# Post Graduate Department of Computer Sciences,
# The University of Kashmir,
# Srinagar - 190006
# Proposed
# Credit Based Choice Based Curriculum
# for
# Master of Computer Applications
# (MCA) Programme
# 2015 - 2016 - 2017

| Semester-I (24 Credit unit Semester) | | | | | | |
|---|---|---|---|---|---|---|
| **Course Code** | **Course name** | **Paper category** | **Hours / Week** | | | **Credits** |
| | | | L | T | P | |
| **12 Core Credit Units** | | | | | | |
| MCA15101CR | Advanced Programming Concepts in C / C++ | Core | 3 | 0 | 2 | 4 |
| MCA15102CR | Advanced Database Systems | Core | 3 | 0 | 2 | 4R |
| MCA15103CR | Discrete Mathematics | Core | 4 | 0 | 0 | 4 |
| **6 Elective Credit Units** | | | | | | |
| MCA15104DCE | Assembly Language Programming | DCE | 3 | 0 | 0 | 3 |
| MCA15105DCE | Technical Communication | DCE | 3 | 0 | 0 | 3 |
| MCA15106DCE | Computer Architecture | DCE | 3 | 0 | 0 | 3 |
| MCA15107DCE | Programming Languages | DCE | 3 | 0 | 0 | 3 |
| **6 credit units to be taken from outside departments** | | | | | | |

## Electives for students from outside Department

| Electives for students from outside Department (available every semester) **(2 Credit course each)** | | | | | | |
|---|---|---|---|---|---|---|
| **Course Code** | **Course name** | **Paper category** | **Hours / Week** | | | **Credits** |
| | | | L | T | P | |
| MCA15108GE | Computer Fundamentals | Generic/Open Elective | 1 | 0 | 0 | 2 |
| MCA15109GE | Pseudo-code Development | Generic/Open Elective | 1 | 0 | 0 | 2 |
| MCA15110OE | Matlab Concepts | Generic/Open Elective | 1 | 0 | 0 | 2 |
| MCA15111OE | SPSS Concepts | Generic/Open Elective | 1 | 0 | 0 | 2 |
| | | | | | | |

**Course No: – MCA15101CR**
**Course Title: Programming Concepts Using C / C++**

**Unit I**

Arrays**:**Declaration; initialization; 2-dimensional and 3-dimensional array, passing array to function, strings and string functions, and character arrays.

Pointers: variables, swapping data, swapping address v/s data, misuse of address operators, pointers and arrays , pointers to pointers , strings , pointer arithmetic, additional operators , portability, pointers to functions, using pointers with arrays , void pointers .

Structures and unions: syntax and use, members, structures as function arguments, structure pointers, array of structures as arguments, passing array of structure members, call by reference.

**Unit II:**

Functions; prototype, passing parameters, storage classes, identifier visibility, Recursive functions. Command-line arguments. Scope rules, Multi-file programming, Introduction to macros.

File processing in C and C++.

Introduction to graphics, graphic initialization, graphic modes, drivers, basic drawing functions, Animations- concept and implementation, Building graphical user interface.

**Unit III**

Introduction to classes and objects; Constructor; destructor; Operator overloading; Function overloading; function overriding; friend function; copy constructor;

Inheritance,: Single , Multiple, and Multilevel Inheritance;

Virtual function and Polymorphism: Dynamic binding, Static binding; Virtual functions; Pure virtual function; concrete implementation of virtual functions; Dynamic binding call mechanism; Implementation of polymorphism; virtual destructors.

**Unit IV**

Templates: Function Templates, Class Templates, Member Function Template and Template Arguments, Exception Handling, Standard Template Library

**Reference Books:**1.


1. FOSTER AND FOSTER "C by discovery" RRI penram.
2. YASHWANT KANETKAR "Let us C" PHI.
3. E. BALAGURUSWAMI "Programming in ANSI C" Tata McGraw Hill.
4. BJARNE STROUSTRUP "The C++ programming language" Pearson Education.
5. HERBERT SCHILD "C++ The complete Reference" Tata McGraw Hill.
6. ROBERT LAFORE "Object orientation with C++ Programming" Waite Group.

