

**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**

<b>Semester-V(24 Credit unit Semester)</b>						
Course Code	Course name	Paper category	Hours / Week			Credits
			L	T	P	
<b>12 Core Credit Units</b>						
MCA15501CR	Java Programming	Core	3	0	2	4
MCA15502CR	Modeling & Simulation	Core	3	0	2	4
MCA15503CR	System Programming	Core	4	0	0	4
<b>6 Elective Credit Units</b>						
MCA15504DCE	Bioinformatics	DCE	3	0	0	3
MCA15505DCE	Machine Learning	DCE	3	0	0	3
MCA15506DCE	Wireless communication	DCE	3	0	0	3
MCA15507DCE	Image processing	DCE	3	0	0	3
<b>6 credit units to be taken from outside departments</b>						

**Electives for students from outside Department**

<b>Electives for students from outside Department (available every semester)</b>						
<b>(2 Credit course each)</b>						
Course Code	Course name	Paper category	Hours / Week			Credits
			L	T	P	
MCA15508GE	Computer Fundamentals	Generic/Open Elective	1	0	0	2
MCA15509GE	Pseudo-code Development	Generic/Open Elective	1	0	0	2
MCA15510OE	Matlab Concepts	Generic/Open Elective	1	0	0	2
MCA15511OE	SPSS Concepts	Generic/Open Elective	1	0	0	2

## **Semester - V**

### **Course NO: MCA15501CR Course Title : Java Programming**

#### **Unit I**

Java Program Development , Java Source File Structure , Comparison with other languages (C & C++), Java and Internet, Features of Java, Java Virtual machine, ByteCode , Lexical Tokens, Identifiers, Keywords, Literals, Comments , Primitive Datatypes, Variables: Assignment, Initialization and Conversions, Operators: Arithmetic, Assignment, Modulus, Relational, Boolean, Bitwise., Precedence Summary ,Unicode Character Set , Arrays: Single and Multidimensional. Control Statements and Looping Structures

#### **Unit II**

Class Fundamentals , Object reference , Garbage Collection, Constructors, Access Control, Modifiers, methods , Nested , Inner Class & Anonymous Classes , Abstract Class, Argument Passing Mechanism , Method Overloading, Recursion , Dealing with Static Members. Finalize() Method, Native Method. Use of “this “ reference , Cloning Objects, Generic Class Types, Inheritance in Java , Overriding Super Class Methods, Use of “super”, Polymorphism in inheritance , Type Compatibility and Conversion ,Packages & Interfaces: Defining and importing packages , Understanding Class path , Implementing interfaces.

#### **Unit III**

Exceptions & Errors ,Types of Exception ,Control Flow In Exceptions , Use of try, catch, finally, throw, throws in Exception Handling ,In-built and User Defined Exceptions, Checked and UnChecked Exceptions, Operation on String ,Mutable & Immutable String , Using Collection Bases Loop for String , Tokenizing a String ,Creating Strings using StringBuffer , Multi-Threaded Programming ,Thread Life-Cycle , Thread Priorities , Synchronizing Threads , Inter - communication of Threads, DeadLock. Applet & Application , Applet Architecture, Parameters to Applet , Embedding Applets in Web page. Utility Methods for Arrays , Observable and Observer Objects , Date & Times , Using Scanner.

#### **Unit IV**

Streams, Input and Output Classes,The Standard Streams,File Object , File I/O Basics , Reading and Writing to Files ,Buffer and Buffer Management, Read/Write Operations with File Channel , Serializing Objects , The Collection Framework , Collection Types , Sets , Sequence , Map , Hashing ,Use of ArrayList& Vector , Event-Driven Programming ,The Event Delegation Model , Event Classes, Event Sources , Event Listeners , Adapter Classes, Anonymous Inner classes , Keyboard and Mouse Event Handling , Avoiding Deadlocks in GUI Code ,Networking Basics , Client-Server Architecture , Socket Overview, Networking Classes and Interfaces , Network Protocols ,Developing Networking Applications in Java

