

**SYLLABUS, TEACHING & EXAMINATION SCHEME
For MCA WEF FROM SESSION 2022-2023**

MCA - I Semester							
Code	Description	Pd/w	Credits	Exam	CIA	ESE	TOTAL
MCA111	Theory of Computation	3	4	3 hrs	20	80	100
MCA112	ASP.NET	3	4	3 hrs	20	80	100
MCA113	Database Management System	3	4	3 hrs	20	80	100
MCA114	Computer Graphics	3	4	3 hrs	20	80	100
MCA115	Operating System	3	4	3 hrs	20	80	100
MCA121	Advanced Python Lab	4	2	3 hrs	20	80	100
MCA122	ASP.NET Lab	4	2	3 hrs	20	80	100
MCA123	DBMS Lab	4	2	3 hrs	20	80	100
MCA124	Computer Graphics Lab	4	2	3 hrs	20	80	100
	TOTAL		28				900
MCA - II Semester							
Code	Description	Pd/w	Credits	Exam	CIA	ESE	TOTAL
MCA211	Advance Java	3	4	3 hrs	20	80	100
MCA212	Artificial Intelligence & Machine Learning	3	4	3 hrs	20	80	100
MCA213	Software Engineering	3	4	3 hrs	20	80	100
MCA221	Advanced JAVA Lab	4	2	3 hrs	20	80	100
MCA222	Colloquium Lab	4	2	3 hrs	20	80	100
MCA223	System Design Project Lab	4	2	3 hrs	20	80	100
	Elective Group 1						
MCA214A	System Programming	3	4	3 hrs	20	80	100
MCA215A	LINUX Operating System	3	4	3 hrs	20	80	100
MCA224A	System Programming Lab	4	2	3 hrs	20	80	100
	Elective Group 2						
MCA214B	Data Warehousing & Data Mining	3	4	3 hrs	20	80	100
MCA215B	Advanced DBMS	3	4	3 hrs	20	80	100
MCA224B	Advanced DBMS Lab	4	2	3 hrs	20	80	100
	Elective Group 3						
MCA214C	Internet Programming in PHP	3	4	3 hrs	20	80	100
MCA215C	Cloud Computing	3	4	3 hrs	20	80	100
MCA224C	PHP Programming Lab	4	2	3 hrs	20	80	100
	TOTAL						900

MCA - III Semester							
Code	Description	Pd/w	Credits	Exam	CIA	ESE	TOTAL
MCA311	Analysis & Design of Algorithms	3	4	3 hrs	20	80	100
MCA312	Information Protection & Security	3	4	3 hrs	20	80	100
MCA321	Information Protection & Security Lab	4	4	3hrs	20	80	100
MCA322	Software Project Lab	4	2	3 hrs	20	80	100
MCA323	Seminar	4	2	3 hrs	20	80	100
	Elective Group 1						
MCA313A	Advance Computer Architecture	3	4	3 hrs	20	80	100
MCA314A	Compiler Design	3	4	3 hrs	20	80	100

MCA315A	Embedded System	3	4	3 hrs	20	80	100
MCA324A	Compiler Design Lab	4	2	3 hrs	20	80	100
	Elective Group 2						
MCA313B	BigData Analytics	3	4	3 hrs	20	80	100
MCA314B	Bioinformatics Database	3	4	3 hrs	20	80	100
MCA315B	Geographical Information Systems	3	4	3 hrs	20	80	100
MCA324B	Bioinformatics Lab	4	2	3 hrs	20	80	100
	Elective Group 3						
MCA313C	AJAX & XML	3	4	3 hrs	20	80	100
MCA314C	Programming in Android	3	4	3 hrs	20	80	100
MCA315C	Wireless Technology	3	4	3 hrs	20	80	100
MCA324C	Android Programming Lab	4	2	3 hrs	20	80	100
	TOTAL						900
MCA - IV Semester							
Code	Description	Pd/w	Credits	Exam	CIA	ESE	TOTAL
MCA411	Practical Training	-	25	3 hrs	-	200	200

MCA - I Semester							
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MCA111	Theory of Computation	3	4	3 hrs	20	80	100
MCA112	ASP.NET	3	4	3 hrs	20	80	100
MCA113	Database Management System	3	4	3 hrs	20	80	100
MCA114	Computer Graphics	3	4	3 hrs	20	80	100
MCA115	Operating System	3	4	3 hrs	20	80	100
MCA121	Advanced Python Lab	4	2	3 hrs	20	80	100
MCA122	ASP.NET Lab	4	2	3 hrs	20	80	100
MCA123	DBMS Lab	4	2	3 hrs	20	80	100
MCA124	Computer Graphics Lab	4	2	3 hrs	20	80	100
TOTAL			28				900

Unit	MCA111: Theory of Computation
I	Sets: Specification of Sets, identity and cardinality, subsets, multisets, relations. Functions. Graphs and Trees: type of graphs: connected, directed, weighted, cyclic, planar, multigraph, pseudograph, complete graph. Properties of Trees.
II	The Central concepts of automata theory: Alphabet, Strings: empty, null, Kleene star (closure), concatenation of strings, reverse of a string, substring, palindrome. Propositions or statements: connectives: AND, NOT, OR, IF..THEN, IFF, well-formed-formulas (WFF), tautology. Introduction to Chomsky classification.
III	Finite automata: designing of finite automata, Transition graphs, transition table, DFA, string processing by DFA, NFA, differences between DFA and NFA, equivalence of DFA and NFA, minimization of Finite automata.
IV	Automata with output: Moore machine, Mealy machine, difference between Moore and Mealy machine, Equivalence of Moore and Mealy machine, Conversion from Moore to Mealy and Mealy to Moore machine. Minimization of a finite automata with output
V	Pushdown Automata: Methods for designing PDA: Numerical Method; operations on stack, PDA moves, representation of PDA, acceptance by PDA. Deterministic PDA, difference between FA and PDA Turing machine: Representation moves in TM. Universal Turing Machine

Suggested Readings

- Mishra, Chandrasekaran "Theory of Computer Science (Automata, Languages and Computation) PHI

Unit	MCA112: ASP.NET
I	Introduction to .NET Framework: Features of .NET, Microsoft Intermediate Language, Meta Data, .NET types and .NET name spaces, Common Language Runtime, Common Type System, Comparison of ASP and ASP.NET.
II	Introducing ASP .NET – Creating the ASP .NET applications, Web forms and Web controls, working with events, Web controls such as Rich web controls, Custom web controls and Validation controls, Application level and Page level Tracing, Debugging ASP .NET pages.
III	Advanced ASP .NET : ASP .NET configuration, Creating and using the Business objects, HTTP Handlers, ASP .NET caching, ASP .NET security, Deployment projects, Localizing ASP .NET applications
IV	Web Services: Introduction to web services, Web services Infrastructure, SOAP with HTTP, Building, Deploying and publishing web services, Finding web services, Consuming web services as a consumer.
V	ADO .NET: Basics of ADO .NET, ADO v/s ADO.NET, Data Table, Data Views, Data Set, Data Relation Type, ADO .NET Managed Providers, OLEDB and SQL Managed Providers, OleDb Data Adapter Type.

