P R O G R A M M E PROJECT REPORT (PPR)

MASTER OF COMPUTER APPLICATION (MCA)
(OPEN AND DISTANCE LEARNING MODE)

School of Open And Distance Learning
JAMIA HAMDARD
(Deemed University)
Hamdard Nagar, New Delhi-110062

Jamia Hamdard

Late JanabHakeem Abdul Hameedsb, the founder of Jamia Hamdard, had a vision to develop Jamia Hamdard into an institution of excellence imparting modern professional education with special emphasis on Unani medicine and Islamic studies. Today, it has evolved into an excellent centre of higher learning, fulfilling the objective of the wakf, which has been funding the University ever since its inception.

As a mark of tribute and thanks to the Almighty Allah for bestowing his guiding spirit to its founder and his associates, Jamia Hamdard adopted a seal inscribed with the following

"He (The Prophet may peace be upon him)
Instructs them in the Book and Wisdom"

Ever since the inception of Jamia Hamdard, this holy verse (ayat) has been a source of inspiration and guidance for all those associated with its management and administration. As an Islamic charity, wakf has played the vital financial role in the making of Jamia Hamdard. He (PBUH) preached his followers that

"Wisdom is (like) the lost animal of a believer
wherever he finds it, catches hold of it"

Inspired by the Holy Qur'an and exhorted by the Prophet (PBHU), Muslims became the torch-bearers of knowledge and civilization in the medieval period, but are lagging behind in present times. Late Hakeem Abdul Hameed Sahib wisely chose education and pursuit of knowledge as his prime objective when he decided to convert Hamdard Dawakhana into a wakf, a charity dedicated to fulfilling educational and health care needs of Indian Muslims. Hamdard (wakf) continues to provide generous grant to the university for building, equipments and salaries of staff and other development activities.

Jamia Hamdard was inaugurated by late Shri Rajiv Gandhi, the then Prime Minister of India, on August 01, 1989. In his impressive speech, the Prime Minister applauded the efforts of Hakeem Abdul Hameed Sahib in setting up institutions of higher learning, which were emerging in the form of a "Deemed to be University." He said, "This will enable (the Muslim) minority to go forward and thus help India to march forward."

The University offers professional courses, which equip the students to get placements in the highly competitive job market. On the basis of the record of performance of the University and quality of infrastructure including staff, the university has been accredited by NAAC in category 'A' of Indian Universities.

Jamia Hamdard is among top 18 universities of India and ranked 1st in the field of Pharmacy and its medical college is ranked 15th by the Govt. of India (HIRF- 2019 ranking)

Jamia Hamdard
(Deemed University)

The Ministry of Human Resource Development, Government of India, granted to Jamia Hamdard, the status of a 'Deemed to be a University', in 1989 under section 3 of University Grant Commission Act, 1956. Since its establishment, Jamia Hamdard has made commendable progress with regard to expansion of facilities for higher learning and diversification of teaching and research programmes in frontier areas of biological Sciences, Unani Tibb, Pharmaceutical Sciences, IT and Management. The University has a strong base of infrastructure for quality teaching and research. On the basis of the overall assessment of its performance in realizing the university mandate and contributions made by various departments and faculties to the growth of knowledge, National Assessment and Accreditation Council of UGC has accredited the University under category 'A' the Indian Universities. Jamia Hamdard is one of the universities selected by the UGC for promoting education abroad. The university attracts over 10 percent of the total students from over 30 countries. The international corporations and Foreign Governments employ a large number of the University graduates in various capacities, which is the testimony of international recognition of degrees/diplomas awarded by the University.

As a Muslim minority institution under Article 30 (1) of the Constitution of India, the University is committed inter alia to improve access and quality of education so as to enable the adult learners to effectively function in the knowledge based economy. In this context, a number of initiatives have been taken to provide high quality of professional education at Undergraduate and Post Graduate levels.

In order to provide opportunities to students for participating in ongoing educational revolution to upgrade the knowledge and skills of working population, entrepreneur and other aspirants of new knowledge, the university has taken initiative to utilize information and communication technologies to extend the reach of education and to enhance quality of education through the use of multi-media methods of teaching and learning. School of Open and Distance Learning has therefore been established to promote education through open and distance learning systems, which adopt flexible and innovative methods of education to ensure 'independent learning' to an one, anytime and anywhere. The programmes of the study will be customized to meet the learning requirements of knowledge seekers as well as to ensure that they learn at their own pace and convenience.

