Course Structure and Syllabi

M. Sc. Computer Science

Academic Programmes

July, 2013
# MSc-CS Syllabus at JECRC University

## Semester – I

<table>
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<tr>
<th>Course Code</th>
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**Total**                                                                                           **25**
# MSc-CS Syllabus at JECRC University

## Semester – II

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### Semester – IV

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Course Code: CA-11021  
Course Name: Programming in C  

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Unit I

UNIT II
Recurrence relations and recursive algorithm-Introduction, Recurrence, Relations, Linear Recurrence With Coefficient Solutions, particular solutions, Total Solutions.

UNIT III
Groups and ring—Groups and Subgroups, Generators and Evaluations of Powers, Cosets and Lagrange Theorem, Permutation, Groups and Codes, Isomorphism and Automorphisms, Homomorphism and Normal Groups, Rings, Integral Domains and Fields, Polynomial Ring and Cyclic Codes.

UNIT IV

UNIT V
Finite state machines—Introduction, Finite State Machines, Finite State Machine as Model of Physical System, Equivalent Machines, Finite State Machine as Language Recognizers.

REFERENCES:
2. Applied Discrete Structure For Computer Science By Alan Doerr And Kenneth Levassur-Galgota Publication
3. Discrete Mathematics by J.K. Sharma ,Macmillan India Ltd
Course Code: CA-11022
Course Name: Advanced Data Structures

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Unit I

Unit II

Unit III
Hashing: Separate Chaining; Open Addressing - Linear Probing - Quadratic Probing; Double Hashing - Rehashing - Extendible Hashing.

Unit IV

Unit V

References:
Course Code: CA-11023  
Course Name: Object oriented Concepts & C++  

UNIT I  
Concepts: Objects, Attributes and Methods, Encapsulation and Information Hiding, State Retention, Object Identity, Messages, Class Hierarchy, Inheritance, Polymorphism, Genericity. Object Oriented System Development, Methodology, Modeling.

UNIT II  
Introduction to programming: Concept of programming, concept of an algorithm, Introduction to object oriented concepts, Features of OOPS, C++ programming basics, Data types, precedence of operators, loops and decisions, functions, objects and classes, constructors, destructors, objects as function arguments, inline functions, friend functions. Arrays, arrays as class member data, arrays of objects, strings, string as class members, operator overloading, overloading unary operators, overloading binary operators, function overloading, data conversion. Inheritance: Derived class and base class, derived class constructors, class hierarchies, private and public hierarchies, levels of inheritance, multiple inheritance, classes within classes, friend functions, inline functions. Pointers: Memory management, new and delete, pointers to objects, pointers to pointers, Polymorphism, virtual functions, Late Binding, Early Binding, static functions, the this pointer.

UNIT III  
Files and streams: Streams, string I/O, character I/O, object I/O, I/O with multiple objects, file pointers, Disk I/O with member functions, redirection, command line arguments. Templates: Introduction, class templates, Function templates, member function templates, Non-Type template argument. Introduction to standard template library, Components of STL, Containers, Iterators, Application of container classes, function objects. Exception Handling: Introduction, Exception Handling mechanism, Throwing mechanism, Catching mechanism.

UNIT IV  

UNIT V  

References

6. E. Balaguruswamy, Object Oriented Programming with C++. 2nd Ed.
7. Tony Gaddis, Starting Out with C++, dreamtech press
Course Code: CA-11024  
Course Name: Theoretical Computer Science  

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**Unit I**


**Unit II**

Context free Languages: Equivalence of CFG and PDA – Normal forms(CNF and GNF) – Closure properties of CFL’s – DCFL’s and their properties – Decision procedures – CYK algorithm – Pumping lemma and proof for existence of non context-free languages – Context sensitive languages: Equivalence of LBA and CSG.

