डॉ. बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद

परिपत्रक क्रमांक/एस.यु./व्यवस्थापनशास्त्र विद्याशाखा/अभ्यासक्रम/७९/२०१४

या परिपत्रकाद्वारे सर्व संबंधीतांना सुचित करण्यात येते की, व्यवस्थापनशास्त्र विद्याशाखेने, शिफारस केल्यानुसार एम.बी.ए., एम.सी.ए., द्वितीय वर्षाच्या (तृतीय व चतुर्थ सत्र) सुधारीत अभ्यासक्रमास तसेच एम.फिल. व्यवस्थापनशास्त्र वार्षिक पध्दतीच्या अभ्यासक्रमास विद्यापरिषदेच्या वतीने मा. कुलगुरु यांनी, त्यांना प्राप्त असलेला विशेष अधिकार महाराष्ट्र विद्यापीठ अधिनियम-१९९४ कलम १४(७) अन्वये शैक्षणिक वर्ष २०१४-१५ या एक वर्षाच्या कालावधी करिता मान्यता दिलेली आहे. करिता विद्यापरिषदेच्या अंतिम मान्यतेनंतर शैक्षणिक वर्ष २०१४-२०१५ या वर्षाकरिता या कार्यालयाने पारीत केलेले परिपत्रक पुढील परिपत्रक येईपर्यंत लागू राहील. त्या अनुषंगाने सदरील सुधारीत व नवीन तयार केलेल्या अभ्यासक्रमाची प्रत या परिपत्रकासोबत आपल्या पुढील कार्यवाहीसाठी पाठविण्यात येत आहे.

व्यवस्थापनशास्त्र विद्याशाखा

	अभ्यासक्रम	सत्र / वार्षिक
१.	एम.बी.ए.	तृतीय व चतुर्थ
२.	एम.सी.ए.	तृतीय व चतुर्थ
३.	एम.फिल. व्यवस्थापनशास्त्र (विद्यापीठ विभागामध्ये सुरु असलेला)	वार्षिक पध्दतीचा

सुधारीत अभ्यासक्रमाचा आराखडा फक्त शैक्षणिक वर्ष २०१४-१५ या वर्षा पुरताच मर्यादित राहील.

अभ्यासक्रमाची प्रत विद्यापीठाच्या (1)www.bamu.net (2) www.affiliation.oaasisbamu.org या संकेतस्थळावर उपलब्ध आहे.

करिता, या परिपत्रकाची सर्व संबंधितांनी नोंद घ्यावी.

विद्यापीठ प्रांगण,
औरंगाबाद-४३१ ००४.
संदर्भ क्र.एस.यु./व्यवस्थापनशास्त्र /एस.एस.बी.
/२०१४-१५/१०२७६-४७५
दिनांक :- १६-०६-२०१४.

संचालक,
महाविद्यालये व विद्यापीठ
विकास मंडळ.

****

या परिपत्रकाची एक प्रत :-

१) मा. परिक्षा नियंत्रक, परिक्षा विभाग,

२) मा. प्राचार्य, सर्व संलग्नीत महाविद्यालये,

३) संचाल , युनि यांना विनंÿी र याÿा येÿो ी, सदरील अभ्यास˗म विद्यापीठाच्या सं`Ÿास्थंळावर उपलब्ध रु ा दे याÿा यावेÿा.

४) संचाल , ई-सुविधा `द्र, विद्यापीठ परिसर,

५) जनसंप ˛ अधि ारी, मु य प्रशास ीय इमारÿा,

६) ा अधि ारी, पात्र□ाा विभा ा, मु य प्रशास ीय इमारÿा,

७) ा अधि ारी, व्यवस्थापन शास्त्र विभा ा, परी ाा भवन,

८) अभिले ा विभा ा, मु य प्रशास ीय इमारÿी मा ो,

डॉ. बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद.

-=**=-

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

REVISED SYLLABUS OF

"MASTER OF COMPUTER APPLICATION"

M.C.A.

IIND YEAR

SEMESTER-III & IV

[Effective from 2014-15 & onwards]

Dr. Babasaheb Ambedkar Marathwada University,

Aurangabad. 43001, Maharashtra, India.

Faculty of Management Science

MASTER OF COMPUTER APPLICATION (MCA)

MCA Syllabus

(III & IV Semester)

(with Practical Lab works)

(EFFECTIVE FROM JUNE 2014)

MASTER OF COMPUTER APPLICATION (MCA)

(AS PER CREDIT SYSTEM EFFECTIVE FROM JUNE 2013)

0.576."A candidate seeking admission to Master of Computer Application (MCA) should have passed Bachelor's Degree examination of any faculty with atleast 50% of marks, of Dr. Babasaheb Ambedkar Marathwada University or any other degree equivalent thereto and have Mathematics/Statistics as one of the subject at Degree level or HSC. level. However in case of students belonging to Backward Classes, a relaxation of 5% shall be available for admission."

0. Lateral entry : For Lateral Entry into MCA III Sem, eligibility is as per DTE (Director of Technical Education) guidelines i.e candidates who have passed Bachelor of Computer Application (BCA), Bachelor of Computer Science (BCS), Bachelor of Science (Computer/Information Technology) are eligible to be admitted to MCA III Semester. Such candidates shall be exempted from appearing in MCA I and II Sem. examinations. For calculations of equivalence of MCA I and II Sem exams their aggregate percentage should be converted and made equal to 1000 marks.

O.577. The Master of Computer Application (MCA) shall be conferred on a candidate who has passed a regular course of study consisting of three years (Six Semesters) in the relevant subjects as prescribed and has appeared at and passed in all the examinations prescribed for Master of Computer Applications.

R-794. The maximum number of students admitted for a theory calss shall be as approved by Govt. and University, AICTE and the number of students in a batch of practicals will depend upon the facilities available at the Centre. The student computer ratio for practical should be 1:1.

R- 795. The course of study for the Master of Computer Application will be of three Years duration (six semester).

