'A' Grade NAAC Re-Accredited (3rd Cycle)

NORTH MAHARASHTRA UNIVERSITY, JALGAON

School of Computer Sciences

MASTER OF COMPUTER APPLICATIONS (MCA)

Syllabus

[under Academic Flexibility]

Faculty of Science and Technology

With effect from July- 2017-18

School of Computer Sciences

School of Computer Sciences
NORTH MAHARASHTRA UNIVERSITY, JALGAON

SYLLABUS for Master of Computer Applications (MCA)
(With Effect from June-2017)
[*under Academic Flexibility*]

COURSE STRUCTURE WITH CREDIT

	Course	Marks	Hour/week	Credit	Total
Semester-I	**CA-101**	100	04	04	**28**
	CA-102	100	04	04	
	CA-103	100	04	04	
	CA-104	100	04	04	
	CA-105	100	04	04	
	CA LAB-I	100	06	04	
	CA LAB-II	100	06	04	
Semester-II	**CA-201**	100	04	04	**30**
	CA-202	100	04	04	
	CA-203	100	04	04	
	CA-204	100	04	04	
	CA-205	100	04	04	
	CA LAB-III	100	06	04	
	CA LAB-IV	100	06	04	
	Audit Course-I	50	02	02	
Semester-III	**CA-301**	100	04	04	**28**
	CA-302	100	04	04	
	CA-303	100	04	04	
	CA-304	100	04	04	
	CA-305	100	04	04	
	CA LAB-V	100	06	04	
	CA LAB-VI	100	06	04	

Semester	Course				
Semester-IV	CA-401	100	04	04	
	CA-402	100	04	04	
	CA-403	100	04	04	
	CA-404	100	04	04	30
	CA-405	100	04	04	
	CA LAB-VII	100	06	04	
	CA LAB-VIII	100	06	04	
	Audit Course-II	50	02	02	
Semester-V	CA-501	100	04	04	
	CA-502	100	04	04	
	CA-503	100	04	04	
	CA-504	100	04	04	28
	CA-505	100	04	04	
	CA LAB-IX	100	06	04	
	CA LAB-X	100	06	04	
Semester-VI	Industrial Training/Project				12

Audit Course I and II: To be completed using IIT Bombay's SPOKEN TUTORIAL online Courseware. It is mandatory for the students to complete the credits of this course along with appearing for the online examination conducted by Spoken Tutorial IIT Bombay.

Degree Name	**:**	**Master in Computer Applications (MCA)** **[Under Academic Flexibility]**
Faculty	**:**	**Science and Technology**
Duration	**:**	**03 years, Full Time course**
Medium of Instruction	**:**	**English**
Pattern	**:**	**Semester Pattern (06 semesters)**
Examination Pattern	**:**	**60% (External Assessment) + 40%(Internal Assessment)**
Passing Standard	**:**	**Separate Passing for internal as well as external assessment.**
Evaluation Mode	**:**	**CGPA**
Lecture	**:**	**Clock hour (60 minutes)**

School of Computer Sciences
NORTH MAHARASHTRA UNIVERSITY, JALGAON

SYLLABUS for Master of Computer Applications (MCA)
(With Effect from June-2017)
[*under Academic Flexibility*]

Semester- I

Course Code	Paper Title
CA-101	Computer Organization & Architecture
CA-102	Database Management System (DBMS)
CA-103	Mathematical Foundations of Computer Science-I
CA-104	System Programming
CA-105	Object Oriented Programming using C++
CA LAB-I	LAB on DBMS
CA LAB-II	LAB on C++ Programming

Semester- II

Course Code	Paper Title
CA-201	Automata Theory and Computability
CA-202	Data Structures and Algorithms
CA-203	Operating systems
CA-204	Computer Networks
CA-205	Python Programming
CA-206	Audit Course-I
CA LAB-III	LAB on Data Structures and Algorithms
CA LAB-IV	LAB on Python programming

Audit Course: To be completed using IIT Bombay's SPOKEN TUTORIAL online Courseware. It is mandatory for student to complete the credits of this course along with passing the online examination conducted by Spoken Tutorial IIT Bombay.

Semester- III

Course Code	Paper Title
CA-301	Accounting and Management Control
CA-302	Design and Analysis of Algorithms
CA-303	Mathematical Foundations of Computer Science-II
CA-304	Artificial Intelligence
CA-305	Web Designing
CA LAB-V	LAB on Design and Analysis of Algorithms
CA LAB-VI	LAB on Web Designing (HTML/XML/CSS/Navigation)

Semester-IV

Course Code	Paper Title
CA-401	High Performance Computing Paradigms and applications
CA-402	Web Application Technology
CA-403	Machine Learning
CA-404	Computer Graphics and Digital Image processing
CA-405	Optimization Algorithms
CA-406	Audit Course-II
CA-Lab VII	LAB on Computer Graphics and Digital Image Processing
CA-Lab VIII	LAB on High Performance Computing (HPC) and Web Application Technology

Audit Course: To be completed using IIT Bombay's SPOKEN TUTORIAL online Courseware. It is mandatory for student to complete the credits of this course along with passing the online examination conducted by Spoken Tutorial IIT Bombay.

Semester –V

Course Code	Paper Title
CA-501	Compiler Construction
CA-502	Software Engineering
CA-503	Natural Language Processing
CA-504	Mobile Application Development
CA-505	CMS: Drupal Website Development Framework
CA LAB-IX	LAB on Android Programming
CA LAB-X	LAB on Drupal Framework

Semester-VI

Course Code	
CA-601	**Full time Industrial Training**

Semester- I

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Course Code:**CA-101** **Computer Organization & Architecture** _Clock Hours:_**60**
Total Marks: **100**

Unit-I **[10]** Max Marks:**15**
Number System and Representation of Information: Positional Number System, Conversions, Complements, Representation of Negative numbers, Fixed Point Representation, Floating Point Representation, Character Codes, Error detection Codes

Unit-II **[10]** Max Marks:**15**
Digital Logic Circuits and Components: Digital Computers, Boolean Algebra, Boolean Identities, Simplifications of Boolean Expressions, Logic gates, Combinational Circuits: Half-Adder, Full-Adder, Decoders, Encoders, Multiplexers, Sequential Circuits: Flip flops, Registers, Shift Registers, Binary Counters, Memory Unit.

Unit-III **[10]** Max Marks:**15**
Processor Organization: General Register Organization, ALU, Instruction codes, Instruction Formats, Stack Organization, Addressing modes, Control Unit, Interrupts

Unit-IV **[10]** Max Marks:**15**
8085 Microprocessor: Introduction, History, Internal Architecture, Instruction set, Assembly Language introduction, Simple programs.

Unit-V **[10]** Max Marks:**15**
Memory Organization: Types of Memory, Main memory, Auxiliary memory, Memory Hierarchy, Cache Memory and related mapping, replacement policies, Virtual memory.

Unit-VI **[10]** Max Marks:**15**
I/O interface, Asynchronous data transfer, Modes of transfer, Interrupt controlled I/O Transfer, Direct memory access, I/O channels

References:
1. Linda Null and Jullia Lobur (2006). The essentials of Computer Organization and Architecture. Jones Bartlett Publication, ISBN: 978-0763737696

2. M. Morris Mano (2007). Computer System Architecture. Pearson Education India, ISBN: 978-8131700709

3. Ramesh S Goankar(1998). Microprocessor Architecture, Programming & Applications with the 8085. Prentice Hall Publishing (India) Pvt. Ltd.

4. V. Heuring, H. Jorden (2003). Computer Systems Design and Architecture, Pearson Education, Second Ed., 2009. ISBN: 978-0130484406

5. William Stallings (2010). Computer Organization and Architecture Designing for Performance, PHI Pvt. Ltd., ISBN-13: 978-0-13-607373-4.

Course Code: **CA-102**	**Database Management System (DBMS)**	*Clock Hours:* **60** *Total Marks:* **100**

Unit-I   [05]   Max Marks:**08**
Introduction: Database system application and purpose, Characteristics of DBMS, Database Users, 1-tier, 2-tier and 3-tier architecture of DBMS along with its advantages, Levels of Database Architecture, Data Models, Data-schemas and instances, Data Independence, Role and responsibilities of DBA.

Unit-II   [10]   Max Marks:**10**
Database Design and E-R Model: Overviews of Database Design, ER Modelling concepts, ER Diagrams, Reduction to Relational Schemas, Extended ER Features, Alternative notations for Modelling, Cardinality constraints, Atomic Domains and 1NF, Decomposition using Functional Dependencies (BCNF, 3NF and 4NF).

Unit-III   [12]   Max Marks:**20**
Relational Databases: Structure of Relational Databases, Database Schemas, Keys, Schema diagrams, Relational Query Languages, Relational Operation. Overview of SQL, SQL Data Definition, Basic Structure of SQL Queries, Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Modification of Databases. Join Expressions, Views, Transactions, Integrity Constraints, SQL data types and Schemas, Authorization, Accessing SQL from Programming Languages, Overview of Dynamic SQL and SQL CLI. Functions and Procedures, Triggers. The relational Algebra fundamental and extended Operations. Tuple and Domain Relational Calculus.

Unit-IV   [10]   Max Marks:**22**
Transaction Management and Query Processing: Transaction Concept, Model, Storage Structure, Atomicity and Durability, Isolation, Levels of Isolation,   Overview of Query Processing, Measuring Query Cost, Selection Operation, Sorting, Join Operation, Other Operations and Evaluation of Expression. Overview of Query Optimization, Transformation

of Relational Expression, Choice of Evaluation Plan.

Unit-V [10] Max Marks:**15**
Concurrency Control and Recovery System: Lock based Protocol, Timestamp based Protocol, Validation based Protocol, Deadlock Handling, Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithms, Buffer Management, Early lock release and logical undo operations, Remote Backup Systems. Case study: ARIES

Unit-VI [13] Max Marks:**25**
Advanced Topics in Databases: Type your unit content here.(comma separated) Introduction to Object Databases: Shortcomings of Relational Data Model, The Conceptual Object Data Model, Objects in SQL:1999 and SQL:2003. Introduction to XML and Web Data: Semi-structured Data, Overview of XML, XML Data Definitions, XML Schema, XML Data Manipulation: XQuery, XPath Query Languages: XPath and SQL/XML. Distributed Databases: Overview, Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control, Cloud based Databases.

References:
1] Michael Kifer, Arthur Bernstein, P.M, Lewis and P.K. Panigrahi (2011), "Database Systems: An Application Oriented Approach", Second Edition, Pearson Education, 2011, ISBN: 9788131703748.
2] C. J .Date, A. Kannan and S. Swamynathan (2006), "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006, ISBN:978-81-7758-556-8
3] A. Silberschatz, H.F.Korth, and S.Sudarshan (2011), "Database System Concepts", TMH Publications, Sixth Edition,2011, ISBN:978-007-132522-6.

Course Code: **CA-103**	**Mathematical Foundations of**	*Clock Hours:* **60**
	Computer Science-I	*Total Marks:* **100**

Unit-I [10] Max Marks:**15**
Logic and Proofs: Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Proof Methods and Strategy.

