

BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ORISSA

FIRST YEAR SYLLABUS FOR MCA PROGRAMME

1.0 Objectives of the MCA course

The M.C.A. program prepares students to take up positions as systems analysts, systems designers, programmers, and managers in any field related to information technology. The program, therefore, aims at imparting comprehensive knowledge with equal emphasis on theory and practice. The M.C.A. students are encouraged to spend a full semester working in the industry/ in the institute giving them insight into the workings of the IT world. However, the course curriculum will have enough flexibility to enable a student to undertake advance studies in Computer Science later on.

2.0 Course Outline Semester Wise

Semester-I

Subject Code	Subject	Contact Hrs.	Credit
MCC101	Programming in C	3-1-0	4
MCC102	Micro-processors and Assembly Language Programming	3-1-0	4
MCC103	Discrete Mathematics	3-1-0	4
MCC104	Engineering Economics and Costing	3-0-0	3
MCC105	Financial Accounting	3-0-0	3
MCC106	Communicative English	2-0-0	2
MCL107	Communicative English Lab-I	0-0-3	2
MCL108	Lab – I (C Programming Lab)	0-0-6	4
MCL109	Lab – II (Assembly Language Programming Lab)	0-0-3	2
Total			28

Semester-II

MCC201	Data Structures Using C	3-0-0	3
MCC202	Computer Organization and System architecture	3-1-0	4
MCC203	Object orientated Programming using C++	3-0-0	3
MCC204	Theory of Computation	3-0-0	3
MCC205	Computer Based Numerical Methods	3-0-0	3
MCC206	Business Communication in English	2-0-0	2
MCL207	Communicative Practice Lab-II	0-0-3	2
MCL208	Lab – III (Data Structure in C Lab)	0-0-6	4
MCL209	Lab – IV (C++ Programming Lab.)	0-0-3	2
MCS210	Seminar	0-0-3	2
Total			28

Semester-III

MCC301	Analysis and Design of Algorithms	3-1-0	4
MCC302	Operating Systems	3-1-0	4
MCC303	Computer Networks	3-0-0	3
MCC304	Data Base Systems	3-1-0	4
MCC305	Probability and Statistics	3-0-0	3
MCC306	Management Information System	3-0-0	3
MCL307	Lab – V (Operating System & Network Lab.)	0-0-6	4
MCL308	Lab – VI (Data base Lab)	0-0-3	2
MCL309	Communication and Interpersonal Skills for Corporate Readiness	0-0-2	1
Total			28

Semester – IV

MCC401	Programming with Java	3-1-0	4
MCC402	Computer Graphics & Multimedia	3-0-0	3
MCC403	Software Engineering	3-0-0	3
MCC404	Compiler Design	3-1-0	4
MCC405	Quantitative Techniques-I (Operations Research)	3-0-0	3
MCC406	E-Commerce & ERP	3-0-0	3
MCL407	Lab – VII (Programming with Java Lab.)	0-0-6	4
MCL408	Lab – VIII (Comp. Graphics & Multimedia Lab.)	0-0-3	2
MCS409	Seminar	0-0-3	2
Total			28

Semester – V

MCC501	Artificial Intelligence and Expert system	3-1-0	4
MCC502	Object Oriented Analysis and Design with UML	3-0-0	3
MCC503	Internet Technology and enterprise Java	3-1-0	4
MCC504	Quantitative Techniques-II (Modeling & Simulation)	3-0-0	3
	ELECTIVE –I	3-0-0	3
	ELECTIVE –II	3-0-0	3
Elective-I			
MCE505	Distributed Systems		
MCE506	Parallel Computing		
MCE507	Image Processing		
MCE508	Web Engineering		
Elective-II			
MCE509	Computer Security		
MCE510	Software Design		
MCE511	Bioinformatics		
MCE512	Soft Computing		
MCA513	Assignment *	0-0-3	2
MCL514	Lab – X (Enterprise Web Computing Java Lab.)	0-0-6	4
MCV515	Comprehensive Viva-voce		4
Total			30

Semester –VI

MCP601	Project work for 16 weeks**		20
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* There will be atleast 10 weekly assignments to be submitted by students on the subject “object oriented Analysis and design with UML”. Weekly evaluation will be done by a group of teachers of the department of 10 marks each taking personal viva of the students for a total of 100 marks.

** There will be a 16 weeks project work to be undertaken by the students in any Industry / Institution. At the end of the project there will an evaluation of the project for 20 credits by a group of experts including one external expert and teachers of the department.