	XML and ADO.NET, Using XML Reader: Reading XML documents using Data Reader, Using Data Set and XML: Loading XML into Data Sets
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Suggested Readings

- Web Standards Programmer's Reference: Steven M. Schafer

Unit	MCA113: Database Management System
I	Entity Relationship Model: Entities, attributes, relationship, constraints, keys, E-R diagram, concept of strong and weak entity sets, generalization, specialization and aggregation. RDBMS – Basic concept, Codd's rule for RDBMS. Functional dependencies and Normalization for relational databases - design guidelines for relational schema, functional dependencies, normal forms (1NF, 2NF and 3NF).
II	SQL data definition and data types – create schema, create table, attribute data types and domains. Basic constraints in SQL – attribute and attribute defaults, key and referential integrity, naming, tuple constraints. Schema change statements in SQL – DROP, ALTER. Basic queries in SQL – select-from-where structure, ordering of query results.
III	Complex SQL queries – comparison involving NULL and three valued logic, nested queries, tuples and set comparison, joined tables. Aggregate functions, grouping – GROUP BY and HAVING clause. Insert, delete and update statements. Assertions and views.
IV	PL/SQL: Basics concepts, advantages, variables, constants, data types, comments, output function, control structures – conditional, iterative and sequential control, database access with PL/SQL, transaction management.
V	Cursor – basic concept, types, Procedures & Functions - advantages, creation, execution, deletion, overloading, stored procedures and functions. Packages – creation and execution. Triggers - use, types, creating, deleting.

Suggested Readings

- Database Concepts, Korth, Silbertz, Sudarshan, McGraw Hill
- Fundamentals of Database Systems, Elmasri, Navathe, Addison Wesley

Unit	MCA114: Computer Graphics
I	Algorithms: Line drawing algorithms- DDA Algorithm, Bresenham's Line Algorithm, Circle and Eclipse generating algorithms, Midpoint Circle Algorithm. 2-D Viewing- The viewing pipeline. Viewing co-ordinate, Reference Frame. Window to viewports co-ordinate transformation
II	Polygons: polygon representation; absolute and relative, inside-outside test, polygon drawing algorithms. Polygon fill algorithms: Scan fill, Boundary fill & Flood fill Algorithm.
III	Geometric Transformations: Matrices, translation, Scaling & Rotation Transformations. Homogeneous transformations, Rotation and scaling about an arbitrary point. Composite Transformations. Inverse Transformations. Clipping: Point clipping, Cohen- Sutherland Line Clipping algorithm, Sutherland Hodgemann polygon clipping algorithm.
IV	Introduction to 3D: 3D geometry, 3D primitives, basic 3D transformations. Projections: Parallel and Perspective, 3D viewing Transformation. Visible surface detection, hidden surface removal, depth buffer and painter's algorithm.
V	Curve -Curve Generation, Interpolation, B-Splines, Bezier Curves. Color: Properties of Color, Color models; RGB, HSV and CMYK. Half-toning, Dithering.

Suggested readings

- Madasu Hanmandlu ,PBP publications.
- Herrington ,Tata McGraw-Hill Education private Limited,New Delhi.
- Gautam Roy,Khanna publications.
- Donald D Hearn, M. Pauline Baker, Pearson Education
- Fundamentals of Computer Graphics & Multimedia, D. P. Mukherje
- S Gokul: Multimedia Magic, BPB Publication.

- Jeffcoat : Multimedia in Practice, Pretice-Hall.
- Bufford: Multimedia Systems, Addison Wesley.

Unit	MCA115: Operating System
I	BASICS OF OS :Architecture of Operating System ,Objectives and functions of OS, Evolution of OS (Batch, Multiprogramming, Multitasking, Multiuser, Parallel, Distributed and Real time operating systems). Computer Hardware review: Processor, Memory and IO. OS Shell and kernel architecture.
II	Process Management: Process, Process state, Process state transitions, PCB, Process hierarchy, operations on a process, multitasking. Scheduling policies: FCFS, SJF (preemptive and non-preemptive), priority scheduling, round robin, multi-level feedback queue scheduling.
III	Memory management: Introduction, contiguous real, non- contiguous real, non-contiguous virtual. Virtual memory management system, page replacement policies: LRU, NRU, FIFO, Second chance, optimal page replacement, Working set. Belady's anomaly. Memory allocation techniques: first fit, best fit, worst fit, next fit. Demand paging. Buddy system.
IV	Process synchronization: race condition, critical region. Semaphores, P&V mutex routines. Inter-process communication: the producer-consumer problem. Classical problems: readers-writes, dining philosophers, sleeping barber. Message passing: Inter-process messages, mailboxes. Threads.
V	Deadlocks: introduction, deadlock detection and recovery, deadlock avoidance, banker's algorithm, deadlock prevention. Introduction to operating protection and security, access matrix, implementation of access matrix.

Suggested Readings

- Operating Systems: Donovan & Madnick, Mc Graw Hill
- Modern Operating Systems, Tanenbaum, Pearson Publications.

MCA121: Advanced Python LAB
Practical Exercises
Python Matplotlib: Intro, Pyplot, Plotting, Markers, Line, Labels, Grid, Subplots, Scatter, Bars, Histograms, Pie Charts. Python Modules: NumPy: Basic, Random, ufunc. Pandas: Basic, Cleaning data, Advanced. SciPy: Basic SciPy. Machine Learning: Introduction, Mean Median Mode, Standard Deviation, Percentile, Data Distribution, Normal Data Distribution, Scatter Plot, Linear Regression, Polynomial Regression, Multiple Regression, Scale, Train/Test, Decision Tree

MCA122: ASP.NET Lab
Practical Exercises
Exercises based on Events such as Click, Indexchanged etc, Controls like button, textbox, checkbox, etc and Rich Web Controls, Validation Controls and Tracing, on Creation of Business Objects(UI centric), Caching Implementations and use of caching, implementing Concept of Localization, Creation of web service, Database connectivity and essential operations like select, insert , update and delete

MCA123: DBMS Lab
Practical Exercises
Exercises based on creating table, inserting data into tables, viewing data in tables, sorting data in table, deleting tuples from table, updating the contents of a table, modifying the structure of table, applying primary key, foreign key and unique key constraints, computations on table data, oracle functions, grouping data from tables, subqueries, Joins etc.

MCA124: Computer Graphics Lab
Practical Exercises
Exercises based on inbuilt graphic functions, line drawing algorithms, polygon fill algorithms, transformation(translation, scaling, rotation), simple animation

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MCA224C	PHP Programming Lab	4	2	3 hrs	20	80	100
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Unit	MCA211: Advanced Java
I	Introduction to Java Enterprise, J2EE Technologies, client server technology, web server technology. Movement to Server-Side Java. Definition of a Java Servlet. Practical. Applications for Java Servlets. Java Servlet Alternatives. Reasons to Use Java Servlets. The Java Servlet Architecture. JNDI, Web Applications in J2EE.
II	JDBC – JDBC Drivers, Products, JDBC Design considerations, Two Tier and Three Tier client server model, J2EE multi-tier architecture, Introduction to Data Source and Connection pooling. JavaMail and Internet E-mail. Preparing to Use JavaMail. A JavaMail Example. Using JavaMail in a Servlet.
III	Servlets - Static and Dynamic contents, Servlet life Cycle and Life cycle methods, Servlet Request and Response Model, Deploying a Servlet, Servlet State Transitions, ServletConfig and ServletContext, Servlet Redirection and Request Dispatch, Servlet Synchronization and Thread Model.
IV	Reading and writing data from client using Servlets, Maintaining Client State - Cookies, URL rewriting, hidden form fields, Session Tracking. Inter servlet communications –JDBC connection pool, servlet security and different packages of servlets.
V	JSP fundamentals, JSP architecture, lifecycle of a JSP, Model View Controller (MVC) architecture, JSP tags and JSP expressions, data sharing among servlets & JSP. JSP implicit objects, request application, session and page scope, JSP standard actions, JSP errors.