Unit-II [10] Max Marks:**20**
Sets, Relations: Sets, Set Operations, Relations and their Properties, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

Unit-III [10] Max Marks:**15**
Functions, Function Types, Some Important Functions, Graphical Representation of Functions.

Unit-IV [10] Max Marks:**15**
Counting: The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations.

Unit-V [10] Max Marks:**20**
Graphs: Graphs and Graph Models, Graph terminology and Special Types of Graphs, Representing Graphs, nGraph Isomorphism, Connectivity, Euler and Hamilton Paths.

Unit-VI [10] Max Marks:**15**
Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees.

References:
1.Rosen Kenneth H. (2007). Discrete Mathematics and Its Applications, Tata McGraw-Hill Publishing Company Limited, New Delhi, ISBN 13: 978-0-07-064824-1, ISBN 10:0-07-064824-7
2. Liu C. L. (1985). Elements of Discrete Mathematics, Second Edition, Mc Graw Hill, ISBN 007043476X, ISBN 9780070434769

Course Code: **CA-104** **System Programming** *ClockHours:***60**
*Total Marks:***100**

Unit-I [06] Max Marks:**12**
Introduction to System Programming: Introduction, Programming Languages and Language Processors, Language Processing Activities, Program Execution, Multi-Pass Organization of Language Processors, Symbol Table Entry Formats.

Unit-II [12] Max Marks:**20**
Assemblers: Elements of Assembly Language Programming, Simple Assembly Scheme, Pass Structure of Assemblers, Design of a Two-Pass Assembler-Pass I of the Assembler Intermediate Code Forms, Intermediate Code for Imperative Statements, Processing of Declarations and Assembler Directives, Pass II of the Assembler.

Unit-III   **[10]**   Max Marks:**12**
Macros and Macro Preprocessor: Macro Definition and Call, Macro Expansion, Nested Macro Calls, Conditional Expansion, Expansion Time Loops, Semantic Expansion, Design of a Macro Preprocessor- Design Overview.

Unit-IV   **[10]**   Max Marks:**15**
Linkers and Loaders: Introduction, Relocation and Linking Concepts, Design of a Linker, Self-Relocating Programs, Linking of Overlay Structured Programs, Dynamic Linking, Loaders.

Unit-V   **[06]**   Max Marks:**10**
Scanning and Parsing: Programming Language Grammars, Scanning, Parsing – Top Down Parsing and Bottom Up Parsing.

Unit-VI   **[10]**   Max Marks:**20**
Compilers: Causes of a Large Semantic Gap, Binding and Binding Times, Static and Dynamic Memory Allocation, Compilation of Expressions – Intermediate Codes for Expressions, Postfix Notation, Triples and Quadruples, Function and Procedure Calls, Code Optimization- Optimizing Transformations, Local Optimization and Introduction to Global Optimization, Pure and Impure Interpreter.

Unit-VII   **[06]**   Max Marks:**11**
Software Tools: Software Tools for Program Development, Editors, Debug Monitors.

References:
1. Dhamdhere D M, (2011). System Programming. Tata McGraw Hill Education Private Limited, New Delhi. ISBN 10: 0071333118
2. Leland L. Beck, D. Manjula (2002). System Software: An Introduction to System Programming, 3rd Edition, Pearson Education, ISBN-10: 817758555X
3. John J. Donavan (2001). System Programming. Indian Edition, Mc Graw Hill Education, ISBN10:0074604821
4. Srimanta Pal, (2011). System Programming. Oxford Higher Education, ISBN-10: 0198070888

Course Code: **CA-105** **Object Oriented Programming** *Clock Hours:* **60**
using C++ *Total Marks:* **100**

Unit-I [10] Max Marks:**12**
Fundamentals
Object-Oriented Programming (OOP): Need, Object Oriented Programming Paradigm, Basic Concepts of Object-Oriented Programming, Benefits of OOP, C++ as object oriented programming language.
Object-Oriented Programming using C++ : C++ programming Basics, Data Types, Structures, Enumerations, control structures, Arrays and Strings, Class, Object, class and data abstraction, class scope and accessing class members, separating interface from implementation, controlling access to members.
Functions: Function, function prototype, accessing function and utility function, Constructors and destructors, Copy Constructor, Objects and Memory requirements, Static Class members, data abstraction and information hiding, inline function

Unit-II [12] Max Marks:**20**
Polymorphism and Inheritance
Operator Overloading: concept of overloading, operator overloading, Overloading Unary Operators, Overloading Binary Operators, Data Conversion, Type casting (implicit and explicit), Pitfalls of Operator Overloading and Conversion, Keywords explicit and mutable.
Inheritance- Base Class and derived Class, protected members, relationship between base Class and derived Class, Constructor and destructor in Derived Class, Overriding Member Functions, Class Hierarchies, Inheritance, Public and Private Inheritance, Levels of Inheritance, Multiple Inheritance, Ambiguity in Multiple Inheritance, Aggregation, Classes Within Classes.
Polymorphism: concept, relationship among objects in inheritance hierarchy, abstract classes, polymorphism.

Unit-III [12] Max Marks:**18**
Virtual Functions: Pointers- indirection Operators, Memory Management: new and delete, Pointers to Objects, A Linked List Example, accessing Arrays using pointers, Function pointers, Pointers to Pointers, A Parsing Example, Debugging Pointers, Dynamic Pointers, smart pointers, shared pointers, Case Study : Design of Horse Race Simulation. Virtual Function Friend Functions, Static Functions, Assignment and Copy Initialization, this Pointer, virtual function, dynamic binding, Virtual destructor.

Unit-IV [10] Max Marks:**18**
Templates: function templates, Function overloading, overloading Function templates, class templates, class template and Nontype parameters, template and inheritance, template and friends Generic Functions, Applying Generic Function, Generic Classes, The typename and

export keywords, The Power of Templates.

Exception Handling: Fundamentals, other error handling techniques, simple exception handling Divide by Zero, rethrowing an exception, exception specifications, processing unexpected exceptions, stack unwinding, constructor, destructor and exception handling, exception and inheritance.

Unit-V   [08]   Max Marks:**16**

Files and Streams: Data hierarchy, Stream and files, Stream Classes, Stream Errors, Disk File I/O with Streams, File Pointers, and Error Handling in File I/O, File I/O with Member Functions, Overloading the Extraction and Insertion Operators, memory as a Stream Object, Command-Line Arguments, Printer output, Early vs. Late Binding.

Unit-VI   [08]   Max Marks:**16**

Standard Template Library (STL): Introduction to STL, Containers, algorithms and iterators,
Containers: Sequence container and associative containers, container adapters,
Algorithms: basic searching and sorting algorithms, min-max algorithm, set operations,
Iterators: input, output, forward, bidirectional and random access. Object Oriented Programming – a road map to future

References:

1. Robert Lafore, Object-Oriented Programming in C++, fourth edition, Sams Publishing, ISBN:0672323087.
2. Bjarne Stroustrup, The C++ Programming language, Third edition, Pearson Education ISBN 0-201-88954-4.
3. Deitel, C++ How to Program, 7th Edition, Pearson Education, ISBN-10: 0-13-611726-0 ISBN-13: 978-0-13-611726-1.
4. Herbert Schildt, C++ The complete reference, Fifth Edition, McGraw HillProfessional, , ISBN-10: 0071634800 ISBN-13: 978-0071634809.
5. Stanley B. Lippman, Josée Lajoie, Barbara E. Moo(2013), C++ Primer, Fifth Edition, Addison-Wesley, 2013, ISBN-13: 978-0-321-71411-4, ISBN-10: 0-321-71411-3

Course Code: **CA LAB-I**   **LAB on DBMS**   *Total Marks:* **100**

1. Creating database tables and using data types.
   - Create table
   - Modify table
   - Drop table
2. Practical Based on Data Manipulation.
   - Adding data with Insert
   - Modify data with Update
   - Deleting records with Delete
3. Practical Based on Implementing the Constraints.
   - NULL and NOT NULL
   - Primary Key Constraint
   - Foreign Key Constraint
   - Unique Constraint
   - Check Constraint
   - Default Constraint
4. Practical for Retrieving Data Using following clauses.
   - Simple select clause
   - Accessing specific data with Where
   - Ordered By
   - Distinct
   - Group By
5. Practical Based on Aggregate Functions.
   - AVG
   - COUNT
   - MAX
   - MIN
   - SUM
   - CUBE
6. Practical Based on implementing all String functions.
7. Practical Based on implementing Date and Time Functions.
8. Practical Based on implementing use of UNION, INTERSECTION, SET DIFFERENCE.
9. Implement Nested Queries & all types of JOIN operation.
10. Practical Based on performing different operations on a view.
11. Practical Based on implementing use of Procedures.
12. Practical Based on implementing use of Triggers
13. Practical Based on implementing Cursor.
14. Demonstrate Database connectivity with front end tools like – VB.NET, C#.NET, JAVA, D2K, etc.

15. Practical based on creating Data Reports. 16. Design entity relationship models for a business problem and develop a normalized database structure

Course Code: **CA LAB-II** **LAB on C++ Programming** *Total Marks:* **100**

1. Write program to demonstrate encapsulation using of class.
2. Write program to demonstrate use of constructor, constructor overloading and destructor.
3. Write program to demonstrate use of array manipulations.
4. Write program to demonstrate use of string manipulations.
5. Write program to demonstrate use of function overloading.
6. Write program to demonstrate use of operator overloading.
7. Write program to demonstrate use of pointers.
8. Write program to demonstrate use of operator overloading.
9. Write program(s) to demonstrate use of all types of inheritance.
10. Write program to demonstrate use of virtual function.
11. Write program to demonstrate use of friend function.
12. Write program to demonstrate use of virtual class.
13. Write program to demonstrate use of function templates.
14. Write program to demonstrate use of class templates.
15. Write program to demonstrate use of static data member and static member function.
16. Write program to demonstrate use of exception handling.
17. Write program to demonstrate command line arguments.
18. Write program to demonstrate file handling.
19. Write program(s) to demonstrate use of STL.

Semester- II

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Course Code: **CA-201**   **Automata Theory and**   *Clock Hours:* **60**
                               Computability   *Total Marks:* **100**

Unit-I   **[12]**   Max Marks:**20**
Finite Automata:

Sets, relations, functions, graphs, trees, mathematical induction, Finite Automata(FA), definition, description, transition systems, acceptability of a string, NFA, DFA, equivalence of DFA and NFA, Melay & Moore model, minimization of automaton, Applications.

Unit-II   **[04]**   Max Marks:**12**
Formal Languages:

Formal languages, Chomsky classification of languages, languages, their relation and automaton.

Unit-III   **[14]**   Max Marks:**23**
Regular Expressions:

Regular expressions, FA and regular expressions, pumping lemma for regular sets, applications of pumping lemma, closure properties of regular sets, regular sets and regular grammars.