Jamia Hamdard is recommended as an "Institute of Eminence" by the Empowered Expert Committee of MHRD.

Mission & Objective

The Study programme aims to provide contemporary education and training to meet the challenges of the evolving global scenario and changing environment in business administration. The objective of the project is to help the students develop ability to apply multi- disciplinary concepts, tools and technique to sole organizational problem.

Jamia Hamdard Mission and Goal in relevance of the programme

JamiaHamdard's study programmes under ODL are selective and customized to meet the learning requirements of knowledge seekers as well as to ensure that they learn at their own pace and convenience. Within the financial means of University, due care has been taken to keep the cost of education low, so that educationally backward sections can take advantage of University's programmes through ODL mode. This goal in view, the SODL of Jamia Hamdard has made concerted efforts to offer professional and job oriented courses with regular updates of curricula and study material and introduction of tools of Information Technology.

Targeted Group

The distance education has potential to reach to unreached and even marginalized and excluded group of the society such as tribal populations and Muslims women. Jamia Hamdard, SODL programme provides an opportunity to students for acquiring new knowledge and skills that are needed for their development. Jamia Hamdard being in education for a long time has taken initiatives to offer an opportunity to those students who are unable to get on campus education and those who have limited access to educational resources. ODL programme of Jamia Hamdard also envisage to provide an opportunity to girls from Muslim community, who by and large have been left out by the national education endeavors.

School of Engineering Science and Technology

During the last few years the Department of Computer Science has established itself as a well-known entity in the field of IT Education, Research and Consultancy. The training facilities at the department are comparable with the best in the country and provide an ideal environment for running MCA, M.Sc. (Comp. Sc.), BCA, B.Sc. (IT), B.Tech (Comp. Sc/ IT), M.Tech (Comp. Sc.), and Ph.D. programs offered by the department. The right kind of ambience coupled with excellent faculty, lab and other support systems has attracted students from the foreign countries. Many national and multinational IT industries visit the department every year for campus placements.

The department is establishing CISCO Networking Local Academy for the benefit of our students who can be trained on CISCO equipments for the award of CISCO Certificates like CCNA, CCNP etc.

Master of Computer Application through Open and Distance Mode

Apart from the full time regular courses, the department has decided to offer these MCA programme through open and distance mode for those students who are not able to afford the expenses of education or who have not been able to make it to the courses offered by the universities and colleges in traditional mode. However, our endeavor is to provide best quality education, keeping with the traditions.

Objective

To prepare highly skilled professionals, with a strong conceptual and theoretical background in the fields of information technologies, especially in the emerging areas of software technologies.

The Course

Highlights of the course are described in the following table:

a.	Name of the Programme and Programme Code	Master of Computer Applications (MCA) – ODL and
b.	Nature	ODL Programme
c.	Duration	Two year (4 Semesters)
d.	Total number of credits	94
e.	Medium of Instruction and English Examinations	English
f.	Eligibility Criteria	i. Passed B. Tech. / B.E. / B.Sc. (Engg) / BCA / B.Sc. (with Mathematics / IT / CS / Electronics / Physics as one subject passed) examination from a recognized institution/university securing at least 50% marks (or equivalent CGPA) in aggregate. ii. Passed at least one paper of Mathematics at Senior Secondary (12thlevel) or Bachelor's level.
g.	Admission Procedure	Through admission counselling
h.	Period of Completion	Not more than 04 years (08 Semesters)
i.	Commencement of the Program	July and January of every year

Curriculum

Highlights of the curriculum of MCA are described in the following table:

a	Total number examinations	While the teaching/counseling of the course will be done in annually, the examinations will be held only once a year for all the papers taken in the last year along with any backlogs or improvement papers. Teaching /counseling of the courses will be
	Major Project	In Final year
b	Total Theory Papers Total Lab Papers Major Project	27 Nos. (2700 marks) 09 Nos. (900 marks) 01 No. (500 marks),
c	Theory Papers / Lab Papers/	01 No. (100 marks) except in final year
d	Counseling Hours for theory Papers	30 Hours per theory paper of 4 credits each
f	Practical Sessions	10 sessions of 3 hours each for a laboratory course of 4 credits each.