CREDIT DISTRIBUTION

Total Proposed Credit: 162

Distribution of credits in different disciplines:-

<u>Proposed</u>	<u>Approval by B.P.U.T.</u>	
	Minimum	Maximum
1. Basic Sciences (Math.) --- 16	12	16
2. Humanities and English --- 15	18	20
3. Professional Core --- 97	98	100
4. Professional Elective --- 06	04	04
5. Seminar --- 04	04	04
6. Comprehensive Viva-Voce--- 04	04	04
7. Projects --- 20	20	20
Total Credits: --- 162	160	168

1st Semester

MCC101 - Programming in C(3-1-0)

Module-I (12 hours)

Introduction to computer: Evolution of computer, Computer system, Compiling environment, Time sharing, Client-Server environment, Distributed computing, Programming languages, Writing and editing programs, Compiling, linking and executing programs, System development, Life cycle, Program development.

Number representation in computer: Number systems, Storing of integers and real numbers, Overflow and underflow, exceptions, Flow chart

C language fundamentals: Character set, Key words, Identifiers, data types, Constants and variables, Statements, Expressions, Operators, Precedence and associativity of operators, Side effects, Type conversion, Managing input and output

Control structures: Decision making, branching and looping.

Module-II (15 hours)

Arrays: one dimensional, multidimensional array and their applications, Declaration and manipulation of arrays

Strings: String variable, String handling functions, Array of strings

Functions: Designing structured programs, Functions in C, User defined and standard functions, Formal vs. actual arguments, Function category, Function prototype, Parameter passing, Recursive functions.

Storage classes: Auto, Extern, register and static variables

Module-III (13 hours)

Pointers: Pointer variable and its importance, pointer arithmetic and scale factor, Compatibility, Dereferencing, L-value and R-value, Pointers and arrays, Pointer and character strings, Pointers and functions, Array of pointers, pointers to pointers

Dynamic memory allocation

Structure and union: declaration and initialization of structures, Structure as function parameters, Structure pointers, Unions.

File Management: Defining and opening a file, Closing a file, Input/output Operations in files, Random Access to files, Error handling

The Pre-processor directives, command line arguments, Macros.

Text books:

1. Behrouz A. **Forouzan** and Richard F. Gilberg. *Computer Science: A Structured Approach Using C*, Third Edition, 2007, CENGAGE Learning India Pvt. Ltd., New Delhi.
2. E. **Balguruswamy**, “*Programming in ANSI C*”, 4th edition, 2007, McGraw-Hill Publication, New Delhi.

Reference books;

1. K.R. Venugopal, S.R. Prasad, “ *Mastering C*, McGraw-Hill Education India
2. P. Dey, M. Ghosh, “*Programming in C*”, Oxford University Press
3. K.N. King, “*C Programming-A modern approach*”, W.W. Norton
4. S. Prata, “ *C Primer plus*”, 5th Edition, Pearson Education India

MCC102 - MICROPROCESSOR AND ASSEMBLY LANGUAGE
PROGRAMMING(3-1-0)

Module I: (15 Hours)

Digital Logic Fundamentals: Introduction, Number System, Binary Arithmetics, Logic Gates, Introduction to Multiplexer, Demultiplexer, Encoder, Decoder & Flip-Flops.

Microprocessor History, 8085 Architecture and Register organization, Functional Block Diagram, Bus Organization, 8085 Instruction Set, Instruction classifications, Instruction word size, Instruction format, Addressing modes, Assembly Language programming,

Memory, I/O devices, Addressing memory and I/O devices, Memory mapping, Memory Interfacing, Tri-State Devices, Buffers.

Module II: (13 Hours)

Programming techniques with additional instructions: Looping, Counting, Indexing, Introduction to Advanced Instructions, Instruction cycle, Machine cycle, Timing Diagram, Stack and subroutine, Counter and Time delay, Debugging.

Module III: (12 Hours)

Interfacing Chips: 8255A (PPI), 8155 (Multipurpose Programmable Device), Interrupts, 8259A (PIC), Serial I/O and Data communication, Serial Data communication standard (RS 232C) 8257 or 8237A (DMA Controller), 8251A (USART).

16 bit processor 8086: Introduction, Architecture, Pin Diagram, Min & Max Mode, Addressing Modes.

Text Books:

1. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming and Application with 8085", 5th edition, Penram International Publishing (India) Pvt. Ltd.
2. D V Hall, "Microprocessor & Interfacing" McGraw Hill Education India

Reference Books:

1. A. P. Mathur, "Introduction to Microprocessor" McGraw Hill Education India.
2. B. Ram, "Fundamentals of Microprocessor and Microcomputer" Dhanpat Rai & Co Publication.
3. P K Ghosh, P R Sridhar, "0000 to 8085 Introduction to microprocessor to Engineers & Scientists" Prentice-Hall of India.
4. M. Mano "Logic and Computer Design Fundamentals" Pearson Education/PHI.