R-796-The following shall be the scheme of examination

MASTER OF COMPUTER APPLICATION (MCA) THIRD SEMESTER

Paper No	Title	Weekly Th	Weekly Pr	Credit Th	Credit Pr	Marks Theory	Marks Sessional or Practical S	Marks Sessional or Practical Pr	Total Marks	Duration Theory Exam
XI	Operation Research	5	-	5	-	60	40	-	100	2 Hrs
XII	Accounting & Management Control	3	4	3	2	60	-	40	100	2 Hrs
XIII	Artificial Intelligence & Expert Systems	3	4	3	2	60	-	40	100	2 Hrs
XIV	Data Communication & Computer Networks	5	-	5	-	60	40	-	100	2 Hrs
XV	**Elective I:** **A.** Windows programming. using VC++ **B.** Multimedia Technology.	3	4	3	2	60	-	40	100	2 Hrs
	Total	19	12	19 + 6 = **25**		300	80	120	500	--

FOURTH SEMESTER

Paper No	Title	Weekly Th	Weekly Pr	Credit Th	Credit Pr	Marks Theory	Marks Sessional or Practical S	Marks Sessional or Practical Pr	Total Marks	Duration Theory Exam
XVI	Advanced Java	3	4	3	2	60	-	40	100	2 Hrs
XVII	DSS&MIS	5	-	5	-	60	40	-	100	2 Hrs
XVIII	Programming using C#.NET	3	4	3	2	60	-	40	100	2 Hrs
XIX	Software Engineering.	5	-	5	-	60	40	-	100	2 Hrs
XX	**Elective II:** **A.** Advanced Database Systems **B.**Network Programming using Linux	3	4	3	2	60	-	40	100	2 Hrs
	Total	19	12	19 + 6 = **25**		300	80	120	500	--

R –797. There will be 5 lectures for theory subject and three lectures for practical based subject. The practical hours are 12 per week. There shall be 5 credit for each paper. The total credit for the MCA Degree shall be 140.

R- 798. In order to pass the examination of Master of Computer Application (MCA) a candidate must score at least 40% marks in each sessional and project work and 50% in aggregate of all semester's marks.

R – 799 To clear a semester a student must have secured atleast 40% marks in each papers of theory and each sessional and project work.

R – 800 a) The sessional work shall be assessed by Institute/ College and marks will be forwarded to the university. The sessional work shall be assessed on the following basis:-

1. Two Home Assignment 10 marks each
2. Two Class Tests 5 marks each
3. One Seminar 10 marks

The sessional marks are subject to scaling down. The scale down will be in relation to performance in respective theory marks. A variation of ± 10% will be permitted.

b) The university will appoint external examiner for assessment of the **minor projects** given in MCA III ,IV and V semester for the elective subjects.The project will be assessed by the university external examiner and the guide jointly on the basis of the following criteria.

1. Preparation of report	20 Marks
2. Presentation	10 Marks
3. Viva Voce	10 Marks

c) The university will appoint external examiner for assessment of the**major project**. The project will be assessed by the unirsity external examiner and the guide separately on the basis of the following criteria.

1. Preparation of report	100 Marks
2. Presentation	50 Marks
3. Viva Voce	50 Marks

R – 801. A student who secures atleast 40% marks in each individual theory papers and project work and secures 50% or more marks but less than 60% of marks in aggregate of all semesters will be declared to have passed in Second Division. There shall be no pass class.

R – 802.A student who has secured 40% of marks in each theory paper and each sessional and project work and 60% or more marks in aggregate of all semesters shall be declared to have passed in First Division.

R- A student who has secured 40% of marks in each theory paper and each sessional and project work and 75% or more marks in aggregate of all semesters shall be declared to have passed with Distinction.

R – 803. A student who have failed to secure atleast 40% marks in any one or more papers will be declared to have failed in that/those papers and such students will have to reappear for such paper/papers and secure minimum passing marks.

R – 804. If a student who has secured minimum 40% of marks in each paper but has failed to secure minimum of 50% of marks in aggregate for one or more semesters may choose to reappear for any one or more papers to secure 50% of aggregate marks in that/those semesters.

"R-805 To be eligible for promotion to second year (Third Semester) of the MCA Course, a student must successfully clear atleast 75% papers offered during the first year (First & Second Semester) of the programme. For promotion to Third Year (Fifth Semester) a student must successfully clear 75% of the total papers offered upto fourth semester and must have cleared all the papers of First and Second Semester.

However for promotion to Second, Fourth and Sixth Semesters, a mere appearance at the respective preceding semester exams is sufficient for promotion."

R- For candidates admitted in MCA III Sem directly through lateral entry shall have carry on as per existing practices. It means for promotion to MCA V Sem such students should clear 75% of the subjects offered at III and IV Semester together.

R – 806. Re-admission:

a) If a student fails to complete his/her major project work before the closure of semester to which it belongs he will have to take fresh admission to the course and pay Rs.1000/- per semester as fee.

b) If a student fails in one or more subjects and desires to take a repeat course by taking regular admission, he must do so. In such a case he will be charged Rs. 500/- per theory course and per sessional work per semester.

R – 807. The following shall be the syllabus for the examination.

Paper XI: Operational Research

Theory	**60**
Sessional / Practical	**40**

Unit I

Basic of Operation Research, Application in Management decision making .

Unit II

Linear Programming, Basic Concepts and Methods of Solution.

Unit III

Assignment and Transportation models

Unit IV

Replecement Theory and Queering Theory.

Unit V

Came Theory and Simulation

Unit VI

Inventory Management Techniques and Project Management by PERT/CPM.

Books

1. Taha, H.A. Operations Research- An Introduction, New York, Macmillan 1989.
2. Narag. A.S. Linear Programming and decision making, New Delhi. Sultan Chand, 1995
3. Sharma S.D. Operations Research Kedar-Nath and Ram Nath and Co, Merrut, Zero.
4. Kanti Swarup Gupta, P.K. Manmohan Operations Resarch, Sultan Chand and Sons Edu, Publishers, New Delhi. 2003
5. Gupta, Prem Kumar Hira. D.S> Operations Research, New Delhi S. CHand and Co. Ltd. 2000.
6. Sharma J.K. Operation & Research Theory and Applications, New Delhi. Macmillan. India Ltd, 1997.
7. E-book Introduction to operations research Mathew Galate Magh@lehigh.edu.

E-Books: www.freebook.centre.net
www.wowebook.com

Web Reference:
http://www-01.ibm.com/software/in/analytics/spss/

PAPER XII: ACCOUNTING AND MANAGEMENT CONTROL

Theory 60
Sessional / Practical 40

Unit I
Introduction to Accounting - Concept of Accounting, Functions of Accounting, Importance of Accounting, Limitations of Accounting, Concept of Generally Accepted Accounting Principles, Accounting Concepts, Accounting Conventions, Accounting as an Information System, Users of Accounting Information.

