsenpeter, TMH, 2009.
R3. " Cloud Computing – insights into New -Era Infrastructure", Kumar Saurabh, Wiley India,2011.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Demonstrate the key concepts related to e-marketing for the given case.	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Demonstrate the use of different electronic media for designing marketing activities.	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Analyze the role of search engine in improving digital marketing.	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Analyze role of social media marketing for the given problem	1	2	2	1	-	1	-	-	-	2	-	-
CO5	Analyze technical solutions to overcome social media threats.	3		1			2			3		2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: SOFTWARE TESTING

Code: CSC33195
Credit - 4 | Semester III

A. Introduction: The primary objective of this module is to study fundamental concepts in software testing. It discusses various software testing issues and solutions in software unit test, integration and system testing. It also exposes the advanced software testing topics, such as object-oriented software testing methods.

B. Course Outcomes : At the end of the course, students will be able to:

[CO1]: Acquire knowledge of basic principles and knowledge of software testing and debugging and test cases.

[CO2]: Will be able to understand the perceptions on testing like levels of testing, generalized pseudo code and with related examples.

[CO3]: To study the various types of testing.

[CO4]: Differentiate between functional testing and structural testing.

[CO5]: Analyze the performance of fault based testing, planning and Monitoring the process, documentation testing.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

D. SYLLABUS

Basics of Software Testing, Basic Principles, Test case selection and Adequacy: Humans, Errors and Testing, Software Quality; Requirements, Behavior and Correctness, Correctness Vs Reliability; Testing and Debugging; Test Metrics; Software and Hardware Testing; Testing and Verification; Defect Management; Execution History; Test Generation Strategies; Static Testing; Test Generation from Predicates. Sensitivity, Redundancy, Restriction, Partition, Visibility and Feedback, Test Specification and cases, Adequacy Criteria, Comparing Criteria. **A perspective on Testing:** Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Level of testing, Examples: Generalized pseudo code, The triangle problem, the Next Date function, The commission problem, The SATM (Simple Automation Teller Machine) problem, The currency converter, Saturn windshield wiper. **Boundary value testing, Equivalence class testing, Decision table based testing:** Boundary value analysis, Robustness testing, Worst-case testing, special value testing, Examples,

Random testing, Equivalence classes, Equivalence test cases for triangle problem, Next Date function and commission problem, Guidelines and observations, Decision tables, Test cases for triangle problem. **Path Testing, Data flow testing, Levels of Testing, Integration Testing:** DD Paths, Test coverage metrics, Basis path testing, guidelines and observations, Definition Use testing, Slice based testing, Guidelines and observations. Traditional view of testing levels, Alternative life cycle models, the SATM systems, separating integration and system testing, Guidelines and observations. **Fault Based Testing, Planning and Monitoring the Process, Documenting Analysis and Test:** Assumptions in fault-based testing, Mutation Analysis, Fault-based Adequacy Criteria; Variations on mutation Analysis; From Test case specification to Test Cases, Scaffolding, Generic vs. specific Scaffolding, Test Oracles, Self checks as oracles, Capture and Replay. Quality and Process, Test and Analysis strategies and plans, Risk Planning, Monitoring the Process, Improving the process, The quality team, Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports

E. TEXT BOOKS:
T1. Adithya P.Mathur " Foundations of Software Testing – Fundamental Algorithms and Techniques", Pearson Education India, 2011
T2. Mauro Pezze, Michael Young, Software testing and Analysis- Process, Principles and Techniques, Wiley India, 2012
T3. Paul C Jorgensen, "Software Testing A Craftsman's Approach", Auerbach publications, 3rd Edition, 2011.   .

F. REFERENCE BOOKS:
R1. KshirasagaraNaik, PriyadarshiTripathy: Software Testing and Quality Assurance, Wiley India 2012
R2. M.G.Limaye: Software Testing-Principles, Techniques and Tools – McGraw Hill, 2009

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Acquire knowledge of basic principles and knowledge of software testing and debugging and test cases.	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Will be able to understand the perceptions on testing like levels of testing, generalized pseudo code and with related examples.	2	2	2	2	-	2	-	-	-	2	1	-
CO3	To study the various types of testing.	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Differentiate between functional testing and structural testing.	1	2	2	1	-	1	-	-	-	2	-	-
CO5	Analyze the performance of fault based testing, planning and Monitoring the process, Documentation testing.	3		1			2			3		2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: NOSQL
Code: CSC33196
Credit - 4 | Semester III

A. Introduction: The primary objective of this module is to summarize and document the information in a simple, concise, and effective way for learning. It focuses on the information in an interesting manner to encourage learning. It also provides the opportunity to learn about different NoSQL databases and their strengths/weaknesses. It allow students to practice their development skills.

B. Course Outcomes: At the end of the course, students will be able to:

[CO1]: Demonstrate the concepts of unstructured data.
[CO2]: Analyse and Manage the Data using CRUD operations
[CO3]: Develop the applications using NoSQL.
[CO4]: Realize the concept of Map Reduce its applicability in the real world application development.
[CO5]: Analyze the framework of NOSQL.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Introduction to NoSQL, Definition of NoSQL, History of NoSQL and Different NoSQL products. Exploring NoSQL. Exploring Mongo DB Java/Ruby/Python, Interfacing and Interacting with NoSQL. NoSQL Basics: NoSQL Storage Architecture, CRUD operations with Mongo DB, Querying, Modifying and Managing. Data Storage in NoSQL: NoSQL Data Stores, Indexing and ordering datasets (MongoDB/CouchDB/Cassandra). Advanced NoSQL, NoSQL in Cloud, Parallel Processing with Map Reduce, Big Data with Hive. Working with NoSQL, Surveying Database Internals, Migrating from RDBMS to NoSQL, Web Frameworks and NoSQL, using MySQL as a NoSQL. Developing Web Application with NOSQL and NOSQL Administration Php and MongoDB, Python and MongoDB, Creating Blog Application with PHP.