**Unit III**

Turing machines: TM computations – Equivalence of standard TM with multitape and nondeterministic TM’s – Turing acceptable, Turing decidable and Turing enumerable language classes - Equivalence of type 0 grammars with TM’s – Church’ thesis – Chomsky hierarchy.

**Unit IV**


**Unit V**


**References:**

3. Linz P An Introduction to formal Languages and Automata, Narosa 1998.
Course Code: CA-11025  
Course Name: Advanced Microprocessor

**Unit I**  

**Unit II**  

**Unit III**  
Video and Keyboard Operations: INT 21H operations for screen display and keyboard input. Video modes and attributes. INT 10H operations. Direct video display, BIOS keyboard areas, INT 21H & 16H operations, extended function keys and scan codes, INT 09H and the keyboard buffer.

**Unit IV**  

**UNIT V**  

**References:**

Course Code: CA-11026
Course Name: Lab I: 1. Data structures using C++. 2. Microprocessor

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Course Code: CA-12021
Course Name: Advanced Computer Graphics

Unit I
Introduction: Three-dimensional Concepts, Display Methods, Introduction to OpenGL.

Unit II
Transformations: 3D Geometric transformations - Translation, Scaling, Rotation, Reflection, Shear, Composite Transformations, Modeling and Co-ordinate transformations, Implementation of transformations in OpenGL.

Unit III
Representations of 3D Objects: Polygon surfaces, Representation of curves and surfaces, Representing solids- Sweep representations, Boundary representations, Spatial partitioning representations, Constructive solid geometry. Visible surface detection methods. Shading and Illumination, Representation of curves and surfaces in OpenGL.

Unit IV
Viewing: Projections, Projection Matrices, Projections in OpenGL.

Unit V
Discrete Techniques: Texture mapping, Bit and Pixel operations, Compositing, Sampling and Aliasing Techniques.

References:
Course Code: CA-12022
Course Name: Database Management Systems

Unit I

Unit II
Relational data structure-A Review of Set Theory, Relations, Domains and Attributes, Tuples, Keys. Integrity Rules Extensions And Intensions, Base Tables, Indexes Relational Algebra and Operations, Retrieval Operations, Relational Calculus and Domain Calculus. Relational database design-Universal Relation, Anomalies in a Database, Normalization Theory, Functional Dependencies. Closure of a Set of F.D Covers, Non Redundant and Minimum Cover, Canonical Cover, First, Second and Third Normal Forms, Relations with more than one Candidate Key, Good and Bad Decompositions, Boyce Codd Normal Form, Multivalued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form. SQL- basic structure, set operations, subqueries,join relation, DDL, DML integrity and security, domain constraits, referential integrity, assertions, authorization.

Unit III

Unit IV
Object Oriented Databases Need for OODBMS, Object structure: Class, polymorphism, encapsulation, inheritance, Object modeling techniques, UML.

Unit V

**References**:  
1. Database Management Systems Ramkrishnan McGraw Hill  
2. Fundamentals of Database Systems Elmasari, Navathe Addison Wesley  
3. Introduction to Database Systems Date Addison Wesley  
5. SQL Essentials. Franklin, Beedle & Associates, 2005
Course Code: CA-12023
Course Name: Software Engineering

Unit I

Unit II

Unit III

Unit IV
Unit V

References:
Course Code: CA-12024
Course Name: Advanced Java programming

Unit I
Swing: Japplet, Icons and Labels, Text fields, Buttons, Combo Boxes, Tabbed Panes, Scroll, Panes, Tables, JDBC: Jdbc Architecture, Drivers, Database connections, statements, ResultSets, Transactions, metadata, stored procedures, error handling.

Unit II
Java Networking: RMI Introduction, Architecture, defining remote objects, creating stubs and skeletons, serializable classes, Accessing remote objects, factory classes, dynamically loaded classes, RMI activation, registering remote objects. Ching.