Suggested Readings

- Developing Java Servlets, by James Goodwill, SAMS.

Unit	MCA212: Artificial Intelligence and Machine Learning
I	Artificial Intelligence (AI) Introduction, Definitions, Basic elements of AI, AI's Application areas, Turing test. Production Systems, Inference Engine, Rule Based Systems, Forward & Backward Chaining, Concepts of Expert System (ES), need, components and architecture of ES. Sub-shells/stages in the development of an ES.
II	Concept of knowledge, Knowledge acquisition, rote learning, discovery, analogy. Monotonic reasoning, logical reasoning, induction and natural deduction. Problems, Problems spaces: Problem characteristics, state space, Production- rules. Non-monotonic reasoning- default reasoning, minimalist reasoning
III	Problems Search: Depth first, Breadth first search methods, A* Algorithms and their analysis. Heuristic search method, generate and test, hill climbing, best first method, constraint satisfaction and backtracking. Statistical reasoning - Baye's theorem, certainty factors, Concepts of Dempster-Shafer theory and Fuzzy logic
IV	Concepts of AI:-Logic, propositional and predicate calculus, Clausal form, Resolution, Unification, Inference, mechanisms. Semantic nets, frames, conceptual dependency, Blackboard architectures, scripts. Introduction to Genetic Algorithms.
V	Neural networks, NN Architectures. Understanding Machine Learning: Big data, hybrid cloud, descriptive analytics, predictive analytics. Machine learning: supervised, unsupervised, reinforcement, neural networks and deep learning. Introduction to statistical methods for machine learning with examples.

Suggested readings

- E. Rich and K. Knight, "Artificial Intelligence", Tata McGraw Hill.
- George F Luger, "Artificial Intelligence", Fifth Edition, Addison-Wesley Publishing Company.
- E. Chamaik and D. McDermott, "Introduction to artificial Intelligence", Addison-Wesley Publishing Company.
- Stuart Russel and Peter Norvig., Artificial Intelligence a Modern Approach, 2nd ed., Pearson Education.
- Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI.
- Nils J. Nilson, "Principles of Artificial Intelligence", Narosa Publishing Co.
- M. Chandwick and J.A. Hannah, "Expert Systems for Personal Computers", Galgotia Publications

Unit	MCA213: Software Engineering
I	Software Problem - Cost, Schedule and Quality, Scale and Change. Software Processes -Process and Project, Component Software Processes, Software Development Process Models, Project Management Process.
II	Software Requirements Analysis and Specification - Value of a Good SRS, Requirement Process, Requirements Specification, functional Specification with Use Cases, And Other Approaches for Analysis, Validation. Software Architecture - Role of Software Architecture, Architecture Views, Component and Connector View, Architecture Styles for C&C View, Documenting Architecture Design, Evaluating Architectures.
III	Planning a Software Project - Effort Estimation, Project Schedule and Staffing, Quality Planning, Risk Management, Planning, Project Monitoring Plan, Detailed Scheduling., Design - Design Concepts, Function-Oriented Design, Object-Oriented Design, Detailed Design, Verification, Metrics.
IV	Coding and Unit Testing - Programming Principles and Guidelines, Incrementally Developing Code, Managing, Evolving Code, Unit Testing, Code Inspection, Metrics. Testing - Testing Concepts, Testing Process, Black-Box Testing, White-Box Testing, Metrics.
V	Introduction to UML, Development Process, Class Diagrams, Sequence Diagrams, Object Diagrams, Package Diagrams, Deployment Diagrams, Use Cases, State Machine Diagrams, Activity Diagrams, Communication Diagrams, Composite Structures, Component Diagrams, Collaborations, Interaction Overview Diagrams, Timing Diagrams.

Suggested Readings

- Pankaj Jalote's Software Engineering: A Precise Approach, By Pankaj Jalote
- UML Distilled Third Edition, A Brief Guide to the Standard Object Modeling Language, by Martin Fowler, Addison Wesley.

Unit	MCA214A: System Programming
I	Systems Programming: Software layered structure & bare machine. Language processor: fundamentals, specifications & language development tools. Systems software and Machine architecture.
II	Macro Processors: Macro Instructions, Features of Macro facility; Macro instruction arguments, conditional macro expansion, macro calls within macros, Macro instruction defining macros. Two pass macro processor. Introduction to MASM macro processor, ANSI C macro language
III	Assemblers: Elements of Assembly language. A simple assembly scheme, Pass structure of Assemblers. Designs of two pass assembler.
IV	Introduction to Loaders and Linkers, functions of a loader. Loader Schemes: Compile-&-go, General Loader, Absolute Loader, Subroutine Linkages, Relocating Loaders, Direct Linking loaders. Introduction to Binders, Overlays and dynamic binders.
V	Software tools: Software tools for program development, editors, Debug monitors, Programming environments, User Interfaces. Introduction to translators

Suggested Readings

- System Software, Beck Leland L, Pearson Education.
- Systems Programming and Operating Systems, Dhamdhare D M, Tata Mc Graw Hill.
- Systems Programming, Donovan John J. Tata Mc Graw Hill.

Unit	MCA214B: Data Warehousing & Data Mining
I	Introduction to Data Warehousing and its building blocks: Definition, Need for Data Warehousing, Operational versus Decision-Support Systems, Scope and Purposes, Features of Data Warehousing :Subject Oriented Data, Integrated Data, Time Variant Data, Non Volatile Data, Data Granularity, Data Warehouses and Data Marts :Their Difference, Top-Down Versus Bottom-Up Approach, Overview of various components: Source Data Component, Data Staging Component, Data Storage Component, Information Delivery Component, Meta Data Component, Management and control Component ,Metadata in the Data warehouse.