MCC103 - DISCRETE MATHEMATICS(3-1-0)

Module-I (15 hours)

Logic, Relation & Functions:

Logic: Propositions and logical Operations, Conditional statements; Predicate Calculus- First order logic, universal and existential quantifiers; Proof Techniques- methods of proof, Mathematical induction, recurrence relations.

Relation and Diagraphs- Properties of relations, composition of relations, closure operation on relations, equivalence relations and partitions, paths in relation and diagraphs, Operations on relations, Transitive closure and Warshall's Algorithm. Partial ordered sets (poset), Hasse diagram, External elements of partially ordered sets

Functions, Functions for computer science, Growth of functions, Permutation functions

Module -II (13 hours)

Topics in Graph Theory: Directed and undirected graphs, basic terminology, paths and circuits, Eulerian paths and circuits, Hamiltonian paths and circuits, Transport Network, Graph coloring.

Trees: definition and properties, rooted trees, tree traversals— preorder, inorder, postorder, binary trees, labeled trees, spanning trees, cut sets, Graph traversals — BFS and DFS, Minimum cost spanning trees-Prim's and Kruskal's algorithm, Shortest paths in weighted graphs- Dijkstra's algorithm,.

Module-III (12 hours)

Algebraic Structures and Applications: Binary operations, semi-groups and groups, subgroups, cosets, Lagrange's theorem, Product and quotient semi-groups and groups, Normal subgroup, Homomorphism; coding of binary information and error detection, group codes, decoding and error correction.

Lattices, finite Boolean algebra, functions of Boolean algebra.

Recommended Text Books:

1. Bernard **Kolman**, Robert Busby, Sharon C. Ross, "Discrete Mathematical Structures", Sixth Edition, 2008, Pearson Education Inc., New Delhi. / Prentice Hall of India (PHI) Pvt. Ltd., New Delhi.

Reference Books:

1. Kenneth H. **Rosen**, "Discrete Mathematics and Its Applications", Sixth Edition, 2008, Tata McGraw-Hill (TMH) Publications Pvt. Ltd., New Delhi.
2. D. S. **Malik** & M. K. Sen, "Discrete Mathematical Structures", First Edition, 2005, CENGAGE Learning India Pvt. Ltd., New Delhi.
3. Judith L. **Gersting**, "Mathematical Structures for Computer Science: A Modern treatment to Discrete Mathematics", Fifth / Sixth Edition (Asian Student Editions), 2008, W. H. Freeman & Company, New Delhi.
4. Richard **Johnsonbaugh**, "Discrete Mathematics", Seventh Edition, 2008, Pearson Education Inc., New Delhi.

MCC104 - ENGINEERING ECONOMICS AND COSTING(3-0-0)

Module-I (12 hours)

Engineering economics- Nature and scope, The theory of demand, demand function, law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply. Determination of equilibrium price under perfect competition (Simple Numerical problems to be solved).

Theory of production and cost, Law of variable proportion, Law of returns to scale,

Module-II (12 hours)

Time value of money-Simple and Compound Interest, Cash Flow Diagram, Principle of Economic Equivalence Evaluation of Engineering projects- Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost-benefit analysis in public projects. Depreciation Policy, Depreciation of capital assets, Causes of depreciation, Straight line method and declining balance method.

Module- III (12 hours)

Cost Concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into Fixed and variable costs. Break-even Analysis-Linear Approach. (Simple Numerical problems to be solved).

Banking: Meaning and functions of commercial banks, function of Reserve Bank of India. Overview Indian Financial System.

Text Books:

1. Riggs, Bedworth and Randhwa , “Engineering Economics”, McGraw Hill Education India
2. C. T. Horngreen, “ Cost Accounting “, Pearson Education India
3. R. R. Paul , “Money banking and International Trade”, Kalyani publisher, New-Delhi
4. H.L. Ahuja , “Principle of Economics”, S. Chand & Co

MCC 105 - FINANCIAL ACCOUNTING (3-0-0)

Module-I (12 hours)

Fundamentals of Accounting; Accounting as a business function and language of business, Functions and objective of Accounting, Users of Accounting information, Limitations of Accounting, Cyclical nature of business and Accounting cycles, Accounting equations, Accounting events and transactions, Classification of transaction and their effect on Accounting Equation, Statement showing the effect of transaction on assets, liabilities and capital, Accounting concepts – as applicable to Balance sheet and Income Statements, The rule of debit and credit

Module-II(12 hours)

Recording transaction: The journal, The ledger postings, Subsidiary Books and Accounts, Capital and revenue transactions, Fixed assets and depreciation policy

Preparation of Financial Statements: Trial balance, Trading Account, Manufacturing Account, Profit and Loss account, Balance sheet

Module-III(12 hours)

