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-II(24 Credit unit Semester)						
Course Code	Course name	Paper category	Hours / Week			Credits
			L	T	P	
12 Core Credit Units						
MCA15201CR	Data and File Structures	Core	3	0	2	4
MCA15202CR	Numerical and Statistical Computing	Core	3	0	2	4
MCA15203CR	Advanced Data Communication	Core	4	0	0	4
6 Elective Credit Units						
MCA15204DCE	Advance Computer Architecture	DCE	3	0	0	3
MCA15205DCE	Advanced Operating Systems	DCE	3	0	0	3
MCA15206DCE	Optimization Techniques	DCE	3	0	0	3
MCA15207DCE	Management Information System	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	
MCA15208GE	Computer Fundamentals	Generic/Open Elective	1	0	0	2
MCA15209GE	Pseudo-code Development	Generic/Open Elective	1	0	0	2
MCA15210OE	Matlab Concepts	Generic/Open Elective	1	0	0	2
MCA15211OE	SPSS Concepts	Generic/Open Elective	1	0	0	2

Semester - II

Course No.: MCA15201CR

Course Title: Data & File Structures

Unit - I

INTRODUCTION TO DATA STRUCTURE: Data Management concepts, Data types – primitive and non-primitive, Performance Analysis and Measurement (Time and space analysis of algorithms-Average, best and worst case analysis), Types of Data Structures- Linear & Non Linear Data Structures.

Unit II
LINEAR DATA STRUCTURE Array: Representation of arrays, Applications of arrays, sparse matrix and its representation Stack: Stack-Definitions & Concepts, Operations On Stacks, Applications of Stacks, Polish Expression, Reverse Polish Expression And Their Compilation, Recursion, Tower of Hanoi Queue: Representation Of Queue, Operations On Queue, Circular Queue, Priority Queue, Array representation of Priority Queue, Double Ended Queue, Applications of Queue Linked List: Singly Linked List, Doubly Linked list, Circular linked list ,Linked implementation of Stack, Linked implementation of Queue, Applications of linked list.

Unit III
NONLINEAR DATA STRUCTURE : Tree-Definitions and Concepts, Representation of binary tree, Binary tree traversal (Inorder, postorder, preorder), Threaded binary tree, Binary search trees, Conversion of General Trees To Binary Trees, Applications Of Trees, AVL trees, 2-3 trees, Height Balanced, Weight Balance, Graph-Matrix Representation Of Graphs, Elementary Graph operations,(Breadth First Search, Depth First Search, Spanning Trees, Shortest path, Minimal spanning tree)

Unit IV
HASHING AND FILE STRUCTURES : Hashing: The symbol table, Hashing Functions, Collision Resolution Techniques, File Structure: Concepts of fields, records and files, Sequential, Indexed and Relative/Random File Organization, Indexing structure for index files, hashing for direct files, Multi-Key file organization and access methods, Sorting – Bubble Sort, Selection Sort, Quick Sort, Insertion Sort Merge Sort, Searching – Sequential Search and Binary Search

References :

1. An Introduction to Data Structures with Applications. by Jean-Paul Tremblay & Paul G. Sorenson Tata McGraw Hill.
2. Data Structures using C & C++ -By Tenenbaun Prenctice-Hall International.
3. Fundamentals of Computer Algorithms by Horowitz, Sahni,Galgotia Pub. 2001 ed.
4. Fundamentals of Data Structures in C++-By Sartaj Sahani.
5. Data Structures: A Pseudo-code approach with C -By Gilberg & Forouzan Publisher Thomson Learning.

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Course No.: MCA15202CR
Course Title: Numerical and Statistical Computing

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UNIT I

Approximations & Errors – Types of Programming Errors, Data Errors, Computer & Arithmetic Errors, Round Off and Truncation Errors. Accuracy and Precision, Measures of Accuracy,Error Propagation.

Non-Linear Equations, Types of Methods to find solutions to nonlinear equations, Algorithms to Compute Roots of Equation – Methods of Tabulation or Brute Force Method, Method of Bisection, Secant Method, Newton-Raphson Method, Method for False Position.