E. TEXT BOOKS:

T1. "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", P. J. Sadalage
and M. Fowler, Pearson Education, Inc. 2012.
T2. NoSQL For Dummies, 2015 by John Wiley & Sons, Inc
T3. Professional NoSQL, Shashank Tiwari, Wrox

F. REFERENCE BOOKS:

R1. "HBase: The Definitive Guide", Lars George, O'Reilley, 2011.
R2. "Cassandra: The Definitive Guide", Eben Hewitt, O'Reilley, 2010.
R3. "MongoDB: The Definitive Guide" by Kristina Chodorow
R4. "Programming Hive", E. Capriolo, D. Wampler, and J. Rutherglen, O'Reilley, 2012.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Demonstrate the concepts of unstructured data.	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Analyse and Manage the Data using CRUD operations	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Develop the applications using NoSQL.	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Realize the concept of Map Reduce its applicability in the real world application development**.**	1	2	2	1	-	1	-	-	-	2	-	-
CO5	Analyze the framework of NOSQL.	3		1			2			3		2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Advanced Java Lab
Code: CSC33197
Credit - 4 | Semester III

A. Introduction: This Course aims at helping learners to get knowledge about Java programming, can know EJB application that demonstrates Session Bean, implement JSP Program, use of JAVA Servlet program to track Http Session.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Apply the concept of Servlet and its life cycle to create web application.

[CO.2]. Apply JSP tags and its services to web application.

[CO.3]. Create packages and interfaces in the web application context.

[CO.4]. Build Database connection for the web applications.

[CO.5]. Design and develop an application for the given problem

[CO.6]. Develop application programs using beans concept.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	10
	Assignment	2.5
	Attendance	2.5
End Term Exam (Summative)	End Term Examination	35
	Total	50
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

D. SYLLABUS

List of Practicals:
1. Write a JAVA Servlet Program to implement a dynamic HTML using Servlet (username and Password should be accepted using HTML and displayed using a Servlet).
2. Write a JAVA Servlet Program to Auto Web Page Refresh (Consider a webpage which is displaying Date and time or stock market status. For all such type of pages, you would need to refresh your web page regularly; Java Servlet makes this job easy by providing refresh automatically after a given interval).

3. Write a JAVA Servlet Program to implement and demonstrate GET and POST methods (Using HTTP Servlet Class).
4. Write a JAVA Servlet Program using cookies to remember user preferences.
5. Write a JAVA Servlet program to track HttpSession by accepting user name and password using HTML and display the profile page on successful login.
6. Write a JSP Program which uses jsp:include and jsp:forward action to display a Webpage.
7.Write a JSP Program which uses tag to run an applet
8.Write a 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
9. Write a JSP program to implement all the attributes of page directive tag.
10. Write a JAVA Program to insert data into Student DATA BASE and retrieve info based on particular queries (For example update, delete, search etc…).
11. An EJB application that demonstrates Session Bean (with appropriate business logic).
12. An EJB application that demonstrates MDB (with appropriate business logic).
13. An EJB application that demonstrates persistence (with appropriate business logic).

E. TEXT BOOKS:
T1. Marty Hall, Larry Brown Core Servlets and Java server pages. Vol 1: Core Technologies. 2nd Edition.
T2. Andrew Lee, Rubinger, Bill Burke, Java 6 Programming Black Book, Dreamtech press 2012
T3. Development Enterprise Java Components. Enterprise JavaBeans 3.1. O'reilly

F. REFERENCE BOOKS:
R1. Michel Siklora, EJB 3 Developer Guide, A Practical Guide For Developers And Architects to the Enterprise Java Beans Standard, Shroff Publishers and Distributers Private Limited
R2. Herbert Schildt, The Java Complete Reference, 8th Edition, Comprehensive coverage of the Java Language, Tata McGraw Hill Edition

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Apply the concept of Servlet and its life cycle to create web application	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Apply JSP tags and its services to web application	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Create packages and interfaces in the web application context	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Build Database connection for the web applications	1	2	2	1	-	1	-	-	-	2	-	-
CO5	Design and develop an application for the given problem	3		1			2			3		2	
CO6	Develop application programs using beans concept.	1				3		1	2		2		3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Data Analytics Lab
Code: CSC33198
Credit - 4 | Semester III

A. **Introduction:** This Course aims at helping learners to get knowledge about python programming, can demonstrate object-oriented principles, implement a python program to demonstrate Data visualization, use of Python program to demonstrate the generation of linear regression models.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Develop python program to perform search/sort on a given data set

[CO.2]. Demonstrate object-oriented principles

[CO.3]. Demonstrate data visualization using NumPy for a given problem

[CO.4]. Demonstrate regression model for a given problem

[CO.5]. Design and develop an application for the given problem

[CO.6]. Control a light source using web page.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	10
	Assignment	2.5
	Attendance	2.5
End Term Exam (Summative)	End Term Examination	35
	Total	50
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

List of Practicals:
1.Write a Python program to perform linear search
2.Write a Python program to insert an element into a sorted list
3.Write a python program using object oriented programming to demonstrate encapsulation, overloading and inheritance
4.Implement a python program to demonstrate 1) Importing Datasets 2) Cleaning the Data 3) Data frame manipulation using Numpy
5.Implement a python program to demonstrate the following using NumPy a) Array manipulation, Searching, Sorting and splitting. b) broadcasting and Plotting NumPy arrays
6. Implement a python program to demonstrate Data visualization with various Types of Graphs using Numpy
7.Write a Python program that creates a mxn integer arrayand Prints its attributes using matplotlib
8. Write a Python program to demonstrate the generation of linear regression models.
9. Write a Python program to demonstrate the generation of logistic regression models using Python.
10. Write a Python program to demonstrate Timeseries analysis with Pandas.
11. Write a Python program to demonstrate Data Visualization using Seaborn.
Students shall carry out a mini project using python/pandas to demonstrate the data analysis. A team shall consist not more than 2 candidates

E. TEXT BOOKS:

T1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016

T2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd.,2011.

