

Semester V

CBCS Course Outline MCA Semester-V

Semester-V (26 Credit Semester)						
Course Code	Course Name	Paper category	Hours / Week			Credits
			L	T	P	
18 Core Credit Units						
MCA-5T1-C	Dot Net	Core	3	0	4	5
MCA-5T2-C	Web Technologies	Core	3	0	4	5
MCA-5T3-C	System Software Design	Core	4	0	0	4
MCA-5T4-C	Operational Research	Core	4	0	0	4
6 Elective Credit Units						
MCA-5E1-DCE	Artificial Intelligence	DCE	3	0	0	3
MCA-5E2-DCE	Machine Learning	DCE	3	0	0	3
MCA-5E3-DCE	Image processing	DCE	3	0	0	3
MCA-5E4-DCE	Cloud and Grid Computing	DCE	3	0	0	3
MCA-5E5-DCE	Organizational Behavior	DCE	3	0	0	3
MCA-5E6-DCE	Research Methodology	DCE	3	0	0	3
MCA-5E7-DCE	Advanced Java	DCE	2	1	0	3
2 credit units to be taken from outside departments						

MCA Syllabus – Department of Computer Science, IUST

Course No.: MCA-5T1-C

Course Title: Dot Net

UNIT I

An Overview of .NET Technology: Features of .NET, Understanding .NET Framework, Main Components of .NET Framework, The Common Language Runtime, The Common Language Specification, The Common Type System, .NET Class Libraries, Assemblies, Metadata and Attributes. Introduction to Visual Studio.NET: Exploring Visual Studio.NET Interface.

UNIT -II

C# 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, type casting, Delegates and Events, Strings, Collections, Array Lists.

UNIT -IV

Introducing Web Application, Components of Web Application, Building a Web Form, HTML Server Controls. ASP.NET, Using Visual Web Developer, Designing a Simple Web Form. Including C# Code in ASP.NET, Hosting the Web Page, IIS Web Server

An Overview of ADO.NET, Design Goals of ADO.NET, ADO.NET Architecture, Objects Used in ADO.NET Model, .NET Framework Data Providers, .NET Framework Data Provider for SQL Server, Provider for Oracle, ADO.NET DataSet Object Model, Data Binding, Types of Data Binding, Generating DataSet, Binding Controls to the DataSet

REFERENCES:

1. Evangelous Petroustos, "Mastering Visual basic.Net", BPB Publication
2. Steven Holzner, "Visual Basic .net Programming", Black book, Dreamtech Press
3. "ASP .Net for beginner", Wrox Publications
4. "ASP .Net : Unleashed" , **SAMS Publications'**
5. Dietel & Dietel , "C# , How to Program", Pearson Education.
6. Visual C#.Net by John Sharp & John Jagger, PHI, New Delhi.

MCA Syllabus – Department of Computer Science, IUST

Course Title: Web Technologies
Course Code: MCA-5T2-C

UNIT I

HTML5 :- Introduction to HTML, Basic Tags, HTML5, Forms, Files - editing, management, file storage, drag & drop, messaging, client storage, offline execution, canvas, svg, video & audio, WebGL,

UNIT II

CSS:- Introduction to CSS - understanding style, internal style sheet, external style sheets. Inline style sheets, selectors - Id, type selector, class selector, tag grouping, pseudo-classes, pseudo-elements, attribute selectors, child-selectors, child type selectors, siblings, target. Style inheritance, style cascading, and selective overriding. Fonts - using fonts, using web fonts. Colours. Lists. Text Shadow. Margins, paddings & Borders. Understanding positioning. Adding graphics - images, background images. CSS3 Transforms, Transitions, Animations, Flex box.

UNIT III

JavaScript: - Literals, Variables, Constants & Data Types. Control Flow - if else, while, for, do-while, break & continue. Expressions & Operators. Functions - destructuring, default arguments, this keyword, arrow notation, call, apply & bind. Scope - global, block, variable masking, closures, function scope & Hoisting, The temporal dead zone, strict mode, Arrays & Arrays Processing, Objects & Object-Oriented Programming, Maps & Sets, Exceptions & Error Handling. Iterators & Generators.

UNIT IV

Advanced JavaScript :- Asynchronous Programming - callbacks, promises, generators. Date & Time. Math - fixed decimals, algebraic functions, regular expressions, jQuery, NodeJs,

REFERENCES:

1. HTML5 in Action by Rob Crowther, Joe Lennon, Ash Blue & Greg Wanish Publisher: Manning Publications
2. Learning JavaScript, 3rd Edition 8 REVIEWS by Ethan Brown Publisher: O'Reilly Media, Inc.
3. CSS: The Missing Manual, 4th Edition by David Sawyer McFarland Publisher: O'Reilly Media, Inc.