**Course No: – MCA15102CR**
**Course Title: Advanced Database Systems**

**Unit I**
Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Architecture, Data Mining and Information Retrieval,Database Models and Comparison, Relation Algebra, ER Model, CODDS Rules, Normalization..

**Unit II**
Introduction to SQL, Data Types, Data Definition Language, Data Manipulation Language, Transaction Control Language, Integrity Constraints, SQL Functions, Set Operators and Joins, View, Synonym and Index, Sub Queries and Database Objects, Locks and SQL Formatting Commands.

**Unit III**
Introduction to PLSQL, Architecture, Data Types, Control Structures, Concept of Error Handling, Cursors and Database Triggers, Subprograms and Packages.

**Unit IV**
Data Storage and Querying using various storage structures, Indexing and Hashing, Query Processing and Optimization.Transaction Management Concepts, Concurrency Control and Recovery.

**Reference Books:**
William Page,"Using Oracle 9i – Special Edition", Que/PHI.
Database System Concepts by A. Silbershatz, H.F. Korth and S. Sudarshan, 6th edition, 1997, McGraw-Hill, International Edition.
Ivan Bayross, "SQL & PL/SQL Using Oracle 8i & 9i with SQLJ", BPB.
Desai.B , "An introduction to Database Concepts", Galgotia Publications, N.Delhi
Dates.C , " An introduction to Database Systems", Pearson Education, Asia

**Course No: MCA15103CR**
**Course Title: Discrete Mathematics**

**UNIT I**

Proposition, Logic, Truth tables, Propositional Equivalence, Logical Equivalence, Predicates and Quantifiers, Sets: operations on sets, Computer representation of sets, Functions: Domain, Range, One-to-One, Onto, Inverses and Composition, Cardinality of a Set, sequences and summations, The growth of functions . Methods of Proof: Different methods of proof, Direct Proof, Indirect Proof, Mathematical Induction for proving algorithms.

**UNIT II**

Discrete probability, Advanced Counting Techniques: Inclusion-Exclusion, Applications of inclusion-exclusion principle, recurrence relations, solving recurrence relation. Relations: Relations and their properties, Binary Relations, Equivalence relations, Diagraphs, Matrix representation of relations and digraphs, Computer representation of relations and digraphs, Transitive Closures, Warshall's Algorithm.

**UNIT III**

Partially Ordered Sets (Posets), External elements of partially ordered sets, Hasse diagram of partially ordered set, isomorphic ordered set, Lattices: Properties of Lattices, complemented Lattices. Graph theory: Introduction to graphs, Graph Terminology Weighted graphs, Representing Graphs, Connectivity of Graphs: Paths and Circuits, Eularian and Hamiltonian Paths, Matrix representation of graphs. Graph Coloring.

**UNIT IV**

Trees: Rooted trees, Application of trees: Binary Search Trees, Decision Trees, Prefix Codes, Tree traversal, trees and sorting, spanning trees, minimal spanning trees.
Finite Boolean algebra, Functions on Boolean algebra, Boolean functions as Boolean polynomials. Groups and applications: Subgroups, Semigroups, Monoids, Product and quotients of algebraic structures, Isomorphism, Homomorphism

## *Reference Books:*


1. KENNETH H. ROSEN "Discrete Mathematics and Its Applications" The Random House/Birkhauser Mathematics series
2. LIU "Elements of Discrete Mathematics " Tata McGraw Hill
3. SCHAUMS "Discrete Mathematics " Tata McGraw Hill
4. KOLMAN/REHMAN "Discrete Mathematical Structures " Pearson Education
5. NICODEMI "Discrete Mathematics " CBS

**Course No: MCA15104DCE**
**Course Title: Assembly Language Programming**

**Unit I**

IBM-compatible Personal Computer, Re-programmable. Microcomputers, General Architecture of Micro-computer System, Evolution of Intel Microprocessor Architecture , Software Model of 8088 / 8086 Microprocessor , Memory Add. Space and Data Organization, Data Types, Segment Registers, Memory Segmentation Dedicated, reserved and General use Memory, Generating a Memory Address, Pin-out diagram of 8086 Microprocessor.