T3. Jake Vander plas, "Python Data Science Handbook: Essential tools for working with data", O'Reilly Publishers, I Edition.

F. REFERENCE BOOKS:

R1. Mark Lutz, "Programming Python", O'Reilly Media, 4th edition,2010.

R2. Tim Hall and J-P Stacey, "Python 3 for Absolute Beginners", Apress, 1st edition,2009

R3. Magnus Lie Hetland, "Beginning Python: From Novice to Professional", Apress,   Second Edition,2005.

R4. Shai Vaingast, "Beginning Python Visualization Crafting Visual Transformation Scripts", Apress, 2nd edition, 2014. 6. Wes Mc Kinney, "Python for Data Analysis", O'Reilly Media,2012

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Develop python program to perform search/sort on a given data set	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Demonstrate object-oriented principles	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Demonstrate data visualization using NumPy for a given problem	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Demonstrate regression model for a given problem	1	2	2	1	-	1	-	-	-	2	-	-
CO5	Design and develop an application for the given problem	3		1			2			3		2	
CO6	Control a light source using web page	1				3		1	2		2		3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: IoT Lab with Mini Project
Code: CSC33199
Credit - 2 | Semester III

A. Introduction: This Course aims at helping learners to get input from two switches and switch on corresponding LEDs, Access an image through a Pi web cam, Get the status of a bulb at a remote place (on the LAN) through web, Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Demonstrate the IoT architecture and design for a given problem

[CO.2]. Apply IOT architecture for a given problem

[CO.3]. Analyze the application protocol, transport layer methods for the given business case.

[CO.4]. Design and develop an application for the given problem

[CO.5]. Develop python program for the given problem and verify the output

[CO.6]. Control a light source using web page.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	10
	Assignment	2.5
	Attendance	2.5
End Term Exam (Summative)	End Term Examination	35
	Total	50
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

1.Run some python programs on Pi like:
   Read your name and print Hello message with name
   Read two numbers and print their sum, difference, product and division.
   Word and character count of a given string
   Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values
   from standard input
   Print a name 'n' times, where name and n are read from standard input
   Using for and while loops.
   Handle Divided by Zero Exception.
   Print current time for 10 times with an interval of 10 seconds.
   Read a file line by line and print the word count of each line.

2. Get input from two switches and switch on corresponding LEDs
3. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
4. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.
5. Access an image through a Pi web cam
6. Control a light source using web page.
7. Implement an intruder system that sends an alert to the given email.
8. Get the status of a bulb at a remote place (on the LAN) through web.
9. Get an alarm from a remote area (through LAN) if smoke is detected. The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.
Candidate shall demonstrate a mini project in a team not more than two candidates.

E. TEXT BOOKS:

T1. From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle, Academic Press

T2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT,2014

F. REFERENCE BOOKS:

R1. The Internet of Things: Connecting Objects by Hakima Chaouchi

R2. Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications,2013

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Demonstrate the IoT architecture and design for a given problem	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Apply IOT architecture for a given problem	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Analyze the application protocol, transport layer methods for the given business case.	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Design and develop an application for the given problem	1	2	2	1	-	1	-	-	-	2	-	-
CO5	Develop python program for the given problem and verify the output	3		1			2			3		2	
CO6	Control a light source using web page.	1				3		1	2		2		3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Syllabus of
Master of Computer Applications
Semester-IV

ARKA JAIN University, Jharkhand
School of Engineering & Information Technology
Department of Computer Science & Information Technology
Faculty – MCA
Scheme of Study (w.e.f Batch 2020)

SEMESTER -I

Sl. No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA *	Attendance
1	Basics of Programming Languages	PCC	4	4	100	70	20	5	5
2	Discrete Mathematics	PCC	4	4	100	70	20	5	5
3	Operating System with Linux	PCC	4	4	100	70	20	5	5
4	Object Oriented Programming with Java	PCC	4	4	100	70	20	5	5
5	Research Methodology & IPR	PCC	4	4	100	70	20	5	5
6	Professional Communication	SDA	4	4	100	70	20	5	5
	Practical								
7	Programming Language Lab	PCC	2	4	50	35	10	2.5	2.5
8	Linux Lab	PCC	2	4	50	35	10	2.5	2.5
9	Java Lab	PCC	2	4	50	35	10	2.5	2.5
	Total		**30**	**36**	**750**	**525**	**150**	**37.5**	**37.5**

SEMESTER –II

Sl. No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA *	Attendance
1	Data Structures	PCC	4	4	100	70	20	5	5
2	Computer Networks	PCC	4	4	100	70	20	5	5
3	Web Technologies	PCC	4	4	100	70	20	5	5
4	Database Management System	PCC	4	4	100	70	20	5	5
5	Software Engineering	PCC	4	4	100	70	20	5	5
6	Elective I	PEC	4	4	100	70	20	5	5
	Practical								
7	Data Structures Lab	PCC	2	4	50	35	10	2.5	2.5
8	Web Technologies Lab	PCC	2	4	50	35	10	2.5	2.5
9	DBMS Lab with Mini Project	PCC	2	4	50	35	10	2.5	2.5
	Total		**30**	**36**	**750**	**525**	**150**	**37.5**	**37.5**

SEMESTER –III

Sl. No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA *	Attendance
1	Advanced Java	PCC	4	4	100	70	20	5	5
2	Data Analytics using Python	PCC	4	4	100	70	20	5	5
3	Internet of Things	PCC	4	4	100	70	20	5	5
4	Design & Analysis of Algorithms	PCC	4	4	100	70	20	5	5
5	Elective II	PEC	4	4	100	70	20	5	5
	Practical								
7	Advanced Java Lab	PCC	2	4	50	35	10	2.5	2.5
8	Data Analytics Lab	PCC	2	4	50	35	10	2.5	2.5
9	IoT Lab with Mini Project	PCC	2	4	50	35	10	2.5	2.5
	Total		**26**	**32**	**650**	**455**	**130**	**32.5**	**32.5**