Company Accounts: Authorized Share Capital, Subscribed, issued,, paid up share capital
Kinds of share capital, relative merits and demerits, Format of Income statements and balance sheet, Issue of share capital and treatment of books of Accounts, Journal entries for issue only(forfeiture of share excluded)

Text books:

1. Bal and Sahoo , “Financial Accounting”, S. Chand Publication
2. Jain and Narang , “Financial Accounting” Kalyani Publisher

Reference

1. A. K. Bhattacharya , “Financial Accounting”, Prentice Hall of India

MCC106- English Communication Skills (Theory) (2-0-0)**Module-I** The elements of communication (6 hours)

- 1.1 the importance of communication through English at the present time
- 1.2 the process of communication & factors that influence communication : sender, receiver, channel, code, topic, message, context, feedback, ‘noise’, filters and barriers
- 1.3 the importance of audience and purpose
- 1.4 the information gap principle : given and new information ; information overload
- 1.5 verbal and non-verbal communication : body language
- 1.6 comparing general’ communication and business communication

Module-II The sounds of English (14 hours)

- 2.1 vowels, diphthongs, consonants, consonant clusters
- 2.2 the International Phonetic Alphabet (IPA) ; phonemic transcription
- 2.3 problem sounds
- 2.4 syllable division and word stress
- 2.5 sentence rhythm and weak forms
- 2.6 contrastive stress in sentences to highlight different words
- 2.7 intonation : falling, rising and falling-rising tunes
- 2.8 varieties of Spoken English : Standard Indian, American and British

(**Note** : This unit should be taught in a simple, non-technical manner, avoiding technical terms as far as possible.)

Module-III Review of English grammar (10 hours)

- 3.1 stative and dynamic verbs
- 3.2 the auxiliary system ; finite and non-finite verbs
- 3.3 time, tense and aspect
- 3.4 voices: active and passive
- 3.5 modality

- 3.7 negation
- 3.8 Interrogation ; reported and tag questions
- 3.9 conditionals
- 3.10 concord
- 3.11 Phrasal verbs

(Note The teaching of grammar should be treated as a diagnostic and remedial activity and integrated with communication practice. The areas of grammar in which errors are common should receive special attention when selecting items for review. Teaching need not be confined to the topics listed above.))

Books recommended

1. A course in communication skills by Dutt,Rajeevan & Prakash (Foundation Books,Cambridge)
2. Business Communication by Meenakshi Raman and Prakash Singh (Oxford)
3. Business Communication Today by Bovee et al (Pearson)

MCL107- Communicative Practice Lab -I (0-0-3)

Lab sessions will be devoted to practice activities based on all three modules of theory.

- a. phonemic transcription 5 hours

Students will be trained to find out the correct pronunciation of words with the help of a dictionary, to enable them to monitor and correct their own pronunciation.

- i transcription of words and short sentences in normal English orthography (writing)
 - into their IPA equivalents ;
- ii transcription of words presented orally ;
- iii conversion of words presented through IPA symbols into normal orthography
- iv syllable division and stress marking (in words presented in IPA form)

- b. Listening 10 hours

- i listening with a focus on pronunciation (ear-training) : segmental sounds, stress, weak forms, intonation

Students should be exposed, if possible, to the following varieties of English during listening practice : Standard Indian, British and American.

- c. Speaking 15 hours

- i pronunciation practice (for accent neutralization), particularly of problem sounds, in
 - isolated words as well as sentences
- ii practising word stress, rhythm in sentences, weak forms, intonation
- ii reading aloud of dialogues, poems, excerpts from plays, speeches etc. for practice in pronunciation

- d. Grammar and usage 12 hours

The focus will be on the elimination of common errors. Some writing activities (e.g. writing of short paragraphs on assigned topics) can be used to identify these errors.

- * identifying the central idea as well as supporting ideas
- * preparing notes in diagrammatic form after reading a text, showing the main idea and supporting ideas and the relationships between them.

Project Work

Students will be required to produce and submit by the end of Semester 1 a 350-500 word project report on a topic of their choice. The project should involve data collection, analysis and reporting. Ten marks (out of the 70 marks allocated for the test at the end of Semester 1) will be set apart for the project.