MCA Syllabus – Department of Computer Science, IUST

Course Title: Systems Software Design
Course No.: MCA-5T3-C

UNIT I

Overview, Introduction to Machine Structure, Evolution of the System Programming Components: Assemblers, Loaders, Macros, Linkers, Compilers.

Evolution of Operating System & User View: Functions, Batch Control Language & Facilities.

Machine Structure 360-370: Memory, Registers, Data, Instructions & Special Features. Machine Language & Assembly Language.

UNIT II

Assemblers: General Design Procedure: Problem Statement, Data Structures, Format of Databases, Algorithms, Modularity Lookup. Table Processing: Review of Searching & Sorting Techniques. Macros: Macro Instructions, Features, Conditional Macro Instructions, Macro Calls within Macros, Single & Two Pass Algorithm, Implementation of Macro Calls within Macros. Implementation within an Assembler

UNIT III

Loaders: Schemes: Compile & Go Loaders, General Loader Scheme, Absolute Loaders, Subroutine Linkages, Relocating Loaders. Other Loader Schemes & Binders: Linking Loaders, Overlays & Dynamic Binders. Design of an Absolute Loader, Design of a Direct Linking Loader. Programming Languages & Formal Systems: Significance of High Level Languages, Features. Data Types & Data Structures, Storage Allocation & Scope of Names, Accessing Flexibility, Functional Modularity, Use of Formal Systems, Formal Specification, Formal Grammars, Hierarchy of Languages, Backus Normal Form – BNF, Canonic Systems & Formal Systems.

UNIT IV

Compilers: Statement of Problem, Phases of Compiler: Lexical Phase, Syntax Phase, Interpretation Phase, Optimization Phase, Storage Assignment & Code Generation Phase & Assembly Phase.

TEXT BOOKS:

1. John J. Donovan, "Systems Programming", **Tata McGraw-Hill**
2. Leland L. Beck. "System Software", **Pearson**

REFERENCES:

1. Barron.D.W. "Assemblers & Loaders", **Mc Donald & Javes**
2. Ullman.J.D."Fundamentals of Programming System" **Addison & Wesley.**
3. M.Dhamdhere."System Programming & Operating Systems"

MCA Syllabus – Department of Computer Science, IUST

Course Title: Operational Research
Course Code: MCA-5T4-C

UNIT I

Linear Programming: L P formulation, Graphical methods for LPP with 2 variables, Simplex Algorithm Duality theorem in linear programming & applications. Transportation problem: Formulation, methods of selecting initial feasible solutions, Degeneracy & resolution. Assignment problem: Balanced & Unbalanced problems & resolution.

UNIT II

Network Analysis: Shortest routes, Enumeration & applications. Max flow problem, Min Cut & max-flow min-cut theorems. PERT & CPM: Use & design of PERT & CPM, Applications. Diagram design & critical path calculation. Floats, Time chart construction & resource leveling, project cost curve & crashing in project management.

UNIT III

Game theory: definition & explanation, saddle points, Dominance mixed strategies, games without saddle points, 2*N games. Replacement & Sequencing models: Replacement of items that fail & deteriorate. Group & individual replacement. Sequencing problems, Johnsons algorithm for processing m jobs through 2, 3 & n machines

UNIT IV

Dynamic programming: Characteristics of dynamic programming problem, Bellman's optimality principles, dynamic programming under certainty, shortest route problem, Single additive constraint & multiplicative separable return.

Queuing & inventory Models: Queuing Models, The M/M/1 System, The M/M/C System, The M/M/∞ System, The M/EK/1 System, Inventory Models: Introduction to the Inventory Problems & their analytical structure, Deterministic & stochastic Models, The Classical EOQ (Economic Order Quantity) Model, The EOQ with Shortages Allowed.

REFERENCES:

1. Hamdy A. Taha, "Operations Research: An Introduction", **Pearson**
2. Sharma J. K., "Operations Research: Theory & Applications", **Macmillan India**
2. Gross Donald, "Fundamentals of Queuing Theory", 3rd Ed., **John Wiley**
3. Mokhtar S. Bazaraa, "Linear Programming & Network Flows", **John Wiley**
4. Hiller Lieberman, "Introduction to Operations Research", **TMH**
5. Laudon, "Decision Support Systems", **PHI**
6. N.D.Vohra, "Quatitative Techniques in management", **TMH**

MCA Syllabus – Department of Computer Science, IUST

Course Title: Artificial Intelligence
Course Code: MCA-5E1-DCE

UNIT I

Introduction to Artificial Intelligence, Applications of Artificial Intelligence, and Intelligent agents: Agents and Environments, the nature of environments, structure of agents, Concept of Rationality. Introduction to First order logic, rules in FOL, Propositional Logic.