Unit III
Servlets, generic servlet, servlets that access request headers, Develop servlets that manipulate response headers, Hypertext Transfer Protocol (HTTP Develop and Deploy a simple HTTP servlet., Forms ,Simple Servlet that Use HTML, structure of HTML FORM tags HTML forms using Common GatewayInterface (CGI) Configuring Servlets, Servlet Context, servlet context listener.

Unit IV
JNDI : Architecture, context initial context class, objects in a context, naming shell application, listing the children of a context binding objects, accessing directory services, attributes and attribute interface modifying directory entities, creating directories entities, search

Unit V
Java Archive file and Jar utility, EJB: roles, EJB client object container Transaction Management, Implementing a basic EJB object, Implementing session beans, implementing Entity bean, Deploying an enterprise bean object. Java Server Pages: Developing JSP Pages, technology, syntax using scripting elements, syntax using the courier page directive, Create and use JSP error pages, Building Reusable Web Presentation, Components Describe how to build Web page layouts from reusable presentation components, JSP technology syntax using the include directive, JSP technology syntax using the jsp:include standard action, Developing JSP Pages Using Custom Tags , problem with JSP technology scriptlet code, Given an existing custom tag library, develop a JSP page using the library, developing a Simple Custom Tag, structure and execution of a custom tag in a JSP page, tag handler class for a simple empty custom tag, custom tag that includes its body in the contour of the HTTP response, tag library description for a simple, empty custom tag.

References:
2. Java 2 The Complete Reference - Galgotia Publications
3. Java Beans Developers Resource – PHI
Course Code: CA-12025  
Course Name: Elective I

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Course Code: CA-12025-E1
Course Name: Principles of Compiler Designing

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Unit I
Introduction to Compiling: Compilers, Analysis of the source program, The phases of a compiler, Compiler Construction tools.

Unit II
Lexical Analysis: Specification and Recognition of tokens, Regular Expressions and Finite Automata, From a Regular Expression to an NFA, Design of a Lexical Analyser Generator.

Unit III

Unit IV

Unit V

References:
Course Code: CA-12025-E2
Course Name: Parallel Processing

Unit I
Fundamentals: Computational Models; Computer Architecture; Parallel Processing.

Unit II
Instruction Level Parallel Processing: Introduction to ILP Processors; Pipelined Processors; VLIW Architectures - Principles - Architecture - Case Study;

Unit III

Unit IV

Unit V
Thread and Process Level Parallel Architectures: Introduction to MIMD Architecture; Multithreaded Architectures - Computational Models, Von-Newmann Based Architectures – Hybrid Multithreaded Architectures; Distributed Memory MIMD Architecture; Introduction to Direct Interconnection Networks - Fine-grain Systems - Medium-grain Systems – CoarsegrainMulti Computers; Shared Memory MIMD Architecture - An Introduction.

References:
Course Code: CA-12025-E3  
Course Name: Simulation and Modeling

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Unit I

Unit II

Unit III

Unit IV
Continues System Simulation: Continues system models – open and closed loop systems – Models described by differential equations – system dynamics – Growth and decay models – System dynamics diagram – Simulation of aircraft models - Biological and sociological system simulation – simulation language overview – CSMP.

Unit V

References:
1. J.E Banks Discrete System Simulation.
4. J Bhaskar A VHDL Primer revised Edition
5. Glenn Vanderburg tricks of the Java Programming
6. Deo N System Simulation and Digital Computer Prentice Hall of India
Course Code: CA-12025-E4
Course Name: Numerical and Statistical Methods

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UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V

REFERENCES:
2. S.G. GUPTA AND V.K. KAPOOR, FUNDAMENTALS OF MATHEMATICAL STATISTICS, 9TH EDITION, SULTAN CHAND & SONS. (REPRINT 1999)
3. COMPUTER ORIENTED NUMERICAL METHODS – V.RAJARAMAN, 3RD EDITION, PRENTICE HALL OF INDIA, 1993
4. GUPTA S.C KAPOOR V.K FUNDAMENTAL OF MATHEMATICAL STATISTICS SULTAN CHAND & SONS
5. MITAL SETHI, LINEAR PROGRAMMING PRAGATHI PRAKASHAN
Course Code: CA-12026
Course Name: Lab II: 1. Java Programming 2. Computer Graphics