MCL108 - PROGRAMMING IN 'C' LAB (0-0-6)

Topics

- 01.....Introduction to OS: Linux/Unix, DOS, and Windows.
 - 02.....vi editor basics, common commands on UNIX.
 - 03.....File handling, directory structures, file permissions,
Creating and editing simple C programme,
Compilation and execution.
 - 04.....C programming on variables and expressions.
 - 05.....Precedence of operators, Type casting.
 - 06.....Decision control structures— if and nested if-else.
 - 07.....Loop controls— do, while, for and case control structure.
 - 08.....Unconditional jumps— break, continue, goto.
 - 09.....Modular program development using functions.
 - 10.....Arrays and matrix operations—add, subtract, multiply.
 - 11.....Recursion
 - 12.....Pointers, address operators and pointer arithmetic.
 - 13.....Structures and Unions, Accessing their members.
 - 14.....Self-Referential Structures and Linked lists.
 - 15.....Files and file operations, standard streams.
 - 16.....Dynamic memory allocation and deallocations.
 - 17.....Different mathematical operations using <math.h>.
 - 18.....Pointers to pointers, arrays, functions, structures and unions.
 - 19.....Command line arguments, enums and preprocessors.
 - 20.....International features and Code optimization.
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MCL109 - Assembly Language Programming Lab (0-0-3)

Topics

1. Verification of 8085 Instruction Set.
2. Addition, Subtraction, Multiplication & Division of two 8-bit numbers.
3. Development of code conversion programs:
 - a) Binary to Gray
 - d) Gray to Binary
 - c) ASCII to Binary
 - d) Binary to ASCII
4. Identification of the ports and pins of I/O ports of Intel 8255.
5. Generation of Square, Triangular and Sinusoidal waveforms using DAC.
6. Study of Interrupt RST 7.5.
7. Stepper Motor control using 8085 Microprocessor.

2nd Semester

MCC201 - DATA STRUCTURE USING 'C' (3-0-0)

Module-I (15 Hours)

Algorithms, Asymptotic notations and analysis, Measuring time and space complexities, Data structure and C: Functions, storage structures for arrays, sparse matrices, strings, pattern matching, structures and arrays of structures, Abstractio Mechanisms, Abstract data type, Stacks and Queues: representation and Applications.

Linked Lists: Singly linked lists, Linked stacks and queues, Operation on polynomial, Lnked dictionary, Doubly linked list, Circular linked list, Doubly circular linked lists,

Module-II (12 hours)

Dynamic storage Management, Garbage collection and compaction, Hashing functions. Hash tables and collision resolution techniques.

Trees: Binary trees, Terminologies and memory representation, Binary search trees, General trees, Tree traversing, Operations on binary trees, - Expression manipulations, Threaded binary trees, Height balancing trees, Heaps, forest, File structures, Introduction to multi-way search trees, B-tree and B⁺-trees.

Module-III (10 hours)

Graphs: Terminologies and representation, Path matrix, graph traversal,- DFS and BFS, shortest path problems, Bi-connected graphs, Topological sort.

Sorting techniques: Bubble sort, selection sort, Insertion sort, Merge sort, Quick sort, Heap sort, Radix sort, Shell sort and address calculation sort, Linear search and binary search.

Text books:

1. Richard **Gilberg**, Behrouz A. **Forouzan**, "*Data Structures: A pseudo code approach with C*", Second Edition, 2007, CENGAGE India Pvt. Ltd., New Delhi.
2. G.A. V. Pai, "Data Structure and Algorithms", McGraw Hills Education India

Reference Books:

1. Alfred V. **Aho**, John E. **Hopcroft** & Jeffrey D. **Ullman**, "*Data Structures and Algorithm*", First Edition, 1983, Pearson Education Inc., New Delhi.
2. Ian Chai & J. White, "Structuring data and building Algorithms", McGraw Hill Education India
3. Aaron M. **Tenenbaum**, Yedidyah Langsam & Moshe J. Augenstein, "*Data Structure Using C*", 1st Edition, 1990, Prentice-Hall of India (PHI) Pvt. Ltd., / Pearson Education Inc., New Delhi.
4. Ellis **Horowitz**, Sartaj Sahni, Susan Anderson-Freed, "*Fundamentals of Data Structures in C*", Second Edition, 2008, Universities Press Pvt. Ltd. Hyderabad.

MCC202 - COMPUTER ARCHITECTURE & ORGANIZATION(3-1-0)

Module I: (15 Hours)

Introduction: Basic architecture of computer, Functional units, Operational concepts, Bus structures, Von Neumann Concept.

Basic Processing: Instruction code, Instruction set, Instruction sequencing, Instruction

cycle, Instruction format, Addressing modes, Micro instruction, Data path, Hardwired controlled unit, Micro programmed controlled unit.

Arithmetic: Design of ALU, Binary arithmetic, Addition and Subtraction of signed number, Multiplication of Positive number, Signed operand multiplication, Division, Floating point number representation and arithmetic.

Module II: (12 Hours)

Memory: Memory Hierarchy, RAM, ROM, Cache memory organization, Mapping techniques, Virtual memory, Mapping technique, Associative memory, Memory Interleaving, Secondary Storage, Flash drives.