UNIT II

Searching for solutions, uniformed search strategies. Search with partial information (Heuristic search) Greedy best first search, A* search, Memory bounded heuristic search, Heuristic functions.

Local search Algorithms: Hill climbing, local beam search.

Game Playing: Adversial search, Games, minimax, algorithm, optimal decisions in multiplayer games, Alpha-Beta pruning

UNIT III

Artificial Neural networks: Introduction to Artificial neural networks, analogy with biological neural network, McCullough-Pitts Model of a neuron, Single layer and Multilayer perceptron, sigmoid function, Training by back propagation, generalization, avoiding, over fitting. Introduction to Learning, concept of supervised, unsupervised and reinforcement learning.

REFERENCES:

1. Introduction to Artificial Intelligence – RajendraAkerkar, PHI.
2. Artificial Intelligence – A Modern Approach. Second Edition, Stuart Russel, Peter Norvig, PHI/Pearson Education.
3. Artificial Intelligence, 3rd Edition, Patrick Henry Winston., Pearson Edition
4. Artificial Intelligence and Expert Systems – Patterson PHI
5. Expert Systems: Principles and Programming- Fourth Edn, Giarrantana/ Riley, Thomson

MCA Syllabus – Department of Computer Science, IUST

Course Title: Machine Learning
Course Code: MCA-5E2-DCE

UNIT I

Introduction: Basic definitions, learning types: supervised & unsupervised, hypothesis space & inductive bias, evaluation, cross-validation, Linear regression, Decision trees, overfitting, Instance based learning, Feature reduction, Collaborative filtering based recommendation

UNIT II

Probability & Bayes learning Logistic Regression, Support Vector Machine, Kernel function & Kernel SVM neural network: Perceptron, multilayer network, back propagation, introduction to deep neural network Introduction to Graphical Models. Generative Vs. Discriminative Models.

UNIT III

Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning, Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model. Some application areas of machine learning e.g. Natural Language Processing, Computer Vision, applications on the web.

REFERENCES:

1. Machine Learning. Tom Mitchell. First Edition, **McGraw- Hill**, 1997.
2. Introduction to Machine Learning Edition 2, by **Ethem Alpaydin**

MCA Syllabus – Department of Computer Science, IUST

Course Title: Image Processing

Course Code: MCA-5E3-DCE

UNIT I

Introduction & Digital Image Fundamentals: The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Representation, Image Sampling & Quantization, Some basic relationships like Neighbors, Connectivity, Distance Measures between pixels, Linear & Non Linear Operations. Image Enhancement in the Spatial Domain: Some basic Gray Level transformations, Histogram Processing, Enhancement Using Arithmetic & Logic operations, Basics of Spatial Filters, Smoothing & Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

UNIT II

Image Enhancement in the Frequency Domain: Introduction to Fourier Transform & the frequency Domain, Smoothing & Sharpening Frequency Domain Filters, Homomorphism Filtering. Image Restoration: A model of The Image Degradation / Restoration Process, Noise Models, Restoration in the presence of Noise Only Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Dedradations, Estimation of Degradation Function, Inverse filtering, Wiener filtering, Constrained Least Square Filtering, Geometric Mean Filter, Geometric Transformations.

UNIT III

Image Compression: Coding, Interpixel & Psychovisual Redundancy, Image Compression models, Elements of Information Theory, Error free comparison, Lossy compression, Image compression standards. Image Segmentation: Detection of Discontinuities, Edge linking & boundary detection, Thresholding, Region Oriented Segmentation, Motion based segmentation.

REFERENCES:

1. Rafael C. Gonzalez & Richard E. Woods, “Digital Image Processing”, **Pearson Education**
2. A.K. Jain, “Fundamental of Digital Image Processing”, **PHI**
3. Bernd Jahne, “Digital Image Processing”, **Springer**
4. William K Pratt, “Digital Image Processing: Piks Inside”, **John Wiley & Sons**

MCA Syllabus – Department of Computer Science, IUST

Course Title: Cloud & Grid Computing
Course Code: MIT-5E4-DCE

UNIT I

Cloud Computing: Introduction to cloud & Cluster computing, cloud computing vs cluster computing, Evolution of cloud computing, principles of cloud computing, cloud Computing architecture, Cloud computing applications. Cloud service models (IaaS, PaaS, SaaS), cloud Deployment models (Public, Private, hybrid & community models). Challenge and Security Issues

UNIT II

Grid Computing: Introduction to Grid Computing, Characteristics, grid computing Architecture, grid complexity levels and topologies, grid components and grid layers, applications of Grid Computing. Grid security issues: Authorization and Authentication methods, Grid computing vs Cloud Computing Cluster Computing.