**Unit II**

The Microcomputer Organization, Assembly Language Programming Development on PC, Instruction Set, Addressing Modes, 8086 Instruction set, Instruction format in 8086. Integer Instructions and Computations, Data Transfer, Arithmetic, Logic Shift, Rotate Instruction, Flag Control, Compare, Control Flow & Jump, Subroutine & Subroutine Handling Instructions, Loop & Loop Handling, String & String Handling Instructions. Statement Syntax for a source Program, Assembler Directives, Assembling, Linking, Loading & executing a run Module.

**Unit III**

Core-Special purpose I / O Interfaces, Byte-only Input / Output ports using Isolated I / O, Input / Output handshaking & Parallel Printer Interfaces, Memory Mapped I/O, DMA Controller, Serial Communication Interface, Programming Communication Interfaces Controller. Interfacing I/O devices to microprocessor, programmable peripheral interface, programmable interrupt controller, Interrupt, Mechanism, Types & Priority, Interrupt Vector table, Interrupt Instruction, Enabling/Disabling of Interrupts

**Unit IV**

8086 / 8088 Microprocessors & their I/P & O/P Interfaces, 8086 / 8088 Microprocessor's Minimum Mode, Maximum Mode Systems and Interface Signals, Electrical Characteristics, System Clock, Bus Cycle & Unit States, Hardware Organization of the memory address space, Address Bus Codes, Memory Control Signals, Read & Write Bus Cycles, Memory Interface Circuits, Transfers Types of I/O, Isolated I/O interfaces, I/O Data Transfers & Instruction, I/O Bus Cycles.

External Hardware-Interrupt Interface Signals/Interrupt Sequence. Software Interrupts, Non-Maskable Interrupts, Reset, Internal Interrupt, Real Mode.

**Reference Books:**


1. DOUGLAS HALL "Microprocessors and Interfacing" Tata McGrawHill.
2. LIU, GIBSON et al "Microcomputer system The 8086/8088 Family" PHI.
3. PAL CHAUDHURI "Computer Organization and Designing" PHI.
4. MORRIS MANO "Computer System Architecture" Pearson Education.
5. GILMORE "Microprocessors" Wiley/ Tata McGraw Hill.

**Course No: MCA15105 DCE**
**Course Title: Technical Communication**

**Unit I**

Basics of Technical Communication, Barriers to Communication, Technology in Communication. Communicating in the Workplace: Problem Solving in Workplace Communication, Guidelines for writing with a computer, Human factors in the communication failure, Solving the persuasion problem. Guidelines for ethical communication. Guidelines for organizing a collaborative team, Peer reviewing and editing.

**Unit II**

Active Listening : Introduction , types of listening, Traits of a good listener , Active versus Passive listening , Implications of a good listening .Introduction to Effective Presentation strategies , Defining purpose , analyzing audience and locale , organizing contents , preparing outline , visual aids , understanding nuances of delivery ,kinesics , proxemics , paralinguistics ,chronemics ,sample speech. Interviews: introduction, Objectives, types of interviews, Job interviews. Group Communication: Introduction, Group discussion, Organizational Group discussions, meetings conferences

**Unit III**

Words and Phrases, Dictionary and Thesaurus , Elements of style , Sentence construction , guidelines for effectiveness, Paragraph development , Central components of a paragraph , length and techniques for paragraph development.

The art of condensation , steps for effective précis writing , samples and guidelines , Reading comprehension , purpose and reading rate , reading comprehension, reasons for poor comprehension, improving comprehension skills , techniques for good comprehension.