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Course Code: CA-13021  
Course Name: Operating System

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**Unit I**

**Unit II**

**Unit III**
Memory UNIX and Solaris Memory Management, Linux Memory Management, Windows 2000 Memory Management.

**Unit IV**
Scheduling Multiprocessor Scheduling, Real-time Scheduling, Linux Scheduling, UNIX SVR4 Scheduling, Windows 2000 Scheduling.

**Unit V**

**References**:

Course Code: CA-13022
Course Name: .Net Technology

Unit I
Basic of the .net framework: .net architecture, managed code, assemblies, clr, execution of assemblies code, il, jit, net framework class library, common type system, common language specification, interoperability with unmanaged code.

Unit II
Introducing ASP.NET:Creating Web Forms,Adding ASP.NET Code to a Page Handling Page Events,Discussion: ASP vs. ASP.NET :working model of architecture of server Controls, Add an HTML server control to a page, Access the properties and methods of server controls in code, Add event handlers for page events, use the IsPostback property to handle postbackforms.Using Web Controls: Web Controls, using Intrinsic Controls, Using Input Validation Controls, Selecting Controls for Applications,Bind two controls together.

Unit III
Using Microsoft ADO.NET to Access Data : Overview of ADO.NET, Connecting to a Data Source, Accessing Data with DateSets, Using Stored Procedures, Accessing Data with DataReaders, Binding to Extensible Markup Language (XML) Data.

Unit IV

Unit V
Using Trace in Microsoft ASP.NET Pages:Overview of Tracing, Trace Information, Page-Level Trace, Application-Level Trace

References:
2. Richard Anderson , Professional ASP.NET Wrox Press Ltd
3. .NET Framework Essentials, 3rd
Course Code: CA-13023
Course Name: Network Programming & Administration

Unit I
Introduction: TCP/IP Architecture, TCP/IP addressing, services, FTP, SMTP, TFTP, SNMP, Network file system, domain name system, transport layer protocols, user datagram protocol, transmission control protocol.

Unit II
Interprocesscommunications: File and record locking, pipes, FIFO’s, stream and messages, message queues, samphorers.

Unit III
Sockets: Sockets system cells, reserved parts, stream pipes, socket option, asynchronous I/O, Sockets and signals.

Unit IV
Transport Lay Interface: Elementary TLI functions, stream and stream pipes, asynchronous I/O I/O multiplexing

Unit V
Remote Procedure calls: Remote login, remote command execution, external data representation.

References:
Course Code: CA-13024
Course Name: Artificial Intelligence

UNIT I
General issues and overview of AI, AI Techniques, AI problems, AI Techniques, importance and areas of AI, problem solving state space search-DLF, BFS Production system, problem characteristics. Heuristic Search Techniques: Generate and Test, Hill Climbing, Best First Search, Problem reduction, Constraint satisfaction- Cryptarithmetic and problems.

UNIT II
Knowledge representation & mapping, approaches to knowledge to representation, issues in knowledge representation, Representing simple facts in logic, representing instance and relationships, Resolution and natural deductionRepresenting knowledge using rules, Procedural v/s Declarative knowledge, Logic programming, Forward v/s Backward chaining, Matching & control knowledge.

UNIT III
AI programming language: Prolog- objects, relationships, facts, rules and variables, Prolog: Syntax and data structures, representing objects & relationships by using “trees” and “lists”, use of cut, I/O of characters and structures.mSymbolic reasoning under uncertainty: Introduction to monotonic reasoning, Logics for Nonmonotonic reasoning, implementation issues, implementation: DFS &BFS.