SEMESTER –IV

Sl. No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA *	Attendance
1	Mobile Application Programming	PCC	4	4	100	70	20	5	5
2	Elective III	PEC	4	4	100	70	20	5	5
	Practical								
3	Mobile Application Programming Lab	PCC	2	4	50	35	10	2.5	2.5
4	Project	PCC	16		300	200	100	0	0
	Total		**26**	**12**	**550**	**405**	**120**	**12.5**	**12.5**

Professional Elective Course (PEC)

Elective-I
(Select any ONE)
Cyber Security
Data Mining and Business Intelligence
Enterprise Resource Planning
Artificial Intelligence
Natural Language Processing

Elective-II
(Select any ONE)
Block Chain Technology
Cloud Computing
Digital Marketing
Software Testing
NOSQL

Elective-III
(Select any ONE)
Deep Learning
Big Data Analytics
Programming using C#
Software Project Management
Software Defined Networks

Distribution of Credit across 4 semesters:

Sl. No	Type of Paper	No. of Paper	Total Credit
1	Professional Core Course Paper	26	96
2	Professional Elective Course Paper	3	12
3	Skill Development Activities Paper	1	4
	Total	30	112

*CIA – Continuous Internal Assessment – Based on Projects / Assignment during the semester
PCC: Professional Core Course
PEC: Professional Elective Course
SDA: Skill Development Activities

ARKA JAIN University, Jharkhand
School of Engineering & Information Technology
Department of Computer Science & Information Technology
PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES
MCA – Semester–IV

PROGRAMME EDUCATIONAL OBJECTIVES

[PEO.1]. To prepare post graduates with a professional skills in computer applications to cater the needs of industry, academia, government, entrepreneurship and consultancy abilities

[PEO.2]. To prepare post graduates to adapt themselves to ever changing IT requirements and need through self-learning techniques

[PEO.3]. To prepare post graduates to contribute to society as proven technologists

[PEO.4]. To prepare post graduates to succeed in industry / technical profession by applying current and innovative engineering technologies by lifelong learning.

PROGRAM OUTCOMES

After completing this post graduate program, a learner:

[PO.1]. Apply knowledge of computing specialization, mathematics and domain knowledge in solving computational problems

[PO.2]. Identify, understand, analyze and solve IT problems using knowledge, skills and expertise in different programming languages and tools

[PO.3]. An ability to design, develop and evaluate software solutions to meet social and environmental concerns

[PO.4]. Select and apply the techniques, skills, and modern Software tools for software development.

[PO.5]. Identify and analyze software application problems in multiple aspect including coding, testing and implementation in industrial applications.

[PO.6]. Ability to practice and follow professional ethics and cyber regulations

[PO.7]. Design, develop and verify software systems to meet desired needs within realistic constraints ensuring quality, reliability, security in addition to satisfying economical, ethical, social and environmental constraints.

[PO.8]. Apply Enterprise level application software for design of diverse software products.

[PO.9]. Communicate effectively in diverse groups and exhibit leadership qualities.

[PO.10]. Understanding of professional and ethical responsibility.

[PO.11]. Ability to work collaboratively as a member or leader in multidisciplinary teams.

[PO.12]. Identify potential business opportunities and innovate to create value to the society and seize that opportunity

Subject: MOBILE APPLICATION PROGRAMMING
Code: CSC34200
Credit - 4 | Semester IV

A. Introduction: This Course aims at helping learners create mobile applications using Google & Android open-source platform. It explains the entire Android Applications Development Life Cycle. It also explains the essential features, as well as the advanced capabilities and APIs such as background services, graphics, and GPS. It helps students to apply advanced android development techniques.

 The main objectives of the course are as follows:

- Understand and demonstrate Android activities life cycle.
- Apply proficiency in coding on a mobile programming platform.
- Design and develop innovative android applications.
- Create real life application with end-to-end understanding of User experience practices.

B. Course Outcomes: At the end of the course, students will be able to:

 [CO.1]. Create mobile applications using Google & Android open-source platform

 [CO.2]. Apply advanced android development techniques

 [CO.3]. Can work with GPS, wi-fi.

 [CO.4]. Create animations with android's graphics API

 [CO.5]. Can understand Android database connectivity using SQLite

 [CO.6]. Can understand SQLite Programming

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

INTRODUCTION TO ANDROID & USER INTERFACES: Brief History of Embedded Device Programming, Introduction to Android, The android platform, the layers of android, Four kinds of android components, understanding the androidManifest.xml file, Creating an Android Application, Introduction to android SDK, Exploring the development environment, Creating the activity ,Working with views, Working with intents and services ,Different types of layouts, components. **STORING AND RETRIEVING DATA:** Using the file system, working with shared preferences, persisting data to a database, Working with content providers**. GRAPHICS AND ANIMATION, MULTIMEDIA, LOCATION, SENSORS:** Drawing graphics in android, creating animations with android's graphics API, playing audio & video, capturing media, Using Location Manager and Location Provider, working with maps, working with GPS, Bluetooth and Wi-Fi, Integrating google maps, services for push notification Googleads. **LOCATION BASED SERVICES AND MESSAGING:** Displaying Maps, Getting Location Data Monitoring a Location. Hands on project: Building a Location Tracker. SMS Messaging, Sending E-mail. **DATABASE CONNECTIVITY AND DISTRIBUTING ANDROID APPLICATION:** SQLite Programming, Android database connectivity using SQLite, Distribution options, Packaging and testing the application, distributing applications on google play store.