Unit II
Accounting Cycle - Meaning of Accounting Cycle, Classification of Accounts, Rules of Debit and Credit, Journal Ledger and Trial Balance, Recognition of expenses, Recognition of revenue, Financial Statements (Balance Sheet, Profit and Loss Statement).

Unit III
Computerized Accounting - Accounting Software Packages, Features of Computerized Accounting, Advantages of Computerized Accounting, Difference between Manual Accounting System Vs Computerized Accounting System, Introduction to Tally.

Unit IV
Valuation of Assets - Depreciation Accounting: Meaning, Depreciation, Depletion and Amortization, Methods of Depreciation, Provisions and Reserves.Inventory: Meaning of inventory, Types of Inventory, Methods of Inventory Valuation, Techniques of Inventory Management, and Levels of Inventory.

Unit V
Statement of Changes in Financial Position, Fund flow statement, Cash Flow Statement, Difference between Fund flow statement and Cash Flow Statement.

Unit VI
Decision Making and Control - Cost Accounting : Concept of Cost, Elements of Cost, Classification of Costs, Relevant cost and Decision Making, Pricing Decision, Make or Buy Decision, Break-even Analysis, Absorption Costing, Marginal Costing, Marginal Costing Vs Absorption Costing, Standard Costing, Labor Cost, Variances, Overhead, Budgeting and Budgetary Control, Benefits of Budgetary Control, Zero Base Budgeting, Traditional Budgeting Vs Zero Base Budgeting, Responsibility Centre's, Types of Responsibility Centre's(Cost, Revenue, Profit, Investment), Responsibility Performance Reporting, Transfer Pricing, Management By Objectives, Measuring Divisional Performance, Non – Financial Measures of Performance.

Books:

1. Dr. Sakshi Vasudevan." Accounting For Business Managers", Himalaya Publishing House.
2. Dr. Jawaharlal; "Accounting For Management", Himalaya Publishing House.
3. Bhattacharya, S.K. and Dearden, John. "Accounting for Management ", prentice Hall of India, New Delhi.
4. Chadiwick." The Essence of Financial accounting", prentice Hall of India Pvt. Ltd., New Delhi.
5. Horngren, Sundem and Selto (9th ed),"Introduction to management accounting ", prentice Hall of India, New Delhi.

E-Books:

Paper XIII : ARTIFICIAL INTILLENGENCE & EXPERT SYSTEM

Theory **60**

Sessional / Practical **40**

Unit-I

Introduction and applications of artificial intelligence, Problem solving: Defining the problem as state space search, Production system, Problem characteristics, Problem system characteristics, Search techniques: Generate and test, Hill climbing, Best first search, A* algorithm, Problem reduction, Expert system: Definition, Role of knowledge in expert system, Architecture of expert system.

Unit-II

Expert system development life cycle:Problem selection, Prototype construction, Formalization, Implementation, Evaluation, Knowledge acquisition: Knowledge engineer, Cognitive behavior, Acquisition techniques, Knowledge representation: Level of representation, Knowledge representation schemes, Formal logic, Inference Engine, Semantic net, Frame, Scripts.

Unit-III

Perception:Sensing, Speech recognition, Vision, Action, Neural networks: Introduction, Comparison of artificial neural networks with biological neural networks, learning in neural networks, Perceptron's, Back propagation networks, application of neural networks, Fuzzy logic : Definition, Difference between Boolean and Fuzzy logic, fuzzy subset, fuzzy membership function, fuzzy expert system, Inference process for fuzzy expert system, fuzzy controller.

Unit-IV

Programming in Logic (PROLOG): Introduction, Prolog variables, Using rules, Input and Output predicates, Fail and cut predicates, Recursion, Arithmetic operation, Compound object, Dynamic database, Lists, String.

Books:

1. David W. Rolston: Principles of Artificial Intelligence and Expert System Development, McGraw Hill Book Company.
2. Elaine Rich, Kevin Knight: Artificial Intelligence, Tata McGraw Hill.
3. Carl Townsend: Introduction to Turbo Prolog, BPB
4. Stamations V. Kartalopous: Understanding Neural Networks and Fuzzy Logic, PHI

EBooks:

www.umsl.edu/~joshik/msis480/chapt11.htmCachedSimilarChapter 11. **Expert Systems** and Applied **Artificial Intelligence**. 11.1 What is **Artificial Intelligence**? The field of **artificial intelligence (AI)** is concerned with methods ...

Web References:

1. www.cse.msstate.edu/~hansen/classes/AIspring04/.../**expertsystem**
2. www.uic.edu/classes/idsc/ids422/aiIntro-ch10
3. www.umsl.edu/~joshik/msis480/chapt11.htmCachedSimilarChapter 11. **Expert Systems** and Applied **Artificial Intelligence**. 11.1 What is **Artificial Intelligence**? The field of **artificial intelligence (AI)** is concerned with methods ...

Paper XIV :DATA COMMUNICATION & NETWORKS

Theory 60
Sessional / Practical 40

Unit I

Data communications, data networking and the internet. Data communications and networking for today's enterprise; a communications model; data communications; networks; the internet.Protocol architecture, tcp/ip, and internet-based applications The need for a protocol architecture; the tcp/ip protocol architecture; the osi model; standardization within a protocol architecture. Data transmission
Concepts and terminology; analog and digital data transmission; channel capacity.Transmission media
Guided transmission media; wireless transmission.

Unit II

Signal encoding techniques Digital data, digital signals; digital data, analog signals; analog data, digital signals; analog data, analog signals. digital data communication techniques types of errors; error detection; line configurations.Data link control protocols Flow control; error control; high-level data link control (hdlc).Multiplexing Frequency-division multiplexing; synchronous time-division multiplexing; statistical time-division multiplexing.

Unit III

Circuit switching and packet switching switched communications networks; circuit switching networks; packet-switching principles.routing in switched networks routing in packet-switching networks; least-cost algorithms.congestion control in data networks effects of congestion; congestion controls.local area network overview background; topologies and transmission media; lan protocol architecture; bridges.high-speed lans the emergence of high-speed lans; ethernet. wireless lans overview; wireless lan technology.