Unit-IV   **[10]**   Max Marks:**15**
Context Free Languages:

CFLs and derivation trees, ambiguity in Context-Free Grammars (CFGs), simplification of CFGs, Normal Forms for CFGs (CNF and GNF), pumping lemma for CFLs, decision algorithms for CFLs.

Unit-V   **[08]**   Max Marks:**15**
Push Down Automata:

Pushdown Automaton (PDA), informal description, basic definitions, acceptance by a PDA, PDA and CFLs.

Unit-VI   **[08]**   Max Marks:**15**
Turing Machine:

Turing Machine, Model, computable languages and function, representation of TMs, Language Acceptability by TMs, Design of TM, Halting Problem of TMs.

References:
1. Smita Rajpal. Theory of Automata and Formal Languages: GALGOTIA Publications ISBN 1234027054.
2. J.E.Hopcraft, R. Motwani and J.D.Ullman. Introduction to Automata Theory languages & Computation: Pearson Education Asia ISBN 978-0321455369.
3. K.L.P.Mishra, N. Chandrashekharan. Theory of Computer Science: PHI ISBN 8120329686.
4. Martin John C. Introduction to Language & Theory of computation: TMH ISBN 9780070660489.
5. M.Sipser (1997). Introduction to the Theory of Computation; Singapore: Brooks/Cole, Thomson Learning I*SBN* 978-1133187790.
6. http://nptel.ac.in/

Course Code: **CA-202**	**Data Structures and Algorithms**	*Clock Hours:* **60**
		Total Marks: **100**

Unit-I   **[08]**   Max Marks:**06**
Introduction to Data Structures and Algorithms: Algorithmic Notation: Format Conventions, Statement and Control Structures. Time and Space Analysis: Data types and Abstract data types, Types of Data structures; Primitive, Non primitive, Linear and Nonlinear Data structures

Unit-II   **[08]**   Max Marks:**15**
Array: Storage representation, operations and applications (Polynomial addition and subtraction) **Stack**: operations and applications (infix, postfix and prefix expression handling), **Queue**: operations and applications, Circular Queues: operations and applications, Concept of Double ended Queue and Priority Queue, Linked representation of stack and queue.

Unit-III   **[10]**   Max Marks:**12**
Linked Lists: Operations and Applications of Linear linked list (Polynomial addition and subtraction), Circular linked list and Doubly linked list.

Unit-IV   **[11]**   Max Marks:**21**
Trees: Binary Trees, Binary Tree: Representations, Operations (insert/delete), Traversal (inorder, preorder, postorder, level order), Threaded Binary Tree, Search Trees: AVL Tree, single and double rotations, B-Trees: insertion and deletion, Introduction to B+ and B* Trees

Unit-V [11]   Max Marks:**18**
Graphs and Their Applications: Representation (Matrix/Adjacency) and Traversal (Depth First Search/Breadth First Search), Spanning Trees, Minimal Spanning Tree (Prim's and Kruskals's algorithm), Shortest Paths and All Pair Shortest Path, Dijkstra's, Floyd-Warshall Algorithms.

Unit-VI [12]   Max Marks:**18**
Hash Table: Hash Function, Collision and its Resolution, Separate Chaining, Open Addressing (linear probing, quadratic probing, double hashing), Rehashing, Extendible Hashing **Searching:** Linear Search and Binary Search (array/binary tree). **Sorting**: General Background, Sorting Techniques: Bubble Sort, Insertion Sort, Selection Sort, Quicksort, Mergesort, Heapsort and Radix Sort.

References:
1. Tremblay, J. & Sorenson, P.G., (2001), An Introduction to Data Structures with Application, Mcgraw Hill India, ISBN: 978-0074624715, 0074624717
2. Langsam, Y., Augenstein, M.J. & Tenenbaum A.M., (2015), Data Structures using C and C++, 2nd Edition, Pearson Education ISBN: 978-9332549319, 9332549311
3. Balagurusamy, E., (2013), Data Structures using C, 1st Edition, Mcgraw Hill Education, ISBN: 978-1259029547, 1259029549
4. Weiss, M.A., (2002), Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson India, ISBN: 978-8177583588, 8177583581
5. Horowitz, E., Sartaj S. & Mehta, D. (2008), Fundamentals of Data Structures in C++, Universities Press ISBN: 978-8173716065, 8173716064 *
6. Lafore, R., (2003), Data Structures & Algorithms in Java, 2nd Edition, Pearson India, ISBN: 978-8131718124, 8131718123
7. Kruse, R., Tondo, C.L., Leung B., & Mogalla S, (2006), Data Structures and Program Design in C, Pearson India, ISBN: 978-8177584233.

Course Code: **CA-203**   **Operating Systems**   *Clock Hours:* **60**
Total Marks: **100**

Unit-I [04]   Max Marks:0**8**
Introduction: review of computer organization, introduction to popular operating systems like UNIX, Windows, etc., OS structure, system calls, functions of OS, evolution of OSs.

Unit-II [03]   Max Marks:0**6**
Computer organization interface: using interrupt handler to pass control between a running program and OS.

Unit-III   [08]   Max Marks:**12**
Concept of a process: states, operations with examples from UNIX (fork, exec), Process scheduling, interprocess communication (shared memory and message passing), UNIX signals.

Unit-IV   [04]   Max Marks:0**6**
Threads: multithreaded model, scheduler activations, examples of threaded programs.

Unit-V   [06]   Max Marks:**10**
Scheduling: multi-programming and time sharing, scheduling algorithms, multiprocessor scheduling, thread scheduling (examples using POSIX threads).

Unit-VI   [08]   Max Marks:**12**
Process synchronization: critical sections, classical two process and n-process solutions, hardware primitives for synchronization, semaphores, monitors, classical problems in synchronization (producer-consumer, readers-writer, dining philosophers, etc.).

Unit-VII   [06]   Max Marks:**10**
Deadlocks: modelling, characterization, prevention and avoidance, detection and recovery.

Unit-VIII   [07]   Max Marks:**12**
Memory management: with and without swapping, paging and segmentation, demand paging, virtual memory, page replacement algorithms, working set model, implementations from operating systems such as UNIX. Current Hardware support for paging: e.g., Pentium/ MIPS processor etc.

Unit-IX   [07]   Max Marks:**12**
Secondary storage and Input/Output: device controllers and device drivers, disks, scheduling algorithms, file systems, directory structure, device controllers and device drivers, disks, disk space management, disk scheduling, NFS, RAID, other devices. operations on them, UNIX FS, UFS protection and security, NFS

Unit-X   [04]   Max Marks:**06**
Protection and security: Illustrations of security model of UNIX and other OSs. Examples of attacks.

Unit-XI   [03]   Max Marks:**06**
Epilogue: Pointers to advanced topics (distributed OS, multimedia OS, embedded OS, real-time OS, OS for multiprocessor machines).

All above topics shall be illustrated using UNIX as case-studies.

References:
1. 1 Abraham Silberschatz, Peter B. Galvin, Greg Gagne (2009), Operating System Concepts, 8th Ed., John Wiley ISBN 0-471-69466-5.

2. William Stallings (2014), Operating Systems: Internals and Design Principles. Pearson, 8th Ed. ISBN-13: 978-0-13-230998-1
3. AS Tanenbaum (2009), Modern Operating Systems, 3rd Ed., Pearson. ISBN: 0135013011
4. AS Tanenbaum, AS Woodhull (2006), Operating Systems Design and Implementation, 3rd Ed., Prentice Hall ISBN-10: 0131429388
5. M. J. Bach (1986), Design of the Unix Operating System, Prentice Hall of India ISBN0. -13-201757-1 025

*Course Code:***CA-204**   **Computer Networks**   *ClockHours:***60**
*Total Marks:***100**

Unit-I   **[10]**   Max Marks:**20**
Overview of Computer Network, OSI and TCP/IP Reference Models, Guided and Unguided Transmission Media, Analog and Digital Communication, Encoding and Modulation, Nyquist Theorem, Shannon's capacity, Switching techniques- TDM,FDM.

Unit-II   **[15]**   Max Marks:**25**
Framing, Error detection and Error correction- Vertical Redundancy Check (VRC) Longitudinal Redundancy Check (LRC), Hamming Distance, Hamming Code, Cyclic Redundancy Check(CRC), Stop and Wait Protocol, Sliding Window Protocol, Go-Back-n ARQ, Selective-Reject ARQ, HDLC.

Unit-III   **[10]**   Max Marks:**15**
Channel Allocation, ALOHA Systems, CSMA Protocols, Collision Free Protocols, Local Area Networks, Bridges, ATM

Unit-IV   **[15]**   Max Marks:**25**
Routing- Flooding, Shortest Path Routing, Distance Vector Routing, Link State Routing, Congestion Control-Leaky Bucket and Token Bucket algorithms, IP Protocol, IP Addressing, ARP, RARP, OSPF, BGP, TCP, UDP,DHCP.

Unit-V   **[10]**   Max Marks:**15**
Cryptography and Network Security- Introduction to the Concept of Security, Cryptographic Techniques, Computer-based Symmetric and Asymmetric Key Cryptographic Algorithms, Public Key Infrastructure (PKI), Internet Security Protocols, Network Security.

References:
1.Andrew S. Tanenbaum ,(2009). Computer Networks 4th Edition , Pearson Prentice Hall.ISBN- 978-81-7758-165-2

2.Behrouz A. Forouzan, (2012).Data Communications and Networking. 5th Edition. Mc Graw – Hill, ISBN-10: 0073376221

3. William Stalling, (2013) Cryptography and Network Security 6 edition Pearson Education India, ISBN-10: 9332518777

4. Behrouz A Forouzan and Fender Mukhopahyay, (2010) Cryptography and Network Security, 2nd edition, McGraw Hill Education, ISBN-10: 007070208X

5. Atul Kahate, (2009),Cryptography and Network Security, 2nd Edition, McGraw Hill Education, ISBN-10: 0070151458

Auxiliary Resources:

   a.   http://nptel.ac.in/courses/106105081/1
   b.   http://www.nptelvideos.in/2012/11/computer-networks.html
   c.   https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-033-computer-system-engineering-spring-2009/video-lectures/lecture-9/

Course Code: **CA-205**	**Python Programming**	*Clock Hours:* **60**
		Total Marks: **100**

Unit-I   **[12]**   Max Marks:**20**

The Python Programming Language, Python Data, Variables, Expressions and Statements, Values and Data Types, Type conversion Functions, Operators and Operands, Input, Order of Operations, Functions, Calling Functions, Passing Functions, Formal Arguments, Variable-length Arguments, Functional Programming, Boolean Expressions, Logical operators, Precedence of Operators, Conditional Execution, Unary Selection, Nested conditionals, Chained conditionals, Boolean Functions, Iteration, The for loop, The while Statement

Unit-II   **[08]**   Max Marks:**15**

Strings, A Collection Data Type, Operations on Strings, Index Operator: Working with the Characters of a String, String Methods, Length, The Slice Operator, String Comparison, Lists, List Values, List Length, Accessing Elements, List Membership, Concatenation and Repetition, List Slices, Lists are Mutable, List Deletion, Objects and References, Aliasing, Cloning Lists, Repetition and References, List Methods, Append versus Concatenate Lists and for loops, Using Lists as Parameters, Nested Lists, Strings and Lists, List Type Conversion Function, Tuples, Tuple operators and built-in functions, Tuples and Mutability, Tuple Assignment, Tuples as Return Values

Unit-III   **[15]**   Max Marks:**20**

Dictionaries, Dictionary Operations, Dictionary Methods, Dictionary Keys, Aliasing and Copying, Sparse Matrices, Working with Data Files, Finding a File on your Disk, Reading a

File, Iterating over lines in a file, Writing Text Files, Object Oriented Programming, Classes, Instances, Class method Calls, Coding Class Tree, Attributes, Building and Method Invocation, Composition, Inheritance, Operator Overloading, Encapsulation and Information Hiding, Search Algorithms, Sorting Algorithms, Hash Tables

Unit-IV **[10]** Max Marks:**20**
Regular Expressions, Exceptions, Standard Exceptions, Exceptions Syntax, The try/except/else Statement, The try/finally Statement, Unified try/except/finally, The raise Statement, The assert Statement, with/as Context Managers String-Based Exceptions, Class-Based Exceptions, General raise Statement Forms, Nesting Exception Handlers, Exception Idioms, Exception Design Tips. Catch All Exceptions, Catch A Specific Exception, Catch Multiple Specific Exceptions, Clean-up After Exceptions, GUI Programming using TKinter.