UNIT IV
Slot and filler structures: Semantic nets, frames, conceptual dependency, scripts, CYC Natural languages and NLP, Syntactic processing parsing techniques, semantic analysis case grammar, augmented transition net, discourse & pragmatic processing, translation.

UNIT V
Definition and characteristics of Expert System, representing and using domain knowledge, Expert system shells . Knowledge Engineering, knowledge acquisition, expert system life cycle & expert system tools, CYCIN & DENDRAL examples of expert system.

REFERENCES:
1. Artificial Intelligence _ Rich & Knight
2. Programming In Prolog-Cloksin&Mellish
3. Introduction To Artificial Intelligence & Expert System
4. Principles Of Artificial Intelligence – Nillson
5. Foundation Of Artificial Intelligence & Expert System _ Janakiraman, Surukes &Gopal Krishnan
Course Code: CA-13025
Course Name: Elective II

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Course Code: CA-13025-E1  
Course Name: Image Processing

Unit I

Unit II

Unit III

Unit IV
Image Segmentation: Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region Oriented Segmentation, Motion based segmentation. Representation and Description: Representation schemes like chain coding, Polygonal Approximation, Signatures, Boundary Segments, Skeleton of region, Boundary description, Regional descriptors, Morphology.

Unit V
Recognition and Interpretation: Elements of Image Analysis, Pattern and Pattern Classes, Decision- Theoretic Methods, Structural Methods, Interpretation.

References:
3. RosefieldKak, “Digital Picture Processing”,
Course Code: CA-13025-E2
Course Name: Multimedia Systems

L T P C
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UNIT I
Multimedia: introduction, text, images & tools: needs and area to use and develop multimedia software? Multimedia development team and skills, mac vs windows platform, basic tools for development multimedia application multimedia building blocks, making simple multimedia with popular applications. Stages of multimedia design: planning, content analysis, instructional design, preparation of media elements, integration of media elements authoring, evolution, text, plain text and formatted text, hyper text, text markup language (html), conversion of text formats, object linking and embedding concept and text preparation tools. Fonts editing and design tools, text effects, image – types of graphics-vector and raster, attributes of image-resolution, images, pixel depth, color, color palates, compression of images and its affects to quality and storage size, various files formats – bmp, dib, eps, cif, pex, pic, tga and tif formats the windows meta files formats, file formats conversion, compression techniques-rel compression, lzw compression, jpeg fractal compression and wavelet compression processing tools – techniques of capturing image and converting image, software tools for processing images techniques of special text effects using various software.

UNIT II
Digital sound - its capturing and editing tools: sound and its attributes-sound and its effects in multimedia, sampling of sound, frequency, sound depth, channels in sound and third effects on quality and storage size estimation of space of a sound file, sound card standard – fm synthesis cards, waves table cards, midi and mp3 files and devices, 3d sounds, capturing and editing sound wave for indo.

UNIT III
Computer animation - its techniques and development tools: animation and its basic – principals of animation and its use in multimedia computer system configuration and peripherals requirements, software for animation, effects of resolution pixel depth image size on quality and storage size types of animation, step for creating and generic animation Animation Techniques – Concept Of Key Frame, Tracing And Path, 2D Animation Techniques: Tweaking, Morphing, Color Cycling, Walk Cycle Wrap, Rotation, 3D Animation Techniques: Lofting, Lighting Revolving Inverse Kinematics Morphing Key Framing Various Tools For Creating Animation Like Animation Pro 3D Studio Paint Shop Pro Animation.