Unit IV

Internetwork protocols Basic protocol functions; principles of internetworking; internet protocol operation; internet protocol; ipv6. Internetwork operation Multicasting; routing protocols.Transport protocols Tcp; udp.Internet applications Electronic mail: smtp and mime.

Books:

1. Data and Computer Communications, Eight Edition (2007), William Stallings, Pearson Education Low Price Edition.
2. Data Communications and Networking, Fourth Edition (2006), Behrouz A. Forouzan, Tata McGraw-Hill Special Indian Edition.

E-Books:

http://www.cisco.com/web/learning/le21/learning_events_home.html

Web References:

http://www.cisco.com/web/learning/le21/learning_events_home.html

Paper XV: (Elective-A) Windows Programming using VC++

Theory 60

Sessional / Practical 40

Unit I

Windows Programming Concept : Elements of Windows, Windows Program and the Operating System, Event Driven Program, Windows Messages, The Windows API, Windows Data Types, The Structure of Windows Program, The WinMain( ) function, Processing Windows Messages, The Microsoft Foundation Classes.

Unit II

Windows Programing with the MFC, The MFC Document/ View Concept, Linking a Document and its Views, Creating MFC Application, SDI and MDI applications, Creating SDI and MDI applications. Communicating with Windows: Understanding Message Maps, Message Handlers, Message Categories.

Unit III

Creating and Editing Menu resource, Adding and Editing Toolbar Buttons, adding Tool Tips. Drawing in a Window : Basics of Drawing in a Window, The Window Client Area, Windows Graphical Device Interface, Working with Device Context, The MFC Drawing Mechanism, OnDraw(), The CDC Class, Drawing Lines, Using Color, Pens and Brush, Programming for Mouse, Drawing using Mouse.

Unit IV

Creating Dialog Resource, Modal and Modeless Dialog, Creating Spin Button, Status Bar, Scroll Bar, Edit Box, Radio Buttons. Handling Database in VC++, ODBC and DAO connectivity. Introduction to working of Wndows 8 Apps.

Books:

1. Beginning Visual C++ 2012 by Ivor Horton.
2. Programming Windows (Fifth Edition) by Charles Petcold, Microsoft Press.
3. Visual C++ Programming by Yashwant Kanitkar.
4. The Complete Reference Visual C++ 6.0 by Pappas Murray.
5. Using Visual C++ 6 by Kate Gregory

E-books :

1. Beginning VC++ 2012 by Ivon Horton http://it-ebooks.info/book/975/
2. Microsoft Visual C++ Step by Step http://it-ebooks.info/book/2527/

Web Reference:

http://www.php.net/
http://www.javascriptkit.com
www.w3schools.com
http://www.rspa.com
http://struts.apache.org/

Paper XV : (Elective B)Multimedia Technology

Theory	**60**
Sessional / Practical	**40**

Unit I

Introduction, Branch overlapping Aspects of Multimedia, Content, Global structure, Multimedia Literature, Multimedia: Media and Data Stream, Medium, Main properties of a multimedia, system, multimedia, traditional Data stream Characteristics, Data stream Characteristics for continuous media, information units

Unit II

Sound/Audio, Basic sound concepts, Music, speech, Images and Graphics, Basic concepts, Computer Image processing, Video and Animation, Basic concepts, Television, Computer-based animation,

Unit III

Data compression, Storage space, Coding requirements, source Entropy and Hybrid encoding, some Basic compression, Techniques, Jpeg, H. 261,MPEG, DVI

Unit IV

Optical storage Media, Basic Technology, Compact Disk Read only Memory, CD-ROM Extended architecture, Further CDROM, based developments, Compact disk write once., Compact Disk Magneto Optical8

Unit V

User Interfaces, General Design Issues, Current Work, Extension through audio and video, Audit at user Interface, user, Friendliness as primary Goal, Document, hypertext and MHEG

Books:

1. Multimedia computer communication-stein Metz and Nahrstedt
2. Multimedia system Design- Thakarr
3. Multimedia Computing Communication & Application-Ralf Strinmrpz
4. Multimedia System- Bufford John F(Pearson Education Asia)
5. Multimedia Magic-S Gokul(BPB Publication)

E-Books:

http://it-ebooks.info/book

Web References:

1. en.wikipedia.org/wiki/Multimedia
2. International Journal of Multimedia Technology(IJMT)www.ijmt.org
3 www.springsource.com/
4. www.w3schools.com

Computer Laboratory Sessions /Practical Guidelines

MCA - III Semester

Paper XII: Accounting and Management Control.

At least four problems should be given on each topic. Solution should be presented by the student along with detailed justification of solution. Problems can be solved using MS-Excel.

Basic concepts of Tally software should be covered in practicals.

Paper XIII: Artificial Intelligence and Expert Systems

Prolog Programs:

1. Program for Medical diagnosis in Prolog
2. A Marcus-Ceasar Predicate Logic example in Prolog.
3. Arithmetic Examples in Prolog
4. Determine whether a given integer is even or odd.
5. Determine whether the number entered is positive or negative.
6. Programs illustrating strings
7. Programs illustrating Lists.

Paper XV: (Elective A) Windows Programming using Visual C++

Note:
The university will appoint external examiner for assessment of the **minor projects** given in MCA III ,IV and V semester for the elective subjects. The project will be assessed by the university external examiner and the guide jointly on the basis of the following criteria.

1. Preparation of report	20 Marks
2. Presentation	10 Marks
3. Viva Voce	10 Marks

Minor Project :
A minor project shall be developed demonstrating various programming aspects of VC++ such as message maps, events, MDI application and ODBC connectivity.

VC++ Programs to be implemented.

1. A procedure oreinted simple program for creating window.
2. MFC Programs for creating window.
3. Programs for creating MENU, TOOLBAR, DIALOG BOX, CURSOR and other

resources.

4. Program for displaying graphics.
5. Programs demonstrating message maps.
6. Creating a menu driven program.
7. Creating a program for handling mouse inputs.
8. Program demonstrating document view architecture.
9. Program to demonstrate SDI and MDI application.
10. Program for demonstrating database connectivity.

Paper XV: (Elective-II B) Multimedia Technology

Note:
The university will appoint external examiner for assessment of the **minor projects** given in MCA III ,IV and V semester for the elective subjects. The project will be assessed by the university external examiner and the guide jointly on the basis of the following criteria.