#### **Suggested Readings:**

1. Herbert Schildt, “The Complete Reference Java-2 “ ,Sixth Edition 2004,Tata McgrawHill.
2. Dietel&Dietel, “Java: How to Program Java 2, Sixth Edition, 2006, Pearson Education.
3. Horstmann& Cornell, “Java2 Vol-1 & Vol-2”,Seven Indian Reprint 2006, Pearson Education.
4. E. BalaGurudamy “ Programming with java A Primer” 3rd edition

**Course NO: MCA15502CR**  
**Course Title: Modeling & Simulation**

**Unit I**

Concepts of Systems, Models, and Simulation. Distributed Lag Model, Cobweb Models, The process of a simulation Study, Exponential Growth Models, Exponential Decay Models, Type of simulation, Discrete-Event Simulation: Time-Advance Mechanisms, Components and Organization of a Discrete-Event Simulation Model. Monte Carlo Method. Simulation of Single-Server Queuing System, Simulation of an Inventory System

**Unit II**

Continuous Simulation: Pure-pursuit Problem.

Random Number Generators: Linear Congruential Generators, Other kinds of Generators, Testing Random-Number Generators.

Generating Random Variate: General Approaches, Continuous and Discrete distributions.

**Unit III**

Introduction to GPSS, General Description, GPSS block-diagram, Simulation of a Manufacturing Shop. SNA, Function, Simulation of a Supermarket, GPSS Model of a Simple Telephone System

**Unit IV**

Output Data Analysis for a Single System: Transient and Steady-State Behavior of a Stochastic Process, Type of Simulations with regard to output Analysis and Statistical Analysis for Testing Simulation. Verification and Validation of Simulation. An introduction of different types of simulation languages.

**Reference Books:**

- G. Gordon. "System Simulation", (3<sup>rd</sup> Edition) Pearson Education, 2000.
- Law and Kelton, "Simulation Modeling and Analysis", McGraw Hill, 2001.
- N. Deo, "System Simulation with Digital Computer", Prentice Hall of India 1979
- Fred Maryanski, "Digital Computer Simulation", CBSPD 1987
- James A. Pyne, "Introduction to Simulation- Programming Techniques and Methods of Analysis", McGraw Hill 1988
- Zeigler and Kim, "Theory of Modeling and Simulation", Academic Press, 2002
- Banks et al, "Discrete event Simulation", Pearson Education, 2001

**Course NO: MCA15503CR**  
**Course Title: System Programming**

**Unit I**

Introduction, Machine Structure , Evolution of the Components of programming system  
Evolution of Operating Systems, General Machine Structure , General Approach to a New  
Machine , Machine Structure 360-370, Machine Language. Assembly Language

**Unit II**

General Design Procedure, Assemblers, Design of an single pass assembler and multi pass  
assembler, Macros: two pass algorithm, single pass algorithm, Implementation of macro calls  
within macros

**Unit III**

Loaders and Linkers, Loader Schemes, subroutine linkages, relocating loaders, Linking loaders,  
Design of an absolute loader, Design of a direct linking loader.

**Unit IV**

Formal Systems and Programming Languages: Formal specification, Hierarchy of Languages,  
BNF, Canonic Systems and Formal Systems.

Compilers, Statement of problem, phases of Compiler-Lexical phase, syntax phase Interpretation  
phase, optimization, storage assignment code generation and assembly phase, Passes of a  
compiler.

