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-IV(24 Credit unit Semester)						
Course Code	**Course name**	**Paper category**	**Hours / Week**			**Credits**
			L	T	P	
12 Core Credit Units						
MCA15401CR	Artificial Intelligence	Core	4	0	0	4
MCA15402CR	Advanced Computer Graphics	Core	3	0	2	4
MCA15403CR	Object Oriented Modeling Analysis and Design	Core	3	0	2	4
6 Elective Credit Units						
MCA15404DCE	Advanced Unix/Linux Programming	DCE	3	0	0	3
MCA15405DCE	Theory of Computation & Formal Languages	DCE	3	0	0	3
MCA15406DCE	Natural Language Processing	DCE	3	0	0	3
MCA15407DCE	C# Programming	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	
MCA15408GE	Computer Fundamentals	Generic/Open Elective	1	0	0	2
MCA15409GE	Pseudo-code Development	Generic/Open Elective	1	0	0	2
MCA15410OE	Matlab Concepts	Generic/Open Elective	1	0	0	2
MCA15411OE	SPSS Concepts	Generic/Open Elective	1	0	0	2

Semester - IV

Course No: MCA15401CR
Artificial Intelligence

Unit I

Introduction to Artificial Intelligence, First Order Logic, Inference in First Order Logic, Prepositional Versus First Order Logic, Expert Systems, Forward chaining , Backward chaining, Conflict Resolution, Knowledge representation , Uncertainty theory.

Unit II

Search Algorithms , Heuristic search, Genetic Algorithms, Cross over, Mutation, Fuzzy Logic, Fuzzification, Fuzzy Sets, Hedges, Max-Product Inferencing, Max-Min Inferencing, Multiple Premise Inference, Multiple Rule Inference, Defuzzification.

Unit III

Knowledge in Learning, Learning Decision Trees , ID3 Algorithm, Inductive Learning Algorithms, AQ Algorithm, Ensemble Learning, Support Vector Machines, Statistical Learning Methods, Reinforcement Learning.

Unit IV

Neural Computing, Network Architectures and Learning Algorithms, Perceptron and its Limitations , Activation Functions, Multilayer Neural Networks, Training by Error Back Propagation, Self-Organising Nets, Kohonen Self-Organising Net.

TEXT BOOK:
1. Artificial Intelligence by Negnevitsky, Addison Wesley Publication.

References :

1. Patterson ,” Introduction to Artificial intelligence and expert systems” , PearsonEducation
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw-Hill, 2003.
3. Luger, G.F., “Artificial Intelligence , Structures and Strategies for Complex Problem Solving”,Pearson Education / Prentice Hall of India, 2002.
4. Russell, S. and Norvig, P., “Artificial Intelligence-A Modern Approach”, Pearson Education / Prentice Hall of India.
5. Neural Computing: An Introduction; R Beale and T Jackson; Institute of Physics Publishing.

Course No: MCA15402CR
Course Title: Advanced Computer Graphics

Unit I

Introduction to Computer Graphics. Applications of Computer Graphics. Graphic Display Devices_ Raster, Refresh, Random. Display Buffer, Concept of Double Buffering and Segmentation of Display Buffer. Use of Lookup tables.

Unit II

2-D Graphics. Cartesian and Homogeneous Coordinate Systems. Line drawing algorithms (Bressenhams and DDA). Circle and Ellipse Drawing Algorithms. 2-Dimensional Transformations.Concepts of Window & Viewport, Window to Viewport Transformations. Filling, Boundary and Floodfill algorithms.

Unit III:

Clipping, Line Clipping Algorithms (Cohen-Sutherland Algorithm), 3-D Graphics, Projections: perspective and parallel projection transformations. 3-Dimensional Transformations. Hidden Surface Removal Techniques, Z-Buffer Algorithm, Back Face Detection.

Unit IV

Curves and Surfaces, Splines, Spline specification, Interpolated & Approximated Splines. Bezier Splines, Bezier Curves, Cubic Bezier Curves, Bezier Surfaces. B-Splines curves and surfaces. Fractals - Fractal Generation Procedure. Introduction to Illumination models and Surface rendering methods.

Text Book : Hearn and Baker " Computer Graphics" 2nd Edition , Pearson Education.

