Guru Nanak Dev Engineering College, Ludhiana

(An Autonomous College u/s 2(f) and 12(B) of UGC Act 1956)

(Affiliated to I.K. Gujral Punjab Technical University, Jalandhar)

Scheme and Syllabus

of

Master of Computer Applications

(MCA)

Batch 2022 Onwards

By

Board of Study

Department of Computer Applications

MCA ELIGIBILITY

THE GENERAL ELIGIBILITY CRITERIA FOR MCA 2 YEARS (FOUR SEMESTERS):

MCA Eligibility:

Passed BCA / B.Sc. (CS/IT) / B.Voc. with Computer as a major subject / Bachelor's Degree in CSE / IT or equivalent degree of minimum three years duration from a recognized University/Institution.

Or

Passed B.Sc./B.Com./B.A. with Mathematics at l0+2 Level or at Graduation Level (With additional bridge course as per norms of IKG PTU Jalandhar)/ Bridge course will be exempted if the candidate apart from above qualification has passed PGDCA or minimum One Year Diploma in Computer Application/Science/IT or equivalent from any recognized University/Institution.

Note: The candidate must have obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination.

PROGRAM OUTCOMES (POs)

Computational Knowledge: Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

Problem Analysis: Identify, formulate, search literature and solve complex computing problem searching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

Design /Development of Solutions: Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

Conduct investigations of complex Computing problems: User search-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Modern Tool Usage: Create, select, adapt and apply appropriate techniques, resources and modern computing tools to complex computing activities within understanding of the limitations.

Professional Ethics: Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices.

Life-long Learning: Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

Project management: Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team to manage projects and in multidisciplinary environments.

Communication Efficacy: Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

Societal and Environmental Concern: Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practices.

Individual and Team Work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

Innovation and Entrepreneurship: Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To provide the opportunities to the students of computer applications to develop software solutions for IT related problems of the real world.

PEO2: To enable the students of computer applications to work with ethics and moral values and exhibit innovativeness through their constant efforts.

PEO3: To groom the students of computer applications in professional career and/or higher education by acquiring in depth knowledge of fundamental core-concepts of computer through academia and training.

Instructions for Setting the External Question Paper

1. External question paper will consist of three sections A, B & C respectively. It contains total nine questions and maximum marks 60.
2. Section A contains ten very short answer type questions covering entire syllabus of 2 marks each. All questions are compulsory.
3. Section B contains five short answer type questions of 5 marks each. Students will have to attempt four questions.
4. Section C contains three long answer type questions of 10 marks each. Students will have to attempt two questions.
5. Time duration of paper is three hours.

First Semester

Course Code	Course Type	Course Title	Load Allocations			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
PGCA-B1	Bridge Course*	Computer Science Essentials	2	0	0	50	-	50	S/US
PGCA-B2	Bridge Course*	Computer Programming using C	2	0	0	50	-	50	S/US
PGCA-2201	Core Theory	Information Management	4	0	0	40	60	100	4
PGCA-2202	Core Theory	Object Oriented Programming using C++ and Java	4	0	0	40	60	100	4
PGCA-2203	Core Theory	Relational Database Management System	4	0	0	40	60	100	4
PGCA-2204	Core Theory	Advanced Software Engineering	4	0	0	40	60	100	4
PGCA-2205	Ability Enhancement Compulsory Course (AECC)	Technical Communication	3	0	0	40	60	100	3
PGCA-2206	Core Practical/Laboratory	Information Management Laboratory	0	0	4	60	40	100	2
PGCA-2207	Core Practical/Laboratory	Object Oriented Programming using C++ and Java Lab	0	0	4	60	40	100	2
PGCA-2208	Core Practical/Laboratory	Relational Database Management System Laboratory	0	0	4	60	40	100	2
TOTAL			**19**	**0**	**12**	**380**	**420**	**800**	**25**

***Bridge courses are not applicable to all the Students. Please refer MCA eligibility given above in order to offer bridge courses to students.**

Second Semester

Course Code	Course Type	Course Title	Load Allocations			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
PGCA-2209	Core Theory	Advanced Operating System	4	0	0	40	60	100	4
PGCA2210	Core Theory	Cyber Laws and E-commerce	4	0	0	40	60	100	4
PGCA-xxxx	Elective Theory	Elective-I	4	0	0	40	60	100	4
PGCA-2211	Core Theory	Data Communication and Networks	4	0	0	40	60	100	4
PGCA-2212	Core Theory	Data Structures	4	0	0	40	60	100	4
PGCA-2213	Core Practical/Laboratory	Advanced Operating System Laboratory	0	0	4	60	40	100	2
PGCA-2214	Core Practical/Laboratory	Data Structures Laboratory	0	0	4	60	40	100	2
TOTAL			**20**	**0**	**8**	**320**	**380**	**700**	**24**
Note: Students will undergo 4 weeks *Institutional Training/ Industrial Training after 2nd semester examination will be conducted along with 3rd semester practical examination.									

Third Semester

Course Code	Course Type	Course Title	Load Allocations			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
PGCA-2215	Core Theory	Web Technologies	4	0	0	40	60	100	4
PGCA-2216	Core Theory	Interactive Computer Graphics	4	0	0	40	60	100	4
PGCA-2217	Core Theory	Artificial Intelligence with Python	4	0	0	40	60	100	4

PGCA-xxxx	Elective Theory	Elective-II	4	0	0	40	60	100	4
PGCA-2218	Training	*Institutional / Industrial Training	4 weeks			60	40	100	2
PGCA-2219	Core Practical/Laboratory	Web Technologies Laboratory	0	0	4	60	40	100	2
PGCA-2220	Core Practical/Laboratory	Interactive Computer Graphics Laboratory	0	0	4	60	40	100	2
PGCA-2221	Core Practical/Laboratory	Artificial Intelligence with Python Laboratory	0	0	4	60	40	100	2
TOTAL			**16**	**0**	**16**	**460**	**440**	**900**	**24**

Fourth Semester

Course Code	Course Type	Course Title	Load Allocation	Marks Distribution		Total Marks	Credits
				Internal	External		
PGCA-2222	Training	Industrial Training	Six months	**350**	**350**	**700**	**24**

***The internal evaluation of six months Industrial Training will be based on instruction provided by Training & Placement Officer.**

List of Elective-I

Course Code	Course Title
PGCA-2223	System Programming
PGCA-2224	Data Warehousing & Mining
PGCA-2225	Theory of Computation

List of Elective-II

Course Code	Course Title
PGCA-2226	Cloud Computing
PGCA-2227	Network Security & Administration
PGCA-2228	Big Data Analytics

First

Semester

Course Code: PGCA-B1

Course Name: Computer Science Essentials

Program: MCA (Bridge Course)	**L**: 2 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: S/US
Semester: 1st	**Contact hours:** 22 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 50	**Duration of end semester exam (ESE):** Nil
External max. marks: Nil	**Elective status:** Nil
Total marks: 50	

Course Outcomes

CO1: Understanding the concept of input and output devices of Computer system.

CO2: Learn the basic concepts of Operating Systems and Database Systems.

CO3: Learn basic word processing, Spreadsheet and Presentation Graphics Software skills.

CO4: Understanding the basic data Communication concept

Section-A

Human Computer Interface: Concepts of Hardware and Software; Data and Information.

Devices: Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter. (Brief introduction of all) [6]

Section-B

Memory: Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks.

Data Representation: Bit, Byte, Binary, Decimal, Hexadecimal, and Octal Systems, Conversions and Binary Arithmetic (Addition/ Subtraction/ Multiplication) Applications of IT. [4]

Section-C

Database Management System: Introduction of DBMS, Data Modeling for a Database, Three level Architecture of DBMS, Components of DBMS. [3]

Fundamentals of Operating system: Introduction to Operating system, Functions of an operating system, Operating system as a resource manager, Structure of operating system (Role

of kernel and Shell), Evolution and types of operating systems. [6]

Section-D

Data communications concepts: Digital and analog transmissions-Modem, parallel and serial transmission, synchronous and asynchronous communication. Modes of communication: Simplex, half duplex, full duplex. Types of Networks: LAN, MAN, WAN. [3]

Text Books:

1. Fundamentals of Computers, V Rajaraman, NAdabala, PHI.
2. Computer Fundamentals and Programming in C, Reema Thareja, Oxford University Press, 2016.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education
4. Computer Fundamentals, A. Goel, 2010, Pearson Education.
5. Computer Course Windows 10 with MS Office 2016 , Satish Jain (Author), BPB Publications. **Reference Books:**

1. “Introduction to Computers”, Peter Norton.