Unit-V **[15]** Max Marks:**25**
Advance Function Topics: Anonymous Function Lambda, Mapping Functions over Sequences: map, Functional Programming Tools: filter and reduce, List Comprehensions Revisited: Mappings. Modules: Python Program Architecture, Module Creation, Module usage, Module Namespaces, Reloading Modules, Module Packages. Data Hiding in Modules, Enabling Future Language Features, Mixed Usage Modes, Changing the Module Search Path, The import as Extension, Relative Import Syntax, Module Design Concepts

References:
1. John V Guttag (2013), Introduction to Computation and Programming Using Python, Prentice Hall of India, 2013, ISBN: 9780262525008
2. R. Nageswara Rao(2016), Core Python Programming, Dreamtech Press, 2016, ISBN-13: 9789351199427
3. Wesley J. Chun(2006), Core Python Programming - Second Edition, Prentice Hall, ISBN-13: 978-0132269933, ISBN-10: 0132269937
4. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser(2013), Data Structures and Algorithms in Pyhon", Wiley, 2013, ISBN : 978-1-118-54958-2, ISBN : 978-1-118-29027-9(HardCover)
5. Kenneth A. Lambert(2011), Fundamentals of Python – First Programs, CENGAGE Publication, 2011, ISBN 1111822700, ISBN 9781111822705
6. Luke Sneeringer(2015), Professional Python, Wiley Inc.,2015, ISBN: 1119070856
7. Mark Lutz (2007), Learning Python, 3rd Edition, O'Reilly Media, Inc., 2007, ISBN-13: 978-0-596-51398- 6, ISBN-10: 0-596-51398-4

Course Code: **CA Lab-III   LAB on Data Structures and Algorithms   *Total Marks:* 100**

Implementation of programs based on the following
- Arrays
- Multidimensional Arrays, Matrices
- Stacks, Polish Notation
- Queues
- Deques
- Linear Linked List, Circular Linked List, Doubly Linked List
- Polynomial Addition/Subtraction

Implementation of programs based on Trees
- Binary Search Tree
- In-order, Pre-order and Post-order Traversals
- Heap Tree
- Balanced Binary Tree (AVL)
- B-Trees

Implementation of programs based on Graphs
- Depth First Traversal
- Breadth First Traversal
- Obtaining Shortest Path (Dijstra and Floyd-Warshall)
- Minimum spanning tree (Kruskal and Prim)

Implementation of programs for Hash Table, Searching and Sorting techniques
- Hash Table
- Linear and Binary Search (using array)
- Bubble sort
- Selection sort
- Insertion sort
- Radix sort
- Quick sort
- Merge sort
- Heap sort

Course Code: **CA Lab-IV   Lab on Python Programming   *Total Marks:* 100**

1. Develop programs to understand the control structures of python
2. Develop programs to learn different types of structures (list, dictionary, tuples) in python
3. Develop programs to learn concept of functions scoping, recursion and list mutability.
4. Develop programs to understand object oriented programming using python.
5. Develop programs for data structure algorithms using python – searching, sorting and hash tables.
6. Develop programs to learn regular expressions using python.

7. Develop programs to learn GUI programming using Tkinter.
8. Demonstrate the concept of exception handling using try/except/else Statement, Unified try/except/finally, try/finally Statement, raise Statement, assert Statement, catch multiple specific exceptions
9. Demonstrate the concept of String-Based Exceptions, Class-Based Exceptions and Nesting Exception handlers.
10. Demonstrate implementation of the Anonymous Function Lambda.
11. Demonstrate implementation Mapping Functions over Sequences.
12. Demonstrate implementation functional programming tools such as filter and reduce
13. Demonstrate the Module Creation, Module usage, Module Namespaces, Reloading Modules, Module Packages, Data Hiding in Modules.
14. Demonstrate Mixed Usage Modes of modules, Changing the Module Search Path, The import as Extension, Relative Import Syntax, Module Design Concepts

Semester- III

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| *Course Code:* **CA-301** | **Accounting and Management Control** | *ClockHours:* **60** *Total Marks:* **100** |

Unit-I [05] Max Marks: **10**
Principles of Accounting - Concepts - Conventions – Principles, methods of accounting, accounting systems, types of accounts.

Unit-II [15] Max Marks: **20**
Financial Accounting –books of accounts, Journal, ledger, trial balance, Financial Statements.

Unit-III [07] Max Marks: **10**
Ratio Analysis, meaning, importance, scope, limitations, types of variances, calculation of variances.

Unit-IV [06] Max Marks: **10**
Cost Accounting - Concept of Cost, Elements of Cost, cost classification, methods and techniques of costing.

Unit-V [06] Max Marks: **10**
Fund Flow Statement, Concept, importance, Simple Problems, Cash Flow Statement, Concept, Advantages, Simple Problems.

Unit-VI [06] Max Marks: **10**
StandardCosting: concept, types of variances, computation of material cost variances, Labor Cost variances, and overhead cost variances.

Unit-VII [05] Max Marks: **10**
Marginal Costing, importance, Marginal Costing Vs Absorption Costing, importance, Break-even Analysis, break even chart.

Unit-VIII [05] Max Marks: **10**
Budgeting and Budgetary Control, Benefits, Zero Base Budgeting, Traditional Budgeting Vs Zero Base Budgeting, types of budget - fixed, flexible, cash budget.

Unit IX: [05] Max Marks: **10**
Responsibility Accounting: Responsibility Centre's, Types of Responsibility Centre's(Cost, Revenue, Profit, Investment), Responsibility, Performance Reporting: Measuring Divisional

Performance, Non – Financial Measures of Performance.

References:

1. Dr. SakshiVasudeva, (2010)," Accounting For Business Managers",   Himalaya Publishing House. ISBN-10: 8184885636
2. Dr. Jawahar Lal, (2017) "Accounting For Management", Himalaya Publishing House, ISBN 81 78663856
3. Bhattacharya, S.K. and Dearden, John. (1997), "Accounting for Management : Text and Cases",3rd edition, Vikas Publishing House ISBN 10- 8125905537
4. Chadiwick.(1996)," The Essence of Financial accounting", Prentice Hall, ISBN-10: 0133565106
5. Horngren, Sundem and Selto (1993),"Introduction to management accounting ", 9th edition,Prentice Hall, ISBN- 0134820924

Course Code: **CA-302**   **Design and Analysis of Algorithms**   *Clock Hours:* **60**
Total Marks: **100**

Unit-I   **[10]**   Max Marks:**15**
 What Is An Algorithm?, Algorithm Specification, Pseudocode Conventions, Recursive Algorithms, Complexity, Asymptotic Notation, Practical Complexities And Performance Measurement
Tree And Graph Representations, Binary Trees Basics, Heaps And Heap Sort, Sets And Disjoint Set Union And Find.

Unit-II   **[12]**   Max Marks:**15**
Divide And Conquer:General Method, Binary Search, Finding Maximum And Minimum, Merge Sort, Quick Sort, Strassen's Matrix Multiplication.

Unit-III   **[08]**   Max Marks:**15**
Greedy Method: General Method, Knapsack Problem, Huffman Code, Minimum-Cost Spanning Trees (Prim's & Kruskal's Algorithm), Optimal Storage On Tapes, Single-Source Shortest Paths.

Unit-IV   **[08]**   Max Marks:**15**
Dynamic Programming: General Method, All-Pair Shortest Path, Matrix Chain Multiplication, Longest Common Sub Sequence, 0/1knapsack, Flow Shop Scheduling

Unit-V   **[06]**   Max Marks:**15**
Basic Search and Traversal Techniques: Breadth First Search And Traversal, Depth First Search And Traversal, Spanning Trees.

Unit-VI [08]   Max Marks:**15**
Backtracking: General Method, Constrains, 8-Queens Problem Graph Coloring

Unit-VII [08]   Max Marks:**10**
NP-Hard and NP-Complete Problems: Basic Concepts, Nondeterministic Algorithms, Polynomial Time, Polynomial-Time Verification, The Classes NP-Hard And NP-Complete, NP-Completeness And Reducibility, NP-Completeness Proofs, NP-Complete Problems

References:
1. Horowitz E. and Sahni S. "Fundamentals of computer Algorithms" Galgotia publications.
2. Horowitz E., Sahni S. and Rajshekaran S(),Computer Algorithms, Computer Science Press.
3. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani(2006), Algorithms. McGraw-Hill publications. ISBN 9780073523408
4. Cormen, Leiserson and Rivest, Introduction to Algorithms,: Prentice Hall of India ISBN: 978-81-203-4007-7

Course Code: **CA-303**   **Mathematical Foundations of**   *Clock Hours:* **60**
                                   Computer Science-II   *Total Marks:* **100**

Unit-I [15]   Max Marks:**25**
Induction and Recursion: Mathematical Induction, Strong Induction and Well Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness, The Towers of Hanoi, Merge Sort, Linear Recurrences, Divide-and-Conquer Recurrences, A Feel for Recurrences

Unit-II [15]   Max Marks:**20**
Advance Counting Techniques: Recursive Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.

Unit-III [05]   Max Marks:**10**
Statistics: Population and sample, parameters and statistics: definition, types: Descriptive and Inferential, applications, Descriptive Statistics: Mean, median, mode and standard deviation, variance, Graphical statistics

Unit-IV [15]   Max Marks:**20**

Probability: Making decisions under uncertainty, Classical definition of Probability, Events and their Outcomes, Rules of Probability, Probability axioms, Random variables (discrete and continuous), Joint and Conditional probability, independence and Bayes theorem, Distribution of a random vector, Probability mass function, Probability density function and distribution function. Distributions: Binomial, Poisson, Uniform, Exponential, Normal.