UNIT III

Introduction to OGSA, Services, Schema and architecture, Overview of OGSI, Virtualization: Virtual machines and visualization of clusters and data centres, levels of virtualization, virtualization structures and tools and mechanism, virtualization of CPU, Memory & I/O devices

REFERENCE BOOKS:

1. Mastering Cloud Computing, Paperback-1 Feb 2013 by Buyya, Vecchiola & Selvi.
2. Cloud Computing: Concepts, Technology & Architecture, 1e Paperback-2014 by Erl. .
3. Grid & Cloud Computing, a business perspective on Technology & Applications, Springer by Stanoevska-Slabeva, Katarina, Wozniak, Thomas, Ristol, Santi (Eds.)

MCA Syllabus – Department of Computer Science, IUST

Course Title: Organizational Behavior

Course No: MCA-5E5-DCE

UNIT I

Evolution of management Thought-Classical, Behavioral and Management Science Approaches; The Hawthorne Studies; Systems and Contingency Approach for understanding organizations; Application of Management thought to the current scenario; Fundamental Concepts of Organizational Behavior; The role of OB in Management; Managerial Process, Functions; Managerial Skills and Roles in Organizations.

UNIT II

Foundations of Individual Behavior-Personality-Meaning; Development of Personality; Personality Determinants; the “Big Five” Personality Traits; Emotional Intelligence. Perception;- Nature and importance; Factors influencing perception; Managing the Perception Process. Learning- Components of learning process; Theoretical process of learning- Classical Conditioning; Operant Conditioning; Cognitive and Social Learning Theory.

UNIT III

Attitude: Nature and dimensions; Components and functions of attitude, Formation and attitude change. Motivation in organizations: Nature and importance; The motivational framework; The content theories of work motivation- Maslow’s Need Hierarchy Theory; The Dual Structure Theory of Motivation; Process theory of work motivation- Vroom’s Expectancy Theory; J. Stacy Adam’s Equity Theory.

Note:- The list of cases and specific references will be announced by the concerned faculty in the class at the beginning of the semester.

REFERENCES:

1. Fundamentals of Management by Griffin, Houghton Mifflin Company, Boston New York, U.S.A
2. Essentials of Management by Andrew J/ DuBrin THOMSON-South western Management
3. Organizational Behavior by Hersey/Balanchard/Johnson Pearson Education-New Delhi
2. Organizational Behavior By Stephen Robins- Pearson Education-New Delhi
3. Organizational Behavior By Fred Luthans McGrawHill
4. Organizational Behavior By Debra/ James – THOMSON-South-Western

MCA Syllabus – Department of Computer Science, IUST

Course Title: Research Methodology

Course Code: MCA-5E6-DCE

UNIT I

Concept of Research: Introduction to research, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research & Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research. What is a Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem.

UNIT II

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Different Research Designs, Basic Principles of Experimental Designs, Sampling Design: Steps in Sampling Design, Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, Different Types of Sample Designs. Methods of Data Collection.

UNIT III

Testing of Hypothesis: What is a Hypothesis, Basic Concepts Concerning Testing of Hypothesis, Procedure for Hypothesis Testing, Data Analysis: Data Preparation, Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations & Chi-square test.

UNIT IV

Report Writing: Meaning of Interpretation , Technique of Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Computers & Researcher.

TEXT BOOKS:

1. Research Methodology – C.R.Kothari

REFERENCE BOOKS:

1. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
2. Business Research Methods – Alan Bryman & Emma Bell, Oxford University Press.

MCA Syllabus – Department of Computer Science, IUST

Course Title: Advanced Java
Course Code: MCA-5E7-DCE

UNIT I

Streams: stream operations, stream creation, filter map & flatmap methods, extracting substreams & concatenating streams, other stream transformation, simple reductions, the optional type, collecting results, collecting into maps, grouping & partitioning, downstream collections, reduction operations, primitive type streams, parallel streams, input & output streams, text input & output, reading & writing binary data, object i/o streams & serialization.

UNIT II

Networking Connecting to a server, implementing servers, Database Programming JDBC design, structured query language, JDBC Configuration, Working with JDBC statements, query execution, scrollable & updatable result sets, row sets, metadata, transactions, advanced sql type, connection management in web & enterprise applications

UNIT III

Core Spring: Introduction to spring, wiring beans, advanced wiring, aspect oriented spring, Spring on web building, spring web application, Spring in the backend using databases with Spring & JDBC, persisting database with object relational mapping, advanced spring MVC, working with spring web flow, securing web applications.

REFERENCES:

1. Core Java, Volume II—Advanced Features, Tenth Edition by Cay S. Horstmann
Publisher: **Prentice Hall** Release Date: December 2016 ISBN: 9780134177878
2. Spring in Action, 4th Edition: Covers Spring 4 by Craig Walls Publisher: **Manning Publications**