E. TEXT BOOKS:
T1. "Android in action, Third Edition". W. Frank Ableson, Robi Sen, Chris King, C. Enrique Ortiz, Dreamtech Press.
T2. "Beginning android 4 application Development", Wei-Meng Lee, John Wiley & sons, Inc

F. REFERENCE BOOKS:
R1. "Hello, Android - Introducing Google's Mobile Development Platform", Third Edition, Ed Burnette, SPD Publications.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Create mobile applications using Google & Android open-source platform	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Apply advanced android development techniques.	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Can work with GPS, wi-fi.	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Create animations with android's graphics API	1	2	2	1	-	1	-	-	-	2	-	-
CO5	Can understand Android database connectivity using SQLite	3		1			2			3		2	
CO6	Can understand SQLite Programming	1				3		1	2		2		3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: DEEP LEARNING

Code: CSC34201

Credit - 4 | Semester IV

A. Introduction: The objective of the course is to provide complete knowledge of Deep Learning. Deep learning is a class of machine learning algorithms, which enables computers to learn from examples. Deep learning techniques have been used successfully for variety of applications, including: automatic speech recognition, image recognition, natural language processing, drug discovery, and recommendation systems.

The main objectives of the course are as follows:
- To understand the fundamentals of deep learning
- To know the main techniques in deep learning and the main research in this field
- Be able to design and implement deep neural network systems
- Be able to identify new application requirements in the field of computer vision.
- Be able to identify reasonable work goals and estimate the resources required to achieve the objectives
- Be able to structure and prepare scientific and technical documentation describing project activities
- Be able to autonomously extend the knowledge acquired during the study course by reading and understanding scientific and technical documentation

B. Course Outcomes: at the end of the course, students will be able to:

[CO.1]. Demonstrate the basics of deep learning for a given context.

[CO.2]. Implement various deep learning models for the given problem

[CO.3]. Realign high dimensional data using reduction techniques for the given problem

[CO.4]. Analyze optimization and generalization techniques of deep learning for the given problem.

[CO.5]. Evaluate the given deep learning application and enhance by applying latest techniques.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Introduction to machine learning- Linear models (SVMs and Perceptron's, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates DEEP NETWORKS : History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets- Deep Vs Shallow Networks Convolutional Networks- Generative Adversarial Networks (GAN), Semi- supervised Learning DIMENTIONALITY REDUCTION : Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization OPTIMIZATION AND GENERALIZATION Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience CASE STUDY AND APPLICATIONS Imagenet- Detection-Audio Wave Net-Natural Language Processing Word2Vec - Joint Detection BioInformatics- Face Recognition- Scene Understanding- Gathering Image Captions

E. TEXT BOOKS:

T1. Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.

F. REFERENCE BOOKS:

R1. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.

R2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.

R3. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Demonstrate the basics of deep learning for a given context.	2	3	2	3	3	2	2	-	-	2	1	-
CO2	Implement various deep learning models for the given problem	3	3	1	2	3	2	3	1	-	2	-	-
CO3	Realign high dimensional data using reduction techniques for the given problem	3	2	1	2	2	2	2	-	-	1	2	-
CO4	Analyze optimization and generalization techniques of deep learning for the given problem.	3	2	2	1	3	1	2	1	-	2	-	1
CO5	Evaluate the given deep learning application and enhance by applying latest techniques	3	3	2	2	2	2	2		3	2	2	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: BIG DATA ANALYTICS

Code: CSC34202

Credit - 4 | Semester IV

A. Introduction: The objective of the course is to provide complete knowledge of Big Data Analytics. The main goal of this course is to help students learn, understand, and practice big data analytics and machine learning approaches, which include the study of modern computing big data technologies and scaling up machine learning techniques focusing on industry applications.

The main objectives of the course are as follows:

- Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications
- Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration
- Ability to solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues
- Ability to understand and apply scaling up machine learning techniques and associated computing techniques and technologies
- Ability to recognize and implement various ways of selecting suitable model parameters for different machine learning techniques
- Ability to integrate machine learning libraries and mathematical and statistical tools with modern technologies like hadoop and mapreduce

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Identify the business problem for a given context and frame the objectives to solve it through data analytics tools.
[CO.2]. Apply various algorithms for handling large volumes of data.
[CO.3]. Illustrate the architecture of HDFS and explain functioning of HDFS clusters.
[CO.4]. Analyses the usage of Map-Reduce techniques for solving big data problems.
[CO.5]. Experiment with various datasets for analysis and visualization.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Big Data and AnalyticsExample Applications, Basic Nomenclature, Analysis Process Model, Analytical Model Requirements , Types of Data Sources, Sampling, Types of Data Elements, Data Exploration, Exploratory Statistical Analysis, Missing Values, Outlier Detection and Treatment, Standardizing Data Labels, Categorization Big Data Technology Hadoop's Parallel World, Data discovery, Open source technology for Big Data Analytics, Cloud and Big Data, Predictive Analytics, Mobile Business Intelligence and Big Data, Crowd Sourcing Analytics, Inter- and Trans-Firewall Analytics Meet Hadoop Data, Data Storage and Analysis, Comparison with Other Systems, RDBMS, Grid Computing, Volunteer Computing, A Brief History of Hadoop, Apache Hadoop and the Hadoop Ecosystem Hadoop Releases Response. The Hadoop Distributed File system The Design of HDFS, HDFS Concepts, Blocks, Namenodes and Datanodes, HDFS Federation, HDFS High-Availability, The Command-Line Interface, Basic Filesystem Operations, Hadoop Filesystems Interfaces, The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the FileSystem API, Writing Data, Directories, Querying the Filesystem, Deleting Data, Data Flow Anatomy of a File Read, Anatomy of a File Write, Coherency Model, Parallel Copying with distcp Keeping an HDFS Cluster Balanced, Hadoop Archives. A Weather Dataset ,Data Format, Analysing the Data with Unix Tools, Analyzing the Data with Hadoop, Map and Reduce, Java MapReduce, Scaling Out, Data Flow, Combiner functions, Running a Distributed MapReduce Job, Hadoop Streaming, Hadoop Pipes, Compiling and Running, Developing a MapReduce Application, The Configuration API, Combining Resources, Variable Expansion, Configuring the Development Environment, Managing Configuration, GenericOptionsParser, Tool and ToolRunner, Writing a Unit Test, Mapper, Reducer, Running Locally on Test Data, Running a Job in a Local Job Runner, Testing the Driver, Running on a Cluster, Packaging, Launching a Job, The MapReduce Web UI, Retrieving the Results, Debugging a Job, Hadoop Logs, Remote Debugging.