Derivation of mathematical formulas, geometricinterpretationand implementation of these methods.

UNIT II

Linear Equations, Types of Methods to find solutions to linear equations. Algorithms to Solve Linear Algebraic Equations: Gauss Elimination, Gauss Jordan, Gauss Seidel, L.U. Decomposition, Lagrange Interpolated Polynomial, Newton'sMethods of INTERPOLATION – Forward difference, Backward difference.

Derivation of mathematical formulasand implementation of these methods.

UNIT III

Differential Equations – Concepts and Terminology, Algorithms to solve Ordinary Differential Equations – Euler Method and Modification. The trapezoidal Rule, Simpson's Rule. 4th order R-K Method.

Derivation of mathematical formulas and implementation of these methods.

UNIT IV

Standard Deviation, Correlation, Regression Analysis, Algorithms for Curve Fitting straight line: Least Square Approximation. Concept of Hypothesis, Statistical Tests: Chi-Square Test, Student t-Test, f-Test.

REFERENCE BOOKS:

1. S.C.Chapra&R.P.Canale: "Numerical methods for Engineering". Tata McGraw Hill.
2. Krishenmurty and Sen : "Numerical Algorithms"
3. V. Rajaraman "Computer oriented numerical methods." Prentice Hall of India.
4. McCalla, Thomas Richard: "Introduction to Numerical Methods and FORTRAN Programming", John Wiley & Sons, Inc.
5. Grewal, B. S.: "Higher Engineering Mathematics", Hindustan Offset Problems Series.
6. "SCHAUM'S Solved Problems Series".
7. Sharma, K. D.:"Programming in Fortran".
8. Jain, M. K., Iyengav, S. R. K., Jain, R. K.: "Numerical Methods for Scientific and Engineering Computation"+, Wiley Eastern Ltd, New Delhi.

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Course No.: MCA15203CR
Course Title: Advanced Data Communication

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Unit I

Bandwidth and Channel Capacity. Quantifying Channel Capacity for noiseless channel(Nyquist Law) and noisy channel(Shannon's Law). Example of a digital telephone system to explain basic concepts of analog signals, digital signals, sampling. Data Rate versus Baud Rate. Nyquist Criterion for Sampling. Data transmission concepts. Electromagnetic spectrum, its applications and allocation to well-known bands. Characteristics of signals(amplitude, frequency, period, wavelength). Signal-to-Noise ratio. Key components in data communications systems. Simplified model. Local area network(LAN) concepts and characteristics.

Unit II

Wide area networks(WANs). WAN technologies (traditional packet and circuit switching, Frame Relay, ATM). ISDN(narrowband) concepts and services. Overview of the OSI model. Transmission media – factors affecting distance and data rate. Guided transmission media: Twisted-Pair, Co-axial Cable. Principles and advantages of optical networks. Types of optical fibers and lasers.

Unit III

Unguided transmission media: Terrestrial Microwave & Satellite Microwave systems and applications. Data encoding. Difference between modulation and encoding. NRZ-L, NRZ-I encoding. Multilevel Binary and Biphase Coding techniques and their implementations. ASK,FSK,PSK and QPSK. PCM concepts: sampling, quantization. Delta Modulation. Amplitude Modulation.

Unit IV

Reliable transmission of data: Asynchronous and Synchronous transmission. Error detection: Parity-based, CRC-based. FCS computation. Error control and recovery techniques. Concept of ARQ standard and its versions. Concept of Multiplexing. FDM. Synchronous and Statistical TDM. Concept of Spread Spectrum(SS) techniques; Frequency Hopping SS . Direct Sequence SS and concept of chip-sequence.

Reference Books:

1. William Stallings, "Data and Computer Communications", Pearson Education
2. Andrew Tanenbaum, "Computer Networks", Pearson Education 4/e.
3. Ulysses Black, "Principles of Data Communications ", PHI.
4. Morley, Gelber, "The Emerging Digital Future", Addison-Wesley.