1. Preparation of report	20 Marks
2. Presentation	10 Marks
3. Viva Voce	10 Marks

Minor Project :
A minor project shall be developed using multimedia features.

Multimedia Programs to be implemented in lab sessions.

1. Introduction to multimedia technology and its tools,
2. Designing static and dynamic web site with Data stream Characteristics for continuous media, information units and development of few web pages demonstrating the use of the following.
   a. Sound/Audio,
   b. Basic sound concepts,
   c. Music,
   d. speech,
   e. Images and Graphics,
   f. Basic concepts,
3. Writing a Theoretical Assignment on Web Technology covering following details.
   a. Use of Computer Image processing,
   b. Video and Animation,
   c. Basic concepts, Television,
   d. Computer-based animation.
   e. Generation of web page with suitable web editor.
4. Practical programing based on good User Interfaces with respect to following.
   a. General Design Issues,
   b. Current Work,
   c. Extension through audio and video,
   d. user, Friendliness as primary Goal(Document, hypertext and MHEG)

MASTER OF COMPUTER APPLICATION (MCA)

MCA-IV Semester

(Subject Syllabus with Practical Lab Sessions)

Paper XVI : Advanced JAVA

Theory	**60**
Sessional / Practical	**40**

Unit I

Threading: Threading Basics:Java Thread Model, Creating and Running Threads, Manipulating ThreadState, Thread Synchronization, Volatile Fields vs. Synchronized Methods, wait and notify, join and sleep,The Concurrency API, Atomic Operations, **Reflection:** Uses for Meta-Data, The Reflection API, TheClass<T> Class, The java.lang.reflect Package, Reading Type Information, Navigating Inheritance Trees,Dynamic Instantiation, Dynamic Invocation, Reflecting on Generics

Unit II

Java Database Connectivity:JDBC, JDBC Architecture (type 1, type 2, Type 3, type 4) the java.sql.*package, Connection, ResultSet, Statements

Unit III

Servlets: Web Application Basics:How the Web works, Thin Clients, TCP/IP, HTTP overview, BriefHTML review, Overview of Java EE, servlets & Web applications., Servlet Basics, Servlet API:-HTMLForms, **HTTP:** Request-response, headers, GET, POST, Overview: How Servlets Work, Servlet Lifecycle:init(), service(), destroy(), Requests and responses, Core Servlet **API:** GenericServlet, ServletRequest,and ServletResponse, HTTP **Servlets:** HttpServletRequest, HttpServletResponse and HttpServlet,Accessing Parameters, Additional Servlet Capabilities, HTTP headers and MIME typesRequestDispatcher: Including and forwarding, Sharing data with the request object attributes, Sharingdata with ServletContext attributes, Error Handling.

Unit IV

Java Server Pages:Basics and Overview, JSP architecture, JSP tags and JSP expressions, Fixed TemplateData, Lifecycle of a JSP, Model View Controller (MVC), Model 1/Model 2 Architecture, **Data Sharingamong servlets & JSP:** Object scopes or "buckets", Request, application, session and page scope,Predefined JSP implicit objects (request, session, application, page), <jsp:useBean>, <jsp:getProperty>,<jsp:setProperty>, <jsp:include>, <jsp:forward>, More JSP Capabilities and Session Management, HTTPas a stateless protocol, Hidden form fields, Cookies: Overview, API, Using cookies, **Session overview:**Cookies and session tracking, HttpSession, Putting data into a session object, Retrieving data from asession object, Using session data in servlets and JSPs Additional JSP Capabilities, Exception handlingand error pages, Directives (page, include, others), Import declarations, Multithreading considerationsand data safety, SingleThreadModel interface, Additional JSP Capabilities, JSP Directives, JSP Error Pages,JSP and Java Declarations, Scriptlet overview, Scriptlet syntax

Unit V

JSTL: Using Custom Tags, Custom tags overview, Reducing JSP complexity, Tag Libraries, Tag LibraryDescriptor (TLD), Loading a tag library in a web app, The JSTL, JSP Expression Language (EL), Usingcustom tags, The c:url, c:param, c:forEach, c:out tags, Overview of JSTL libraries, The JSTL ExpressionLanguage, Expressions, Type Coercion, Operators, String concatenation, Implicit Objects, The Core JSTLLibrary, General Purpose: c:out, c:set, c:catch, Conditional: c:if, c:choose,, Overview of

other capabilities,Additional Topics : Servlet Filter overview, Filtering examples, lifecycle, & filter chains, Filter API,Modifying a request, Modifying a response, Struts Overview Advanced MVC – Struts overview, Commandand State patterns, Struts View and Controller elements.

Books:

1. Java 2 Complete Reference by Herbert Schieldt (Sixth Edition)
2. Core Java Vol 1: Sun Press
3. Core Java Vol 2: Sun Press

Ebook:

1. Java 2 Complete Reference by Herbert Schieldt (Fourth Edition)

Web Reference:

http://www.javapassion.com/javaintro/
Presentation Slides (Available in .ppt format), www.manzaramesh.in

PaperXVII : DSS & MIS

Theory 60

Sessional / Practical 40

Unit I

Introduction to Management Information Systems,Overview of Management Information System.Structure of Management Information system, MIS: Support to Management, MIS and the user.Management as a control system, Information Systems Technology, Hardware, Software & communication technology for information systems.

Unit II

E-business Enterprise, Introduction, Organization of business in an E-enterprise. E-business, E-communication & E-collaboration, Information Security Challenges in E-enterprises, Security Threats & Vulnerability, Controlling security threat and vulnerability.

Unit III

Management Support System an Overview: Managers and Decision Making; Managerial Decision Making and Information Systems; Computerized Decision Support and Supporting Technologies; Benefits of MSS. Decision Support Systems: Introduction to the concept of Decision Support System; Components of DSS; Dialogue Management; Data Management and Model Management for DSS; Types of DSS, Systems Analysis and Design for DSS; Models in the context of DSS;

Unit-IV

Expert system: Definition, Role of knowledge in expert system, Architecture of expert system.**Expert system development life cycle:** Problem selection, Prototype construction, Formalization, Implementation, Evaluation, Knowledge acquisition: Knowledge engineer, Cognitive behavior, Acquisition techniques, Knowledge representation: Level of representation, Knowledge representation schemes, Formal logic, Inference Engine, Semantic net, Frame, Scripts.