Unit-V   **[10]**   Max Marks:**15**
Stochastic Processes: Definitions and classifications of Stochastic Processes, discrete and continuous Markov models, Hidden Markov Models, Chapman-Kolmogorov equation

References:
1. Kenneth H. Rosen, Discrete Mathematics and its Applications 6th Ed, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007 ISBN 10: 0070681880
2. Michael Baron (2014) Probability and Statistics For Computer Scientists Second Edition, CRC press. ISBN: 978-1-4822-1410-9
3. Bhat B.R, Srivenkatramana T and Rao Madhava K.S. (1996): Statistics: A Beginner's Text, Vol. I, New Age International (P) Ltd.
4. Croxton F.E, Cowden D.J and Kelin S (1973): Applied General Statistics, Prentice Hall of India ISBN 10: 0201089947 ISBN 13: 9780201089943
5. Hogg, Robert V. & Craig Allen T. (2008). Introduction to Mathematical Statistics, Pearson Education ISBN 0-02-978990-7
6. Goon A.M., Gupta M.K., Dasgupta. B. (2001), Fundamentals of Statistics, Volume I and II, World Press, Calcutta.
7. Ross, S. (2005). Introduction to Probability Models, (6th Ed. Academic Press). ISBN 978-0-12-375686-2
8. Medhi, J. (1994). Stochastic Processes, (2nd Ed. New Age Publisher) ISBN : 978-93-86286-48-2

Course Code: **CA-304**   **Artificial Intelligence**   *Clock Hours:* **60**
                                                                                    Total Marks: **100**

Unit-I   **[08]**   Max Marks:**10**
Introduction: Overview and Historical Perspective, Turing test, Physical Symbol Systems and the scope of Symbolic AI, Agents.

Unit-II   **[06]**   Max Marks:**10**
State Space Search: Depth First Search, Breadth First Search, DFID.

Unit-III   **[08]**   Max Marks:**12**
Heuristic Search: Best First Search, Hill Climbing, Beam Search, Tabu Search.

Unit-IV [08] Max Marks:**15**
Randomized Search: Simulated Annealing, Genetic Algorithms, Ant Colony Optimization.
Unit-V [08] Max Marks:**12**
Problem Decomposition: Goal Trees, AO*, Rule Based Systems, Rete Net.

Unit-VI [06] Max Marks:**12**
Game Playing: Minimax Algorithm, AlphaBeta Algorithm, SSS*.

Unit-VII [08] Max Marks:**14**
Planning and Constraint Satisfaction: Domains, Forward and Backward Search, Goal Stack Planning, Plan Space Planning, Graphplan, Constraint Propagation.

Unit-VIII [08] Max Marks:**15**
Logic and Inferences: Propositional Logic, First Order Logic, Soundness and Completeness, Forward and Backward chaining.

References:
1. Deepak Khemani (2013). A First Course in Artificial Intelligence, McGraw Hill Education (India).
2. Elaine Rich and Kevin Knight (1991). Artificial Intelligence, Tata McGraw Hill.
3. Stuart Russell and Peter Norvig (2009). Artificial Intelligence: A Modern Approach, 3rd Edition, Prentice Hall.

Course Code: **CA-305** **Web Designing** *Clock Hours:* **60**
Total Marks: **100**

Unit-I [05] Max Marks:**10**
Introduction to Web Development: Components of Web application, Static vs. dynamic web pages, A survey of browsers, servers and scripting languages, URL, Introduction to HTML, HTML5, XHTML and CSS, Semantic markup, Web Page Designing Principles, Page layout, Website organization

Unit-II [10] Max Marks:**15**
HTML 5.0: Structure of HTML5 Document, Elements, tags and attributes, DOCTYPE declaration, HEAD section, Coding text elements, Headings and paragraphs, Inline elements for formatting and emphasizing text, div and span elements, Events, WEB Form2.0, SVG, Canvas, Audio &Video, Geolocation, Drag & Drop, Web Workers.

Unit-III   **[10]**   Max Marks:**20**
CSS to format elements of a web page: CSS applications, Selectors: Basic Rule, Grouping, class and ID selectors, attribute selectors, document structure, Specificity, Inheritance, cascade, Values and Units, Fonts, Colors Working with text, text alignment, spacing(letter/word), Text decoration, Text Shadows, CSS box model, Spacing, borders and backgrounds, Page layout using CSS, Floating elements, Multicolumn layout, Ways to include CSS in a web page.

Unit-IV   **[15]**   Max Marks:**20**
HTML and CSS skills: Working with links and lists, Working with images, Working with tables, Working with forms, Adding audio, video to web pages, JavaScript for image rollovers, image swaps, slide shows, tabbed data and data validation

Unit-V   **[10]**   Max Marks:**20**
Core Concepts of XML: Parts of an XML document, Document Prolog, The XML declaration, The document type declaration, Elements, Attributes, Namespaces, Entities, Comments, CDATA Section, Processing instructions, XSL, Displaying XMLwith CSS, JAVA Script, XSLT

Unit-VI   **[10]**   Max Marks:**15**
Modeling Information: Simple Data storage, Dictionaries, Records, XML and Databases, Narrative Documents, Flows and sections, Blocks and inlines, Complex structures, Metadata, Linked Objects

References:
1. Anne Boehm, Murach's HTML, XHTML and CSS, Shroff Publishers and Distributers Pvt. Ltd., ISBN 13: 978-93-5023-095-4
2. Learning XML, Erik T. Ray, O'Reilly, Shroff Publishers and Distributers Pvt. Ltd., ISBN 13: 978-81-8404-896-4
3. Learning Web Design
4. Eric A. Meyer, CSS: The Definitive Guide, Visual Presentation for the Web, 3rd Edition, O'Reilly Media, November 2006, ISBN:978-0-596-52733-4| ISBN 10:0-596-52733-0(Print), ISBN 978-0-596-15940-5, 10:0-596-15940-4(Ebook)
5. Benoit Marchal, XML by Example, 2nd Edition, Microsoft Press 2001,ISBN-10: 0-7897-2504-5, ISBN-13: 978-0-7897-2504-2.
Auxiliary Resources :
    https://www.tutorialspoint.com/html5/

Course Code: **CA Lab-V**   **LAB on Design and Analysis of Algorithms**   *Total Marks:* **100**

Laboratory Requirements:
OS: Windows/Linux,
Programming Language: C++/Java/C#

1. Write a program for creating max./min. heap using
   - INSERT
   - ADJUST/HEAPIFY
2. Write a program to implement union and find operation.
3. Write a program to find minimum and maximum form a given array.
4. Write a program for searching element form given array using binary search for n=1000,2000,3000 find exact time of execution.
5. Write a program for sorting given array in ascending/descending order with n=1000,2000,3000 find exact time of execution using
   - Heap sort
   - Merge sort
   - Quick sort
6. Write a program for matrix multiplication using Strassen's matrix multiplication.
7. Write a program to find solution of Knapsack instant.
8. Write a program to find shortest path using single source shortest path.
9. Write a program to find Minimum-Cost Spanning Trees (Prim's & Kruskal's Algorithm).
10. Write a program to find shortest path using all pair path.
11. Write a program to find longest common subsequence.
12. Write a program to implement breadth first and depth first search.
13. Write a program to implement breadth first and depth first traversal.
    Write a program to find all solutions for 8-queen problem using backtracking.

Course Code: **CA Lab-VI**   **LAB on Web Designing**   *Total Marks:* **100**
(HTML/XML/CSS/Navigation)

Demonstrate following Assignments with appropriate HTML tags and CSS :

1. Design a web page for clickable table of contents (TOC) of your first semester syllabus. Every click should display detailed content.
2. Design a web page for online books catalog.
3. Design a first page of online newspaper.
4. Design a web page for lecture schedule of current semester.

5. Demonstrate various CSS features
6. Design a web page that displays student feedback form for a scheduled course.
7. Design a web page that allows mp3 downloads.
8. Design a web page for nursery for plant selection using XML.
9. Design a web page for restaurant/ice cream parlor using XML.
10. Create a dictionary database using XML.
11. Design a narrative document using XML.
12. Display XML file using CSS
13. Display XML file of your choice using XSL
14. Display XML file using DSO data binding
15. Demonstrate Event Handling.
16. Draw Circle, Rectangle, Line, Ellipse and Polygon using SVG.
17. Create a Drawing Application with Canvas using HTML5.
18. Display Audio & Video playlist on browser using HTML5.
19. Display your location and location's coordinates of Longitude and latitude on Google Map.
20. Create a web page for shopping cart using Drag and Drop Events.
21. Design a web page which demonstrates Web Workers feature.

Semester-IV

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Course Code: **CA-401** **High Performance Computing** _Clock Hours:_ **60**
Paradigms and Applications _Total Marks:_ **100**

Unit-I **[06]** Max Marks:**20**
Basics of Cloud Computing: Introduction to Distributed Systems, Single System Image, Naming and Synchronization Communication in DS, Load Balancing, Process Migration, Fault Tolerant Systems. Introduction to Grid and Cluster Computing.

Unit-II **[06]** Max Marks:**15**
Introduction to Cloud Computing: Roots of Cloud Computing, Layers and Types of Clouds, Features of a Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, and Challenges and Opportunities

Unit-III **[06]** Max Marks:**10**
Virtualization and Resource Provisioning in Clouds: Introduction and Inspiration, Virtual Machines (VM), VM Provisioning and Manageability, VM Migration Services, VM Provisioning in the Cloud Context, and Future Research Directions.

Unit-IV **[10]** Max Marks:**10**
Cloud Computing Architecture: Cloud Benefits and Challenges, Market-Oriented Cloud Architecture, SLA-oriented Resource Allocation, Global Cloud Exchange; Emerging Cloud Platforms, Federation of Clouds

Unit-V **[12]** Max Marks:**15**
Programming Enterprise Clouds using Aneka: Introduction, Aneka Architecture, Aneka Deployment, Parallel Programming Models, Thread Programming using Aneka, Task Programming using Aneka, and MapReduce Programming using Aneka, Parallel Algorithms, Parallel Data mining, Parallel Mandelbrot.

Unit-VI **[12]** Max Marks:**15**
Advanced Topics and Cloud Applications: Integration of Private and Public Clouds, Cloud Best Practices, GrepTheWeb on Amazon Cloud, ECG Data Analysis on Cloud using Aneka, Hosting Massively Multiplayer Games on Cloud.

Unit-VII **[08]** Max Marks:**15**
Practical Related Topics: Topics related to Practical hands on will be added later on.