**Text Book:** John J. Donovan, “Systems Programming”, Tata McGrawHill

**Reference Books:**

Leland L.Beck."System Software" 4<sup>th</sup> edition Pearson 1997

Barron.D.W."Assemblers and Loaders" Mc Donald and Javes 1978

Ullman.J.D."Fundamentals of Programming System" Addison and Wesley

D.M.Dhamdhere."System Programming and Operating Systems"2<sup>nd</sup> edition

**Course NO: MCA15504DCE**  
**Course Title: Bioinformatics**

**Unit I**

Introduction to bioinformatics, Definitions and concepts, Biological complexity, The role of bioinformatics. Types of biological data, types of Biological Databases – flat file databases, relational databases, object-oriented databases, XML representation of biological databases, Sequence databases (EMBL, GenBank, DDBJ, SWISS-PROT, PIR, TrEMBL), Protein family/domain databases (PROSITE, PRINTS, Pfam, SMART, etc), Protein structure and fold classification databases (PDB, CATH, SCOP), pathway databases, PubMed database.

**Unit II**

Search engines - SRS, Entrez; BLAST, FASTA, Data Submission Tools: Nucleotide Sequence Submission Tools, Protein submission tools, Command line Tool for GenBank; Data Analysis Tools: Tools for Nucleotide Sequence Analysis, Tools for Protein sequence Analysis; Prediction tools: Phylogenetic trees and phylogenetic Analysis, Gene Prediction, Protein structure and Function prediction; Modeling tools: Tools for 2D Protein Modeling, Tools for 3D protein Modeling

**Unit III**

Ontologies in Bioinformatics: The need for ontologies (Gene naming, functional classifications, references schemes), Classification of ontologies – one dimensional, 2 dimensional, three dimensional, Gene ontology, EcoCyc etc.  
Introduction to Markup Languages for biological data: BioML, ProML, CML, GAME, AGAVE

**Unit IV**

Integration and querying of Biological Databases: Data integration issues, Warehouse Integration, mediator-wrapper based integration, navigational integration, Querying biological database with SQL.

**Reference Books:**

1. Developing Bioinformatics Computer Skills, Cynthia Gibas & Per Jambeck, O'Reilly
2. Bioinformatics – Databases, Tools and Algorithms, Orpita Basu, Simminder Kaur Thukral, Oxford Higher Education.
3. Introduction to bioinformatics, T. K. Attwood & D J Parry-Smith, Pearson Education
4. Bioinformatics – A beginner's Guide, Jean-Michel Claverie, Cerdric Notredame, WILEY DreamTech India Pvt.
5. Krane, "Bioinformatic", Pearson Education.

**Course NO: MCA15505DCE**  
**Course Title: Machine Learning**

**Unit I**

MATLAB Concepts, Classification Algorithms, Euclidean Distance Classifier, Mahalanobis Classifier, Basic Sequential Algorithm Scheme, KMeans Algorithm, Fuzzy C-Means Clustering, Clustering with Gaussian Probability Density Function.

**Unit II**

Learning Algorithms, Support Vector Machines, Principal Component Analysis, Projection of Data to an Optimal Plane, Fisher Linear discriminant Analysis, Multiple Discriminant Analysis, Dimensionality Reduction.

**Unit III**

Emerging Topics in Machine Learning. This may include topics like Biometrics, Algorithms for Face Recognition, Algorithms for Finger Print Recognition, Algorithms for Iris Recognition, Algorithms for Speech Recognition.

**Unit IV**

Group Research Project. Students will work on a Research Project. Each research project will be done by a team of students. Each team will select a research project in consultation with the faculty member. Scope of the research project needs to be approved by the concerned faculty member.

**Reference Books :**

1. *Machine Learning* by Tom M. Mitchel, McGraw-Hill publication
2. *Pattern Classification* by Duda and Hart. John Wiley publication
3. *The Elements of Statistical Learning: Data Mining, Inference, and Prediction* by Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer.
4. *Learning From Data*, Yaser S. Abu-Mostafa, Hsuan-Tien Lin, Malik Magdon-Ismael, AML Book.
5. *Introduction to Machine Learning* by Ethem Alpaydin, The MIT Press.
6. *Machine Learning: An Algorithmic Perspective* by Stephen Marsland, Chapman and Hall/CRC.
7. *Building Machine Learning Systems with Python* by Willi Richert, Luis Pedro Coelho, Packt Publishing

**Course NO: MCA15506DCE**  
**Course Title: Wireless Communications**

**Unit I**

Classification and types of Wireless telephones. Introduction to Cordless, Fixed Wireless(WLL), Wireless with limited mobility(WLL-M) and (Fully)Mobile Wireless phones. Introduction to various generations of mobile phone technologies and future trends. Wireline vs. Wireless portion of mobile communication networks. Mobile-Originated vs. Mobile-Terminated calls. Mobile-Phone numbers vs. Fixed-Phone numbers.