Course Code: PGCA-B2

Course Name: Computer Programming using C

Program: MCA (Bridge Course)	**L**: 2 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: S/US
Semester: 1st	**Contact hours:** 22 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 50	**Duration of end semester exam (ESE):** Nil
External max. marks: Nil	**Elective status:** Nil
Total marks: 50	

Course Outcomes

CO1: Student should be able to understand the logic building blocks used in Programming.

CO2: Student should be able to write algorithms for solving various real-life problems.

CO3: Student should be able to convert algorithms into programs using C.

CO4: Student should be able to understand the basic object-oriented concepts.

Section-A

Logic Development: Data Representation, Flowcharts, Problem Analysis, Decision Trees/Tables, Pseudo code and algorithms. Fundamentals: Character set, Identifiers and Key Words, Data types, Constants, Variables, Expressions, Statements, Symbolic Constants. [3]

Operations and Expressions: Arithmetic operators, Unary operators, Relational Operators, Logical Operators, Assignment and Conditional Operators, Library functions. [3]

Section-B

Data Input and Output: formatted & unformatted input output. [2]

Control Statements: While, Do-while and For statements, Nested loops, If–else, Switch, Break–Continue statements. [3]

Section-C

Office Automation: Arrays: Defining, processing arrays, passing arrays to a function, multi–dimensional arrays. [2]

Strings: String declaration, string functions and string manipulation Program Structure Storage

Class: Automatic, external and static variables. [3]

Section-D

Functions: Brief overview, defining, accessing functions, passing arguments to function, specifying argument data types, function prototypes, recursion. [3]

Objects and Classes: Introduction to Object Oriented Concepts, Features of OOP, Basic of classes and Objects. [3]

Text Books:

1. Programming in ANSI C, E. Balagurusami, Fourth Edition, Tata McGraw Hill.
2. Programming in C, Third Edition, Stephen G Kochan, Pearson.
3. The C Programming Language, Kernighan & Richie, Second Edition, PHI Publication.

Reference Books:

1. Object Oriented Programming, Lafore R, Third Edition, Galgotia Publications
2. Let us C, Yashvant P Kanetkar, Seventh Edition, BPB Publications, New Delhi.
3. Programming in C, Byron S. Gottfried, Second Edition, McGraw Hills.
4. Problem Solving and Programming in C, R.S. Salaria, Second Edition
5. Programming in C, Atul Kahate

Course Code: PGCA- 2201

Course Name: Information Management

Program: MCA	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 1st	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Core
Total marks: 100	

Course Outcomes

CO1: Build an understanding about the basic hardware and software requirements for information technology.

CO2: Understand the core aspects of information technology infrastructure for their implementation in a business.

CO3: Acquire knowledge of the information management principles, design knowledge management system and information security.

CO4: Acquire knowledge about various office automation software.

Section-A

Introduction to Information Technology: Definition, Applications in various sectors, Different types of software, Generations of Computers, Input and output Devices, Various storage devices like HDD, Optical Disks, Flash Drives. Different Types of data file formats: Types and Applications. [10]

Section-B

IT Infrastructure in India: Telecommunication, Internet research and Broadband Data Collection and Data Management, Data Models, Information vs. Knowledge, Various techniques

to derive information, Information Management [12]

Section-C

Management Information System: Definition, Strategic Management of Information, Decision Making, Development Process of MIS, Strategic Design of MIS, Business Process Reengineering, Understanding Knowledge Management, designing a Knowledge Management System, Nature and Scope of Business Intelligence, Information Security- Meaning and Importance, Organizational Security Policy and Planning, Access Control and Operations Security [14]

Section-D

Office Automation: Word processing, Spreadsheet, Presentation, E-Mail Clients, Content Management System and Architecture [8]

Suggested Books:

1. **Introduction to Information Technology, Second Edition,** *Turban, Rainer, Potter,* WSE, Wiley India.
2. **Data Warehousing Fundamentals: A Comprehensive Study for IT Professionals,** *Paulraj Ponnian BWSTN*, Wiley India.
3. **Information Assurance for The Enterprise: A Roadmap To Information Security**-*Corey Schou, Daniel Shoemaker*, McGraw Hill Publications.
4. **Management Information System: Text and Cases,** *Waman Jawadekar*, McGraw Hill Publications.

Course Code: PGCA -2202

Course Name: Object Oriented Programming using C++ and Java

Program: MCA	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 1st	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Core
Total marks: 100	

Course Outcomes

CO1: Develop an understanding of object-oriented programming principles and object-oriented design.

CO2: Use of operators, control structures, and data types with their methods.

CO3: Make use of arrays and string handling methods.

CO4: Design user defined functions, modules, and packages.

CO5: Investigate and implement polymorphism, inheritance, dynamic memory management and exception handling techniques to solve problems.

Section-A

Object-Oriented Programming Concepts: Introduction, Comparison between procedural programming paradigm and object-oriented programming paradigm, Features of object-oriented programming: Encapsulation, Class, Object, Abstraction, Data hiding, polymorphism, and Inheritance. Introduction of object-oriented design.

Data Types, Operators, and Control Structures: Basic data types, Derived data types, Keywords, Identifiers, Constants and variables, Type casting, Operators, and Operator

precedence. Control Structures: if statement, switch-case, for, while and do-while loops, break and continue statement. [11]

Section-B

Classes and Objects: Implementation of a class, creating class objects, Operations on objects, Accessing class members, Constructor and destructor, Types of constructor, Static members, Empty classes, Nested classes, Local classes, Abstract classes, Container classes.

Functions, Arrays, and String Handling: Function components, Default arguments, passing parameters, Function prototyping, call by value, call by reference, Return by reference, Inline functions, Friend functions, Static functions, Recursion, Array declaration, Types of arrays, Array of objects, String handling. [11]

Section-C

Polymorphism: Introduction, Concept of binding – Early binding and late binding, Virtual functions, Pure virtual functions, Operator Overloading, Rules for overloading operators, Overloading of various operators, Function overloading, Constructor overloading.

Inheritance: Introduction, defining derived classes, Types of inheritance, Ambiguity in multiple and multipath inheritance, Virtual base class, Object composition and delegation. [12]

Section-D

Introduction to Java: Definition, History of Java, The Internet and Java's Place of IT, Applications and Applets, Java Virtual Machine, Byte Code-not an Executable code, Procedure Oriented vs. Object-Oriented Programming, Difference between Java and C++, Structure of Java Program.

Java Programming: Packages and Interfaces, Exception handling, Multithreaded programming, Strings, Input /Output. [10]

References:

1. R. Lafore, “Object Oriented Programming in C++”, Waite Group.

2. E. Balagurusamy, “Object Oriented Programming with C++”, Tata McGraw Hill.

3. P YashavantKanetkar, “Let Us C++”, BPB Publications.

4. BjarneStroustrup, "The C++ Programming Language", Addison Wesley.

5. Herbert Schildt, "The Complete Reference to C++ Language", McGrawHill-Osborne.

6. B.F.Lippman, "C++ Primer", Addison Wesley.

7. Farrell, "Object Oriented using C++", Cengage Learning.

Course Code: PGCA -2203

Course Name: Relational Database Management Systems

Program: MCA	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 1st	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Core
Total marks: 100	

Course outcomes

CO1: Express the basic concepts of DBMS and RDBMS.

CO2: Apply the concept of Relational Algebra & calculus in RDBMS.

CO3: Apply the concept of Transaction Management & concurrency control in RDBMS.

CO4: Apply normalization theory to the normalization of a database

CO5: Demonstrate No SQL databases (Open Source)

Section-A

Introduction to DBMS: Basic DBMS terminology; Components, Advantages, Disadvantages Architecture of a DBMS, Data Independence - Physical and Logical Independence, Degree of Data Abstraction, DBLC (Initial Study of the Database, Database Design, Implementation and Loading, Testing and Evaluation, Operation, Maintenance and Evaluation), Difference between DBMS and RDBMS.

Data Models: Data Associations, Representation of associations and relationships, Data model's classification: File based System, Traditional data models - Hierarchical, Network, Relational Models. Entity- relationship model: Entities, Relationships, Representation of entities, attributes, Representation of relationship set, Generalization, Aggregation. [12]

Section-B

Relational Algebra and Relational Calculus: Relational Algebra: Operations- union, intersection, difference, Cartesian product, projection, selection, division and relational algebra queries; Relational Calculus: Tuple oriented and domain oriented relational calculus and its operations.

Transaction and Concurrency control: Transaction and Concurrency control: Concept of Transaction, ACID properties, Serializability, States of transaction, Concurrency control: Locking techniques, Time stamp-based protocols, Granularity of data items, Deadlock. [12]

Section-C

Relational Design: Relation scheme, Codd's Rules for RDBMS, Anomalies in a database.