Books:

1. MIS: Conceptual Foundations, structure & development by Gordon B.Davis, Margrethe H.Olson, Tata McGraw Hill.
2. MIS, Text & Cases, Third Edition by Waman S. Jawadekar, Tata McGraw Hill.
3. David W. Rolston: Principles of Artificial Intelligence and Expert System Development, McGraw Hill Book Company, Decision Support System and Expert System, Pearson, Efrain. E. Turban
4. Elaine Rich, Kevin Knight: Artificial Intelligence, Tata McGraw Hill.

E-Book: 3. http://www.ibm.com/in/en/

Web reference:

1. Decision Support System_Efraim_Turban_- Free DOC downloads*ebookily.net/doc/decision-support-system-efraim-turban*50+ items - Decision Support System Efraim Turban downloads at ...Turban 2nd edition - Wiley: Home.BIS 4533/6533 — Decision Support Systems.
2. [PPT] DSS_Development(ppt)
   www.uic.edu/classes/idsc/ids422/dssDevelopment-ch06.ppt
3. http://www.ibm.com/in/en/

Paper XVIII : PROGRAMMING USING C#.NET

Theory 60

Sessional / Practical 40

Unit – I

Getting started with .NET Framework 4.0Benefits of .NET framework, Architecture of .NET Framework 4.0, Components of .NET framework 4.0: CLR, CTS, Metadata and Assemblies, .NET framework class library, Windows forms, ASP .NET and ASP AJAZ, ADO. NET, Windows workflow foundation, Windows presentation foundations, windows communication foundation, windows cardspace and LINQ.
Introducing C# : Need of C#, C# Pre-Processor directives, creating a simple C# console application, identifiers and keywords. Data types, variables and constants: Value types, reference types, type conversions, boxing and unboxing, variables and constants. Expression and operators: operator precedence , using the ?? (Null coalescing) Operator, using the :: (Scope resolution) operator and using the is and as operators. Control flow statement: selection statements, iteration statements and jump statements.

Unit – II

Namespace, classes, objects and structuresNamespaces, the system namespace, classes and objects: Creating a class, creating an object, using this keywork, creating an array of objects, using the nested classes, defining partial classes and method, returning a value from a method and describing access modifier. Static classes and static class members. Properties: read-only property, static property, accessiblity of accessors and anonymous types. Indexers, structs: syntax of a struct and access modifiers for structs.

Unit- III

Object – Oriented ProgrammingEncapsulation: Encapsulation using accessors and mutators, Encapsulation using properties. Inheritance : inheritance and constructors, sealed classes and sealed method, extension methods. Polymorphism: Compile time polymorphism/ Overloading, runtime polymorhphism/ Overriding. Abstraction: Abstract classes, abstract method. Interface: Syntax of interfaces, implementation of interfaces, interfaces and inheritance.

Unit – IV

Delegates and Events and Exception HandlingDelegates: Creating and using delegates, multicasting with delegates. Events: Event sources, event handlers, events and delegates , multiple event handlers. Exception handling: The try/catch/finally statement, checked and unchecked statements.

Unit – V

Graphical user interface with windows formsIntroduciton, windows forms, event handling: A simple event – Driven GUI, Visual studio generated GUI code, delegates and event- handling mechanism , another way to create event handlers, locationg event information. Control properties and layouts, labels, textboxes and buttions,groupboxes and panels, checkboxes and radio buttons, tooltips, mouse-evemt handling, keyboard-event handling,. Menus, monthcalendor control, date timepicker control, linklabel control, listbox control, checklistbox control, combobox conrol, treeview control, listview control, tabcontrol control and multiple documents interface (MDI) windows.

Unit – VI

Date Access witih ADO.NETUnderstanding ADO.NET: Describing the Architecture of ADO.NET, ADO.NET entity framework. Creating connection strings: Syntax for connection strings. Creating a connection to a Database: SQL Server database, OLEDB database, ODBC data source. Creating a

Command object. Working with DataaAdapters: Creating dataset from DataAadapter, paging with DataaAdapters, updating with DataAdapters, adding multiple tables to a Dataset, creating data view. Using Datareader to Work with Databases.

Books:

1. .NET 4.0 Programming [6-in-1], Black Book, Kogent Learning Solution Inc, Wiely Dream Tech Press.
2. Paul Deital and Harvey Deital. C# 2010 for Programmers 4th Edition, Pearson Education.
3. Anderw Trolsen: Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition, Wiely-Appress.
4. Bart De Smet: C# 4.0 Unleashed, Pearson Education – SAMS Series.
5. Hebert Shildt: Programming in C# 4.0., Tata McGraw Hill.

E-Books:

IT55 Advanced Internet Technology www.w3schools.com

Web Reference:

1. http://www.php.net/
2. http://www.javascriptkit.com
3. www.w3schools.com
4. http://www.rspa.com
5. http://struts.apache.org/
6. www.springsource.com/

Paper XIX: SOFTWARE ENGINEERING

Theory	**60**
Sessional / Practical	**40**

Unit-I

Software Engineering Paradigms: Software Characteristics, Software myths, Software Applications,Software Engineering Definitions, Software Process Models, Process iteration, Process activities,

Unit-II

Software Requirements Engineering: Requirements Engineering Processes, Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management. Software Requirements, Functional and non-functional requirements, User requirements, System requirements, Interface specification, software requirement specification document. Specification languages.

Unit III

Software Metrics and Measures — Process Metrics, Project metrics, Software Project Estimation Models-Empirical, Putnam, COCOMO models.

Unit-IV

Software Design Process, Principles of s/w design, Design Strategies, Levels of s/w Design, Interface Design, Coding, Software Reuse, Computer Aided Software Engineering (CASE), CASE Tools. Software Testing, Software Reliability, Software Safety, Defect testing, Debugging Tools.

Unit-V

Software Maintenance and its types, S/w Configuration Management, S/w Reuse, Software Evolution, Software Quality Assurance – plans & activities, Software Documentation.

Unit-VI

Computer-aided software engineering (CASE) and CASE Tools. Software Project Management: Management activities, Project planning, Project scheduling, Risk management and activities.