**Unit II**

Concept of cells, sectorization, coverage area, frequency reuse, cellular networks & handoffs. Wireless Transmission concepts; types of antennas; concepts of signal propagation, blocking, reflection, scattering & multipath propagation. Comparison of multiple access techniques FDM, TDM and CDM.

**Unit III**

Concept of CDMA (PCS & Cellular) channel; Forward and Reverse CDMA channel for a cell/sector. Concept/derivation of Walsh codes & Code Channels within a CDMA Channel. Simplified illustration of IS-95 CDMA using chip sequences. Purpose of Pilot, Sync, Paging, Forward Traffic Channels. Purpose of Access & Reverse TCs.

**Unit IV**

GSM reference architecture and components of Mobile Networks: MS, BTS, BSC, MSC; their basic functions and characteristics. Use of HLR and VLR in mobile networks. Handoff scenarios in GSM.

**References Books:**

- T. Rappaport, “Wireless Communications, Principles and Practice(2<sup>nd</sup> Edition)”, Pearson.  
Andy Dorman, “The Essential Guide to Wireless Communications Applications”, Pearson.  
Jochen Schiller, “Mobile Communications”, Pearson.  
K.Pahlavan, P.Krishnamurthy, “Principles of Wireless Networks”, PHI.  
Andrew Tanenbaum, “ Computer Networks(4th Edition)”, PHI.

**Course NO: MCA15507DCE**  
**Course Title: Image Processing**

**UNIT I**

Introduction to digital image processing: Digital Image representation, Fundamental steps in image processing. Elements of digital image processing systems, Applications of digital image processing

**UNIT II**

Image sensing and acquisition. Image sampling and quantization, imaging geometry. Image transforms: Concepts of Spatial domain and Frequency domain Images, Fourier, Inverse Fourier, Fast Fourier.

**UNIT III**

Image Enhancement: Enhance in the spatial domain, some basic grey level transformations, Histogram processing, Enhancement using arithmetic/logic operations, Basics of spatial filtering, Smoothing of spatial filters, Sharpening spatial filters. Enhancement in frequency domain: Smoothing frequency domain filters, Sharpening frequency domain filters.

**UNIT IV**

Image segmentation: Detection of discontinuities, Edge linking and boundary detection, Thresholding based segmentation, Region based segmentation. Image Compression models.

**Reference Books :**

- 1) Digital image processing 2nd edition by Rafael C. Gonzalez, Richard E. Woods (Pearson edition)
- 2) Fundamentals of digital image processing by A.K. Jain (Pearson edition)
- 3) Fundamentals of digital image processing by Catlemrene (Pearson edition).
- 4) Image processing analysis and machine vision by Milan Sonka, Vaclav Hlavac, Roger Boyle.
- 5) Digital signal processing by John G. Proakis, G. Manolakis, 4/e Pearson Education



**Course Code: MCA15508GE**  
**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 :** Functions of Operating System, 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, Find Sys, Filter Commands, General Commands, 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. Merrill Pub. And Co.
- Computers and Their Applications, Larry Joel Goldstein, PHI.
- Computers in Business, Donald H. Sanders. McGraw Hill Publishing Company.
- Access-2000, Simpson, Bpb Publications.

**Course Code: MCA15509GE**  
**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: MCA155010GE

### 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.spatial-econometrics.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: MCA155011GE**  
**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.