Modes of curriculum transaction include teaching/ counselling, assignments, tests, presentations, participation in relevant events and regularity

Course Structure

Semester-wise course structure, guidelines for teaching, practical and associated assessment of MCA programme is described in the following tables:

PROGRAMME STRUCTURE

Course Type	Abbreviation	Credits
Program Core Course	PCC	36
Program Elective	PE	12
Open Elective	OE	04
Foundation Course	FC	04
Ability Enhancement Course	AEC	04
Skill Enhancement Elective	SEE	04
Laboratory	LAB	12
Dissertation	DISS	18
Total Credits		**94**

L-T-P stands for number of contact hours as Lecture-Tutorial-Practical in a week.

Semester – I

Course Code	Course Title	Course Type	Marks			L-T-P	Credits
			Internal Assessment	Semester Exam	Total		
MCAD 101	Object oriented programming	PCC	25	75	100	3-1-0	4
MCAD 102	Computer Organization and Architecture	PCC	25	75	100	3-1-0	4
MCAD 103	Database Management Systems	PCC	25	75	100	3-1-0	4
MCAD 104	Software Engineering	PCC	25	75	100	3-1-0	4
MCAD 105	Data Communication and Computer Networks	PCC	25	75	100	3-1-0	4
MCAD106	Communication Skills	AEC	25	75	100	2-0-0	2
MCAD 107	'OO Programming Lab	LAB	25	75	100	0-0-4	2
MCAD 108	Database Management Systems Lab	LAB	25	75	100	0-0-4	2
					Total	**17-5-8**	**26**

Semester – II

Course Code	Course Title	Course Type	Marks			L-T-P	Credits
			Internal Assessment	Semester Exam	Total		
MCAD 201	Mathematical Foundations for Computer Applications	FC	25	75	100	3-1-0	4
MCAD 202	Data Structures	PCC	25	75	100	3-1-0	4
MCAD 203	Java Programming	PCC	25	75	100	3-1-0	4
MCAD 204	Operating Systems	PCC	25	75	100	3-1-0	4
	PE – 1	PE	25	75	100	3-1-0	4
	PE-2	PE	25	75	100	3-1-0	4
MCAD 205	Data Structures Lab	LAB	25	75	100	0-0-4	2
MCAD 206	Java Programming Lab	LAB	25	75	100	0-0-4	2
					Total	**15-5-8**	**28**

Semester – III

Course Code	Course Title	Course Type	Marks			L-T-P	Credits
			Internal Assessment	Semester Exam	Total		
MCAD 301	Design and Analysis of Algorithms	PCC	25	75	100	3-1-0	4
MCAD 302	Artificial Intelligence	PCC	25	75	100	3-1-0	4
	PE – 3	PE	25	75	100	3-1-0	4
	SEE	SEE	25	75	100	3-1-0	4
	OE	OE	25	75	100	3-1-0	4
MCAD 303	AI Lab	LAB	25	75	100	0-0-4	2
MCAD 304	Lab based on SEE	LAB	25	75	100	0-0-4	2
					Total	**15-5-8**	**24**

Semester – IV

Course Code	Course Title	Course Type	Marks			L-T-P	Credits
			Internal Assessment	Viva Voce	Total		
MCAD 401	Dissertation/Industrial Project	DISS	300	200	500	0-0-36	18

Grand Total of Credits = 96

PROGRAM ELECTIVES (PE)

PE – 1	
MCAD PE111	Formal Languages and Automata Theory
MCAD PE112	Compiler Design
MCAD PE113	Distributed systems
PE – 2	
MCAD PE221	data science
MCAD PE222	Data Mining,
MCAD PE223	Knowledge discovery
PE – 3	
MCAD PE331	Soft Computing
MCAD PE332	Machine Learning
MCAD PE333	Cryptography and Network Security

Skill Enhancement Electives (SEE)

SEE	
MCAD SEE311	Android Programming
MCAD SEE312	Linux and Unix Programming
MCAD SEE313	ASP.net Programming

OPEN ELECTIVES (OE)

OE	
MCAD OE311	E-Governance and Smart City
MCAD OE312	Cyber physical system and IoT
MCAD OE313	Sustainable Development and Green Computing

Duration of the Programme
(Minimum-3 Years, Maximum-6 Years)

To fulfill the degree requirements for acquiring the BCA, a student may clear all the papers in three years. If a student fails to clear all the requirement of course in three years he/ she may be permitted to stretch it over a period of another 3 years. In case the student is unable to pass all the courses of BCA programme in 6 years, the students may be permitted to stretch it for another two years. In such cases, the student has to seek readmission as per 'Re-Admission' rules and pay the requisite fees.