Course No: MCA15204DCE

Course Title: Advanced Computer Architecture

Unit I

Computational Models : Introduction , Interpretation of the concept of a computational model , Relationship between , the concepts of computational model , programming language and architecture , Basic Computational models , The Von , Neumann computational model ,Key concepts related to computational models , Granularity , typing . The concept of computer architecture : Evolution and interpretation of the concept of Computer Architecture at different levels of abstraction. The concept of computer architecture at multilevel hierarchical framework. Extensions , Description of Computer Architectures.

Unit II

Introduction to Parallel Processing , : Basic Concepts about program , process, thread , process and treads in languages , concurrent and parallel execution , concurrent and parallel programming languages, Types and levels of Parallelism , Classification of Parallel architectures , Basic Parallel Techniques , Relationship between languages and parallel architectures . Introduction to Instruction level Parallel Processors , Evolution and overview , dependencies , instruction scheduling , preserving sequential consistency , the speedup potential of ILP Processing , Pipelined Processors , Basic Concepts , Design space of Pipelines , Pipelined instruction Processing , Pipelined execution of integer and Boolean instructions , Pipelined Processing of loads and stores.

Unit III

VLIW , Basic Principles ,Overview of Proposed and Commercial VLIW , Superscalar processing , introduction , parallel decoding , superscalar instruction issue , shelving , register renaming , parallel execution , preserving the sequential consistency of instruction execution and exception processing ,Implementation of superscalar CISC processor using a superscalar RISC core. Processing of control transfer instructions. The branch problem ,basic approaches . Guarded exception. Code Scheduling of ILP.

Unit IV

Introduction to data-[parallel architectures , connectivity , SIMD Architecture , fine and coarse grained SIMD architectures , Associative and neural architectures ,Data Parallel pipelined and systolic architectures , vector architectures , Introduction to MIMD architectures , Multi threaded architectures , Distributed Memory MIMD architecture , Shared memory MIMD architectures..

Text Book : Advanced Computer Architecture DEZSO SIMA , TERENCE Mountain , PETER KACSUK , Pearson Education, Fifth Indian reprint 2004.

Reference Books :
V.C. Hamacher. A.G. Vranesic and S. G. Zaky: "Computer Organization", Tata McGraw Hill.
J.P. Hayes: "Computer Architecture and Organization", McGraw Hill.
Morris Mano: "Computer System Architecture", Pearson Education ,3/e.

Unit I

Introduction to Distributed Systems: Goals – Advantages of distributed systems over centralized systems – disadvantages of distributed systems, Hardware & Software Concepts, loosely coupled systems, network operating systems, Design Issues –transparency – Flexibility – performance – scalability. Concept of Client – Server Model

Unit II

Remote Procedure Calling: Introduction , Features of RPC, Design issues, RPC Classification and Implementation, Interface definition language (IDL), Exception handling, Delivery guarantees, Interface processing, Binding, Locating the binder, RPC in Unix system, Synchronization in Distributed systems: Clock synchronization, Logical Clocks, Physical Clocks, Clock synchronization algorithms.

Unit III

Mutual exclusion, A centralized algorithms, A distributed algorithms, A token ring algorithms, comparison of the three algorithms, Election algorithms, The Bully algorithms, Ring algorithms, Dead Locks in distributed systems, Distributed deadlock detection. Process and Processors in distributed systems: Threads, Introduction, Usage, Design issues for thread packages, An example for thread packages, System models, The workstation model, The processor pool model, The hybrid model , Processor allocation, Allocation models, Design issues, Implementation issues.

Unit IV

Network file systems, Distributed File and Directory Services: Distributed file service requirements, File service components, Flat file service, Directory Service, Client module, Design issues and implementation techniques. Distributed shared memory. Introduction: Shared memory, Consistency models, Page based Distributed shared memory, Shared – variable Distributed shared memory, Object based Distributed Shared Memory.

Text Book: Distributed Operating systems, Andrew s.Tanenbanm

Reference Books:
1. Singhal and Niranjan G.Shivaratna, "Advanced Concepts in Operating Systems", Tata McGraw Hill.
2. Dietel, H.M. "An introduction to operating system" Pearson Education, 2/e.
3. Couloris et. al., "Distributed Systems: Concepts and Design" Addison-Wesley, 2005.
4. P.K. Sinha, "Distributed Operating Systems: Concepts & Design", PHI, 2007.