E. TEXT BOOKS:
T1. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications" Wiley.
T2. Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", 1st Edition, Michael Minelli, Michele Chambers, AmbigaDhiraj, Wiley CIO Series, 2013.
T3. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.

F. REFERENCE BOOKS:
R1. Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
R2. Chris Eaton, Dirk deroos et al., "Understanding Big data", McGraw Hill, 2012.
R3. Vignesh Prajapati, "Big Data Analytics with R and Haoop", Packet Publishing 2013.
R4. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Identify the business problem for a given context and frame the objectives to solve it through data analytics tools.	1	2	2	2	2	2	3	2	1	-	-	2
CO2	Apply various algorithms for handling large volumes of data.	3	2	2	2	2	2	1	-	-	2	1	1
CO3	Illustrate the architecture of HDFS and explain functioning of HDFS clusters.	3	2	2	3	3	2	2	-	2	3	-	1
CO4	Analyses the usage of Map-Reduce techniques for solving big data problems.	3	2	2	2	3	2	2	-	-	2	-	1
CO5	Experiment with various datasets for analysis and visualization.	3	2	1	2	3	2	1	-	-	-	2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

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Subject: PROGRAMMING USING C#

Code: CSC34203

Credit - 4 | Semester IV

A. Introduction: The objective of the course is to provide complete knowledge of Programming Using C#. An overview of .NET including the Common Language Interface, the Common Type System, the Common Language Runtime, and .NET Framework and class libraries. Language and platform neutrality. An introduction to C# syntax, content, and structure. Console, Windows Forms, and Web applications. Event-driven programming, event-handlers, and the .NET library of classes.

The main objectives of the course are as follows:

- Knowledge of the structure and model of the programming language C #
- Use the programming language C # for various programming technologies (understanding)
- Develop software in C #
- Evaluate user requirements for software functionality required to decide whether the programming language C # can meet user requirements
- Propose the use of certain technologies by implementing them in the C # programming language to solve the given problem
- Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Analyse C# and client-server concepts using .Net Frame Work Components.

[CO.2]. Apply delegates, event and exception handling to incorporate with ASP, Win Form, ADO.NET.

[CO.3]. Analyze the use of .Net Components depending on the problem statement.

[CO.4]. Implement & develop a web based and Console based application with Database connectivity

[CO.5]. Implement & develop a web-based application with Database connectivity

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Getting started with .NET Framework 4.0 and C# Understanding Previous Technologies, Benefits of .NET Framework, Architecture of .NET Framework 4.0,.NET Execution Engine, Components of .NET Framework 4.0: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library, Windows Forms, ASP .NET and ASP .NET AJAX, ADO .NET, Windows workflow Foundation, Windows Presentation Foundation, Windows Communication Foundation, Widows Card Space and LINQ. Introducing C# Creating a Simple C# Console Application, Identifiers and Keywords. System Data Types, Variables and Constants: Value Types, Reference Types, Understanding Type Conversions, Boxing and UnBoxing. Namespaces, The System namespace, .NET Array Types. Classes, Objects and Object Oriented Programming Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Returning a Value from a Method and Describing Access Modifiers. Static Classes and StaticMembers, Properties: Read-only Property, Static Property, Indexers, Structs: Syntax of a struct and Access Modifiers for structs, System.Object Class Encapsulation: Encapsulation using accessors and mutators, Encapsulation using Properties. Inheritance: Inheritance and Constructors, Sealed Classes and Sealed Methods, Extension methods. Polymorphism: Compile time Polymorphism/ Overloading, Runtime Polymorphism/ Overriding. Abstraction: Abstract classes, Abstract methods. Interfaces: Syntax of Interfaces, Implementation of Interfaces and Inheritance. Delegates, Events, Exception Handling and ADO.NET Delegates:Creating and using Delegates, Muticasting with Delegates. Events: Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers. Exception Handling: The try/catch/throw/finall statement, Custom Exception.System.Exception, Handling Multiple Exception.\ Data Access with ADO.NET :Understanding ADO.NET: Describing the Architecture of ADO.NET, ADO.NET,ADO.NET Entity Framework. Creating Connection Strings: Syntax for Connection Strings.Creating a Connection to a Database: SQL Server Database, OLEDB Database, ODBC Data Source. Creating a Command Object. Working with DataAdapters: Creating DataSet from DataAdapter. Graphical User Interface with Windows Forms and WPF Windows Forms : Introduction, Windows Forms, Event Handling: A Simple Event- Driven GUI, Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling. Menus, Month Calendar Control, LinkLabel Control, ListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl and Multiple Document Interface (MDI) Windows. WPF: New WPF Controls, WPF Architecture: Presentation Framework, Presentation Core, WindowsBase, MIL or Milcore, Working with WPF Windows: Using XAML in WPF 4.0 Applications : Contents of XAML and WPF Applications: XAML Elements Namespace and XAML, XAML Property Syntax, Markup Extensions. Web App Development and Data Access using ADO.NET Introduction, Web Basics, Multitier Application Architecture, Your First Web Application: Building Web-Time Application, Examining Web-Time.aspx's Code- Behind File, Understanding Master pages, Standard Web Controls: Designing a Form, Validation Controls, GridView Control, DropDownList, Session Tracking, ASP.NET AJAX : Exploring AJAX,Need for AJAX, AJAX and other Technologies, AJAX Server Controls, ScriptManager control, Update Panel, UpdateProgress Control, Creating Simple Application using AJAX Server Controls

E. TEXT BOOKS:

T1. .NET 4.0 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc., Wiley- Dream Tech Press.

T2. Paul Deitel and Harvey Deitel: C# 2010 for Programmers, 4th Edition, Pearson Education.