Module III (13 Hours)

Input/Output: Accessing I/O devices, I/O mapped I/O, Programmed I/O, Memory Mapped I/O, Interrupt Driven I/O, Standard I/O interfaces, Synchronous and Asynchronous Data transfer, DMA data transfer.

Introduction to Parallel processing: Flynn's Classification, Pipelining, Array processing, vector processing

Text Books:

1. V. Rajaraman, and T. Radhakrishnan, "Computer Organization and Architecture", Prentice-hall of India
2. M. Murdocca, "Computer Architecture and Organization- An Integrated Approach", Willey India Pvt Ltd

Reference Books:

1. William Stalling , "Computer Organization and Architecture "Pearson Education
2. J. P. Hayes "Computer Architecture and Organization" McGraw Hill Education India.
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "ComputerOrganization", 5th Edition, Mc Graw-Hill Education India
4. A.S. Tananbaum "Structured Computer Organization" Pearson Education.

MCC203 - OBJECT ORIENTED PROGRAMMING USING C++ (3-0-0)

Module-I (12 hrs)

Introduction to C++ : C++ as multi-paradigm language, features supported by C++, syntax, data-type, const and bool qualifiers, variables, strings, operators

Control Structures, Decision and Loop Control Statements, Modular program design using functions, Top down program design with examples, parameter passing mechanisms, inline functions, recursion, Arrays and pointers, dynamic arrays, structures and unions in C++, Coding Style in C++

Object Oriented Programming in C++: Abstraction, OOP concepts, software life cycle, Abstraction Mechanisms: Procedural Abstraction and data abstraction; Classes and objects, object creation, access specifier-private, public and protected, constructors, default constructors, copy constructors, destructors, member functions, static members, references; Message communication using objects

Module-II (12 hrs)

Inheritance: Is-a Vs. Has-a relationships, simple inheritance—Class hierarchy, derived classes, Multiple inheritance, multileveled and hybrid inheritance, Abstract Base Classes, Composition and aggregation with example, polymorphism—compile time & run time polymorphisms, object slicing, base class initialization, virtual functions and Dynamic Binding.

Overloading: Function overloading and Operator overloading, ambiguity, Overloading Restriction, friends function, member operators, operator function, I/O operators, Automatic Conversions and Type Casts for Classes, Memory management in C++: new, delete, object copying— deep & shallow copy, this pointer.

Module-III (12 hrs)

Exception Handling Mechanisms: Exceptions and exception class, exception declarations, unexpected exceptions, RTTI, Calling abort(), Returning an Error Code, Exception Mechanism, Using Objects as Exceptions

Templates and Standard Template Library (STL): Generic Programming in C++, Template classes, declaration, Template functions, Template Classes and Friends, Namespaces and separate compilation; String class, Containers, Iterators, Vectors

Files in C++: Buffers, and the iostream File, redirection, streams and I/O streams classes, File Input and Output, Stream Checking and is_open(), Opening Multiple Files, Command-Line Processing, File Modes

Recommended Texts:

1. B.A. Forouzan & R. F. Gilberg, “A structured approach using C++”, CENGAGE learning India
2. E. Balguruswamy. [Object-Oriented Programming with C++](#), 3rd Edition, 2007, Tata McGraw-Hill (TMH) Publication Pvt. Ltd., New Delhi.

Reference Books:

1. David Parsons, “[Object-Oriented Programming with C++](#)”, Pearson Education .
2. H. Schild, “A complete reference to C++”, TMH
3. Walter Savitch, “[Absolute C++](#)”, 2nd Edition, 2007, Pearson Education Inc., New Delhi.
4. Stephen Prata, “C++ Primer plus”, Pearson Education

MCC204 - THEORY OF COMPUTATION 3-0-0

Module- I (12 hours)

Introduction of Automata, Computability, and Complexity ; Mathematical notations and terminology; Finding proofs and types of proofs.

Finite Automata and regular languages: Formal definitions, Designing finite automata, Deterministic finite automata, Non-deterministic finite automata, Equivalence of NFAs and DFAs, finite automata with ϵ -transition; regular expressions and languages, Properties of Regular languages, conversion of RE to FA and vice versa.

Module –II (12 hours)

Push down Automata and Context free languages: Context free grammars, Designing context free grammar, Ambiguity in CFG and its removal, Chomsky normal form

Push down Automata: formal definition, graphical notations, Languages accepted by PDA, Equivalence of PDA and CFG, Non-context free languages.

Module-III (12 hours)

Turing Machines and Computability: Formal definition of Turing machines with examples, Graphical notations, Variants of Turing machines, Church-Turing thesis, Hilbert's problem

Decidability, undecidability and reducibility: Decidable languages; Decidable problems concerning regular languages and context free languages, The halting problem, Post correspondence problems, Undecidable problems, Mapping reducibility, Decidability of logical theories, Turing reducibility.