II	Warehousing Strategy, Warehouse Management and Support Process: Strategy Components, Determine Organizational Context, Conduct Preliminary Survey Of Requirements, Conduct Preliminary Source System Audit, Identify External Data Sources, Define Warehouse Rollouts, Preliminary Data Warehouse Architecture, Issue Tracking and Resolution Process, Perform Capacity Planning, warehouse Purging Rules, Security Management, Backup and Recovery Strategy.
III	What is Data Mining? Motivating Challenges; The origins of data mining; Data Mining Tasks. Types of Data; Data Quality, Data Pre-processing; Measures of Similarity and Dissimilarity. Classification: Preliminaries; General approach to solving a classification problem; Decision tree induction; Rule-based classifier; Nearest-neighbour classifier
IV	Association Analysis : Problem Definition; Frequent Item set generation; Rule Generation; Compact representation of frequent item sets; Alternative methods for generating frequent item sets, FP-Growth algorithm, Evaluation of association patterns; Effect of skewed support distribution; Sequential patterns, Cluster Analysis: Overview, K-means, Agglomerative hierarchical clustering, DBSCAN, Overview of Cluster Evaluation.
V	Applications: Data mining applications; Data mining system products and research prototypes; Additional themes on Data mining; Social impact of Data mining; Trends in Data mining.

Suggested Readings

- Introduction to Data Mining - Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Pearson Education, 2007
- Data Mining – Concepts and Techniques - Jiawei Han and Micheline Kamber, 2nd Ed, Morgan Kaufmann, 2006.
- Insight into Data Mining – Theory and Practice - K.P.Soman, Shyam Diwakar, V.Ajay, PHI, 2006.
- Data Warehousing Fundamentals: Paulraj Ponniah, S. Nagabhushana, Sam Anahory, Dennis Murray.
- Data Mining: Richard J.Roiger and Michael W. Geatz, Margaret H. Dunham

Unit	MCA214C: Internet Programming in PHP
I	Introduction to PHP, Control Structures, Arrays and Functions: Application: To understand the basics of PHP and MySQL Introducing PHP: Why PHP and MySQL Side Scripting Overview: Static HTML, Client-Side Technology, Server-Side Scripting and Escaping from HTML Learning PHP Syntax and Variables: PHP's Syntax, Comments, Variables, Types in PHP, Type Summary, The simple types, Output
II	Features of PHP Application: To understand the major features needed to work with php applications Php Control Structures and Functions: Boolean Expression, Branching, Looping and Using functions. Passing Information with PHP: HTTP is Stateless; GET and POST Arguments, Formatting Form Variables. String Handling: Strings in Php, String Functions Learning Arrays: Php Arrays, Creating arrays, Retrieving values, multidimensional arrays, inspecting arrays, deleting arrays Number Handling: Numerical types, Mathematical operators, mathematical functions.
III	MySQL Database Integration and Query Processing and Web Forms: Application: To understand and implement MySQL database with Php Introducing Database and MySQL: Integrating PHP and MySQL: Connecting to MySQL, Making MySQL Queries, Fetching Data, Multiple connections, Building in error-checking, Creating MySQL database with PHP, MySQL functions. Performing Database Queries: HTML Tables and Database Tables, Complex Mapping. Integrating Web Forms and Databases: HTML Forms, Basic Form Submission to a Database, Self-Submission, Editing Data with an HTML Form.
IV	Advanced PHP and PHP CMS: Application: To understand and implement the concept of cookies and sessions. To create blogs and websites using WordPress Working with Cookies and Sessions: What is a Session? How Session works in PHP, Session Functions, Cookies. Exception with PHP: Error Handling in PHP. WordPress: About WordPress: Why WordPress? Sites Built with WordPress, Installing and Upgrading WordPress, Dashboard and Settings Working with Content: Post, Pages, Posts vs. Pages, Media Files, Links, Feeds Importing Content: Importing Blogs, Importing HTML Files, Creating a Basic Theme.
V	PHP Framework: Application: To learn and implement php framework using Laravel Laravel – What is Laravel? Installation Quick start: Creating your first web application: Database configuration, Creating the users table using migrations, Creating an Eloquent user model, Routing to a closure,

	Creating users with Eloquent, The users controller, Creating the users index view, Passing data from a controller to a view, Adding our dynamic content to the view, RESTful controllers, Creating a form for adding users, Routing POST requests to a controller action, Receiving form input and saving to the database, Creating links with the HTML helper, Deleting user records with Eloquent, Updating a user with Eloquent, Creating the update form with the form helper.
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Suggested Readings

- PHP Bible, (Author) Tim Converse , Joyce Park.
- Beginning PHP5(Author) David Mercer, Allan Kent , Steven Nowicki, Clark Morgan, Wanky Choi.

Unit	MCA215A: LINUX Operating System
I	Introduction to concept of Open source software, Linux Architecture, Linux file system, Kernel, Process Management in Linux, Signal Handling, System call, and System call for Files, Processes and Signals.
II	Command Structure, cal, date, echo, printf, bc, script, passwd, PATH, who, uname, tty, stty, pwd, cd, mkdir, rmdir. The File System, cat, cp, rm, mv, more, file, ls, wc, pg, cmp, comm, diff, gzip, tar, zip, df, du, mount, umount. Filtering commands: head, tail, cut, paste, sort, grep, sed.
III	Shell Programming– Introduction to Shell, Various Shell of Linux, Shell Commands, I/O Redirection and Piping, Vi and Emacs editor. The Logical operators && and conditional Execution, Shell control statements, Variables, if-then-else, case-switch, While, Until, Find, Shell Meta-characters, Shell Scripts, Shell keywords, Built in Commands, Shell Procedures and Reporting, Handling documents.
IV	File listings, Ownership and Access Permissions, File and Directory types, Managing Files, User and its Home Directory, Booting and Shutting down. Installing and upgrading the package. Configure IP and telnet, ping. Installing apache web server for Linux operating system.
V	BootLoaders, LILO, GRUB, Bootstrapping, init Process, System services, Internet and Web service tools, E-mail, Remote Login and FTP, Networks and server setup, LAN, Connection with Internet, Setting up routers, Proxy Servers, Print Servers, File Server, Mail server, FTP server, Web server, DHCP.

Suggested Readings

- Linux: The Complete Reference, Sixth Edition by Richard Petersen (Author)
- Design of the UNIX Operating System Maurice J. Bach, AT&T Bell Labs.
- Yashwant Kanetkar, Unix shell programming,(BPB).

Unit	MCA215B: Advanced DBMS
I	Transactions and Concurrency Control: Transaction Concept, Transaction State, Implementation of Atomicity & Durability, Concurrent Executions, Serializability, Lock-Based Protocols, Timestamp-Based Protocols, Deadlock Handling.
II	Database Security and Authorization: Introduction to Database Security Issues, Discretionary Access control Based on Granting and Revoking Privileges, Mandatory Access Control and Role-Based Access Control for Multilevel Security, Introduction to Statistical Database Security, Encryption and Public Key Infrastructures.
III	Distributed Databases: Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control in Distributed Databases, Distributed Query Processing.
IV	Object Orientated Database: Features of an Object-Orientated DBMS, Object-Oriented Database Design, How OO Concept has Influenced the Relational Model, Object Oriented Languages, Persistent Programming Languages, Nested Relations, Complex Types, Inheritance, Reference Types, Querying with Complex Types, Object-oriented data model.
V	Parallel Databases: Introduction, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Design of Parallel Systems

Suggested readings:

- Database Concepts, Korth, Silbertz, Sudarshan, McGraw Hill.