**Unit IV**

Visual Design and usability elements ,Designing Pages and Documents, Adding a document supplements, testing the usability of your document.

Memo reports and Electronic Mail : Purpose of memo reports , Elements of a usable memo Interpersonal considerations in writing a Memo , Common types of memo report. E-mail , Guidelines for using electronic mail, Letters and Employment correspondence , How applicants are screened for personal qualities , electronic job hunting , guidelines for surviving a job interview , Technical definitions : Purpose , level of detail , expansion methods , Purpose and general model of Technical description ,Elements of usable description .Procedure and processes , Proposal and analytical reports, Recording and documenting research findings.

**Reference Books:**

1. Meenakshi Raman and Sangeeta Sharma, "Technical Communication", Oxford University Press
2. William Pfeiffer, Padmaja "Technical Communication A Practical Approach" , Pearson Education.

## Course No: - MCA15106 DCE
## Course Title: Computer Architecture

**UNIT I**

**Data representation:** signed number representation, fixed and floating point representations, character representation. Computer arithmetic - integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication - shift-and-add, Booth multiplier, carry save multiplier, etc. Division - non-restoring and restoring techniques, floating point arithmetic.Boolean algebra, simplification of Boolean expressions, k-map, tabulation method. Implementation of Boolean functions with logic gates.

**UNIT II**

Sequential logic , flip - flops , registers , up/down counters , BCD/Binary counters, Analysis and design of synchronous sequential systems, state assignment, races and hazards. Introduction to threshold logic & relay circuits. Introduction to switching devices. Positive and Negative logic of OR, AND, NOR, NAND.Exclusive OR and Exclusive NOR gates. RTL, DTL, DCTL, TTL, RCTL, ECL, HTL, MOS and CMOS logic circuit and their realization. Speed and delay in logic circuit and their realization. Fan-in, Fan-out, wired-or, wired-and, and noise immunity

**UNIT III**

**CPU control unit design:** hardwired and micro-programmed design approaches, Case study - design of a simple hypothetical CPU. **Memory system design:** semiconductor memory technologies, memory organization.

**Peripheral devices and their characteristics:** Input-output subsystems, I/O transfers - program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes - role of interrupts in process state transitions.

**UNIT IV**

**Performance enhancement techniques**

**Pipelining:** Basic concepts of pipelining, throughput and speedup, pipeline hazards.

**Memory organization:** Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs block size, mapping functions, replacement algorithms, write policy.

**References:**


1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Elsevier.
2. Carl Hamachar, ZvoncoVranesic and SafwatZaky, Computer Organization, McGraw Hill.
3. John P. Hayes, Computer Architecture and Organization, McGraw Hill.
4. William Stallings, Computer Organization and Architecture: Designing for Performance, Pearson Education.
5. Vincent P. Heuring and Harry F. Jordan, Computer Systems Design and Architecture, Pearson Education.

**Course No: MCA15107 DCE**

**Course Title: Programming Languages**

**Unit I**

The role of Programming Languages, programming paradigms,
Language implementation. Language Description: Syntactic Structures, Expression Notations, Abstract Syntax trees, Lexical Syntax, Context free grammars, grammars for expression. Imperative Programming: Structured Programming, Syntax directed control flow, Design considerations, handling special cases in loops, programming with invariants, proof rules for partial correctness, control flow in C

## *Unit II*

Data Representation : The role of types , basic types , arrays , records , unions and variant records , Sets , Pointers , Two String tables , types and error checking. Procedure Activations: Introduction to Procedures, parameter passing methods, scope rules for names, nested scope in source text, activation records, lexical scope: procedures as in C
Objected oriented programming: Constructs for program structuring, Information hiding , Program design and modules , modules and defined types class declarations in C++, dynamic allocation in C++, templates : Parameterized types , Implementation of Objects in C++., Inheritance , derived classes and information hiding