References

1. A. S Tanenbaum and M.V. Steen(2007), Distributed Systems: Principles and Paradigms, Second Edition, Pearson Prentice Hall Publication, 2007, ISBN:0-13-239227-5
2. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi(2013), Mastering Cloud Computing, Tata McGraw Hill, New Delhi, India, 2013 **ISBN**-13: 978-1-25-902995-0
3. Rajkumar Buyya, James Broberg , Andrzej M. Goscinski(2011), Cloud Computing: Principles and Paradigms, Wiley India Publication, 2011, ISBN: 978-0-470-88799-8
4. Toby Velte, Anthony Velte, Robert Elsenpeter (2009), Cloud Computing: A Practical Approach, Tata McGraw Hill Publication,2009, ISBN 0071626948 / 9780071626941
5. Barrie Sosinsky (2011), Cloud Computing Bible, Wiley Publishing India Pvt Ltd.,2011, ISBN: 978-0-470-90356-8

Course Code: **CA-402**	**Web Application Technology**	*Clock Hours:* **60**
		Total Marks: **100**

Unit-I   **[10]**   Max Marks:**15**

Desktop Computing vs. Internet Computing, Internet computing infrastructure, Client side scripting vs. Server Side Scripting technologies, Web Server basics and configuration: IIS, Apache etc., Web site hosting basics, Web Publishing, HTML, introduction to .NET framework, Features of .NET frameowork:CTS,CLS,CLR,.NET technologies, languages'C#.NET,VB.NET, basics of ASP.NET page framework, Visual studio .NET IDE, Page Life Cycle, PostBack, Viewstate, Page directives, ASP.Net page execution cycle, HTTP Pipeline, HTTP Application, HTTP Request, HTTP Response classes, HTTP Modules and HTTP Handlers, State Management, Role of *Global.asax*, Application configuration using *web.config* file

Unit-II   **[15]**   Max Marks:**25**

ASP.NET Control hierarchy, HTML Server Controls, Web Server Controls, User and Server controls, Validation Controls, List bound controls:dropdown lists, list boxes, Repeater, DataList, Data Grid, DataGridView,FormsView controls, Data binding to List Bound Controls, Templating and Styling of ASP.NET server controls

Unit-III   **[20]**   Max Marks:**25**

Web Page Designing principles, CSS anatomy, Anatomy of Master Pages, nesting master pages, Site map file, Web site Navigation controls, properties:TreeView, Sitemap Path, Menu, Other Navigation methods: Response.Redirect(), Server.Transfer(), Personalization through Profiles, Themes/Skins, Web Site security basics: authentication modes:Windows,Forms,passport, authorization, roles/Membership, access rules, login

controls,Web services: working, anatomy, hosting

Unit-IV [15] Max Marks:**25**

Database technology: ADO.NET, Anatomy/architecture of ADO.NET, working with Connection, Command, Data Adaptor, DataReader, DataSet, DataTable objects, Editing data in Data Tables, concurrency control. Introduction to MVC, Data Reports

References:

1. Richard Anderson, Brian Francis, Alex Homer, Rob Howard, David Sussman, Karli Watson(2002), Professional ASP.NET 1.0, Special Edition, Wrox Press Ltd., 2002, ISBN 1-861007-0-3-5.
2. Chris Hart, John Kauffman, Dave Sussman, and Chris Ullman(2006), Beginning ASP.NET 2.0, Wiley Publishing, Inc., 2006, ISBN-13: 978-0-7645-8850-1, ISBN-10: 0-7645-8850-8.
3. Beginning ASP.NET 4: in C# and VB, Imar Spaanjaars, Wiley Publishing, Inc 2010., ISBN: 978-0-470-50221-1
4. Bill Evjen, Scott Hanselman, Devin Rader (2008), Professional ASP .NET 3.5 in C# and VB, Wiley Publishing Inc.,2008 ISBN:978-0-470-18757-9.
5. Dino Esposito (2008), Programming Microsoft ASP.NET 3.5, Second Edition, Microsoft Press, 2008, ISBN-10: 0735625271, ISBN-13: 978-0735625273

Auxiliary Resources:
   d.   Website URLs

https://www.asp.net/

http://asp.net-tutorials.com/
   e.   Video Links
   1.   https://www.asp.net/web-forms/videos
   2.   https://www.youtube.com/playlist?list=PL6n9fhu94yhXQS_p1i-HLIftB9Y7Vnxlo&feature=view_all

Course Code: **CA-403**   **Machine Learning**   *Clock Hours:* **60**
                                                       Total Marks: **100**

Unit-I [08] Max Marks:**10**

Introduction: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation

Unit-II [08] Max Marks:**15**

Linear regression, Decision trees, overfitting

Unit-III [09] Max Marks:**15**

Instance based learning, Feature reduction, Collaborative filtering based recommendation

Unit-IV [08]   Max Marks:**15**
Probability and Bayes learning

Unit-V [09]   Max Marks:**15**
Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM

Unit-VI [09]   Max Marks:**15**
Neural network: Perceptron, multilayer network, backpropagation, introduction to deep neural network

Unit-VII [09]   Max Marks**15**
Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model

References:
1. Tom Mitchell (1997). Machine Learning. First Edition, McGraw- Hill.
2. Ethem Alpaydin (2009). Introduction to Machine Learning Edition 2. The MIT Press.

Course Code: **CA-404**   **Computer Graphics and Digital Image**   *Clock Hours:* **60**
Processing   *Total Marks:* **100**

Unit-I [08]   Max Marks:**12**
Introduction to Computer Graphics and Output Primitives: Overview of Computer Graphics, Its Applications and Software, Representation in Graphics, Vector Graphic Display, Raster Graphics Display, I/O Devices, Representing Image, Straight Line, Line Drawing Algorithm, DDA, Bresenham's Line Algorithm, Circle-generating algorithm, Ellipse-generating Algorithm, Polygon Filling Algorithm.

Unit-II [06]   Max Marks:**12**
Two-Dimensional Transformation: Matrix and transformation, 2D Basic transformation, Homogeneous coordinates, Translation, Scaling and Rotation of straight line or polygon, Combined Transformation, Rotation about an arbitrary point/line, Reflection and Shearing Transformation, Viewing Transformation, Clipping, Cohen-Sutherland line clipping.

Unit-III [06]   Max Marks:**12**
Three-Dimensional Transformation :Introduction, Matrix representation of 3D Transformation, 3D Translation, Scaling, Rotation, Composition of 3D Transformation, Projection, Orthographic, Isometric, Oblique Projection, Perspective Projection, One-Two-Three point perspective Projection.

Unit-IV [08] Max Marks:12

Introduction to Digital Image Processing & Applications: Digital Image Processing. Applications of Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Image Sensing and Acquisition. Image Sampling and Quantization. Some Basic Relationships Between Pixels.

Unit-V [10] Max Marks:15

Image Enhancement: Background, Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods,
Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency Domain Filters, Homomorphic Filtering,

Unit-VI [10] Max Marks:15

Image Restoration and Color Image Processing: A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Color Fundamentals, Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening.

Unit VII. Morphological Image Processing & Segmentation [06] Max Marks:12

Detection of Discontinuities, Edge linking & Boundary Detection, Thresholding, Region based segmentation Laplacian of Gaussian, Derivative of Gaussian, Canny Edge Detection, Morphological operation: Dilation erosion, Opening & Closing, Basic Morphological Algorithm, Image representation schemes.

Unit VIII. MATLAB Image processing toolbox [06] Max Marks:10

Introduction to MATLAB, Matrix Operations, Introduction to Image Processing Tool Box, Image Read & Write, Filters (spatial and frequency domain), Image Restoration and Reconstruction, Morphological Operations, Edge Detection and linking, Segmentation

References:
1. Amarendra N Sinha, Arun D. Udai, (2008). Computer Graphics, TMH publication ISBN-13 : 978-0-07-063437-4.
2. D. Hearn and M. Pauline Baker, Computer Graphics (C Version), Pearson Education, 2nd Edition ISBN-13: 978-0135309247
3. D. F. Rogers and J. A. Adams, Mathematical Elements for Computer Graphics, 2nd

Edition, McGraw-Hill International Edition, ISBN-13:978-0-07-0486775

4. R.C.Gonzalez & R.E.Woods, Digital Image Processing, Pearson Education, 3rd edition, ISBN. 13:978-0131687288

5. S. Jayaraman Digital Image Processing TMH (McGraw Hill) publication, ISBN-13:978-0-07-0144798

6. Gonzalez, Woods & Steven, Digital Image Processing using MATLAB, Pearson Education, ISBN-13:978-0130085191

*Course Code:***CA-405**   **Optimization Algorithms**   *Clock Hours:***60**
                                                                        Total Marks: **90**

Unit-I   **[05]**   Max Marks:**08**
Overview of operations Research: Introduction, Applications, Role of OR in Decision Making, Feasible and optimal Solutions

Unit-II   **[15]**   Max Marks:**20**
Linear Programming: Special Types: Transportation Problem as LPP, Initial Basic Feasible Solution, North West corner Rule, Lowest Cost Method, Vogel's Approximation Method, MoDi method for optimization, Degeneracy.
Assignment problem, Hungarian Method, Special cases of assignment problem

Unit-III   **[18]**   Max Marks:**24**
Linear Programming Problems: Introduction, Formulation of Mathematical model of LPP, Standard form of linear programming problems, Solving LPP using Graphical method, Infeasible LPP, Unbounded LPP, Basic feasible solutions, Simplex method for solving LPP, augmentation using Slack and artificial variables, Big M and two phase method, Degeneracy, alternative optima, Interpretation of final Simplex table, Duality: concept, applications and example.

Unit-IV   **[06]**   Max Marks:**08**
Integer Programming: Introduction, How it differs from LPP, Pure and mixed integer programming problems, Binary IPP, Techniques to solve IPP.

Unit-V   **[08]**   Max Marks:**15**
Network Models: Definitions, Applications, Representation of a problem in network form, Critical Path Analysis, Resource planning, Giantt Chart.