Admission

a. A candidate, aspiring for admission to BCA programme, shall have to apply in the prescribed application form that is complete in all respects, on or before the last date of submission.

b. The Admission committee shall display/publish the list of candidates who are declared eligible for admission, after the due approval of the competent authority.
c. Eligible candidates shall have to complete the prescribed formalities, for completion of admission, within the stipulated period of time; otherwise they will forfeit the right to admission.

Semester Teaching and Annual Examination

For the purpose of teaching and counseling, each academic year shall consist of two Academic Semesters, the first referred to as ODD Semester (July-December) and the second as EVEN semester (January-June). Examinations of papers of both the semesters will be held at the end of every EVEN semester.

Prescriptions for conducting examinations of papers, are presented in the following table:

Prescriptions for conducting semester examinations of theory and lab courses, those shall be conducted after the conclusion of each of the semesters, are presented in the following table:

a.	Mode	(Theory Papers)	Written only
		(Lab Papers)	Written, Demo, Programming and viva-voce.
b.	Duration	(Theory paper)	03 Hours
c.	Total Marks	(Theory Papers)	70 (Seventy only)
		(Lab Papers)	50 (Fifty only)

DISSERTATION / INDUSTRIAL PROJECT

a. Each student of the final semester will have to go for a Dissertation / Industrial Project work either in the industry or in the Department under the guidance of one or two faculty members.
b. Period of completion of Dissertation/Industrial Project work shall be full one semester.
c. There shall normally be two supervisors - one internal and one external (in the case of industry project form the place where the student is pursuing project-work).
d. All the students, who are pursuing the Dissertation /I ndustrial project work, shall be continuously in touch with the internal supervisor.
e. There shall be a mid-term evaluation of the progress and the internal supervisors will conduct it. However, an internal supervisor may ask the student to submit a

confidential progress-report from the external supervisor (in the case of industry project).

f. All the candidates shall submit Three (03) hard copies of the project reports that are duly approved and signed by internal as well as external (if applicable) supervisors.
g. An external examiner, appointed for the purpose, shall evaluate the project report.
h. The Head of the Department shall fix a date and time for viva-voce examinations, on receipt of the evaluation-report of the project reports from the external examiner.
i. Head of the Department shall forward the compiled total marks (awarded in internal assessment, project Report and Viva-voce Examination), in the project-semester of each of the candidate, to the Controller of Examination.

8. EXAMINATION

a. The performance of a student in a semester shall be evaluated through continuous class assessment and end semester examination. The continuous assessment shall be based on class tests, assignments / tutorials, quizzes / viva voce and attendance. The end semester examination shall be comprised of written papers, practical and viva voce, inspection of certified course work in classes and laboratories, project work, design reports or by means of any combination of these methods.
b. The marks obtained in a subject shall consist of marks allotted in end semester theory paper, practical examination and sessional work.
c. The minimum pass marks in each subject including sessional marks (Theory, Practical or Project etc.) shall be 40%.

10. PROMOTION SCHEME

a. A student will be promoted from 1st year to 2nd year/2nd year to 3rd year provided that he / she is not having more than 06 (Six) backlog papers (including Labs; excluding non-credit papers) in total. A student who fails to satisfy the criteria mentioned for the promotion shall be detained in the same year.
b. A detained Student is not allowed to re-appear in the minor tests. His / her old internal assessment marks will remain same. However, he / she will be required to re - appear in the semester examination for those papers in which he / she had failed, when these papers are offered again (Examination for Odd semester paper will be held in Odd semester, and for Even semester papers will be held in Even semester).
c. Supplementary Examination: For the final year students, students can appear in supplementary examinations in their all backlog papers after the declaration of their Final semester results only.