F. REFERENCE BOOKS:

R1. Andrew Trolsen: Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition, Wiley-Appress.
R2. Bart De Smet: C# 4.0 Unleashed, Pearson Education- SAMS Series.
R3. Herbert Schildt: Complete Reference C# 4.0, Tata McGraw Hill, 2010.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Analyses C# and client-server concepts using .Net Frame Work Components	2	2	2	2	2	-	-	-	-	2	-	-
CO2	Apply delegates, event and exception handling to incorporate with ASP, Win Form, ADO.NET.	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Analyze the use of .Net Components depending on the problem statement.	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Implement & develop a web based and Console based application with Database connectivity	1	2	2	1	-	1	-	-	-	2	-	-
CO5	Implement & develop a web-based application with Database connectivity	3		1			2			3		2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: SOFTWARE PROJECT MANAGEMENT

Code: CSC34204

Credit - 4 | Semester IV

A. Introduction: An introduction to the concept and techniques of project management for a broad range of systems, including Web-based application development. Topics include resource management, organizational factors, project manager responsibilities, team building, and risk management. Tools and techniques for project estimating and scheduling will be presented. Case study and group projects.

The main objectives of the course are as follows:
- Apply project management concepts and techniques to an IT project.
- Identify issues that could lead to IT project success or failure.
- Explain project management in terms of the software development process.
- Describe the responsibilities of IT project managers.
- Apply project management concepts through working in a group as team leader or active team member on an IT project.

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Apply the practices and methods for successful software project management

[CO.2]. Identify techniques for requirements, policies and decision making for effective resource management

[CO.3]. Illustrate the evaluation techniques for estimating cost, benefits, schedule and risk

[CO.4]. Devise a framework for software project management plan for activities, risk, monitoring and control

[CO.5]. Design a framework to manage people

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT Introduction, Why is Software Project Management important? What is a Project?, Contract Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some ways of categorizing software projects, Stakeholders, Setting Objectives, Business Case, Project Success and Failure, What is Management? Management Control, Traditional versus Modern Project Management Practices PROJECT EVALUATION & FINANCE Evaluation of Individual Projects, Cost Benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing allocation of Resources within Programmes, Financial Accounting –An overview – Accounting concepts, Principles & Standards, Ledger posting, Trial balance, Profit and Loss account Balance sheet ACTIVITY PLANNING Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass – Backward Pass , Identifying critical path, Activity Float, Shortening Project Duration, Activity on Arrow Networks Risk Management, Nature of Risk, Categories of Risk, A framework for dealing with Risk, Risk Identification, Risk analysis and prioritization, risk planning and risk monitoring MONITORING AND CONTROL Creating the Framework, Collecting the Data, Review, Project Termination Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting Project Back To Target, Change Control, Software Configuration Management MANAGING PEOPLE AND WORKING IN TEAMS Introduction, Understanding Behavior, Organizational Behavior: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham – Hackman Job Characteristics Model, Stress –Health and Safety Working In Teams, Becoming a Team, Decision Making, Leadership.

E. TEXT BOOKS:
T1. Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", Fifth Edition, Tata McGraw Hill, 2011

T2. "Accounting for Management" JawaharLal, 5th Edition, Wheeler Publications, Delhi.

F. REFERENCE BOOKS:

R1. Jack Marchewka, "Information Technology-Project Management", Wiley Student Version, 4th Edition, 2013.

R2. James P Lewis,"Project Planning, Scheduling & Control", McGraw Hill, 5th Edition, 2011.
R3. Pankaj Jalote ," Software Project Management in Practice", Pearson Education, 2002.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Apply the practices and methods for successful software project management	2	3	2	2	2	2	3	3	-	2	-	2
CO2	Identify techniques for requirements, policies and decision making for effective resource management	3	2	2	2	-	2	3	2	-	2	1	2
CO3	Illustrate the evaluation techniques for estimating cost, benefits, schedule and risk	3	2	2	2	2	-	-	2	-	3	-	1
CO4	Devise a framework for software project management plan for activities, risk, monitoring and control	3	2	2	1	2	1	2	2	-	2	-	1
CO5	Design a framework to manage people	3	2	2	1		2		3	3		2	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: SOFTWARE DEFINED NETWORKS
Code: CSC34205
Credit - 4 | Semester IV

A. Introduction: The basic concept of SDN is to make network control decisions from centralized location. This is done by decoupling and optimizing the system that makes switching/routing decisions and other control functions such as signaling (the control plane) from the underlying systems that forwards traffic to the selected destination

The main objectives of the course are as follows:

- Describe the key concepts in Software Defined Networks (SDN)
- Examine the SDN architecture and key functions
- Evaluate several SDN controller platforms such as Open Stack Orchestration, POX and Open Daylight
- Evaluate several Cloud Computing Platforms such as OpenStack and CloudStack
- Examine Northbound Interfaces such as REST and Southbound Interfaces such as OpenFlow and Netconf
- Review the architecture and development of the OpenFlow standards
- Appreciate the problems of management and security in SDN
- Describe the key concepts of Network Virtualization and Network Functions Virtualization (NFV)
- Understand how Network Functions Virtualization (NFV) can be managed
- Identify the current status for development of SDN and NFV technologies

B. Course Outcomes: At the end of the course, students will be able to:

[CO.1]. Recognize the fundamentals and characteristics of Software Defined Networks
[CO.2]. Understand the basics of Software Defined Networks Operations and Data flow
[CO.3]. Discriminate different Software Defined Network Operations and Data Flow
[CO.4]. Analyze alternative definitions of Software Defined Networks
[CO.5]. Apply different Software Defined Network Operations in real world problem

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	20
	Assignment	05
	Attendance	05
End Term Exam (Summative)	End Term Examination	70
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Introduction to SDN Understanding the SDN, Understanding the SDN technology, Control Plane, Data Plane, Moving information between planes, separation of the control and data planes, Distributed control planes, Load Balancing, Creating the MPLS Overlay, Centralized control planes. Working of SDNEvaluation of Switches and Control planes, SDN Implications, Data centre Needs, Forerunner of SDN, Software Defines Networks is Born, Sustain SDN interoperability, Open source contribution, Fundamental Characteristics of SDN, SDN Operations, SDN Devices, SDN Controllers, SDN Applications, Alternate SDN methods. The Open Flow Specifications Open Flow Overview, Open Flow Basics, Open Flow 1.0 additions, Open Flow 1.1 additions, Open Flow 1.2 additions, Open Flow 1.3 additions, Open Flow limitations. SDN via APIS, SDN via Hypervisor-Based Overlays, SDN via Opening up the device, Network function virtualization, Alternative Overlap and Ranking. Data centres definition, Data centres demand, tunnelling technologies for Data centres Path technologies in data centres, Ethernet fabrics in Data centres, SDN use case in Data centres.