UNIT IV
Digital video and video making tools: basic of video – analog and digital video type of video computer system configuration and peripherals required digitization of analog video type of video problems due to interlacing or non interlacing, video standard – ntsc, pal, secma, hdtv, video capturing media / instruments videodisk camcorder compression techniques, file formats avi, mjpg, mpeg, move real video, video editing and movie making tools quick time video for window adobe premier.
UNIT V
Multimedia, authoring and virtual reality: selecting and using and authoring tool factor for selecting and authoring tool multimedia and internet tools pro web multimedia various plug ins for web. Html and multimedia designing tips text and image pro web planning and distribution of a multimedia project, virtual reality terminology head mounts display (hmd), boom, cave, input devices and sensual technology, characteristic if immersive vr shared virtual environments, non immersive vr, vrml, vr - related technology application

REFERENCES:
2. Multimedia In Action By James E Shuman, Vikas Publishing
3. Multimedia On The Pc By – Norman Desmarasis Tata Megraw Hill
Course Code: CA-13025-E3
Course Name: Web Technology

Unit I
Overview of HTML. Dynamic HTML: Introduction to Dynamic HTML; the Dynamic HTML object model; Dynamically changing text & styles; JavaScript style sheets; dynamically changing control & placement.

Unit II

Unit III
Java Scripts Introduction, Identifiers, Operators, Functions, Event handling, Classes, objects, Array, math, string, window object, Navigator DHTML Font, Text, Image change, Table expansion,JavaScript’s object model; Strengths and weaknesses of JavaScript; Building and extending objects in JavaScript; Events in JavaScript; Event-handlers; Creating interactive forms; Introduction to cookies; using cookies in JavaScript & storing users choices in cookies. Encoding cookies; Browser objects: Object hierarchy, Creating Browser objects, Working with window, Document, History &location; Browser detection, Java to JavaScript communication.

Unit IV

Unit V
XML Programming in Java, □ SAX, APIs DOM ,JDOM JAXP,JAXB, JAXM, Emerging Java APIs for XML , XML in Enterprise Application XML with JSP/ Servlet , XML and Messaging Service, JMS,XML and database,
References:
2. Laura Lemay, “Teach yourself web publishing with HTML 4 in 14 days”
4. Javascript from SAMS written by Wagner and R. Allen Wyke
5. ArmanDanesh, “JavaScript Interacting Course”
7. Michael Moncur, “Teach yourself JavaScript in 24 hours”
10. XML Bible
11. "XML in a Nutshell" written by Elliotte Rusty Harold & W. Scott
12. “Java and XML” written by Brett McLaughlin
13. Professional XML from Wrox press
14. "Applied XML Solutions" from SAMS, written by Benoit Marchal
15. "Learning XML" written by Erik Ray from O'Reilly
17. SAMS teach yourself Apache Lupev
Course Code: CA-13025-E4
Course Name: Data Warehousing and Mining

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Unit I

Unit II

Unit III
Data Mining: An Overview : Data Mining, Data Mining Functionalities, Classification of Data Mining Systems, Discovery Vs. Verification Mode Analysis, Data Mining Process, Application Domains, Data Mining Techniques: Classification, Association Detection, Sequential Pattern Detection, Automatic Cluster Detection, Similar Time Sequence Detection, Data Mining Scenario.

Unit IV
Characterization and Comparison & Applications and Trends in Data Mining : Characterization and Comparison: Data Generalization and Summarization, Based Characterization, Analytical Characterization: Analysis of attribute relevance, Mining Class Comparisons: Discriminating Between Different Classes, Mining Descriptive Statistical Measures in Large Database.

Unit V
Data Mining Applications: Data Mining System Products and Research Prototypes, Additional Themes of Data Mining, Social Impacts of Data Mining, Trends in Data Mining.

References:
1. IBM An Introduction to Building the Data Warehouse By PHI Publication.
2. Data Mining: Concept and Techniques By Jiawei Han and MichelineKamber Morgan Kaufmann Publishers
<table>
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<th>Course Code: CA-13026</th>
<th>Course Name: Lab III: 1.ASP.Net 2. Network programming &amp; Administration</th>
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Course Code: CA-14021
Course Name: Industrial Training project

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