Recommended Texts:

1. Michael **Sipser**, "Introduction to the Theory of Computation", Second Edition, 2007, CENGAGE learning India Pvt. Ltd., New Delhi.
2. John E. **Hopcroft**, Rajeev **Motwani** & Jeffrey D. **Ullman**, "*Introduction to Automata Theory, Languages, and Computation*", Third Edition, 2007, Pearson Education Inc., New Delhi.

Reference Books:

1. Nasir S.F.B., P.K. Srimani "A text book on Automata Theory", Cambridge University press India Pvt. Ltd.
2. Peter **Linz**, "*An Introduction to Formal Languages and Automata*", Fourth Edition, 2007, Narosa Publishing House, New Delhi.
3. John C. **Martin**, "*Introduction to Languages and the Theory of Computation*", Third Edition, 2003, Tata McGraw-Hill (TMH) Publication Pvt. Ltd., New Delhi
4. Thomas A. **Sudkamp**, "*Languages and Machines: An Introduction to the Theory of Computer Science*", Third Edition, 2006, Pearson Education Inc., New

MCC205 - COMPUTER BASED NUMERICAL METHODS (3-0-0)

(Students are required to write C programming of the numerical methods)

Module-I (14 Hrs)

Errors and approximations in Numerical Computation, sources of errors, significant digits, Numerical solution of algebraic and transcendental equations by simple iteration method, Bisection method, Regula-falsi method (method of false position), Newton-Raphson method and their rate of convergence.

Solution of simultaneous linear system of equations by Cramer's Rule, Stability, ill conditioning, Gauss- elimination method, Gauss-Jordan method, Matrix inversion by Gauss-Jordan method, Iterative method for solving linear equations by Gauss-Jacobi and Gauss-Seidel method, Methods for solution of Eigen value problems.

Module-II (12 Hrs)

Interpolation: Newton's forward and backward interpolation formulae, Lagrange's interpolation formula, divided differences, Newton's divided difference formula, Inverse interpolation.

Numerical differentiation based on Newton's forward and backward interpolation formula, Numerical integration by Trapezoidal rule, Simpson's $\frac{1}{3}$ rd rule (with linear multiple application), Simpson's $\frac{3}{8}$ rule, error estimates of the rules, Gaussian quadrature formulae (2-point,3-point and 4-point).

Module-III (10 Hrs)

Numerical solution of ordinary differential equation using Taylor Series method, Euler method, Modification of Euler's method, Picard's method, Runge-Kutta method of order two and four, Predictor-Corrector methods.

Recommended Text Book:

1. S. **Rajasekaran**, "*Numerical methods in Science and Engineering: a practical approach*", S. Chand and company Ltd., New Delhi.
2. T. **Veerarajan** and T. Ramachandran, "*Theory and problems in Numerical methods*", Tata McGraw-Hill Publications, New Delhi.

Reading Chapters: 1, 3.0-3.4, 4.1, 4.2, 4.4, 7.0-7.7, 9.0-9.4, 9.6, 9.8, 10.0, 10.2, 10.5, 11.0-11.7, 11.9 (from Book-1) and Chapter-9 (from Book-2)

Reference Books:

1. W. Chenny and D. Kincaid, "Numerical Mathematics and Computing", CENGAGE publication
2. J. H. Mathews, "Numerical methods for Mathematics, Science and Engineering", PHI publication

MCC206 - Business Communication (2-0-0)

Module -I The Elements of Business Communication (5 hours)

- 1.1 patterns of communication in the business world: upward, downward, horizontal, grapevine etc
- 1.2 internal and external channels of communication; formal and informal channels
- 1.3 cross-cultural communications
- 1.4 avoiding gender, racial and other forms of bias in communication
- 1.5 common forms of oral and written communication in the business world:
Oral presentations, interviews and group discussions
Memos, reports, summaries and abstracts, e-mails

Module-II Reading and writing (15 hours)

- 2.1 the importance of developing reading skills
- 2.2 the sub-skills of reading :

- a. understanding the main idea and supporting details
 - b. reading between the lines : inferential reading
 - c. understanding the writer's point of view
 - d. making predictions
 - e. guessing the meanings of unfamiliar words
 - f. skimming and scanning
 - g. note-making
- 2.3 the importance of writing skills
- 2.4 the differences between speech and writing
- 2.5 the qualities of effective writing : coherence, cohesion, logical structuring and organization, clarity of language, stylistic variation etc.
- 2.6 the writing process : pre-writing, drafting, re-writing

Module -III Personality development and soft skills (10 hours)

- 4.1 personality theories: Carl Rogers, Maslow, Eysenck, Murray
- 4.2 emotional Intelligence
- 4.3 lateral thinking: Edward De Bono
- 4.4 soft skills: becoming a good leader and team-player
- 4.5 inter-relating soft skills and communication skills