Books:

1. Pressman: Software Engineering, Tata McGraw Hill.
2. Gill N.S. : Software Engineering, Khanna Book Publishing Co.(P) Ltd, N. Delhi
3. Jalote, Pankaj: An Integrated Approach to Software Engineering, Narosa Publications.
4. Chhillar Rajender Singh: Software Engineering: Testing, Faults, Metrics, Excel Books, New Delhi.
5. Ghezzi, Carlo: Fundaments of Software Engineering, PHI.
6. Fairley, R.E.: Software Engineering Concepts,McGraw-Hill.
7. Lewis, T.G.: Software Engineering, McGraw-Hill..
8. Shere: Software Engineering & Management, Prentice Hall.
9. Deutsch, Willis: Software Quality Engineering : A Total Technical and Management Approach, Prentice Hall.

Web References:

Software Engineering: A Practitioner Approach by Roger S. **Pressman**
www.academia.edu/.../**Software_Engineering**_A_Practitioner_Approach_by_Roger_S._**Pressman**
http://www.research.ibm.com/softeng

Paper XX : (Elective A) Advance Database Management Systems

Theory 60

Sessional / Practical 40

Unit I

The Relational Model of Data and RDBMS Implementation Techniques, Relational Algebra, Relational Query Languages, Advanced SQL programming : PL/SQL – Introduction to PL/SQL – Declare, begin statements, Variables, Control Structure, PL/SQL Transactions – Savepoint, Cursor, PL/SQL Database Objects – Procedures, Functions, Packages, Triggers. Programmatic SQL – Embedded SQL, Dynamic SQL, and ODBC Standard.

Unit II

Transaction processing and concurrency controlDefinition of Transaction and ACID properties. Transaction Processing - Transaction-processing monitors, transactional workflows, main-memory databases, real-time transaction systems, long-duration transactions, transaction management in multi-databases. Concurrency Control – Locks, Optimistic Concurrency Control (Backward and Forward validations), Timestamping Concurrency Control. Query Processing and Query Optimization and Recovery concepts.

Unit III

Emerging Database Management System Technologies Object Oriented database concepts; Object Relational database concepts; Active database concepts; Temporal database concepts; Spatial database concepts and architecture; Deductive databases and Query processing; Mobile Databases; Geographic Information Systems.

Unit IV

New database applications and environments Data Warehousing and Data Mining, Multimedia; Mobility; Multidatabases; Native XML databases (NXD).

Books

1. Ivan Bayross, SQL, PL-SQL Programming Language of Oracle, 4th Edition, BPB publications.
2. Date C. J., An Introduction to Database Systems, Addison-Wesley Longman (8ThEdition).
Silberschatz A. Korth H., and Sudarshan S., Database System Concepts, McGraw Hill (5th Edition)
3. Catell, R. G. G., Barry, D. K. M., et al, The Object Data Standard : ODMG 3.0, Morgan Kaufmann, 2000.
4.Charles F. Goldfarb, Paul Prescod, The XML Handbook, Prentice Hall. (5th Edition), 2004.
5. Morgan Kaufmann, Advanced Database Systems (The Morgan Kaufmann Series in Data Management Systems) 1st edition.

E-books :

1. http://computerscienceebooks.wordpress.com/2011/12/05/adbms-ebook-advanced-database-management-system-complete-syllabus-free-ebook/
2. http://www.ebook3000.com/Advanced-Database-Systems--The-Morgan-Kaufmann-Series-in-Data-Management-Systems-_109814.html/

Web Reference:

www.oracle.comwww.nosqldatabases.comhttp://www.ibm.com/in/en/

Paper XX : (Elective B) Networking Programming Using Linux

Theory 60

Sessional / Practical 40

Unit I

Linux Utilities-File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities, sed – scripts, operation, addresses, commands, applications, awk – execution, fields and records, scripts, operation, patterns, actions, functions, using system commands in awk.Working with the Bourne again shell(bash): Introduction, shell responsibilities, pipes and input Redirection, output redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts.

Unit II

Linux Files: File Concept, File System Structure,Inodes, File types, The standard I/O (fopen, fclose, fflush, fseek, fgetc, getc, getchar, fputc, putc, putchar, fgets, gets etc.), formatted I/O, stream errors, kernel support for files, System calls, library functions, file descriptors, low level file access - usage of open, creat, read, write, close, lseek, stat family, umask, dup, dup2, fcntl, file and record locking. file and directory management - chmod, chown, links(soft links & hard links - unlink, link, symlink), mkdir, rmdir, chdir, getcwd, Scanning Directories-opendir, readdir, closedir,rewinddir, seekdir, telldir functions.

Unit III

Linux Process – Process concept, Kernel support for process, process attributes, process hierarchy,process states,process composition, process control - process creation, waiting for a process, process termination, zombie process,orphan process, system call interface for process management-fork, vfork, exit, wait, waitpid, exec family, system. Linux Signals – Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions.

Unit IV

Interprocess Communication : Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems,pipes, FIFOs, Introduction to three types of IPC(Linux)-message queues, semaphores and shared memory. Message Queues- Kernel support for messages, Linux APIs for messages, client/server example. Semaphores-Kernel support for semaphores, Linux APIs for semaphores, file locking with semaphores. Shared Memory- Kernel support for shared memory, Linux APIs for shared memory, semaphore and shared memory example.

Unit V

Multithreaded Programming – Differences between threads and processes,Thread structure and uses,Threads and Lightweight Processes,POSIX Thread APIs, Creating Threads,Thread Attributes,Thread Synchronization with semaphores and with Mutexes,Example programs. Sockets: Introduction to Linux Sockets, Socket system calls for connection oriented protocol and connectionless protocol, example-client/server programs.

Books

1. Linux System Programming, Robert Love, O'Reilly, SPD, rp-2007.
2. Unix Network Programming ,W.R.Stevens,PHI.

3. Unix for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson Education, 2003.
4. Advanced Programming in the Unix environment, 2nd Edition, W.R.Stevens, Pearson Education.
5. System Programming with C and Unix,A.Hoover,Pearson.
6. Unix Programming, Kumar Saurabh, 1st Edition, Wiley India pvt Ltd.
7. Unix and Shell programming, B.A.Forouzan and R.F.Gilberg, Cengage Learning.