Normalization: Normal forms- INF, 2NF, 3NF, BCNF, Difference between 3NF and BCNF, Multivalued dependencies and join dependencies, 4NF, 5NF, Difference between 4NF and 5NF. [10]

Section-D

SQL: Types of SQL (DCL- DDL- DML)- SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database, Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Authorization, Accessing SQL From a Programming Language, Functions and Procedures, Triggers. [10]

References:

1. Data Base Systems, Peter Rob Carlos Coronel, Cengage Learning, 8thed.

2. Database System Concepts, Henry F. Korth, Abraham, McGraw-Hill, 4thed.

3. An Introduction to Database Systems, C.J.Date, Pearson Education, 8thed.

4. Principles of Database Systems, Ullman, Galgotia Publication, 3rded.

5. An Introduction to Database Systems, Bipin C. Desai, GalgotiaPublication

Course Code: PGCA 2204

Course Name: Advanced Software Engineering

Program: MCA	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 1st	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Core
Total marks: 100	

Course Outcomes

CO1: Plan a software engineering process life cycle, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements.

CO2: Able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project.

CO3: Analyze and translate a specification into a design, and then realize that design practically, using an appropriate software engineering methodology.

CO4: Know how to develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice.

CO5: Able to use modern engineering tools necessary for software project management, time management and software reuse.

Section-A

Software Engineering: The software problem, Evolution of Software Engineering, Principles of software engineering, Software Development vs. Software Engineering.

Software Process: Software Process, Selection of appropriate process model, Software Process Models- Waterfall, Spiral, Prototyping, Agile Methodology- Scrum and XP. [12]

Section-B

Advanced Requirement Analysis & Design: Analysis Principles, SRS, Requirement Elicitation Techniques- FAST and QFD, Design Principles, Design Concepts, Data Design, Architectural Design-Architectural Styles, Procedural Design [10]

Section-C

Software Project Management: The Management Spectrum, Software Project Planning and its characteristics, Types of metrics, Effort Estimation- FP, LOC, FP vs. LOC, Schedule & Cost Estimation Models- Activity Networks- PERT/CPM, COCOMO-I, COCOMO-II, Risk Assessment- Probability Matrix, Risk Management.

Software Testing: Testing Fundamentals- Error/Fault/Failure, Testing Principles, Test Cases, Testing Techniques-White Box & Black Box, Unit Testing, Integration Testing, System Testing, Verification and Validation Testing, Acceptance Testing. [14]

Section-D

Software Quality Management: S/W Quality, Importance of S/W Quality, Quality Metrics, Quality Standards- ISO 9126, Change Control, Change Control Process.

Advanced S/W Engineering: CASE Tools, Reverse Engineering, Re-Engineering, Web Engineering. [8]

References:

1. R.S. Pressman, Software Engineering: A Practitioner's Approach (6th ed.), McGraw-Hill,2006

2. P. Jalote, An Integrated Approach to Software Engineering (3rd ed.), Narosa Publishing House,2005

3. K.K. Aggarwal and Y. Singh, Software Engineering (revised 2nd ed.), New Age International Publishers, 2006.

4. Sommerville, Ian, Software Engineering, Addison-Wesley Publishing Company, (2006) 8thed.

5. Bob Hughes and Mike Cotterell, Software Project Management, Tata McGraw Hill Publishing Company Ltd., New Delhi (2006) 3rded.

Course Code: PGCA -2205

Course Name: Technical Communication

Program: MCA	**L**: 3 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 3
Semester: 1st	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Ability Enhancement Course
Total marks: 100	

Course outcomes

CO1: The objective of the course is to help the students become the independent users of English language.

CO2: Students will acquire basic proficiency in reading & listening, comprehension, writing and speaking skills.

CO3: Students will be able to understand spoken and written English language, particularly the language of their chosen technical field.

CO4: They will be able to converse fluently.

CO5: They will be able to produce on their own clear and coherent texts.

Section-A

Basics of Technical Communication- Functions of Communication-Internal & External Functions, Models-Shannon & Weaver's model of communication, Flow, Networks and importance, Barriers to Communication, Essential of effective communication (7 C's and other principles), Non-verbal Communication. [12]

Section-B

Basic Technical Writing: Paragraph writing (descriptive, Imaginative etc.), precise writing, reading and comprehension, Letters – Format & various types. [8]

Section-C

Advanced Technical Writing: Memos, Reports, E-Mails & Net etiquettes, Circulars, Press Release, Newsletters, and Notices. Resume Writing, Technical Proposals, Research Papers, Dissertation and Thesis, Technical Reports, Instruction Manuals and Technical Descriptions, Creating Indexes, List of References and Bibliography. [12]

Section-D

Verbal Communication: Presentation Techniques, Interviews, Group Discussions, Extempore, Meetings and Conferences. Technical Communication-MS-Word, Adobe Frame maker and ROBO Help [12]

Suggested Books:

1. Vandana R Singh, The Written Word, Oxford University Press, NewDelhi
2. KK Ramchandran, et al Business Communication, Macmillan, NewDelhi
3. Swati Samantaray, Business Commnication and Commnicative English, Sultan Chand, New Delhi.
4. S.P. Dhanavel English and Communication Skills for Students of Science and Engineering (with audio CD)

Course Code: PGCA -2206

Course Name: Information Management Lab

Program: MCA	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits**: 2
Semester: 1st	**Contact hours:** 44 hours
Theory/Practical: Practical	**Percentage of numerical/design problems**: -
Internal max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 40	**Elective status:** Core
Total marks: 100	

Course outcomes

CO1: Get familiar with computer system hardware related to information management.

CO2: Understand the various root process such as boot process of computer and graphical interface concept

CO3: Grasp the core aspects of WWW, e-mails, DNS and IP addresses.

CO4: Develop the knowledge for various Information System Software.

List of Experiments

1. Familiarization with the Computer System:
   a) To explain the part of the computer system such as system unit, input devices, output devices connected to the computer.
   b) To explore the outside view of the system unit that includes the panels on front and ports at the rear.
   c) To explore the inside view of the system unit that includes the motherboard, processor, expansion slots, various add-on cards, storage devices, power supply, fans.
   d) To understand the booting process that includes switching on the system, execution of POST routine, then bootstrap loader, and loading of the operating system, and getting it ready for use.

e) To introduce the graphical user interface (desktop) of Windows operating system to explain the various elements of the desktop such as taskbar, icons (My Computer, Recycle Bin, etc.), short cuts, notification area to configure the desktop that include selecting the wall paper, selecting the screen saver with or without password protection, selecting the screen resolution and color quality.

2. Navigating with Window Explorer:
   a) To navigate with the drives.
   b) To create new folders.
   c) To move folders from one drive to another drive.
   d) To search files and folders.
   e) To view and/or change the attributes of the files and folders.
3. Exploring the Internet:
   a) To understand the working of the internet that include the use of protocols, domains, IP addresses, URLs, web browsers, web servers, mail-servers, etc.
   b) To create email-account, sending mails, receiving mails, sending files as attachments, etc.
   c) To login to a remote computer
   d) To search information using search engines
4. Microsoft Word:
   a) To familiarize with parts of Word window
   b) To create and save a document to set page settings, create headers and footers
   c) To edit a document and resave it to use copy, cut and paste features
   d) To use various formatting features such as bold face, italicize, underline, subscript, superscript, line spacing, etc.
   e) To use spelling and grammar checking feature
   f) To preview print a document
   g) To create a table with specified rows and columns
   h) To enter data in a table to select a table, a row, a column or a cell
   i) To inset new row and/or a column
   j) To delete a row and/or a column

k) To split and merge a row, column or a cell

5. Microsoft Excel:
   a) To familiarize with parts of Excel window
   b) To create and save a workbook with single and/or multiple worksheets
   c) To edit and format text as well numbers
   d) To apply operations on range of cells using built-in formulae
   e) To preview and print a worksheet
   f) To insert new row and/or column in a worksheet to delete a row and/or column in a worksheet
   g) To create a variety of charts
   h) To import and export data to or from worksheet
6. Microsoft PowerPoint:
   a) To familiarize with parts of PowerPoint window
   b) To create and save a new presentation
   c) To apply design templates to a presentation
   d) To insert, edit and delete a slide
   e) To use different views of slides
   f) To use slide show from beginning or from the current slide
   g) To preview and print a presentation
   h) To check spellings in a presentation
   i) To add clip art and pictures in a slide
   j) To add chart, diagram and table in a slide
   k) To set animation for a selected slide and/or for entire presentation
   l) To create slide master and title master
   m) To create a custom show

Course Code: PGCA- 2207

Course Name: Object Oriented Programming using C++ and Java Lab

Program: MCA	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits**: 2
Semester: 1st	**Contact hours:** 44 hours
Theory/Practical: Practical	**Percentage of numerical/design problems**: -
Internal max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 40	**Elective status:** Core
Total marks: 100	

Course Outcomes

CO1: Compare and contrast object-oriented programming paradigm with procedure-oriented programming paradigm.