Books recommended

- 1 Business Communication Today by Bovee et al (Pearson)
- 2 Business Communication by Meenakshi Raman and Prakash Singh (Oxford)
- 3 Personality : Classic Theories and Modern Research by H.S.Friedman and M.W.Schustack (Pearson Education)
- 4 Personality Theories by Barbara Engler (Houghton Mifflin Company)
- 5 Crash Course in Personal Development by Brian Clegg (Kogan Page)
- 6 Activities for Developing Emotional Intelligence by Adele B.Lynn (HRDPRESS)
- 7 Lateral Thinking by Edward De Bono (Penguin)

MCL207 - Communicative Practice Lab -II (0-0-3)

- a. **Communication Practice** **30 hours**
- i Speaking : oral communication in social and 10 hours
Work-related situations, e.g.:
 - Greeting an acquaintance/ friend, introducing oneself, introducing a friend to another friend, breaking off a conversation politely, leave-taking;
 - making and responding to inquiries; expressing an opinion;
 - expressing agreement/ disagreement, contradicting/ refuting an argument;
 - expressing pleasure, sorrow, regret, anger, surprise, wonder, admiration, disappointment etc.
 - Narrating or reporting an event;
 - Describing people, objects, places, processes etc.
 - Ordering / directing someone to do something
 - Making requests; accepting / refusing a request
 - Expressing gratitude; responding to expressions of gratitude
 - Asking for or offering help; responding to a request for help

Asking for directions (e.g. how to reach a place, how to operate a device etc.) and giving directions
asking for and granting/ refusing permission
prohibiting someone from doing something
suggesting, advising, persuading, dissuading, making a proposal
praising, complimenting, felicitating
expressing sympathy (e.g. condolence etc.)
Complaining, criticizing, reprimanding

ii Reading

10 hours

Students will be given practice in reading and comprehending 6-8 simple passages of 100-300 words each, on topics of general as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment, together with study skills (note making) and reference skills (using a dictionary).

Practice will be provided in the important sub-skills of reading which are introduced in Module 2 of the theory component.

iii Writing

10 hours

Writing short paragraphs on given topics or topics of one's choice; social and business letters; reports; applications ; resumes ; summaries

The principles of 'Process Writing' should be used to teach writing skills.

- i pre-writing : generating ideas, brain-storming, idea mapping, outlining
- ii writing : generating a first draft ; reviewing, redrafting, editing
- iii post-writing : making a presentation ; discussion and feedback, preparing the final draft.

b. Soft skills practice

10 hours

Activities designed to highlight leadership and 'team' skills ; Group discussion

MCL208 - DATA STRUCTURE USING 'C' LABORATORY (0-0-6)

Topic

- 01.....Matrix Operations-Add, Multiply, Rank, Det.etc.
 - 02.....Stack & Queue operations using Arrays.
 - 03.....Self-referential structures & single linked list operations.
 - 04.....Implementing Stack and queues using linked lists.
 - 05.....Implementing Polish Notations using Stacks.
 - 06.....Circular and double linked list operations.
 - 07.....Implementing priority queue & dequeue using lists.
 - 08.....Evaluating polynomial operations using Linked lists.
 - 09.....Implementing set related operations & Hashing.
 - 10.....linear & binary search, bubble sort technique.
 - 11.....Insertion sort, selection sort & merge sort techniques.
 - 12.....Quick sort, counting sort and Shell sort techniques.
 - 13.....Radix (bucket) and address calculation sort methods.
 - 14.....Binary tree traversals (preorder, inorder, postorder).
 - 15.....Heap sort & AVL tree implementations.
 - 16.....Graph representation with matrix & adjacency lists.
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MCL209 - OBJECT ORIENTED PROGRAMMING WITH C++
LABORATORY (0-0-3)

Topic

- 01..... Implementing classes and creation of objects.
 - 02..... Checking Precedence of operators & side effects.
 - 03..... Implementing various control structures & loops.
 - 04..... Making structured programming & stepwise refinement.
 - 05..... Implementing Procedural abstraction with functions.
 - 06..... Implementing Constructors and destructors.
 - 07..... Implementing Data abstraction & inheritance.
 - 08..... Implementing Multiple & hybrid inheritance.
 - 09..... Implementing Polymorphism concepts.
 - 10..... Implementing Operator overloading & friend's functions.
 - 11..... Working with new & delete, object copying.
 - 12..... Implementing Object slicing, this operator.
 - 13..... Exception handling mechanisms.
 - 14..... Implementing class templates & function templates.
 - 15..... Working with STL.
 - 16..... Creating files in C++ and file related operations.
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MCS210 - Seminar