- SQL/ PL/SQL The Programming Language of Oracle, Ivan Bayross, BPB Publications
- Database Management Systems, Ramakrishnan, Gehrke, McGraw Hill

MCA215C: Cloud Computing	
I	Enterprise computing: a retrospective – Introduction, Mainframe architecture, Client-server architecture, 3-tier architectures with TPmonitors, The internet as a platform - Internet technology and web-enabled applications, Web application servers, Internet of services. Software as a service - Emergence of software as a service architectures and cloud computing, Successful SaaS architecture.
II	Enterprise architecture: role and evolution - Enterprise data and processes, Enterprise components, Application integration and SOA, Enterprise technical architecture, Data center infrastructure: coping with complexity. Cloud computing platforms - Infrastructure as a service: Amazon EC2, Platform as a service: Google App Engine, Microsoft Azure. Cloud computing economics - Is cloud infrastructure cheaper?, Economics of private clouds, Software productivity in the cloud, Economies of scale: public vs. private clouds.
III	Data in the cloud - Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo, Cloud data stores: Datastore and SimpleDB. MapReduce and extensions - Parallel computing, The MapReduce model, Parallel efficiency of MapReduce, Relational operations using MapReduce, Enterprise batch processing using MapReduce.
IV	Enterprise software: ERP, SCM, CRM - Anatomy of a large enterprise, Partners: people and organizations, Products, Orders: sales and purchases, Execution: tracking work, Billing, Accounting, Enterprise processes, build vs. buy and SaaS. Custom enterprise applications and Dev 2.0 - Software architecture for enterprise components, User interface patterns and basic transactions, Business logic and rule-based computing, Inside Dev 2.0: model driven interpreters, Security, error handling, transactions and workflow.
V	Enterprise cloud computing ecosystem - Public cloud providers, Cloud management platforms and tools, Tools for building private clouds. Roadmap for enterprise cloud computing - Quick wins using public clouds, Future of enterprise cloud computing.

Suggested Readings

- Enterprise Cloud Computing Technology, Architecture, Applications by GautamShroff. Cambridge University Press.

MCA221: Advanced Java Lab	
SNo	Practical Exercises
1	Assignments based on basic Java Servlets.
2	Assignments based on JDBC and Servlets , Data Source and Connection pooling, JavaMail in a Servlet.
3	Assignments based on Servlet Request and Response Model, Deploying a Servlet, Servlet State Transitions, ServletConfig and ServletContext, Servlet Redirection and Request Dispatch, Servlet Synchronization and Thread .
4	Assignments based on Reading and writing data from client using Servlets, Maintaining Client State - Cookies, URL rewriting, hidden form fields, Session Tracking. Inter servlet communications –JDBC connection pool.
5	Assignments based on JSP fundamentals, JSP tags and JSP expressions, data sharing among servlets & JSP. JSP implicit objects, request application, session and page scope, JSP standard actions, JSP errors.

MCA222: Colloquium Lab	
Practical Exercises	
The aim of the subject is to develop ability of a student to be able to discuss and speak about various issues/subjects/topics/matters. The students in the group will discuss the topics and present their views. The evaluation will be carried out by the examiners based on their thoughts, language proficiency, presentation skills etc.	

MCA223: System Design Project Lab	
Practical Exercises	
Students in a group of 3-4 shall prepare a system design of their choice, in guidance of teacher.	

MCA224A: System Programming Lab	
Practical Exercises	
SNo	
1	Implementation of word recognizer
2	Basic parser, syntax and semantic analyzer
3	Problems related to Macros
4	Assembler POT and MOT construction
5	Generating machine Code for assembly program
6	Implementation of basic functions of Loaders and linkers
7	Overlay memory computations.

MCA224B: Advanced Database Lab	
Practical Exercises	
The practical exercises based on MCA415B	

MCA224C: PHP Programming Lab	
Practical Exercises	
Exercise based on how to install and configure server with execution of php files, passing information between pages, operators in php, loops in php, get values form different types of control in php, dynamic control generation in php, array used in php, associative array used in php, multi dimension array used in php, in built array functions, file handling functions, login and logout with session, cookies use, database MySql connection. Insert, Update, delete and select records from table, String and regular expression function.	

MCA - III Semester							
Code	Description	Pd/w	Credits	Exam	CIA	ESE	TOTAL
MCA311	Analysis & Design of Algorithms	3	4	3 hrs	20	80	100
MCA312	Information Protection & Security	3	4	3 hrs	20	80	100
MCA321	Information Protection & Security Lab	4	2	3hrs	20	80	100
MCA322	Software Project Lab	4	2	3 hrs	20	80	100
MCA323	Seminar	4	2	3 hrs	20	80	100
	Elective Group 1						
MCA313A	Advance Computer Architecture	3	4	3 hrs	20	80	100
MCA314A	Compiler Design	3	4	3 hrs	20	80	100
MCA315A	Embedded System	3	4	3 hrs	20	80	100
MCA324A	Compiler Design Lab	4	2	3 hrs	20	80	100
	Elective Group 2						
MCA313B	BigData Analytics	3	4	3 hrs	20	80	100
MCA314B	Bioinformatics Database	3	4	3 hrs	20	80	100
MCA315B	Geographical Information Systems	3	4	3 hrs	20	80	100
MCA324B	Bio informatics Lab	4	2	3 hrs	20	80	100
	Elective Group 3						
MCA313C	AJAX & XML	3	4	3 hrs	20	80	100
MCA314C	Programming in Android	3	4	3 hrs	20	80	100
MCA315C	Wireless Technology	3	4	3 hrs	20	80	100
MCA324C	Android Programming Lab	4	2	3 hrs	20	80	100
	TOTAL						900

Unit	MCA311: Analysis and Design of Algorithms
I	Introduction: Need of algorithm, specification of algorithm, Design of Algorithms, Finding time and Space units of algorithms. Performance analysis: Complexity of Algorithms: time complexity, space complexity, calculation of time and space complexity, Asymptotic Notations: Big O, Small o, Omega, Theta, Growth of function, Recurrences.
II	Divide – and – conquer: Basic concept, binary search (recursive and iterative both), MinMax problem, merge sort, Quick sort. Greedy method: -Basic concept, knapsack problem: Binary and Fractional, minimum cost spanning tree: Prim's algorithm, Kruskal's algorithm, Dijkstra.
III	Dynamic Programming – general method of dynamic programming, multistage graphs, all pair shortest path, optimal binary search trees, Travelling salesman problem, flow shop scheduling, Matrix chain multiplication, longest common sequence.
IV	Backtracking: Basic concept of Backtracking, 8-Queens problem, sum of subsets, graph colouring, Hamiltonian cycles, knight tour, puzzle. Branch and bound: Basic Method of branch and bound, 0/1 Knapsack, Problem, travelling salesperson.
V	String Matching: Introduction, The naive string-matching algorithm, The Rabin-Karp algorithm, String Matching with finite automata, The Knuth-MorrisPratt algorithm. Introduction to NP-Completeness: The class P and NP, Polynomial reduction. NP- Completeness Problem, NP-Hard Problems.

Suggested Readings

- Fundamentals of COMPUTER ALGORITHMS : Ellis Horowitz Sartaj Sahni, Sanguthevar, Rajshekaran.