CO2: Design and implement efficient programs to solve computing problems in a high-level programming language.

CO3: Utilize knowledge of different object-oriented principles to identify and apply the appropriate techniques in problem solving.

CO4: Apply the knowledge of JAVA language syntax and semantics to write and execute Java programs.

CO5: Analyze the different aspects of a specific problem and design Java programs based on object-oriented principles like classes, objects, constructors and inheritance.

List of Experiments

1. Program to illustrate the concept of classes and object.
2. Program to demonstrate the use of friend functions.
3. Program to illustrate the concept of default constructor, parameterized constructor, and copy constructor.

4. Program to illustrate the concept of destructor.
5. Program to demonstrate the concept of operator overloading
6. Program to illustrate the concept of function overloading and constructor overloading.
7. Program to illustrate the concept of virtual functions and pure virtual functions.
8. Program to illustrate the concept of inheritance.
9. Program to illustrate the concept of ambiguity in multiple Inheritance.
10. Program to demonstrate the concept of function overriding.
11. Implementation of basic Java programs.
12. Implementation of control structures.
13. Implementation of classes and objects.
14. Using constructors and overloaded methods.
15. Reading and writing Console Input / Output.

Course Code: PGCA- 2208

Course Name: Relational Database Management Systems Lab

Program: MCA	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits**: 2
Semester: 1st	**Contact hours:** 44 hours
Theory/Practical: Practical	**Percentage of numerical/design problems**: -
Internal max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 40	**Elective status:** Core
Total marks: 100	

Course Outcomes

1. Understand, analyze and apply common SQL statements including DDL, DML and DCL statements to perform different operations.
2. Design different views of tables for different users and to apply embedded and nested queries.
3. Design and implement a database for a given problem according to well-known design principles that balance data retrieval performance with data consistency.
4. Demonstrate and understand relational algebra in Database which is helpful to design related database software components.
5. Identify the user requirements from a typical business situation, and to document them.

List of Experiments

Perform demonstration in PL/SQL on:

1. Comparative study of various Database Management Systems

2. Data Definition Language (DDL), Data Manipulation Language (DML), and Data Control Language (DCL)

3. How to apply Constraints at various levels.

4. View data in the required form using Operators, Functions and Joins.

5. Creating different types of Views for tailored presentation of data
6. How to apply Conditional Controls in PL/SQL
7. Error Handling using Internal Exceptions and External Exceptions
8. Using various types of Cursors
9. How to run Stored Procedures and Functions
10. Creating Packages and applying Triggers
11. Creating Arrays and Nested Tables.

Second Semester

Course Code: PGCA- 2209

Course Name: Advanced Operating Systems

Program: MCA	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 2nd	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Core
Total marks: 100	

Course Outcomes

CO1: Understand the basics of concepts of multiprocessor and distributed operating system.

CO2: Describe the various CPU scheduling algorithms.

CO3: Explain various real time operating systems concepts like kernel, shell and their types.

CO4: Use of cluster and grid computing methods for better utilization in network interfaces.

CO5: Recognize various building blocks of cloud computing and mobile computing.

Section-A

Multi-Processor and Distributed Operating System: Introduction, Architecture, Organization, Resource sharing, Load Balancing, Availability and Fault Tolerance, Design and Development Challenges, Inter-process Communication, Distributed Applications – Logical Clock, Mutual Exclusion, Distributed File System. [12]

Section-B

Real Time and Embedded Operating Systems: Introduction, Hardware Elements, Structure - Interrupt Driven, Nano kernel, Microkernel and Monolithic kernel-based models. Scheduling - Periodic, Aperiodic and Sporadic Tasks, Introduction to Energy Aware CPU Scheduling [12]

Section-C

Cluster and Grid Computing: Introduction to Cluster Computing and MOSIX OS, Introduction

to the Grid, Grid Architecture, Computing Platforms: Operating Systems and Network Interfaces, Grid Monitoring and Scheduling, Performance Analysis, Case Studies [10]

Section-D

Cloud Computing: Introduction to Cloud, Cloud Building Blocks, Cloud as IaaS, PaaS and SaaS, Hardware & Software Virtualization, Virtualization of OS – Hypervisor KVM, SAN & NAS back- end concepts. [5]

Mobile Computing: Introduction, Design Principals, Structure, Platform and Features of Mobile Operating Systems (Android, IOS, Windows Mobile OS) [5]

Reference Books:

1. SibsankarHaldar, Alex A. Arvind, —Operating Systems, Pearson Education Inc.
2. Tanenbaum and Van Steen, —Distributed Systems: Principles and Paradigms, Pearson, 2007.
3. M. L. Liu, —Distributed Computing: Principles and Applications, Addison-Wesley, Pearson
4. Maozhen Li, Mark Baker, —The Grid - Core Technologies, John Wiley & Sons, 2005

Course Code: PGCA- 2210

Course Name: Cyber Laws and E-Commerce

Program: MCA	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 2nd	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Core
Total marks: 100	

Course Outcomes

CO1: Acquire knowledge about various basic concepts of cyber security world.

CO2: Understand the key security requirements of Confidentiality, Integrity &Availability.

CO3: Demonstrate the concept of Intrusion Detection & Intrusion Prevention.

CO4: Demonstrate an understanding of the foundations of Intellectual Property rights and importance of Patents

CO5: Understand and analyze the impact of E-commerce on business models and strategy along with Electronic Payment systems.

Section-A

Cyber World: Introduction to Cyberspace and Cyber law, Different components of cyber laws, Cyber law and Netizens, The Zero-Day Attack and Mutation in delivery, Crimeware Toolkits and Malicious Software: Types of Malicious Software (Malware)-Viruses, Worms, SPAM E-mail, Trojans, Zombie, Bots, Key loggers, Phishing, Smishing, Whaling, Spyware, Backdoors. [7]

Section-B

Defensive measures of Cyber security: Denial-of-Service Attacks, D-DoS, Defenses against Denial-of-Service Attacks Virtual Private Networks (VPN) and Access control, Preventive Measures, The Firewall, The Intrusion Detection System (IDS) and The Intrusion Prevention System (IPS), Integrated defense for an enterprise network. [8]

Section-C

Intellectual Property Rights: IPR regime in the digital society, International treaties and conventions, Business software patents, Domain name disputes and resolution, Intellectual property issues in cyber space Domain names and related issues, Copyright in the digital media. [7]

Patents: Objectives, Rights, Assignments, Defenses in case of infringement, Copyright Objectives, Rights, Transfer of copyright. Work of employment infringement, Defenses for infringement. Trademarks Objectives, Rights, Protection of Goodwill, Infringement, Passing off, Patents in the cyber world, Overview of IT Act 2000 [8]

Section-D

Introduction to Electronic Commerce: Potential benefits & limitations of E-Commerce, Traditional Commerce vs. E-Commerce v/s M-Commerce, Different E-Commerce Models (B2B, B2C, C2C, P2P), E-Commerce applications, Social Networks, Auctions & Portals, Legal and Ethical issues in E- Commerce, E-commerce trends and prospects, E-commerce and taxation, Legal aspects of e-commerce [7]

Introduction to Electronic Data Interchange: Types of EDI, Benefits of EDI. Overview of Electronic Payment system, Types of Electronic payment schemes (Credit cards, Debit cards, Smart cards, Internet banking), Issues in Electronic payment systems, Web Based Marketing and Communications: Online Advertising, E-Mail Marketing, Online Catalogs, Social Marketing and Targeted Marketing, Techniques and Strategies [7]

Text Books:

1. William Stallings, Lawrie Brown, "Computer Security: Principles & Practice", 3rd Edition, Pearson, 2015.
2. Surya Prakash Tripathi, Ritendra Goel, Praveen Kumar Shukla, "Introduction to Information Security and Cyber Laws", Wiley India, 2014.
3. E-Commerce Essentials by Kenneth Laudon and Carol Traver – Pearson Publication

Reference Books:

1. Christof Paar , Jan Pelzl, "Understanding Cryptography: A Textbook for Students and Practitioners", 1st Edition, Springer, 2010
2. William Stallings, "Cryptography and Network Security Principles and Practices", 4th Edition, Prentice Hall, 2006.
3. Frontiers of Electronic Commerce by Ravi Kalakota, Andrew B.Whinston -Addison Wesley Publication

Course Code: PGCA- 2211

Course Name: Data Communication and Networks

Program: MCA	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 2nd	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Core
Total marks: 100	

Course Outcomes

CO1: Understand basics of data communication and computer networking.
CO2: Enumerate various layers of OSI model and TCP/IP.
CO3: Describe data link layer and multi-channel access protocols for LAN.
CO4: Describe routing concepts with routing algorithms and IPV4 addressing scheme.
CO5: Discuss various elements and protocols of application and transport layer.
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Section-A

Introduction to Data Communication: Components of Data Communication, Data representation, Transmission Impairments, Switching, Modulation, Multiplexing. Review of Network Hardware: LAN, MAN, WAN, Wireless networks, Internetworks. Review of Network Software: Layer, Protocols, Interfaces and Services. Review of Reference Models: OSI, TCP/IP and their comparison.