Course No: MCA15206DCE
Course Title: Optimization Techniques

Unit I

Linear Programming Problem (LPP): Formulating LPPs, Simplex Algorithm, Big-M Method, Two-

Phase Method, Sensitivity Problems. Duality in LPP: Duality Theorems, Dual Simplex Method

Unit II

Transportation Problems: Mathematical Formulation of Transportation problem, Methods of

selecting initial basic feasible solution: Matrix minima method, North-West Corner Rule,

Vogel's Approximation Method; Unbalanced Transportation Problem; Degeneracy in

Transportation

Problem and its resolution through MODI Method(U-V Method). Assignment problems:

Algorithm, Unbalanced Assignment Problem, Hungarian Method

Unit III

Inventory Models: Inventory problems and their analytical structures, deterministic economical

lot size model, Stochastic and deterministic order level system. Game theory: Definition and

Terminologies; Pure Strategy: saddle point, Game with two saddle points; Mixed strategies:

games without saddle points, 2Xn games, Dominance Property.

Unit IV

Replacement Theory: Replacement of items that fail completely, Replacement of items that

deteriorate with time. Sequencing models: Sequencing of n jobs on two machines and three

machines with no passing. CPM- Determination of critical tasks. PERT- probability of

completing the project on schedule.

Reference Books:

1. H.A.TAHA," Operations Research". Pearson Education

2. S.D. Sharma," Operations Research & Optimization".

3. KantiSwaroop, " Operations Research and Applications
4. R. PanneerSelvam :Operations Research"
5. N.D. Vohra "Quantitative Techniques"

Course No: MCA15207DCE
Course Title : MANAGEMENT INFORMATION SYSTEM (MIS)

Unit I

Organisation and Information Systems , Changing Environment and its impact on Business - The IT/IS and its influence - The Organisation: Structure, Managers and activities - Data, information and its attributes - The level of people and their information needs - Types of Decisions and information - Information System, categorisation of information on the basis of nature and characteristics. , Transaction Processing System (TPS) - Office Automation System (OAS) - Management Information System (MIS) - Decision Support System (DSS) and Group Decision Support System (GDSS) - Expert System (ES) - Executive Support System (EIS or ESS).

Unit II

Need for System Analysis - Stages in System Analysis - Structured SAD and tools like DFD, Context Diagram Decision Table and Structured Diagram. System Development Models: Water Flow, Prototype, Spiral, RAD – Roles and responsibilities of System Analyst, Database Administrator and Database Designer. Information systems for Accounting, Finance, Production and Manufacturing, Marketing and HRM functions - IS in hospital, hotel, bank

Unit III

Enterprise Resources Planning (ERP): Features, selection criteria, merits, issues and challenges in Implementation - Supply Chain Management (SCM): Features, Modules in SCM - Customer Relationship Management (CRM): Phases. Knowledge Management and e-governance ,Nature of IT decision - Strategic decision - Configuration design and evaluation Information technology implementation plan.

Unit IV

Security and Ethical Challenges , Ethical responsibilities of Business Professionals – Business, technology, Computer crime – Hacking, cyber theft, unauthorized use at work. Piracy – software and intellectual property. Privacy – Issues and the Internet Privacy. Challenges – working condition, individuals. Health and Social Issues, Ergonomics and cyber terrorism.

RECOMMENDED BOOKS:
1. "Management Information Systems", Kenneth J Laudon, Jane P. Laudon, Pearson/PHI,10/e, 2007
2. "Management Information Systems", W. S. Jawadekar, Tata McGraw Hill Edition, 3/e, 2004
3. Turban, Efraim, Ephraim McLean, and James Wetherbe. 2007. Information Technology for Management: Transforming Organizations in the Digital Economy. New York, John Wiley & Sons.

Course Code: MCA15208GE
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: MCA15209GE
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"

<center>**Course Code: MCA152010GE**</center>

<center>**Course Title : Matlab Concepts**</center>

<u>Unit I</u>

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

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.