Unit-VI   **[08]**   Max Marks:**15**
Game Theory : Concept, Two party zero sum game, Pay off matrix, Pure and mixed strategy games, Rule of Dominance, Subgame method, Brown's Algorithm

References:

1. Hamdy Taha (2010). Operations Research: An Introduction. Pearson Education. ISBN: 978-0132555937
2. L C Jhamb. Quantitative Techniques For Managerial Decisions Vol I, Vol II. Everest Publishing House, ISBN: 8186314628
3. PanneerSelvan R (2006). Operations Research. Prentice Hall of India. ISBN: 978-8120329287

Course Code: **CA LAB-VII** **LAB on Computer Graphics and** *Total Marks:* **100**
Digital Image Processing

1. Line drawing algorithm (DDA and Bresenham's Line Algorithm)
2. Circle drawing algorithm
3. Ellipse drawing algorithm
4. Polygon filling algorithm
5. Windowing and clipping algorithm (Point, line and polygon clipping)
6. Composite 2-D transformation, (rotation, scaling & reflection)
7. 3-D geometric transformation (rotation, scaling & reflection)
8. Introduction to Image Processing Toolbox
9. Read an 8 bit image and then apply different image enhancement techniques:
   a) Brightness improvement
   b) Brightness reduction
   c) Thresholding
   d) Negative of an image
   e) Log transformation
   f) Power Law transformation.
10. Implement different interpolation techniques using MATLAB/ SciLab
11. Read an image, plot its histogram then do histogram equalization. Comment about the result.
12.
   a) Implement Gray level slicing (intensity level slicing) in to read cameraman image.
   b) Read an 8 bit image and to see the effect of each bit on the image.
   c) Read an image and to extract 8 different planes i.e. 'bit plane slicing.'
13. Implement various Smoothing spatial filter.
14. Read an image and apply
    1. Gaussian 3x3 mask for burring
    2. High pass filter mask with different masks
    3. Laplacian operator with center value positive and negative
    4. High boost filtering.
15. Write a program to implement various low pass filters and high pass filter in frequency domain.
16. Write a program for erosion and dilation, opening & closing using inbuilt and without inbuilt function.
17. Implement and study the effect of Different Mask (Sobel, Prewitt and Roberts)
18. Implement various noise models and their Histogram
19. Implement inverse filter and wiener filter over image and comment on them

Course Code: **CA LAB-VIII**	**LAB on High Performance Computing (HPC) and Web Application Technology**	*Total Marks:* **100**

High Performance Computing

Practical's on HPC

The syllabus of Practical on HPC will be prepared before the beginning of the Fifth Semester by the Instructors based on the content of CA-502 Theory course. This will cover demonstration of use of IaaS, PaaS and SaaS along with some case studies such as Amazon EC2, Amazon S3, Aneka, Google AppEngine.

Web Application Development Technology Practical Assignments

1. Demonstrate followings in IIS:
    a. Creation of Virtual Directory, Home directory, Home page, hosting of website
2. Demonstrate Page Life Cycle of ASP.NET. Use important page events for your demonstration.
3. Write VB.Net/C# console applications to demonstrate: OO concepts: polymorphism, encapsulation, inheritance, interface inheritance, abstract classes/methods, overloading, overriding, collection classes, properties
4. Demonstrate concept of postback and viewstate using web form server controls of ASP.NET
5. Demonstrate various Web form server controls using sample data entry screen form for registering for a service on website. Also use validation controls to validate input data.
6. Demonstrate DropDown List box, CheckButtonList, RadioButtonList controls.
7. Demonstrate Databinding using Hashtable, ArraryList, DataTable data sources.
8. Demonstrate Repeater control with the help of various templates.
9. Demonstrate paging, sorting,filtering of data in asp:DataGrid/DataGridView.
10. Demonstrate editing process in DataGrid and DataList controls. Make use of necessary templates for proper visual appearance.
11. Demonstrate State Management features of ASP.NET using sample shopping cart application.
12. Create sample website for demonstrating use of Profiles/Themes using skin files.
13. Demonstrate Master Pages and website navigation controls(sitemap path, treeview, menu) using SiteMap file.
14. Demonstrate Properties of website navigation controls.
15. Demonstrate Authorization/Authentication using Login controls and Roles/Membership/AccessRules
16. Demonstrate creation of simple/complex DataReader/DataSet Objects.
17. Demosntrate editing in DataTable objects.
18. Demonstrate Web Service hosting, access in ASP.NET

Semester- V

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Course Code: **CA-501**   **Compiler Construction**   *Clock Hours:* **60**
                                                              Total Marks: **100**

Unit-I   **[05]**   Max Marks:**10**
Introduction to Compilation
Compiler Basics, Issues in Compilation, Phases of Compilation: the Analysis – Synthesis Model, Compiler Construction Tools.

Unit-II   **[06]**   Max Marks:**15**
Designing a Lexical Analyzer
Role of Lexical Analysis, Input Buffering, Specification of Tokens, Recognition of Tokens, Finite automata, Conversion from regular expression to NFA, Deterministic finite automata, Conversion from NFA to DFA, Minimization of DFA, Creating Lexical Analyzer with LEX.

Unit-III   **[15]**   Max Marks:**30**
Designing Syntax Analyzer
Role of Syntax Analyzer, Classification of parsers, **Top-Down Parsing:** Introduction, Problems in top-down parsing, Recursive Parsing, Problems in Recursive Procedures, Predictive Parsing, Error Handling in Predictive Parsers, **Bottom Up Parsing**: Shift Reduce Parser, Actions of shift reduce parser, Construction of parse tree, Operator Precedence Parsing, Components of operator precedence parsers, Parsing action, Construction of operator precedence parsers, Error reporting and recovery in operator precedence Parsers, Advantages and disadvantages of operator precedence Parsing. LR Parsing: Simple LR parser, LR (1) parser, LALR parser.

Unit-IV   **[10]**   Max Marks:**15**
Intermediate Code Generation
Need For Intermediate Code Generation, Intermediate Forms: Polish Notation, Quadruples, Triples, Indirect Triples & Blocks.

Unit-V   **[10]**   Max Marks:**15**
Code Optimization
Introduction, need for code optimization, Classification of code optimization techniques: Optimization techniques that work on machine code, Optimization techniques that work on intermediate forms of source code i.e. Optimization with in Basic Blocks: Folding, Redundant operation elimination, Optimization with in Loop: Strength Reduction, Dead code elimination, Moving operation within block out of block.

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Unit-VI   **[10]**   Max Marks:**15**
Symbol Table Organization
Introduction, Methods of organizing a symbol table: Unsorted, sorted symbol tables, binary search, hashing, its advantages, disadvantages, Collision, Collision resolution techniques: Rehashing, Chaining.

References:
1. Aho A.V., R. Sethi and J.D. Ullman. Compiler Principle, Techniques and Tools: Addison Wesley, ISBN 0-321-48681-1.
2. Barret, Couch. Compiler Construction Theory and Practice: Computer Science series, Asian Student Ed, ISBN 978-0574213358
3. Dhamdhere D.M. Compiler Construction Principle and Practice: McMillan India, ISBN 9780333904060
4. Gres D. Compiler Construction for Digital Computer: Wiley, ISBN 047132776X.
5. David Galles (2009). Modern Compiler Design: Pearson Education, ISBN 9788131709412

Course Code: **CA-502**   **Software Engineering**   *Clock Hours:* **60**
                                                                      Total Marks: **100**

Unit-I   **[10]**   Max Marks:**10**
Introduction and Process Models: Nature of Software, Software Engineering the process, Software Myths. Process Models: Generic process model, Prescriptive process models, Specialized process models, Unified process, Personal and Team process model, Process Technology, Product and Process. Agility, cost of change, Agile process, Extreme Programming, Agile Process models: Adaptive Software development, Scrum, Dynamic system development model, Crystal, Feature Driven development, Lean Software development, Agile modelling, Agile Unified process. Tool set for Agile process

Unit-II   **[10]**   Max Marks:**15**
Requirement Analysis and Modelling: Requirement Engineering, Establishing Groundwork, Eliciting Requirements Developing Use cases, Building Requirement model, Negotiating and Validating requirements. Requirement analysis, Scenario based modelling, UML models that supplements use case, Data modelling concepts, class based modelling. Requirement Modelling strategy, Flow oriented modelling, Creating Behavior model, Pattern for Requirement modelling.

Unit-III [08] Max Marks:**15**
Quality Assurance and Change Management: Elements of SQA, SQA Tasks, Goal and Metrics, Formal approaches to SQA, Software Reliability, ISO 9000 Quality standards, SQA Plan. Software Configuration Management, SCM Repository, SCM process

Unit-IV [11] Max Marks:**20**
Design Concept: Design process, Design Concept: Abstraction, Architecture, Pattern, Separation of concept, Modularity, Information hiding, Functional independence, Refinement, Aspects, Refactoring. Design Model: Data design element, Architectural design element, Interface design element, Component level design element, Deployment level design element.

Unit-V [11] Max Marks:**20**
Architectural and Component Level Design: Software Architectures, Architectural Genres, Architectural styles, Architectural design, Accessing alternatives Architectural design, Architectural mapping using dataflow. Introduction to component, Designing class based component, Conducting component level design, Designing traditional component, component based development.

Unit-VI [10] Max Marks:**20**
Software Testing: Strategic approach to software testing, Test strategies for conventional software, Validation Testing, System testing, Software testing fundamentals, Internal and external view of testing, White box testing, Basic path testing, Control structure testing, Black box testing, model based testing, Testing for specialized Environment, Architectures and applications.

References:
1. R. S. Pressman(2010), "Software Engineering: A Practitioner's Approach", McGraw-Hill International Edition, Seventh Edition, 2010, ISBN:978-007-126782-3.
2. Pankaj Jalote(2010), "Software Engineering: A Precise Approach", Wiley India Pvt. Limited, 2010 ISBN: 978-81-265-2311-5.
3. K. K. Aggarwal and Yogesh Singh(2008), "Software Engineering", Third Edition, New Age International Publishers, 2008, ISBN:978-81-224-2360-0.

Course Code: **CA-503**   **Natural Language Processing**   *Clock Hours:* **60**
Total Marks: **100**
Unit-I [08] Max Marks:**12**

Introduction to NLP, brief history, NLP applications: Speech to Text(STT), Text to Speech(TTS), Story Understanding, NL Generation, QA system, Machine Translation, Text

Summarization, Text classification, Sentiment Analysis, Grammar/Spell Checkers etc., challenges/Open Problems, NLP abstraction levels, Natural Language (NL) Characteristics and NL computing approaches/techniques and steps, NL tasks: Segmentation, Chunking, tagging, NER, Parsing, Word Sense Disambiguation, NL Generation, Web 2.0 Applications : Sentiment Analysis; Text Entailment; Cross Lingual Information Retrieval (CLIR).

Unit-II **[12]** Max Marks:**16**
Text Processing Challenges, Overview of Language Scripts and their representation on Machines using Character Sets, Language, Corpus and Application Dependence issues, Segmentation: word level(Tokenization), Sentence level. Regular Expression and Automata Morphology, Types, Survey of English and Indian Languages Morphology, Morphological parsing FSA and FST, Porter stemmer, Rule based and Paradigm based Morphology, Human Morphological Processing, Machine Learning approaches.

Unit-III **[12]** Max Marks:**18**
Word Classes ad Part-of-Speech tagging(POS), survey of POS tagsets, Rule based approaches (ENGTOWL), Stochastic approaches(Probabilistic, N-gram and HMM), TBL morphology, unknown word handling, evaluation metrics: Precision/Recall/F-measure, error analysis.

Unit-IV **[15]** Max Marks:**22**
NL parsing basics, approaches: TopDown, BottomUp, Overview of Grammar Formalisms: constituency and dependency school, Grammar notations CFG, LFG, PCFG, LTAG, Feature-Unification, overview of English CFG, Indian Language Parsing in Paninian Karaka Theory, CFG parsing using Earley's and CYK algorithms, Probabilistic parsing, Dependency Parsing: Covington algorithm, MALT parser, MST parser.

Unit-V **[15]** Max Marks:**22**
Concepts and issues in NL, Theories and approaches for Semantic Analysis, Meaning Representation, word similarity, Lexical Semantics, word senses and relationships, WordNet (English and IndoWordnet), Word Sense Disambiguation: Lesk Algorithm Walker's algorithm, Coreferences Resolution:Anaphora, Cataphora.