Physical Layer Transmission Media: Twisted pair, Coaxial cable, Fiber optics, Wireless transmission (Radio, Microwave, Infrared), Introduction to ATM, ISDN, Cellular Radio and Communication Satellites [12]

Section-B

Data Link Layer: Services provided by DLL: framing, error control, flow control, medium access

Medium Access Sub layer: Channel Allocation, MAC protocols – ALOHA, CSMA protocols, Collision free protocols, Limited Contention Protocols, Wireless LAN protocols, IEEE 802.3, 802.4, 802.5 standards and their comparison [10]

Section-C

Network Layer: Design Issues, Routing Algorithms (Shortest Path, Flooding, Distance Vector, Hierarchical, Broadcast, Multicast). Congestion Control Algorithms (Leaky bucket, Token bucket, Load shedding), Internetworking, IP Protocol, ARP, RARP

Network Trouble Shooting: Using Ping, Traceroute, IPconfig, Netstat, nslookup [14]

Section-D

Transport Layer: Addressing, Establishing and Releasing Connection, Flow Control, Buffering, Internet Transport Protocol (TCP and UDP)

Application Layer: Domain name system, E-mail, File transfer protocol, HTTP, HTTPS, World Wide Web. [8]

Suggested Books: -

1. Tanenbaum, Andrew S., 2009: ComputerNetworks(4thEdition), PHI.

2. Forouzan, B. A., 2009: Data Communications and Networking, Fourth Edition, Tata McGrawHill.

3. DouglasE.Comer, 2004: Internetworking with TCP/IP(Vol.1, 4th Edition), CPE.

4. Stallings,William 2008: Data and ComputerCommunications(8thEdition), PHI.

5. Nance, Bary, 1997: Introduction toNetworking, PHI, 4th Edition.

Course Code: PGCA- 2212

Course Name: Data Structures

Program: MCA	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 2nd	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Core
Total marks: 100	

Course Outcomes

CO1: Choose appropriate data structures and algorithms and use it to design solution for a specific problem.

CO2: Comprehend and select algorithm design approaches in a problem specific manner.

CO3: Design and analyze programming problem statements.

CO4: Come up with analysis of efficiency and proofs of correctness

CO5: Execute the operations of hashing to retrieve data from data structure.

Section-A

Introduction to Data Structure: Concept of data, problem analysis, data structures and data structure operations, notations, mathematical notation and functions, algorithmic complexity, Big-O Notation and time space trade off. Overview of Arrays, Recursion, Pointers, Pointer Arithmetic, Array of pointers, Arrays in terms of pointers, Static and Dynamic Memory Management, Garbage Collection, Understanding and Implementation of various Data Structures with applications, Stack: operations like push, pop and various applications like conversion from infix to postfix and prefix expressions, evaluation of postfix expression using stacks, Queues:

operations like enqueue, dequeue on simple, circular and priority queues. Linked Lists: operations like creations, insertion, deletion, retrieval and traversal on single, circular and doubly linked list [14]

Section-B

Trees definitions and concepts: Root, Node, Leaf Node, Level, Degree, Height and Tree representation using Linked List and Array Types of Trees: Binary trees, Binary search tree, Height balanced (AVL) tree, B- trees, B+ Tree Tree operations: creation, insertion, deletion and traversals (Preorder, In-order, Post- ordered) and searching on various types of trees [10]

Section-C

Heap: Definition, Structure, Algorithms and applications, Graph definitions and concepts: Edge, Vertices, and Graph representation using Adjacency matrix, Adjacency lists, Types of graphs: Weighted, Unweighted, Directed, Undirected Graphs, Graph operations: creation, insertion, deletion, traversals and searching (depth-first, breadth-first) of various types of graphs and Dijkstra's algorithm for shortest distance calculation. [12]

Section-D

Searching: Concept and efficiency of linear and binary search algorithms, Sorting: Concepts, Order, Stability, Efficiency of various algorithms (Selection Sort, Bubble Sort, Insertion Sort, Merge Sort, Quick Sort, Heap Sort, Radix Sort), Hashing: Definition, Implementation and applications [8]

Suggested Books:

1. Data Structures, A Pseudo code Approach with C++ - Gilberg and Forouzan by Cengage Hill
2. Schaum's Outline of Data Structures with C++ - Hubbard John. R by Tata McGraw-
3. Data Structures Using C and C++ - Langsam, Augenstein, Tanenbaum by Pearson Education

Course Code: PGCA -2213

Course Name: Advanced Operating System Lab

Program: MCA	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits**: 2
Semester: 2nd	**Contact hours:** 44 hours
Theory/Practical: Practical	**Percentage of numerical/design problems**: -
Internal max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 40	**Elective status:** Core
Total marks: 100	

Course Outcomes:

CO1: Analyze the services, architectures and principles used in the design of modern operating systems.

CO2: Execute Linux commands for files and directories, creating and viewing files, File comparisons and Disk related commands.

CO3: Utilize the concept of virtualization for creating a virtual machine and installing operating system on virtual machine.

CO4: Demonstrate shell programming by using shell variables and shell keywords for automated system tasks.

CO5: Identify the key characteristics of multiple approaches used for the design and development of the operating system.

List of Experiments:

1. Installation process of various Operating Systems.
2. Virtualization, Installation of virtual machine software and installation of Operating System

on virtual machine.

3. Execute various basic Linux commands, commands for files and directories, creating and viewing files, File comparisons, Disk related commands.

4. Execute Linux commands for processes in Linux, connecting processes with pipes, background processes, managing multiple processes.

5. Study and usage of vi Editor.

6. Basics of Shell programming, various types of shell, Shell Programming in bash.

7. Study and implementation of shell variables, shell keywords.

8. Implement conditional statements, looping statement and case statement in Shell programming.

9. Implement parameter passing and arguments in Shell programming.

10. Implement Shell programs for automate system tasks and report printing.

Course Code: PGCA -2214

Course Name: Data Structure Lab

Program: MCA	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits**: 2
Semester: 2nd	**Contact hours:** 44 hours
Theory/Practical: Practical	**Percentage of numerical/design problems**: -
Internal max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 40	**Elective status:** Core
Total marks: 100	

Course Outcomes:

CO1: Apply knowledge of mathematics and programming skills to implement and analyze different data structures.

CO2: Design and implement efficient algorithms to solve computing problems in a high-level programming language.

CO3: Understand the concept of data structures, python and apply algorithm for solving problems like Sorting, searching, insertion and deletion of data.

CO4: Analyze various algorithms based on their time and space complexity.

CO5: Compare and analyze different solutions of complex engineering activities with an understanding of their advantages and limitations.

LIST OF EXPERIMENTS

1. Write a program to append a new item to the end of the array and remove a specified item using the index from an array.
2. Write a program for binary search.

3. Write a program for sequential or linear search.

4. Write a Program to Design and implement Stack and its operations using List.

5. Write a Program to Design and implement Queue and its operations using List.

6. Write a program to create a Balanced Binary Search Tree (BST) using an array (given) elements where array elements are sorted in ascending order.

7. Write a program to traverse the binary tree using pre-order, post-order and in- order traversal.

8. Write a program to traverse the graph using Depth First Search and Breadth First Search.

9. Write a program to implement AVL Trees as well as various operations of searching, insertion and deletion on AVL Trees.

10. Write a program to sort a list of elements using the bubble sort algorithm.

11. Write a program to sort a list of elements using the selection sort algorithm.

12. Write a program to sort a list of elements using the insertion sort algorithm.

13. Write a program to sort a list of elements using the quick sort algorithm.

Third

Semester

Course Code: PGCA-2215

Course Name: Web Technologies

Program: MCA	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 3rd	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Core
Total marks: 100	

Course Outcomes

CO1: Analyze a web project and identify its elements and attributes in comparison to traditional projects.