Unit	MCA312: Information Protection & Security
I	History of Information Systems and its Importance, basics, Changing Nature of Information Systems, Need of Distributed Information Systems, Role of Internet and Web Services, Information System Threats and attacks, Classification of Threats and Assessing Damages Security in Mobile and Wireless Computing- Security Challenges in Mobile Devices, authentication Service Security, Mobile Devices: Security Implication for organizations.
II	Information security management (ISM) in organizations, Security policy, standards, guidelines and procedures, Information security management system (ISMS). Basic Principles of Information Security, Confidentiality, Integrity Availability and other terms in Information Security, Information Classification and their Roles.
III	Overview of physical security for Information Systems- Needs, Disaster and Controls, Basic Tenets of Physical Security and Physical Entry Controls, Perimeter security for physical protection, Biometrics controls for security- Factors in Biometrics Systems, Benefits, Criteria for selection of biometrics, Design Issues in Biometric Systems, Interoperability Issues.
IV	Model of Cryptographic Systems, System of Keys, Public Key Cryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints, Firewalls, Network Security- Basic Concepts, Dimensions, Perimeter for Network Protection, Network Attacks, Need of Intrusion Monitoring and Detection, Intrusion Detection Virtual Private Networks- Need, Use of Tunneling with VPN, Authentication Mechanisms, Types of VPNs and their Usage, Security Concerns in VPN.
V	Cyber Crime, Information Security and Law, Types & overview of Cyber Crimes, Overview of Indian IT Act,, Understanding Ethical hacking. Understanding Intellectual property rights, Copy Right, Patents, Trademark, Trade Secret, Trade Name and Trademark, Domain Name. Software Piracy, Plagiarism

Suggested Readings

- Godbole, "Information Systems Security", Wiley

Unit	MCA313A: Advance Computer Architecture
I	Introduction to Parallel Processing. Trends towards parallel processing. Parallelism in uniprocessor systems. Parallel processing mechanisms. Parallel computer Structures: pipeline, array and multiprocessor systems.
II	Architectural classification schemes: Flynn's classification. Serial vs. Parallel processing. Parallelism vs. pipelining. Applications of Parallel Processing. RISC, CISC & VLIW architecture
III	Principles of Pipelining and vector processing: linear pipelining. Classification of pipeline processors. General pipelines and reservations tables. Interleaved memory organization. Introduction to arithmetic pipeline.
IV	Memory: Introduction to Virtual and Cache memory. Multiprocessor memory interface techniques: multiport, cross-bar, timeshared and dual bus structure. Cache Memory mapping: associative, direct & set-associative mappings. Cache writing methods. Cache coherence problems. Snoopy bus protocol
V	Dataflow architecture: Control flow vs. data flow computers. Static and dynamic data flow computer organization. Data flow graphs and languages. Data flow design alternatives.

Suggested Readings

- Computer system architecture. Mano Morris M. PHI
- Computer Architecture and parallel processing. Briggs & Hwang. Mc Graw Hill International.

Unit	MCA313B: BigData Analytics
I	Introduction to BigData Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools -Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

II	MINING DATA STREAMS - Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.
III	HADOOP - History of Hadoop- The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features
IV	HADOOP ENVIRONMENT - Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation – Hadoop Configuration-Security in Hadoop - Administering Hadoop – HDFS - Monitoring-Maintenance-Hadoop benchmarks- Hadoop in the cloud
V	FRAMEWORKS - Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams. Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications

Suggested Readings

- Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
- Tom White "Hadoop: The Definitive Guide" Third Edition, O'reilly Media, 2012.
- Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw-Hill Publishing, 2012
- Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
- Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", JohnWiley & sons, 2012.
- PeteWarden, "Big Data Glossary", O'Reilly, 2011.
- Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.
- Da Ruan, Guoqing Chen, Etienne E. Kerre, GeertWets, Intelligent Data Mining, Springer, 2007.
- Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, Harness the Power of Big Data The IBM Big Data Platform, Tata McGraw Hill Publications, 2012.
- Michael Minelli, Michele Chambers, Ambiga Dhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley Publications, 2013.
- Zikopoulos, Paul, Chris Eaton, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, Tata McGraw Hill Publications, 2011

Unit	MCA313C: AJAX & XML
I	Introducing Ajax, Ajax in Action - flickr, Basecamp, Amazon (A9.com), Google Suggest and Google Maps, Other Sites, Bad Examples, Ajax- The Acronym, XHTML and CSS, The Document Object Model (DOM), JavaScript, XML, XSLT, and XPath, The XMLHttpRequest Object, Server-Side Technologies, The Ajax Application Model, Advantages of Ajax - Partial Page Updating, Invisible Data Retrieval, Constant Updating, Smooth Interfaces, Simplicity and Rich Functionality, Drag and Drop, Disadvantages of Ajax - Poor Responsiveness, Breaks the Back Button on Your Browser, Breaking Bookmarks and Blocking Search Engine Indexes, Strain on the Browser.
II	JavaScript Refresher - Core JavaScript, Syntax, Variables, Primitive Datatypes, Reference Datatypes, Operators, Assignment Operator, Arithmetic Operators, Comparison Operators, Logical Operators, Increment and Decrement Operators, Statements, Conditional Statements, Loops, Functions, Object-Oriented JavaScript, Built-in Objects, Browser Objects, User-Defined Objects, Constructors, Prototypes, Destroying Objects, The Document Object Model, The Document as a Family Tree, The Document as a Node Tree, DOM Methods for Accessing Objects, getElementById, getElementsByTagName, Creating Nodes, The innerHTML Alternative, JavaScript and Events,

	Event Models, Event Registration, The Internet Explorer Event Registration Model, The W3C DOM Event Registration Model, Event Objects.
III	Ajax and Server-Side Technologies - Forms and HTML Controls, The Forms Model of Submission, The Ajax/JavaScript Model of Submission, Submitting Data to the Server, The Server Receives the Request,, The XMLHttpRequest Object, The Callback Function, The responseText Property, The responseXML Property, Debugging responseXML, Debugging responseXML in IE, Using the Data, ASP.NET - Example Using AJAX and ASP.NET, PHP - Example Using AJAX and PHP, Java Servlets - Example Using AJAX and JavaServlets. Ajax Techniques - The XMLHttpRequest Object, Creating an XMLHttpRequestObject,Synchronous Usage, Asynchronous Usage, The readyState Property, XMLHttpRequest Properties and Methods, The POST Method, Advantages and Disadvantages of Using the POST and GET Methods. Other Ajax Techniques - Hidden Frames, Hidden Inline Frames, Dynamic Script Loading, Images and Cookies.
IV	Working with XML - XML Basics , Creating Tags , XML Syntax ,Well-Formed and Valid XML Documents , Extracting XML Data with JavaScript , Using Nodes , Accessing XML Elements by Name , Accessing Attribute Values , Using CSS with XML Data , Using CSS with XML Documents , Using CSS with Ajax , The style Property , The className Property . XSLT and XPath - XSLT and Its Purpose ,XSLT Elements ,xsl:stylesheet , xsl:output , xsl:includes , xsl:template, xsl:apply-templates, and xsl:call-template , The Match Attribute , The Name Attribute , XSLT Parameters , xsl:if , xsl:choose , Escaping XSLT Special Characters , xsl:for-each , xsl:value-of , xsl:sort , xsl:variable , XSLT Support in the Main Browsers , Performing a Transform , Performing a Transform Using IE , Performing a Transform in Firefox , Performing a Transform on the Server Side , Creating an XSLT Style Sheet for a Shopping Cart, XPath and Its Purpose, Basic XPath Functionality , XPath Expressions , Current Context , Document Root , Root Element , Recursive Descent , Specific Elements or Items , XPath Functions , The number Function ,The position Function , The count Function , String Formatting , Arithmetic Functions , Logical Functions , Querying in an XML Document Using XPath, Amending the Shopping Cart Example to Use XSLT and Ajax
V	Debugging and Error Handling - JavaScript Error Handling ,Handling Exceptions , The onerror Event Handler , Mozilla JavaScript Console , Microsoft Script Debugger , Firebug , DOM Inspectors ,Firefox DOM Inspector ,IE DOM Inspector, Mouseover DOM Inspector (MODI) , Troubleshooting Ajax , Using the Firebug Console with XMLHttpRequest , Live HTTP Headers , ieHTTPHeaders Explorer Bar.