E Books:

1. **Red-Hat**
2. **Red Hat Certified System Administrator (RHCSA)**
3. http://www.redhat.com/certification/rhct/
4. **Red Hat Certified Engineer (RHCE)**
5. http://www.redhat.com/training/certifications/rhce/

Computer Laboratory Sessions/ Practical Guidelines

(MCA) IV-Semester

Paper XVI: Advanced JAVA

Java Programs to be implemented in lab sessions.

1. Programs based on SWING Concept.
2. Program demonstrating concept of socket programming.
3. Database handling and perfoerming different operations on database.
4. JDBC Program To Insert The Detail Of College Student In The MS Access
5. Advance Java Practicals AWT Program To Create Checkboxes
6. Advance Java Practicals Java Awt Itemlistener
7. Advance Java Practicals Split Pane In Swing
8. Client Server Application For Find Particular File On Server
9. Swing Example Login Form Validation
10. Tcp Chat Program In Java

Paper XVIII : C# .NET

Programming using C#.NET Laboratory

1. Write a Program in C# to demonstrate Command line arguments processing.
2. Write a Program in C# to demonstrate boxing and Unboxing.
3. Write a program to demonstrate Operator overloading.
4. Find the sum of all the elements present in a jagged array of 3 inner arrays.
5. Using Try, Catch and Finally blocks write a program in C# to demonstrate error handling.
6. Demonstrate Use of Virtual and override key words in C# with a simple program.
7. Write a program to demonstrate delegates.
8. Write a program to demonstrate abstract class and abstract methods in C#.
9. Write a program to illustrate the use of different properties in C#.
10. Demonstrate arrays of interface types (for runtime polymorphism) with a C# program.
11. Write Program to find LCM of 2 numbers in C#.NET
12. Write a Program to find GCD of 2 numbers using C#.NET
13. Write a Program to convert Decimal to Binary in C#.NET
14. Program to print Fibonacci Number below 100
15. Write a Program to reverse a String in C#.NET
16. Write a Program to reverse a number using C#

17. Consider the Database **STUDENT** consisting of following tables: tbl_Course (CourseID: int, CourseName: string) tbl_Student (USN: string, StudName: string, Address: string, CourseID: int, YrOfAdmsn: int)

Develop suitable windows application using C#.NET having following options:
1. Entering new course details.
2. Entering new student details.
3. Display the details of students (in a Grid) who belong to a particular course.
4. Display the details the students who have taken admission in a particular year.

18. Consider the Database **BLOODBANK** consisting of following tables: tbl_BloodGroup (BloodID: int, BloodGroup: string) tbl_Donor (DonorID: int, DonorName: stirng, Address:string, ContactNo: int, DOB: date, Gender: string, Weight: int, BloodID: int)

Develop suitable windows application using C#.NET having following options:

1. Entering Blood group details.
2. Entering new donor details.
3. Display the details of donors (in a Grid) having particular blood group.
4. Display the details of donors (in a Grid) based on gender.
5. Display the details of donors (in a Grid) based on age (above 18), weight (above 45KG) and Gender(user's choice).

19. Consider the Database **STUDENT** consisting of following tables: tbl_Course (CourseID: int, CourseName: string) tbl_Book (BookID :int, BookTitle: string, Author: string, CourseID: int) tbl_Student (USN: string, StudName: string, CourseID: int) tbl_BookIssue(USN: string, BookID: int, IssueDate: Date)

Develop suitable windows application using C#.NET having following options:
1. New Course Entry.
2. New Book Entry
3. New Student Entry
4. Issue of books to a student.
5. Generate report (display in a grid) showing all the books belonging to particular course.
6. Generate report (display in a grid) showing all the books issued on a particular date.
7. Generate report (display in a grid) showing all the books issued to a particular student.

Paper XX : (Elective II A) Advanced Database Management System

Note:
The university will appoint external examiner for assessment of the **minor projects** given in MCA III ,IV and V semester for the elective subjects. The project will be assessed by the university external examiner and the guide jointly on the basis of the following criteria.

1. Preparation of report	20 Marks
2. Presentation	10 Marks
3. Viva Voce	10 Marks

Minor Project :
A minor project shall be developed using any RDBMS package with ODBC connectivity.

ADBMS programs for Lab Sessions.

1. Introduction to basic structure of PL-SQL program
2. Programs illustrating use of control structure in PL-SQL.
3. Programs illustrating functions, procedures and triggers in PL-SQL.
4. Programs illustrating Database connectivity using SQL.
5. JDBC connectivity using SQL
6. Program illustrating Nested Queries with SQL.

Paper XX : (Elective II B) Network Programming using Linux

Note:
The university will appoint external examiner for assessment of the **minor projects** given in MCA III ,IV and V semester for the elective subjects. The project will be assessed by the university external examiner and the guide separately on the basis of the following criteria.

1. Preparation of report	20 Marks
2. Presentation	10 Marks
3. Viva Voce	10 Marks

Minor Project :
A minor project (documented in the form of report)demonstrating Linux features.

Linux Programs to be implemented in Lab sessions
(Note: Use Bash for Shell scripts.)

1. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
2. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
3. Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
4. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the

argument is a file, the number of lines on it is also reported.

5. Write a shell script that accepts a list of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.
6. Write a shell script to list all of the directory files in a directory.
7. Write a shell script to find factorial of a given integer.
8. Write an awk script to count the number of lines in a file that do not contain vowels.
9. Write an awk script to find the number of characters, words and lines in a file.
10. Write a c program that makes a copy of a file using standard I/O and system calls.
11. Implement in C the following Unix commands using System calls
    (i). cat (ii). ls (iii). mv
12. Write a program that takes one or more file/directory names as command line input and reports the following information on the file.
    (i). File type. (ii). Number of links. (iii). Time of last access.
    (iv). Read, Write and Execute permissions.
13. Write a C program to emulate the Unix ls –l command.
14. Write a C program to list for every file in a directory, its inode number and file name.
15. Write a C program that demonstrates redirection of standard output to a file.
    Ex: ls > f1.
16. Write a C program to create a child process and allow the parent to display "parent" and the child to display "child" on the screen.
17. Write a C program to create a Zombie process.
18. Write a C program that illustrates how an orphan is created.
19. Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex:- ls –l | sort
20. Write C programs that illustrate communication between two unrelated processes using named pipe.
21. Write a C program (sender.c) to create a message queue with read and write permissions to write 3 messages to it with different priority numbers.
22. Write a C program (receiver.c) that receives the messages (from the above message queue as specified in (21)) and displays them.