CO2: Understand, analyze and apply the role of languages like HTML, DHTML, CSS, XML, JavaScript, VBScript, ASP, PHP and protocols in the workings of the web and web applications

CO3: Create web pages using HTML, DHTML and Cascading Styles sheets.

CO4: Analyze and build interactive web applications using ASP and ASP.NET.

CO5: Build web applications using PHP, XML documents and XML Schema, and consume web services.

Section-A

Introduction to XML: XML Basics, XML Syntax and Editors, Elements, Attributes, Document Type Definitions (DTD), XML Schemas (XSD), XML Namespaces, XML Document Object Model, XSLT, Use of XSLT with XML. [10]

Section-B

Introduction to Ajax: Use of Ajax in Website, Introduction to J-Query, Overview, retrieving page content, manipulating page content, working with events [12]

Section-C

Introduction to Web Services: Use of Web Services, Types of Web Services, Introduction to SOAP, Syntax of SOAP, Envelope, Header and Body, Introduction to JSON, Syntax and Use. [12]

Section-D

Introduction to Content Management System: CMS-Types, Usages, Benefits, Introduction to WordPress- Use, building a simple website using WordPress, Study of WordPress dashboard, Customization of WordPress website, Creation of Network Websites. [10]

TEXT BOOKS:

1. Professional XML, Wrox Publications.
2. Web Services Essentials: Distributed Applications with XML-RPC, SOAP,
3. Web Services Essentials: Distributed Applications with XML-RPC, SOAP, UDDI & WSDL By Ethan Cerami, O'Reilly

Course Code: PGCA -2216

Course Name: Interactive Computer Graphics

Program: MCA	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 3rd	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Core
Total marks: 100	

Course Outcomes

CO1: Demonstrate an understanding of contemporary graphics hardware.

CO2: Create interactive graphics applications in C++ using one or more graphics application programming interfaces.

CO3: Functions to implement graphics primitives.

CO4: Demonstrate geometrical transformations.

CO5: Demonstrate an understanding of the use of object hierarchy in graphics applications.

Section-A

Review of Computer Graphics: Applications of computer graphics, Introduction to Graphic devices like light pens, Graphic tablets, Graphic Cards, Data Glove, Digitizers, Graphs and types of Graphs. Cathode-Ray tube, Raster Scan displays, Random Scan displays, Architecture of a Raster and Random Graphics System with display processor, Color generating techniques (shadow mask, beam penetration) , 3-D viewing devices, Raster Scan Systems, Random Scan Systems, Graphics Monitors and Workstations, Color Models (RGB and CMY), color lookup Table. [12]

Section-B

Input and Output primitives: Process and need of Scan Conversion, Scan conversion algorithms for line, circle and ellipse, effect of scan conversion, Bresenham's algorithms for line and circle along with their derivations, midpoint circle algorithm with derivation, area filling techniques, flood fill

techniques, character generation techniques (like typography, vector and bitmap).

Two-Dimensional Graphics: Cartesian and Homogeneous Co-ordinate System, Geometric transformations (translation, Scaling, Rotation, Reflection, Shearing), Composite transformations, affine transformation, two-dimensional viewing transformation and windowing and clipping (line, polygon and text). Concave and Convex Polygon, Cohen Sutherland line clipping and its algorithm, Sutherland Hodgeman polygon clipping. [14]

Section-C

Three-Dimensional Graphics: Geometric transformations (translation, Scaling, Rotation, Reflection, Shearing), Composite transformations, Parallel and Perspective Projections. Bezier curves and its properties, B-Spline curves. Fractals, Classification of fractals. [8]

Section-D

Hidden line and surface elimination algorithms: Z-buffer, Painters algorithm, scan-line, sub-division, Shading and Reflection: Diffuse reflection, specular reflection, refracted light, half toning, dithering techniques. Surface Rendering Methods: Constant Intensity method, Gouraud Shading, Phong Shading (Mash Band effect). Morphing of objects [10]

References:

1. D. Hearn and M.P. Baker, —Computer Graphics, PHI New Delhi; Third Edition.
2. J.D. Foley, A.V. Dam, S.K. Feiner, J.F. Hughes, R.L Phillips, ¦Computer Graphics Principles & Practices, Second Edition¦, Pearson Education, 2007.
3. R.A. Plastock and G. Kalley, —Computer Graphics¦, McGraw Hill, 1986.
4. F.S. Hill: Computer Graphics using Open GL- Second Edition, PearsonEducation-2003.

Course Code: PGCA -2217

Course Name: Artificial Intelligence with Python

Program: MCA	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 3rd	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**:
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Core
Total marks: 100	

Course Outcomes

CO1: Learn various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms).

CO2: Analyze a problem, identify and define the computing requirements appropriate to its solution

CO3: Understand the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving.

CO4: Know how to build simple knowledge-based systems.

CO5: Understand and analyze the process of natural language processing.

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Section - A

History of AI from Alan Turing and developments in AI, types of AI, AI techniques, Criteria for success, Problem Solving Concepts and Methods, Agents, Introduction to Algorithms, Performance Analysis. [9]

Section - B

State Space Representation, Problem Characteristics, Breadth -first Search and Depth-First Search methods, Heuristic Search Techniques - Hill Climbing, best first Search, A*, Problem

reduction, Ao*, Constraint satisfaction and means-ends analysis techniques. **[10]**

Section - C

Information and Knowledge, Knowledge Acquisition and Manipulation, Issues in knowledge representation, Knowledge Representation Methods, Propositional Logic and First Order Predicate Logic, Resolution Principle, Horn's Clauses, Semantic networks, Partitioned Semantic Nets, Frames, Scripts and Conceptual Dependencies, Game playing: Minimax Search Procedure, Adding Alpha-Beta Cutoffs. **[13]**

Section - D

Definition and Applications, Characteristics of Expert Systems, Architecture of a typical expert system, Expert system Shells, Building an Expert System, Knowledge Acquisition, Case studies of Expert Systems like MYCIN, Specific Application of AI. **[7]**

Section - E

Natural Language understanding and Processing, Complexity of the problem, Syntactic processing, Semantic Analysis, Pragmatic processing, Introduction to Perception and Action. **[5]**

Text Books:

1. Rich Elaine and Knight Kevin,1991: Artificial Intelligence, second edition; Tata-McGraw Hill Company, New Delhi.
2. Russel, Sturat & Norviig, Peter, 2007: Artificial Intelligence; a modern Approach published by Person Education (Singapore)Pvt. Ltd.

Reference Books:

1. Balaguruswami, 1994: Artifical Intelligence & Technology.
2. George F Luger; William A. Stubblefield, 2009: Artificial Intelligence; Structures and Strategies for Complex problem solving, Second edition.

Course Code: PGCA -2219

Course Name: Web Technologies Lab

Program: MCA	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits**: 2
Semester: 3rd	**Contact hours:** 44 hours
Theory/Practical: Practical	**Percentage of numerical/design problems**: -
Internal max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 40	**Elective status:** Core
Total marks: 100	

Course Outcomes

CO1: Develop XML files using concept of XML DOM, XSLT and XML Namespaces.

CO2: Implement programs to validate the XML Documents with respect to given XML schemas and DTD.

CO3: Develop an interactive website using jQuery or AJAX.

CO4: Develop solution to complex problems using appropriate web services and content management software.

CO5: Develop pages using suitable client side and server-side web technologies.

CO6: Design and develop websites using word press software.

List of Experiments

1. Installation of Apache Tomcat Server.
2. Design an XML document to store information about a student in an engineering college. The information must include URN, Name, Branch, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
3. Write an XML file which will display the Book information. It includes the following:

1) Title of the book

2) Author Name

3) ISBN number

4) Publisher name

5) Edition

6) Price

Write a Document Type Definition (DTD) to validate the above XML file.

4. Display the XML file created in previous program as: The contents should be displayed in a table. The header of the table should be in color GREY. And the Author names column should be displayed in one color and should be capitalized and in bold. Use your own colors for remaining columns. Use XML schemas XSL and CSS for the above purpose.

5. Create a script to retrieve data from a TXT file using XML Http Request.

6. Create a script to retrieve data from an XML file and display the data in an HTML table.

7. Develop a script using jQuery to solve the following:

a) Limit character input in the text area including count.

b) Based on check box, disable/enable the form submit button.

8. Develop a script using jQuery to solve the following:

a) Fade in and fade out all division elements.

b) Animate an element, by changing its height and width.