## *Unit III*

Functional Programming : Language of expressions, types, values and operations , approaches to expression evaluation , lexical scope , type checking, Function declaration by cases , Functions as first-class values ,Implicit types , data types exception handling , Scheme , a dialect of Lisp , the structure of lists, list manipulation, Simplification of expressions. Logic Programming, Computing with relations , Introduction to Prolog , data structures in Prolog , Programming techniques , controls in Prolog, Cuts

## *Unit IV*

An introduction to concurrent Programming: Parallelism in hardware,Streams: implicit synchronization, concurrency as interleaving, Liveliness properties, safe accesses to shared data, concurrency in ADA.
Language Description: Semantic Methods, Synthesized attributes, Attribute grammars, natural semantics, Denotational Semantics, Equality of Pure Lambda terms, Computation with pure lambda terms, programming constructs as lambda terms , the typed lambda calculus , polymorphic types

**Reference Books:**

Ravi Sethi ," Programming Languages ,Concepts and Constructs", Pearson Education
Freidman, Wand ,Haynes, "Essentials of Programming Languages", PHI.

## Course Code: MCA15108GE
## Course Title: Computer Fundamentals

**Unit-I: Computer Appreciation,** Introduction, Characteristics of computer, History of Computers, Classification of Computers of Size, Architecture and Chronology, Applications of Computers, Commonly used Terms: Hardware, Software, Firmware, Units of Measurement of Storage, Input/output Devices, Secondary Storage Devices, Generation of Languages, Types of Software, Flowcharts and Algorithms, Translators-Interpreters, Compilers and Assemblers. Introduction to Internet & E-Mail.

**Introduction to Operating System :**FunctionsofOperatingSystem, evaluation, Batch Processing, Multiprogramming,Multiprocessing, Time Sharing, Real-Time Processing, Advantages and Disadvantages, Single User, Multi-User O.S. Viruses: Types and Control Measures.

**Profiling an Operating System:** Booting sequence, Operating System, File and Command Processor File, Definition of File,File,Naming,Booting from Floppy and HDD,Warm and Cold Reboot, Types of Dos Commands, Internal and External, Introduction of Autoexec.bat, Attrib,Backup,Restore,FindSys, FilterCommands,GenralCommands,Types,Data,Time,Prompt,Disk Organization and Disk Storage, Disk Management, Format, CHKSk, DISK COPY, LABEL, VOL, DISKCOMP, COMP, RECOVER, Redirecting Commands Input and Output.

### Reference Books:


- Computer today, Donald H. Sanders, McGraw Hill Publishing Company.
- Microcomputers Software and Applications, Dennis P.Curtin and Leslie R.Portel, PHI.
- Data Processing: An Introduction, Donald P.Spencer and Charles R. Merril Pub. And Co.
- Computers and Their Applications, Larry Joel Goldestein, PHI.
- Computers in Business, Donald H.Sanders.Mc Graw Hill Publishing Company.
- Access-2000, Simpson, Bpb Publications.

## Course Code: MCA15109GE
## Course Title: Pseudo-code Development

**Unit I:** Learning and writing flowcharts and algorithms:

Introduction, conversions, Programming and Problem Solving: The Basic Model of Computation, Algorithms, Flow-charts, Programming Languages, Compilation, Linking and Loading, Testing and Debugging, documentation.

Algorithms for Problem Solving: Exchanging values of two variables, summation of a set of numbers, Decimal Base to Binary Base conversion, Reversing digits of an integer, GCD (Greatest Common Division) of two numbers, Test whether a number is prime, Organize numbers in ascending order, Find square root of a number, factorial computation, Fibonacci sequence, Evaluate 'sin x' as sum of a series, Reverse order of elements of an array, Find largest number in an array, Print elements of upper triangular matrix, multiplication of two matrices, Evaluate a Polynomial.

file.