Reference Books

1. W.M.Newman and Sproull. "Principles of interactive Computer Graphics" ,TMH
2.Steven Harrington." Computer Graphics a Programming Approach" McGraw Hill.
3. Plastock and Kelley. "Schaums outline of theory and problems of computer Graphics"
4. David F Frogers and J Alan Adams. "Procedural Elements of Computer Graphics" McGraw Hill
5. David F Rogers and J Alan Adams. "Mathematical Elements of Computer Graphics" McGraw Hill
6. James. D. Foley, A Vandametal "Computer Graphics" Pearson.

Course No: MCA15403CR
Course Title: Object Oriented Modeling, Analysis & Design

Unit 1

OOAD – Introduction , Applying UML and Patterns in OOAD , Assigning Responsibilities , What is analysis and Design , An Example , The UML , Iterative Development –an Unified Process idea , Additional UP Best Practices and Concepts , The UP Phases and Schedule oriented Terms , The UP disciplines. Process Customization and the development case. The Agile UP. The Sequential Waterfall Lifecycle. Inception. Artifacts that may start in inception, Understanding requirements, types of requirements.

Unit 2

Use –case Model , Writing requirements in context , goals and stories , background , use cases and adding value , use cases and functional requirements , use case types and formats . Goal and scope of a use case , Finding primary actors , goals and use cases , writing use cases in an essential UI-free style , Actors , Use Case Diagrams , Use Cases witin the UP , Case Study. Identifying other requirements. From inception to elaboration.

Unit 3

Use Case Model: Drawing System Sequence Diagrams. Example of an SSD. Inter System SSDs , SSDs and Use Cases , System Events and the System Boundary , Name System Events and Operations , Showing Use Case Text , SSDs within the UP. Domain Model : Visualizing Concepts , Domain Models , Conceptual Class Identification , Candidate Conceptual classes , Adding Associations , The UML association notation , NextGen POS Domain Model Associations , NextGen POS Domain Model , Adding Attributes , Non Primitive Data Type Classes , Adding Detail with Operation Contracts , Contract Sections , Post Conditions , Contracts , Operations and the UML. Operation Contracts within the UP.

Unit 4

From Requirements to Design , Interaction Diagram Notation , Sequence and Collaboration Diagrams , GRASP , Responsibilities and methods , interactions diagrams , Patterns , GRASP : Pattern of General Principles in Assigning Responsibilities , Information Expert , creator , Low Coupling , High Cohesion , Controller , Object Design and CRC Cards , Design Model : Use Case Realization with GRASP Patterns , Determining Visibility , Creating Design Class Diagrams , Mapping Design to Code. GRASP : More Patterns , Polymorphism , Pure Fabrication , Indirection , Protected Variations , GoF Design Patterns : Adapter , Factory , Singleton , Strategy , Façade , Observer / Publish-Subscribe / Delegation Event Model ,Relating Use Cases , Modeling Generalization , Refining the Domain Model , Adding New SSDs and Contracts , Modeling Behaviour in Statechart Diagrams , Designing Architecture with Patterns , Organizing the Design and Implementation Model Packages , Introduction to Architecture Analysis and the SAD.

Reference Books:
1. James Rumbaugh, "Object Oriented Models and Design" Pearson Education 2/e Harrington."
2. C & Object Oriented Paradigm" John Viley& sons Publication
3. Ali Bahrani "Object Oriented Systems Development" McGraw -Hill 1999
4. Lafore Robert, "Object Oriented Programming in C++", Galgotia Publications.
5. Balagurusami, E, "Object Oriented with C++", Tata McGraw-Hill.

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Course No: MCA15404DCE
Course Title: Advanced UNIX/LINUX Programming

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Unit I
Unix Basics: Introduction to Unix/Linux, Basic Commands, Text processing commands, data processing in Unix/Linux, Unix Administration – creating and managing users, managing printing.

Unit II
Introduction to Shell: Unix/Linux Shells, Shell variables, Environment variables. Arithmetic, Relational and Logical operators.
Programming with Shell: Shell Programming, Different Shell constructs, looping statements, decision statements, keywords, solving arithmetic expressions.

Unit III
GUI Development in Unix/Linux: Accessing Unix and Linux in GUI mode, Introduction to X Windows. Introduction to GUI development in Unix and Linux, Introduction to Qt as development tool. Introduction to various controls and forms in Qt. Designing simple forms in Qt, manipulating various controls in Qt.

Unit IV
Database Basics with Unix and Linux: Basics of Database, Introduction to MySQL, Basic commands of MySQL e.g. insert, delete, update etc. Connecting to database with Qt. Develop small application using Qt and MySQL.