9. Create a script to send some request to a SOAP Server over HTTP.

10. Create your own website using word press software.

Course Code: PGCA- 2220

Course Name: Interactive Computer Graphics Lab

Program: MCA	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits**: 2
Semester: 1st	**Contact hours:** 44 hours
Theory/Practical: Practical	**Percentage of numerical/design problems**: -
Internal max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 40	**Elective status:** Core
Total marks: 100	

Course Outcomes

CO1: Understand the structure of modern computer graphics.

CO2: Develop and design drawings that demonstrate computer graphics and design skills.

CO3: Make use of the key algorithms for modeling and rendering graphical data.

CO4: Develop, design and problem-solving -skills with application to computer graphics.

CO5: Creating programs in C++ to implement various graphical features like clipping, filling etc.

List of Experiments

1. Write a program to plot a pixel on the screen in a particular color.
2. Write a program for creating a simple two-dimensional shape of any object using lines, circle, etc.
3. Using different graphics functions available for text formatting, write a program for displaying text in different sizes, different colors, font styles.
4. Implement the DDA algorithm for drawing line (programmer is expected to shift the origin to the center of the screen and divide the screen into required quadrants)
5. Write a program to input the line coordinates from the user to generate a line using Bresenham's method and DDA algorithm. Compare the lines for their values on the plotted line.
6. Write a program to generate a complete moving wheel using Midpoint circle drawing

algorithm and DDA line drawing algorithm.

7. Write a program to draw an ellipse using the Midpoint ellipse generation algorithm for both the regions.
8. Write a program to draw any 2-D object and perform the transformations on it according to the input parameters from the user, namely: Translation, Rotation or Scaling.
9. Write a program to rotate a triangle about any one of its end coordinates.
10. Write program to draw a house like figure and perform the following operations.

a) Scaling about the origin followed by translation.

b) Scaling with reference to an arbitrary point.

11. Write a program for filling a given rectangle with some particular color using boundary fill algorithm.
12. Write a program for filling a polygon using Scan line Polygon fill algorithm.
13. Write a program to perform clipping on a line against the clip window using any line clipping algorithm. The output must be twofold showing the before clipping and after clipping images.
14. Write a program to implement the Sutherland Hodgeman algorithm for clipping any polygon.

Course Code: PGCA- 2221

Course Name: Artificial Intelligence with Python Lab

Program: MCA	**L**: 0 **T**: 0 **P**: 4
Branch: Computer Applications	**Credits**: 2
Semester: 3rd	**Contact hours:** 44 hours
Theory/Practical: Practical	**Percentage of numerical/design problems**: -
Internal max. marks: 60	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 40	**Elective status:** Core
Total marks: 100	

Course Outcomes:

CO1: Understand and analyze various languages used for AI

CO2: Apply the knowledge of python programming for solving various problems

CO3: Design and implement efficient informed and Uninformed search techniques to solve problems

CO4: Utilize the knowledge and techniques of Artificial Intelligence while working in multidisciplinary
teams.

CO5: Design and develop solutions using Artificial Intelligence tools and techniques.

List of Experiments:

1. Discussion on Languages Available for AI: Prolog, LISP and Python
2. Hands on practice on Python data types
3. Introduction to Control flow and Loops in python programming
4. Introduction to classes and objects in python programming
5. Implementation of Depth First Search using python programming
6 Implementation of Breadth First Search using python programming
7. Implementation of Best Fit Search using python programming
8. Implementation Of 4 Queen Problem using python programming

9. Implementation Of 8-Puzzle Problem using python programming
10. Implementation of travelling salesman problem using python programming
11. Convert text into speech using python programming.

Elective-I

Course Code: PGCA- 2223

Course Name: System Programming

Program: MCA	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 2nd	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Elective - I
Total marks: 100	

Course Outcomes

CO1: Familiarity with basic UNIX OS concepts such as: process, program, process groups, signals, running programs, process control, address space, user and kernel modes, system calls, and context switching.

CO2: Acquire knowledge in file I/O (i.e. open, close, read, write, seek).

CO3: Familiar of using sockets to implement client-server environment.

CO4: Familiar in using thread execution models.

CO5: Understand to handle signals and exceptions within a process and to control processes.

Section-A

Assemblers and Macro Processors: Language processors, data structures for language processing, General Design Procedure, Single pass and two pass assembler and their algorithms, assembly language specifications (example MASM). Macro Instructions, Features of Macro Facility: Macro instruction arguments, Conditional macro expansion, Macro calls within macro. [10]

Section-B

Loaders and Linkers & Editors: Loader Schemes: Compile and go loader, general loader scheme, absolute loaders, subroutine linkages, relocating loaders, direct linking loaders, Relocation, Design of Absolute Loader, Bootstrap Loaders, Dynamic Linking, MS-DOS Linker,

Text Editors, Line Editor, Steam Editors, Screen editor, Word processors, Structure editors. [12]

Section-C

Compiler Design: Introduction to various translators, interpreters, debuggers, various phases of compiler, Introduction to Grammars and finite automata, Bootstrapping for compilers, Lexical Analysis and syntax analysis, Intermediate Code Generation, Code optimization techniques, Code generation, Introduction to YACC, Just-in-time compilers, Platform Independent systems. [14]

Section-D

Operating System: Operating Systems and its functions, Types of operating systems: Real-time OS, Distributed OS, Mobile OS, Network OS, booting techniques and subroutines, I/O programming, Introduction to Device Drivers, USB and Plug and Play systems, Systems Programming (API's). [8]

TEXT BOOKS:

• Donovan J.J., Systems Programming, New York, Mc-Graw Hill,1972.

• Leland L. Beck, System Software, San Diego State University, Pearson Education,1997.

• Dhamdhere, D.M., System Programming and Operating Systems, Tata Mc-Graw Hill1996.

REFERENCES:

1. Aho A.V. and J.D. Ullman Principles of compiler Design Addison Wesley/ Narosa 1985.

Course Code: PGCA- 2224

Course Name: Data Warehousing and Data Mining

Program: MCA	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 2nd	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Elective - I
Total marks: 100	

Course Outcomes

CO1: Design a data mart or data warehouse for any organization

CO2: Develop skills to write queries using DMQL

CO3: Extract knowledge using data mining techniques

CO4: Adapt to new data mining tools

CO5: Explore recent trends in data mining such as web mining, spatial-temporal mining

Section A

Review of Data Warehouse: Need for data warehouse, Big data, Data Pre-Processing, three tier architecture; MDDM and its schemas, Introduction to Spatial Data warehouse, Architecture of Spatial Systems, Spatial: Objects, data types, reference systems; Topological Relationships, Conceptual Models for Spatial Data, Implementation Models for Spatial Data, Spatial Levels, Hierarchies and Measures Spatial Fact Relationships. [12]

Section B

Introduction to temporal Data warehouse: General Concepts, Temporality Data Types, Synchronization and Relationships, Temporal Extension of the Multi-Dimensional Model, Temporal Support for Levels, Temporal Hierarchies, Fact Relationships, Measures, Conceptual Models for Temporal Data Warehouses: Logical Representation and Temporal Granularity [12]

Section C

Introduction to Data Mining: functionalities, mining different kind of data, Pattern/Context based Data Mining, Bayesian Classification: Bayes theorem, Bayesian belief networks Naive Bayesian classification, Introduction to classification by Back propagation and its algorithm, Other classification methods: k-Nearest Neighbor, case-based reasoning, Genetic algorithms, rough set approach, Fuzzy set approach [12]

Section D

Introduction to prediction: linear and multiple regression, Clustering: types of data in cluster analysis, interval scaled variables, Binary variables, Nominal, ordinal, and Ratio-scaled variables; Major Clustering Methods: Partitioning Methods: K-Mean and K-Mediods, Hierarichal methods: Agglomerative, Density based methods: DBSCAN [8]

References:

1. Data Mining: Concepts and Techniques by J. Han and M. Kamber Publisher Morgan Kaufmann Publishers

2. Advanced Data warehouse Design (from conventional to spatial and temporal applications) by Elzbieta Malinowski and Esteban Zimányi Publisher Springer

3. Modern Data Warehousing, Mining and Visualization by George M Marakas, Publisher Pearson

Course Code: PGCA -2225

Course Name: Theory of Computation

Program: MCA	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 2nd	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**:
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Elective - I
Total marks: 100	

Course Outcomes

CO1: Understand the basic concepts of formal languages, automata and grammar types, as well as the use of formal languages and reduction in normal forms.

CO2: Demonstrate the relation between regular expressions, automata, languages and grammar with formal mathematical methods.

CO3: Design push down automata, cellular automata and Turing machines performing tasks of moderate Complexity.

CO4: Analyse the syntax and formal properties, parsing of various grammars such as LL(k) and LR(k).