References:
1. Indurkhya, N., & Damerau, F. J. (2010), *Handbook of Natural Language Processing, 2nd Edition.* New York: CRC Press Taylor and Francis Group, Boca Raton London, New York. ISBN-10: 1420085921, ISBN-13: 978-1420085921
2. Martin, J. H., & Jurafsky, D.(2013), *Speech and Language Processing,* Pearson Education India; 2 edition, ISBN-10: 9332518416, ISBN-13: 978-9332518414
3. Manning, Christopher and Heinrich, Schutze(1999), Foundations of Statistical Natural Language Processing", MIT Press, ISBN-10: 0262133601, ISBN-13: 978-0262133609.

4. Akshar Bharati, Chaitanya, V., Kulkarni, A., & Sangal, R. (July 1997). *Machine translation in Stages* (Vol. 10 no. 3). Mumbai: NCST, Mumbai.
5. Bharati, A., Chaitanya, V., & Sangal, R. (1995). *Natural Language Processing: A Paninian Perspective,* New Delhi: Prentice Hall of India, ISBN 10: 8120309219, ISBN 13: 9788120309210.
6. Steven Bird, Edward Loper (2016),Natural Language Processing With Python, Ed. 2, O'Reilly Media,ISBN 1491913428, 9781491913420

Auxiliary Resources:

Web Links

1. https://see.stanford.edu/Course/CS224N
2. https://web.stanford.edu/~jurafsky/NLPCourseraSlides.html
3. https://stp.lingfil.uu.se/~nivre/docs/ACLslides.pdf

Video Links

1. http://www.nptelvideos.in/2012/11/natural-language-processing.html
2. https://www.youtube.com/playlist?list=PL6397E4B26D00A269

Course Code: **CA-504**	**Mobile Application Development**	*Clock Hours:* **60**
		Total Marks: **100**

Unit- I [10] Max Marks:**10**

Mobile Application Development: Introduction to handheld devices (Palm, Pocket Pc, Symbian OS smart phones, MS windows based smart phones, BlackBerry, iphone etc.), features of handheld devices, Device Applications Vs Desktop application, overview of application development platforms (OS-Palm OS, Symbian, BlackBerry, Windows CE, OS for iphone, Android), Programming Languages (C/C++, JAVA), IDE tools. Comparison of Android with other Mobile OS. Comparative study of all versions of Android.

[Note: The unit is to be thought with respect to current scenario of Mobile Development hence above contents may change]

Unit-II [12] Max Marks:**15**

Hello, Android and Installations: Background, What is android and what isn't, Open Mobile Development Platform, Native Android Applications, Android SDK Features, Introducing the Open Handset Alliance, What Does Android Run On? Why Develop for Android?, Introducing the Development Framework. What Comes in the Box, Developing for Android, Developing for Mobile Devices, Android Development Tools as per current version, Installations, Emulator.

Unit-III [16] Max Marks:**20**

Creating Applications, activities and User Interfaces: What Makes an Android Application?, Introducing the Application Manifest. Using the Manifest Editor. The Android

Application Life Cycle. Understanding Application Priority and Process States. Externalizing Resources. A Closer Look at Android Activities. Fundamental Android UI Design. Introducing Views. Introducing Layouts and fragments, Using Adapters, Creating New Views.

Unit-IV [12] Max Marks:**20**

Intents, Broadcast Receivers, and the Internet: Introducing Intents, Creating Intent Filters and Broadcast Receivers, Using Internet Resources. Introducing Dialogs and Action Bars, Creating and Using Menus.

Unit-V [06] Max Marks:**15**

Working in the Background: Introducing Services, Using Background Worker Threads, Using Toast, Introducing Notifications, Using Alarms.

Unit-VI [12] Max Marks:**15**

Data Storage, Retrieval, and Sharing: FILES, SAVING STATE, AND PREFERENCES: Saving Application Data, Creating and Saving Shared Preferences, Retrieving Shared Preferences, Introducing the Preference Framework and the Preference Activity, Persisting the Application Instance State, Including Static Files as Resources, Working with the File System.

DATABASES AND CONTENT PROVIDERS: Introducing Android Databases, SQLite Databases, Content Providers, Introducing SQLite, Content Values and Cursors, Working with SQLite Databases, Creating Content Providers.

References:
1. Reto Meier. Professional Android Application Development, Wrox Publications ISBN: 978-0-470-34471-2.
2. Rick Rogers, John Lombardo, Zigurd Mednieks, G. Blake Meike. Android Application Development: Programming with the Google SDK. O'Reilly ISBN 10: 0596521472 / ISBN 13: 9780596521479.
   Auxiliary Resources:
   https://developer.android.com/index.html

| *Course Code:* **CA-505** | **CMS: Drupal Website Development Framework** | *Clock Hours:* **60** *Total Marks:* **100** |

Unit-I [05] Max Marks:**05**

PHP Overview: PHP syntax highlights, PHP arrays, Superglobal Arrays, PHP and MySQL

Unit-II [08] Max Marks:**10**

CMS: Definition, Advantages, Challenges. Survey of CMS systems and their features and comparison.

Drupal Introduction and Installation: History, Drupal community, Professional support , The Drupal association, Drupal Installation: single Drupal website, Installation Profiles, Installing , Acquia's stack installer, Don't Hack Core, Core Files , Sites Folder, Inheritance and Overrides.

Unit-III [07] Max Marks:**15**

Drupal Website Development: Adding Content , Differences between Articles and Pages , Modifying the Defaults, Modifying your Menus, Adding Blocks to your website, Getting in contact, Adding the Contact Form to Your Main Menu, Summing Up the Contact Form , Exploring your site's permissions, Creating a members-only site, Exploring Roles, Wrapping up Users and Permissions.

Unit-IV [10] Max Marks:**20**

Administration-Configuration, Modules, and Reporting: Configuration, System — Site Information, Regional and Language — Settings, Media, Media — File System, Temporary Directory , PHP File Size Limitations , Media — Image Toolkit, Web Services, Web Services — RSS Publishing, Web Services — Feed Aggregator, Content Authoring — Text Formats, Explore the filtered html text format, Choosing Roles and the Importance of the Order.

Unit-V [10] Max Marks:**20**

Blocks, Menus, Themes And Content: Blocks, Block Visibility, Block Visibility Using PHP, Menus, url aliases aka custom paths, Themes, Theme Global Settings, Content, Nodes, Creating Custom Content types, Submission Form Settings, Publishing Options, Display Settings, Comment Settings, Menu Settings, Adding an Image Upload Field, Multiple Fields for Multiple Images? Permissions, Digging Deeper into Fields, Content Construction Kit (CCK), Views, Content Moderation, Comments, Permissions, WYSIWYG.

Unit-VI [10] Max Marks:**15**

User Management: Creating User Accounts, Creating Accounts, Canceling Accounts, Setting Up Account E-Mails, using OpenID, Creating Roles and Permissions, Creating Custom User Profiles, User Sessions.

Triggers, Actions, Workflow, and Rules: Triggers and Actions, Workflow, Rules, Features of the Rules Module, Conditions, Scheduler and Rule Sets, Input Evaluators.

Unit-VIII [10] Max Marks:**15**

Views: Overview of Views, The Frontpage View, Displays and Style Settings, Creating a Photo Gallery, Arguments, Exposed Filters, Relationships and Permissions, Caching, Advanced Views.

Theming: Installing Themes, Configuring Themes, Custom Theming, Theme Functions, .info file, Regions and Template Files (.TPL.PHP), Swapping Theme Functions And Template Files, Theme Registry, Theme Engines.

References:

1. Beginning Drupal, Jacob Redding ,Wiley Publishing, Inc., 2010,ISBN:978-0-470-43852-7
2. Beginning PHP 5.3, Matt Doyle , Wiley Publishing, Inc., 2010, ISBN: 978-0-470-41396-8
3. Learning PHP and MySQL , Michele E. Davis ,Jon A. Phillips , 2nd edition, Published by O'Reilly Media, Inc., August 2007, ISBN-10: 0-596-51401-8 | ISBN-13: 978-0-596-51401-3.

Auxiliary Resources:

   a) www.wiley.com , https://www.tutorialspoint.com/drupal/ , https://www.tutorialspoint.com/php/
   b) https://www.youtube.com/watch?v=-DYSucV1_9w&list=PLtaXuX0nEZk9MKY_ClWcPkGtOEGyLTyCO , http://getlevelten.com/tutorial/course/getting-started-drupal-7 , https://www.tutorialspoint.com/listtutorial/PHP-Getting-Started-Video-Tutorial/5443 .

Course Code: **CA LAB-IX**   **LAB on Android**   *Total Marks:* **100**
                                      Programming

1. Create "Hello World" application. That will display "Hello World" in the middle of the screen in the red color with white background with change in fonts & styles of text.
2. Create List with string taken from resource folder (res>>value folder). On changing list value change image.
3. Create android UI such that, one screen have radio button of the types of cars. On selecting any car name, next screen should show car details like: name, company name, images if available, show different colors in which it is available.
4. Create android application that will display toast (Message) on android life cycle stages.
5. Create the application that will change color of screen , based on selected option from the menu.
6. Create android application with login module. (Check username & password) on successful login, go to next screen. And on falling login, alert user using Toast.
7. Create android application that will display toast (Message) on specific interval time.
8. Create the android application that calls 3 native applications using intents.
9. Create the android application that will read phonebook contact using content providers and display in list on selecting specific contact makes a call to selected contact.
10. Create android application to take a picture using native application.
11. Create the android application that will send SMS using your android application.
12. Create android background application that will open activity on specific time.
13. Create the android application that will demonstrate shared preferences.
14. Create the android application that will call maps using android application.
15. Create android application to make Insert, Update, Delete and retrieve operation on employee database.

Course Code: **CA LAB-X**   **LAB on Drupal Framework**   *Total Marks:* **100**

1. Installation of Drupal.
2. Demonstrate menu Management in Drupal.
3. Write an application to create Blocks & Regions in Drupal.
4. Write an application to create Themes and Layouts in Drupal.
5. Demonstrate how to create Front Page & Static Pages in Drupal.
6. Demonstrate how to create Blogs & articles in Drupal.
7. Demonstrate how to create, modify, delete and publish content in Drupal.
8. Demonstrate User Management in Drupal.
9. Demonstrate URL Alias in Drupal.
10. Demonstrate Triggers and Actions in Drupal.
11. Demonstrate Views in Drupal.

12. Create a new custom theme with CSS in Drupal.

Semester- VI

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CA-601 Full Time Industrial Training

Twelve credits shall be awarded to the Industrial Training/Project course, which will commence in VIth Semester and the final work and report will be completed at the end of VIth Semester for M.C.A. The student is expected to work on software development project. The project work should have coding part. Student will have to submit the bound project report in university prescribed format at the end of the semester. Student will have to appear for Project Viva-voce and the marks/credits will be allotted at the end of VIth semester of M.C.A.