**References:**


1. 2. P.K. Sinha and P. Sinha, "Foundation of Computers" BPB Publishers
2. R.G. Dromey, "How to solve it by Computer"

## Course Code: MCA151010GE

## Course Title : Matlab Concepts

**Unit I**

Introduction, Using variables, Introduction to MATLAB commands, Introduction to arrays, Array operations, Indexing, Entering external data, Introduction to Cells, Introduction to Structures. Introduction to branching, If statements, While Loops, Solving Linear Equations, Use of matrices to solve equations, Introduction to Statistical Operations. Introduction to Plotting ,Introduction to Curve Fitting section, Introduction to Curve Fitting section , Linear Regression section , Error Analysis , Estimation , Polynomial Curve fitting , Splines .

**References and Resources**


1. The MathWorks. The official website for MATLAB is at http://www.mathworks.com.
2. Hart, David and Clinton Wolfe, 1999. "Getting Started with MATLAB," Indiana University, http://www.indiana.edu/~statmath/support/bydoc/
3. Miranda, Mario J. and Paul L. Fackler, 2002. ,Applied Computational Economics and Finance , Cambridge, MA: MIT Press A textbook discussing computational methods and solutions to dynamic problems generally, as well providing MATLAB tools in the CompEcon Toolbox, http://www4.ncsu.edu/~pfackler/compecon/toolbox.html
4. LeSage, James P. Econometrics Toolbox. (http://www.spatial-econometrics.com/) This website provides a MATLAB toolbox implementing a variety of functions for econometric analysis, including spatial econometrics.
5. Applied Econometrics Using MATLAB. This book/working paper provides general guidance for using MATLAB in econometric applications. The link for the book is: http://www.spatialeconometrics.com/html/mbook.pdf
6. Frain, John C., 2010. "An Introduction to MATLAB for Econometrics," TEP Working Paper No. 0110.This guide describes the use of MATLAB in econometric applications, and discusses LeSage's Econometrics Toolbox in particular http://www.tcd.ie/Economics/staff/frainj/main/MSc%20Material/MATLAB/matlab.pdf

**Course Code: MCA151011GE**
**Course Title : SPSS Concepts**

## Unit I

Descriptive v. Inferential Data Analysis, Measuring Variables (validity, reliability, replicability),Types of Variables (nominal, ordinal, interval), Common Terms (dataset, population sample, parameter, statistic) Misuses of Data (examples), Univariate (Descriptive) Statistics, Sample Size (N) , Range , Frequency Distributions, Histograms, Other Charts, Measures of Central Tendency and Dispersion , Means, medians, modes ,Variance, standard deviation , Introduction to SPSS for Windows ,Starting an SPSS Session ,Creating a New Dataset , Using an Existing Dataset ,Manipulating and Merging Datasets ,Importing and Exporting Data , Printing Datasets , Descriptive Statistics in SPSS (mean, standard deviation, variance, range, frequencies) Manipulating Data in SPSS ,Recoding and Transforming Variables ,Graphs and Charts , Scatter plots , Histograms ,Box Plots and Other Charts , Cross-tabulations ,Printing and Saving Output ,Probabilities and Sampling, Binomial and Normal Random Variables, Z-scores ,Using the Normal Table ,Other distributions ,Methods of Sampling ,Systematic Sampling, Random Sampling ,Sampling Error,

**References and Resources**


1. Joseph F. Healey, Statistics—A Tool for Social Research(Belmont, CA: Wadsworth Publishing, 1996).
2. Jane Fielding and Nigel Gilbert, Understanding Social Statistics, (London: Sage Publications, 2000).
3. Stephen Van Evera,Guide to Methods for Students of Political Research (Ithaca, NY: Cornell University Press, 1997).
4. Zina O'Leary, The Essential Guide to Doing Research(London, Thousand Oaks, New Delhi: Sage Publications, 2004).
5. Laurence F. Jones and Edward C. Olson, Researching the Polity: A Handbook of Scope and Methods(Cincinnati, OH: Atomic Dog Publishing, 2005).
6. SPSS Instruction Manual, Department of Statistics and Actuarial Science, University of Waterloo, September 1, 1998.