CO5: Describe the rewriting systems and derivation languages.

Section-A

Introduction, Sets, Logic, Functions, Relations, Languages, Proofs Mathematical Induction, Strong Principle of Mathematical Induction, Recursive Definitions, Structural Induction Regular Languages & Regular Expressions, Finite Automata (FA), Distinguishing Strings w.r.t. Language, Union, Intersection, & Compliment of Languages [10]

Section-B

Non-deterministic Finite Automata (NFA), NFA with Null-Transitions, Kleene's Theorem A Criterion for Regularity, Minimal Finite Automata, Pumping Lemma for Regular Languages

Introduction to Context-Free Grammar (CFG), Regular Grammars, Derivation (Parse) Trees & Ambiguities, An Unambiguous CFG for Algebraic Expressions, Simplified Forms & Chomsky Normal Forms [12]

Section-C

Introduction to Push Down Automata (PDA), Deterministic PDA (DPDA), PDA corresponding to a Given CFG, CFG Corresponding to a Given PDA, Parsing the Pumping Lemma for CFG, Intersection & Complement of CFGs, Decision Problems Involving CFGs [14]

Section-D

Turing Machine (TM) Definition & Examples, computing a Partial Function with a TM Recursive Enumerable & Recursive Languages, Enumerating a Language, Context-Sensitive Languages & Chomsky Hierarchy [8]

Reference Book:

"Introduction to Languages and the Theory of Computation", John C. Martin, Tata McGraw-Hill, (2003), 3rd Edition, ISBN: 007049939X

Suggested Additional Reading:

1. "Elements of the Theory of Computation", Harry Lewis & Christos H. Papadimitriou, IEEE (PHI), 2nd Edition, ISBN-978-81-203-2233-2.

2. " Theory of Computation¦, Michael Sipser, ", Cengage Learning (2007), ISBN-13: 978-81-315-0513-7

3. Introduction to Automata Theory, Languages, and Computation ¦, Hopcroft, Motwani & Ullman, Pearson Education, 3rd Edition, (2008), ISBN:978-81-317-2047-9

Elective-II

Course Code: PGCA- 2226

Course Name: Cloud Computing

Program: MCA	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 3rd	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Elective-II
Total marks: 100	

Course Outcomes

CO1: Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics.

CO2: Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.

CO3: Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.

CO4: Analyze various cloud programming models and apply them to solve problems on the cloud.

CO5: Understand the advantages and challenges brought about by the various models and services in cloud computing.

Section-A

Cloud Computing: Basics of emerging cloud computing paradigm, Deployment models, Reference models, Cloud cube model, Cloud software and service providers, Cloud migration, Benefits and challenges to cloud computing, Characteristics of Clouds. Virtualization: Concept and types, Advantages of Virtualization, Taxonomy of virtualization, Physical and logical partitioning, Migration and deployment of virtual machines, XEN, QEMU, VMware, Hyper-V

etc., Uses of virtual server consolidation. [10]

Section-B

Cloud Storage: Architecture of storage (S3), Different storage models, Blobs, Buckets, Tables, ACL, Storage network design considerations, NAS and Fibre channel SANs, Global storage management locations, scalability, operational efficiency. [12]

Section-C

Cloud Security: Trust models for clouds, Security and disaster recovery, Security base line, Fear Uncertainty Doubt and Disinformation factor, Challenges, Data center security recommendations, Statement of audit standards, Cloud security alliance, Recovery time objectives and vendor security process [12]

Section-D

Cloud Monitoring: Architecture for federated Cloud Computing, Service Oriented Architecture, Foundation for SLA, Components of the SLA, Selected business use cases. Demystifying the Cloud: Using case studies like Hadoop, Google App Engine, Amazon EC2, Eucalyptus, Open Nebula etc. [10]

Recommended Books:

1. Rajkumar Buyya, James Broberg, AndrzejGoscinski, Cloud Computing: Principles and Paradigms, John Wiley and Sons (2011).
2. David E.Y. Sarna, Implementing and Developing Cloud Computing Applications, CRC (2011).
3. William von Hagen, Professional Xen Virtualization, Wrox Publications, (2008).
4. Chris Wolf, Erick M. Halter, Virtualization: From the Desktop to the Enterprise, APress(2005).
5. George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, O'Reilly Publishers (2009).

Course Code: PGCA -2227

Course Name: Network Security & Administration

Program: MCA	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 3rd	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 40	**Duration of end semester exam (ESE):** 3hrs
External max. marks: 60	**Elective status:** Elective-II
Total marks: 100	

Course Outcomes

CO1: Undertake routine tasks to secure a network.

CO2: Understand the factors that place an internet-based information system at risk

CO3: Evaluate procedures to secure a system against failure, theft, invasion and sabotage.

CO4: Understand and apply the concepts for administrating a small company's network.

CO5: Apply knowledge to simple case studies to implement network security.

Section-A

Security Attacks: Passive & Active Attacks, Security Services, Security Mechanisms, Model for Internetwork Security, Man –In – the middle attack, meet – in – the middle attack Conventional Encryption Principles, Mono alphabetic ciphers, play fair Ciphers, Transposition Ciphers, Cipher block chaining mode, approaches of message authentication. [12]

Section-B

Public Key cryptography Principles: RSA algorithm, Digital Signatures, Digital Certificates, Certificate Authority and Key management Kerberos, X.509 Directory Authentication Service. [10]

Section-C

IP Security: Security Problems of IP, Security Objectives, IP Security Protocol Modes, Authentication Header, Security Payload. Firewall Characteristics, Types of Firewalls and their practical use, NAT [12]

Section-D

Email Security: PGP, S/MIME Web Security: Security Socket Layer, Transport Layer Security, Secure Electronic Transaction. [10]

Text Books:

1. Handbook of Applied Cryptography - Alfred J. Menezes, Paul C. van Oorschot and Scott A.Vanstone
2. Network Security and Cryptography – Bernard Menezes
3. Network Security Essentials – William Stallings
4. Data Communication and Networking- Behrouz A. Forouzan

Course Code: PGCA- 2228

Course Name: Big Data Analytics

Program: MCA	**L**: 4 **T**: 0 **P**: 0
Branch: Computer Applications	**Credits**: 4
Semester: 3rd	**Contact hours:** 44 hours
Theory/Practical: Theory	**Percentage of numerical/design problems**: -
Internal max. marks: 40	**Duration of end semester exam (ESE):**3hrs
External max. marks: 60	**Elective status:** Elective - I
Total marks: 100	

Course Outcomes

CO1: Apply knowledge of statistics, science and programming skills, to solve of complex analytical problems related to big data and business analytics.

CO2: Identify, formulate, and analyze business analytical problems concerning and demanding big data.

CO3: Design and evaluate fully distributed model of big data to solve real time problems.

CO4: Make use of research-based knowledge to identify the appropriate data collection methods, apply statistical methods to analyze, synthesis and interpretation of data, to provide valid conclusions.

CO5: Function in multi-disciplinary teams through groups while working on mini-project concerning business analytical problems.

Section-A

Introduction to Data Analytics: Data and Relations, Data Visualization, Correlation, Regression, Forecasting, Classification, Clustering.

Big Data Technology Landscape: Fundamentals of Big Data Types, Big data Technology Components, Big Data Architecture, Big Data Warehouses, Functional vs. Procedural Programming Models for Big Data. [10]

Section-B

Introduction to Business Intelligence: Business View of IT Applications, Digital Data, OLTP vs. OLAP, Why, What and How BI? BI Framework and components, BI Project Life Cycle, Business Intelligence vs. Business Analytics

Big Data Analytics: Big Data Analytics, Framework for Big Data Analysis, Approaches for Analysis of Big Data, ETL in Big Data, Introduction to Hadoop Ecosystem, HDFS, Map-Reduce Programming, Understanding Text Analytics and Big Data, Predictive analysis on Big Data, Role of Data analyst. [14]

Section-C

Business implementation of Big Data: Big Data Implementation, Big Data workflow, Operational Databases, Graph Databases in a Big Data Environment, Real-Time Data Streams and Complex Event Processing, Applying Big Data in a business scenario, Security and Governance for Big Data [8]

Section-D

Big Data on Cloud: Best practices in Big Data implementation, Latest trends in Big Data, Latest trends in Big Data, Big Data Computation, More on Big Data Storage, Big Data Computational Limitations, Introduction to most recent advancements in Big Data technology along with their usage and implementation with relevant tools and technologies [12]

Recommended books:

1. Michael Minelli, Michele Chambers, AmbigaDhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley CIO Series (2013), 1st ed.

2. T. white, Hadoop: The Definitive Guide, O' Reilly Media (2012), 3rd ed.