References Books:
Kernighan and Pike, "The UNIX Programming Environment", Pearson Education.
Karnetkar, " UNIX Shell Programming", BPB.
Tackett & Burnett, "Using Linux- Special Edition(Que)", PHI.

Course No: MCA15405DCE
Course Title: Theory of Computation & Formal Languages

Unit I

Basic concepts of theory of computation: Formal Languages and Grammars, Finite State Transducers, Finite-State Automata and Regular Languages, Limitations of Finite-Memory Programs.

Unit II

Recursive finite-domain programs, Recursion, Pushdown Transducers, Context-Free Languages, Limitations of Recursive Finite-Domain Programs

Unit III

Turing Machines. Programs and Turing Transducers, Universal Turing Transducers, Un-decidability.

Unit IV

Introduction to resource-bounded computation, Time and Space, A Time Hierarchy, Nondeterministic Polynomial Time, some *NP*-Complete Problems

Text Book:
1. Hopcroft, J., and Ullman, J. (1979), "*Introduction to Automata Theory, Languages and Computation*", Pearson Education.
1. P. Linz, "*Introduction to Formal Languages and Automata*", 3rd edition, 2000, Jones and Barlett, PWS Publishing Company.

Suggested Readings:

1. EitonGurarri : *Introduction to Theory of computation*, Computer Science press
2. Hopcroft J, R. Motwani, and J. Ullman, "*Introduction to Automata Theory, Languages and Computation,* 3rd Ed. 2006, Pearson Education.

Course No: MCA15406DCE
Course Title: Natural Language Processing

Unit I

Introduction to Natural Language Processing, Finite-state automata and transducers, Computational morphology

Unit II

N-gram language models; smoothing; interpolation; backoff, Part-of-speech tagging,Syntactic parsing: rule-based parsing; CYK algorithm; Earley's algorithm

Unit III

Computational semantics and lexical semantics, Computational lexicons: WordNet, Word Sense Disambiguation and Induction, Roles and frames: FrameNet

Unit IV

Semantic Role Labeling , Discourse and dialogue, Statistical Machine Translation

References
1. Jurafsky and Martin. Speech and Language Processing, Prentice Hall, 2009.
2. Manning and Schűtze. Foundations of Statistical Natural Language Processing, MIT Press, 1999.
3. Larry Wall, Tom Christiansen, Jon Orwant. Programming Perl. O'Reilly. 1996. ISBN 1-56592-149-6.

Course No: MCA15407DCE
Course Title: C# Programming

Unit I

Introduction to windows Programming. .Net Architecture and Platform, The relationship of C# to .net, The Common Language Runtime, A Closer Look at Intermediate Language , Distinct Values and Reference types, Use of Attributes, Assemblies , Private Assemblies , Shared Assemblies, Creating .net applications using C#, Creating windows forms ,Windows controls, The role of C# in the .net enterprise architecture. C# IDE.

Unit II

Variables and Data Types, Program Flow Control in C#, Arrays, Using statement, Namespace , Aliases , The Main() Method, Passing Arguments to main() . Console I/O, Using Comments, Operators and Casts, Error and Exception Handling.
C# IDE, Basic Window Controls: Text Box, Label, Check Box, List Box, Checked List Box, Radio Buttons, Buttons, Tree View and List View Controls,

Unit III

Objects and Type: Classes and Structs, Partial classes , static classes ,Function Overloading, Operator Overloading, Inheritance : Types of inheritance, virtual methods, hiding methods , Sealed classes and methods, Interfaces, Derived interfaces.

Type safety, Type conversions, Boxing and unboxing , comparing objects for equality , Operator overloading , User defined casts. Delegates and Events, Strings and regular expressions, Collections, Array Lists, The Stack, Queue, and Sorted List class, Hash Tables.

Unit IV

Multi Threading in C#, ADO.NET overview, Using Database Connections ,Executing commands , The Data Reader, The Dataset Class Populating a Dataset , Persisting Dataset Changes , viewing .net data using Data Grid.

Text Book : Professional C# 2008 by Christian Nagel , Bill Evgen , Jay Glynn Wrox Publications , 2008.
Reference
1. Dietel &Dietel , "C# , How to Program",Pearson Education.
2. Visual C#.Net by John Sharp & John Jagger, PHI, New Delhi.
3. Visual Studio .Net by Francisco, Microsoft Publication.

Course Code: MCA15408GE
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: MCA15409GE
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 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

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.
4.