Suggested Readings

- Beginning Ajax, By Chris Ullman, Lucinda Dykes, Wrox Publication.

Unit	MCA314A: Compiler Design
I	Introduction to translators: assemblers, interpreters, compilers & cross-compilers. Analysis & Synthesis phases of a compiler. Intermediate code representation: Polish notation, quadruples, triples, indirect triples, abstract syntax tree. Classification of Grammars (Chomsky Classification).
II	Finite automata and lexical analysis: The role of lexical analyzer, Regular expressions. Recognition of tokens, Introduction to Finite Automata & NFA, From regular expression to Finite automata, Conversion form NFA to DFA. Minimization of DFA. Introduction to LEX
III	Parsers: Introduction to Parsing. Top-down &Bottom up Parsers. Introduction to LL, LR, RL and RR parsers. Top Down Parsers: Brute Force & Recursive descent. Bottom Up Parsers: Table driven parser, Shift-reduce parser; LR parser, Action-goto table construction & parsing. Operator precedence Parser.
IV	Semantic Analysis: Symbol tables, Syntax directed translation schemes, Synthesized and Inherited attributes. Code optimization: Basic blocks, DAG, local optimization, copy propagation, folding, redundant sub-expression elimination, dead code removal. Optimization within iterative loops. Global optimization through flow graphs.
V	Code generation: Generic issues in code generation, machine dependent code optimization. Introduction to Peephole optimization. Run time storage management. Object and executable code generation. Introduction to Compiler-compilers: YACC.

Suggested Readings

- Compilers principles and practice, Dave and Dave, Pearson Publications.
- The theory and practice of Compiler writing, Trembley& Sorenson. Mc Graw Hill International Editions.
- Principles of Compiler Design, Aho& Ullman, Narosa Publishing.

Unit	MCA314B: Bioinformatics Databases
I	Fundamentals of Bioinformatics: Introduction, principles and scope of bioinformatics, Fundamentals of molecular biology: DNA sequences, Gene structure, Gene expression and gene mutations. Genomics, proteomics, transcriptomics and metabolomics. Biological data: Nucleotide and protein sequences, genetic code and their interpretations. Macromolecular structures: Primary, secondary, tertiary and quaternary structures and its significance.
II	DNA Sequence analysis: Features of sequence analysis, sequence alignment (Local alignment, global alignment, FASTA, BLAST and similarity searching scores and their statistical interpretation. Pairwise alignment techniques, Multiple sequence alignment), sequence comparison algorithms, sequence scoring schemes. Introduction, database searching, alphabets and complexity, algorithms and programs, comparing two sequences a simple case, sub-sequences, identity and similarity, the dot plot, local and global similarity,
III	Archives and Information Retrieval: Introduction, biological databases, primary sequence databases, composite protein sequence database, secondary databases, structure classification databases, web addresses. Genome information resources: Introduction, DNA sequence databases, specialised genomic resources. Secondary database searching: Introduction, secondary database searches. Biological databases: EMBL, GenBank, DDBJ, TrEMBL, SWISS-PROT, PIR; primary and secondary composite databases; SCOP, CATH, Overview of web servers: NCBI, EBI, PDRB; Search engines: Pub Med, ENTREZ, ExPasy and SRS.
IV	Genome annotation, Computational evolutionary biology, Analysis of gene expression, gene regulation, protein expression and mutations, Modeling biological systems, High-throughput image analysis, Prediction of protein structure, Molecular Interaction and Docking algorithms. Bioinformatics tools: Visualisation of sequence data, Building a sequence search protocol: Introduction, a practical approach, when to believe a result, structural and functional interpretation. Analysis packages: Introduction, what's in an analysis package, commercial software, comprehensive packages, packages specialising in DNA analysis, intranet packages, and internet packages.
V	Applications and commercial aspects of Bioinformatics: Drug discovery, genetic basis of disease, personalised medicine and gene-based diagnostics, legal, ethical and commercial ramifications of bioinformatics. Macromolecular Modelling and Chemoinformatics : Acquisition of chemical information, including molecular structure from databases visualisation of molecules simulation of molecular interaction introduction to industry standard modelling software.

Unit	MCA314C: Programming in Android
I	Introduction to the Development Framework: Understanding the Android Software Stack, The Dalvik Virtual Machine, Android Application Architecture, Android Libraries. Developing with Android Studio, Creating Your First Android Application, Starting a New Android Project, Creating a Launch Configuration, Running and Debugging Your Android Applications, Types of Android Applications: Foreground Applications, Background Applications, Intermittent Applications, and Widgets.
II	Hardware-Imposed Design Considerations for mobile devices. The Android Virtual Device and SDK Manager, Android Emulator, SDK Manager, The Android Emulator, Dalvik Debug Monitor Service (DDMS), The Android Debug Bridge (ADB). Externalizing Resources, Creating Resources, Simple Values, Styles and Themes, Drawables, Layouts, Animations, Menus. Introducing the Application Manifest, The Android Application Life Cycle, Understanding Application Priority and Process States, Introducing the Android Application Class and Activity Class, Extending and Using the Application and Activity Class, Overriding the Application Life Cycle Events.

III	Assigning User Interfaces to Activities, Introducing Views, Introducing Layouts: Using Layouts, Optimizing Layouts. Creating New Views, Drawable. Android UI Controls: TextView, EditText, Button, CheckBox, RadioButton and RadioGroup. Introducing Adapters for binding controls like ListView and Spinner. Event Listeners & Event Handlers methods in Android.
IV	Saving Simple Application Data, Creating and Saving Preferences, Retrieving Shared Preferences, Saving and Loading Files, Including Static Files as Resources, File Management Tools. Introducing Android Databases, Introducing SQLite, Cursors and Content Values, Working with SQLite Databases, Creating a New Content Provider, adding, Deleting, and Updating Content. Native Android Content Providers. Introduction to Services, Broadcast Receiver Fragments and Intents.
V	Creating and Using Menus, Defining Menu Hierarchies in XML, Updating Menu Items Dynamically, Handling Menu Selections, Creating Submenus, Using Context Menus and Popup Menus. Creating a Dialog, Using the Alert Dialog Class, Using Activities as Dialogs, Customizing Toasts, Creating Notifications.