E. TEXT BOOKS:

T1. Software Defined Networking by Thomas D Nadeau and Ken Gray.

T2. Software Define Networks, A Comprehensive Approach, Paul Goransson, Chuck Black. MK Publications.

F. REFERENCE BOOKS:

R1. Software Defined Networking for Dummies brought you by cisco, Brian Underdahl and Gary Kinghorn.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Recognize the fundamentals and characteristics of Software Defined Networks	2	3	1	3	3	2	2	1	3	2	-	1
CO2	Understand the basics of Software Defined Networks Operations and Data flow	1	2	2	2	3	2	1	-	-	2	1	
CO3	Discriminate different Software Defined Network Operations and Data Flow	3	2	2	1	1	2	-	2	-	3	-	1
CO4	Analyze alternative definitions of Software Defined Networks	3	2	2	2	2	1	-	2	-	2	-	-
CO5	Apply different Software Defined Network Operations in real world problem	3	2	3	2	2	2			3		2	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

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Subject: MOBILE APPLICATION PROGRAMMING LAB
Code: CSC34206
Credit - 4 | Semester IV

A. Introduction: This Course aims at helping learners create mobile applications using Google & Android open-source platform. It explains the entire Android Applications Development Life Cycle. It also explains the essential features, as well as the advanced capabilities and APIs such as background services, graphics, and GPS. It helps students to apply advanced android development techniques.

The main objectives of the course are as follows:

- Understand and demonstrate Android activities life cycle.
- Build your own Android apps.
- Design and develop innovative android applications.
- Create real life application with end-to-end understanding of User experience practices.
- Secure, tune, package and deploy Android Applications.

B. Course Outcomes: At the end of the course, students will be able to:

   [CO.1]. Create mobile applications using Google & Android open-source platform

   [CO.2]. Apply advanced android development techniques

   [CO.3]. Can work with GPS, wi-fi.

   [CO.4]. Create animations with android's graphics API

   [CO.5]. Can understand Android database connectivity using SQLite

   [CO.6]. Can understand SQLite Programming

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination	10
	Assignment	2.5
	Attendance	2.5
End Term Exam (Summative)	End Term Examination	35
	Total	50
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

Sl. No.	List of Practicals
1	Installation – Android Studio
2	Develop an application that uses GUI components, Font and Colors.
3	Develop an application that uses Layout Managers and event listeners.
4	Develop a native calculator application
5	Develop an Application that used the camera in phone and allows to click the photo.
6	Develop an application that uses that demonstrates the use of Fragments
7	Develop a Music player – Basic controls to play, pause and stop the MP3 file
8	Implement an application that writes data to the SD card.
9	Write a mobile application that creates alarm clock.
10	Develop an application that makes use of database.
11	Creating application using App Inventor
12	Packaging and Deploying the APK file in Google Play store

E. TEXT BOOKS:

T1. Beginning android 4 application Development, Wei-Meng Lee, John Wiley & sons, Inc.

F. REFERENCE BOOKS:

R1. Android for Programmers an App Driven Approach, Paul Deitel-Harvey Deitel-Abbey Deitel-

Michael Morgano, Pearson Education Inc.

R2. Android - A programmer's Guide, Jerome (J.F) DiMarzio , TataMcgraw Hill

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	COURSE OUTCOME STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Create mobile applications using Google & Android open-source platform	1	2	2	2	2	-	-	-	-	2	-	-
CO2	Apply advanced android development techniques.	2	2	2	2	-	2	-	-	-	2	1	-
CO3	Can work with GPS, wi-fi.	3	2	2	1	1	-	-	-	-	3	-	1
CO4	Create animations with android's graphics API	1	2	2	1	-	1	-	-	-	2	-	-
CO5	Can understand Android database connectivity using SQLite	3		1			2			3		2	
CO6	Can understand SQLite Programming	1				3		1	2		2		3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Project
Code: CSC36099
16 Credits | Semester IV

A. Introduction: The objective of this course is to prepare students to use applications of the theory and practical learned during the course. It will also help students to develop an industry or research oriented project. This course helps students how to carry out project/studies in the field of interest of the student or as given by the industry.

The main objectives of the course are as follows:

• To learn languages to code front end and back end of a software.
• To initiate into the process of designing, coding and testing a software module.
• To develop a complete software module.

B. Course Outcomes: At the end of the course, students will be able to:
[CO.1]. Apply Software Development Cycle to develop a software module.
[CO.2]. Use the techniques, skills and modern engineering tools necessary for software development.
[CO.3]. Develop a software product along with its complete documentation.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Examination(Assessment)	100
	Assignment	-
	Attendance	-
End Term Exam (Summative)	End Term Examination	200
	Total	300
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. Project/ Dissertation

 Students will carry out a research/industrial project under the supervision of faculty(s) on a particular software and at the end of the semester; they will submit their compiled Research / Industrial Project to the department. The details on how to prepare the project is available in Annexure I. By following the details, students can develop their research writing and project compilation skills.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES									CORRELATION WITH PROGRAM SPECIFIC OUTCOMES				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	Apply Software Development Cycle to develop a software module	2	3	3	2	1	2	2	-	-	2	-	1	2	2
CO2	Use the techniques, skills and modern engineering tools necessary for software development.	2	3	2	2	2	2	-	-	-	2	1	-	1	2
CO3	Develop a software product along with its complete documentation.	2	2	2	2	1	2	-	-	-	3	-	1	-	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

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