Suggested Readings

- PROFESSIONAL Android™ 4 Application Development by Reto Meier

Unit	MC3515A: Embedded System
I	Introduction to Embedded systems: what are Embedded systems? , Embedded systems architectures, Special challenges with embedded systems: Real time execution, Physical size, power consumption, user interface, multirate operations, cost, hardware software trade-offs. Application of embedded systems.
II	Hardware architecture: Processors, microcontrollers, DSP, graphic processors. Memory: Primary, secondary and auxiliary memories. Interfaces: Output & input; LED, LCD displays, actuators, Sensors and keypads. Touch and haptic inputs. Introduction to ADC and DAC. Introduction to Watch dog timers.
III	The AVR microcontroller: History and features. AVR architecture & variants of AVR. AVR assembly language programming: list of registers, RAM, Status registers, ROM, Data directives.
IV	AVR instruction set: I/O port programming. Arithmetic, logic, branch call and bit manipulation instructions. Addressing modes in AVR. Introduction to AVR programming in C
V	Interfacing: Timer programming, Interrupt programming, Serial port programming, LCD, Keyboard, ADC, DAC, Sensor Interfacing, Relay, motors and stepper driving. Basic introduction to Arduino boards and programming.

Suggested Readings

- Embedded Systems Architecture, Noergaard, Elsevier.
- Embedded Systems, Barret& Pack, Pearson publications.
- Embedded Systems, Rajkamal, Mc Graw Hill.
- Programming for Embedded Systems, Dreamtech software team. Wiley publications.
- The AVR microcontroller and embedded systems, using assembly and C.Mazidi, Nairi & Nairi. Pearson publications.

Unit	MCA315B: Geographical Information Systems
I	Introduction to GIS and Geographical Information: Basic concepts, Socioeconomic Challenges, Benefits of Computerizing Information, Users of GIS. From Real world to GIS: The real world, Real-world model, Data model, from database to GIS to Map, Application of GIS.
II	Basic Data models: Introduction, Vector data model, raster data models, conversion between vector and raster models, vector vs raster models. Attribute data. Advanced data models: surface representation, three dimensional objects, representation of time. Global Positioning System: Introduction, History, GPS System Description, Structure of GPS system, GPS Accuracy and Error, Introduction to DGPS.
III	Data collection: Introduction, digitizing maps, scanning, aerial photographs and photo interpretation, Remote sensing. Surveying, satellite positioning systems, photogrammetric mapping, collection of

	attribute data, text data. Data input: data pre-processing, methods of data capture, digitization and scanning methods, commonly used map projections and ellipsoids.
IV	Basic spatial analysis: Analysis of spatial information, logic operations, general arithmetic and statistical operations. Report generation from attribute data. overlays, buffer zones, raster data overlay. Integrated data analysis.
V	Digital Elevation Model (DEM): need, methods, data sources and products of DEM - Digital Terrain Modelling (DTM) - Input verification, storage and methods of data analysis for Spatial modelling - Methods of GIS and Spatial interpolation.

Suggested Readings

- Geographical Information System for Geoscientists by Bonham-Carter G.F., Pergamon Press, Tarrytown, New York.
- Principles of Geographical Information System for Land Resources Assessment by Burrough, PA., Clarendon, Press, Oxford.
- Geographical Information System by Fraser Taylor, D.R., The Microcomputer and Modern Cartography, Pergamon Press.
- Mathematical Geography by Jameson, A.H. and Mornsby, Mt. Mornsby., Vol I and II, Sir Issac Pitman and Sons Ltd. London.

Unit	MCA315C: Wireless Technology
I	Introduction to Wireless Communication Systems - Evolution of Mobile Radio Communications. Mobile Radiotelephony in the U.S. Mobile Radio Systems Around the World. Examples of Wireless Communication Systems. Trends in Cellular Radio and Personal Communications. Modern Wireless Communication Systems -Second Generation (2G) Cellular Networks. Third Generation (3G) Wireless Networks. Wireless Local Loop (WLL) and LMDS. Wireless Local Area Networks (WLANs). Bluetooth and Personal Area Networks (PANs).
II	Modulation Techniques for Mobile Radio - Frequency Modulation vs. Amplitude Modulation. Amplitude Modulation. Angle Modulation. Digital Modulation: An Overview. Line Coding. Pulse Shaping Techniques. Geometric Representation of Modulation Signals. Linear Modulation Techniques. Constant Envelope Modulation. Combined Linear and Constant Envelope Modulation Techniques. Spread Spectrum Modulation Techniques. Modulation Performance in Fading and Multipath Channels.
III	Multiple Access Techniques for Wireless Communications - Introduction. Frequency Division Multiple Access (FDMA). Time Division Multiple Access (TDMA). Spread Spectrum Multiple Access. Space Division Multiple Access (SDMA). Packet Radio. Capacity of Cellular Systems.
IV	Wireless Networking - Introduction to Wireless Networks. Differences Between Wireless and Fixed Telephone Networks. Development of Wireless Networks. Fixed Network Transmission Hierarchy. Traffic Routing in Wireless Networks. Wireless Data Services. Common Channel Signaling (CCS). Integrated Services Digital Network (ISDN). Signaling System No. 7 (SS7). An Example of SS7 Network Global Cellular Network Interoperability. Personal Communication Services/Networks (PCS/PCNs). Protocols for Network Access. Network Databases. Universal Mobile Telecommunication System (UMTS).
V	Wireless Systems and Standards - AMPS and ETACS. United States Digital Cellular (IS-54 and IS-136). Global System for Mobile (GSM). CDMA Digital Cellular Standard (IS-95). CT2 Standard for Cordless Telephones. Digital European Cordless Telephone (DECT). PACS N Personal Access Communication Systems. Pacific Digital Cellular (PDC). Personal Handyphone System (PHS). US PCS and ISM Bands. US Wireless Cable Television.

Suggested Readings

- Wireless Communications: Principles and Practice, by Theodore S. Rappaport

MCA321: Information Protection & Security Lab
Practical Exercises
Exercises based on different encryption and decryption algorithm, different cryptography algorithms, password encryption and protection, document security like digital signature and digital watermarking

MCA324A: Compiler Design Lab
Practical Exercises

Exercises based on Basic parser structure, Syntax analyzer, Semantic Analyzer, Expression evaluation using stacks, Intermediate code representation, Code optimization, Code generation.

MCA324B: Bio Informatics Lab

Practical Exercises

Exercises based on Usage of NCBI resources, Retrieval of DNA and Protein sequences and structures from databases, BLAST exercises, Visualization of structures

MCA324C: Android Programming Lab

Practical Exercises

Exercises based on Android UI design, Controls, their events, Menus, Dialog and local storage.

Practical Examination [80] Marks Breakup	
Practical Hands on TWO Exercises	60
Viva-voce	20
Total Marks	80

MCA - IV Semester							
Code	Description	Pd/w	Credits	Exam	CIA	ESE	TOTAL
MCA411	Practical Training	-	25	3 hrs	-	200	200