Semester Examinations

Examinations of all the papers will be held twice in a year. Students will be required to fill up an examination form that will be made available at School of open and Distance Learning. The

university would send admit-cards to all the eligible students. Examination fee of Rs. 2,000 will be charged. Admit cards will be issued for examination in the papers for which the student had registered. The decision about the Examination Centers will be the prerogative of the university.

The evaluation in each course shall consists of 100 marks (75 marks for Semester end examination and 25 marks for Internal Assessment)

A candidate will be evaluated in each course depending on learning objectives and requirements of the course contents.

The scheme of marks consists of 25% weight age to continuous internal evaluation i.e. assignment and 75% to evaluation based on Semester–end Examination consisting of written papers.

Award of division to successful candidates

The result of the successful candidates shall be classified at the end of the final year of examination on the basis of the aggregate of marks of all subjects (theory, practical and project) secured by the candidate in the I& II year examinations, as indicated below:

Passing percentage	40% & above
II Division	50% & above
I Division	60% & above
Distinction	75% & above in each paper.

Rationalization of weightage for internal assessment and term end examination in programmes offered in SODL :-

1. The Weightage of term- end examination would be 75%.
2. Weightage for Internal Assessment would be 25%.

Grading System

The grade awarded to a student in any particular course will be based on his/her performance in sessional and final examinations. The letter grades and their equivalent numerical points are listed below

% of Marks	Letter Grade	Grade Point	Description of Performance
> 85	A+	10	Outstanding
75 - <85	A	9	Excellent
65 - <75	B+	8	Very Good
60 - <65	B	7	Good
50 - <60	C+	6	Average
45 - <50	C	5	Marginal
<45	F	4	Poor
Absent/ Detained	I	-	Incomplete

If a candidate does not write a paper, he/ she will be awarded I grade. Earned Credit (E C)

The credit for the course in which a student has obtained "C" or a higher grade will be counted as credits earned by him / her. Any course in which a student has obtained "F" grade will not be counted towards his/ her earned credits

Evaluation of Performances

- SGPA (Semester Grade Point Average) will be awarded on successful completion of each semester
- CGPA (Cumulative Grade Point Average) which is the grade point average for all the completed semester at any point in time, which will be awarded in each semester on successful completion of the current semester as well as all of the previous semester. CGPA is not applicable in semester I.

Calculation of SGPA and CGPA in a semester

a. The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

SGPA (Si) = ∑(Earned Credits Ci x Grade Point Gi)/∑Earned Credits Ci;

Where Ci is the number of credits of the ith course and Gi is the Grade Point Scored by the student in the ith course.

b. The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

CGPA (Ci) = ∑(Earned Credits Ci x SGPA Si)/∑Ci);

Where Si is the SGPA of the ith semesters and Ci is the total number of credits in that semester.

c. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

Classification of successful candidates

The result of successful candidates who fulfill the criteria for the award of MBA shall be classified at the end of last semester, on the basis of his/her CGPA
Classification shall be done on the basis following criteria: -

- He/ she shall be awarded "Distinction" if her/ his final CGPA is 9 and above and passed all the semester examinations in the first attempt
- He/ she shall be awarded "First Division" if her/ his final CGPA is 6.75 and above but less than 9.00
- He/ she shall be awarded "Second Division" if her/ his final CGPA is 6.00 and above but less than 6.75.
- He/ she shall be awarded "Pass" if her/ his final CGPA is 5.00 and above but less than 6.00
- He / she shall be treated as "Fail" if his/ her final CGPA is less than 5.00

SYLLABUS

MCAD 101- Object oriented programming

UNIT 1
Introduction of object oriented Programming
Object oriented programming paradigm, Features of object oriented programming, advantage of OOP over procedure oriented programming, Introduction of object based, class based and object oriented languages, Applications of OOP.

UNIT 2

Basics of C++

History of C++, Structure of C++ program, Application areas of C++, Basis types and size, User defined data types and derived data types.

UNIT 3

Tokens, operators and expressions

Tokens, Identifiers, Keywords Constants, Symbolic constants and it's advantage, Reference variable, Variable declaration and definition, Static and dynamic initialization of variables, Operators, Scope resolution operator, member dereferencing Operator, member management operator, Type cast operator, precedence and associativity of operators.

UNIT 4

Control flow structures

Branching constructs: if –else, switch, else-if ladder, Looping constructs : for loop, while loop, do…while loop.

UNIT 5

Functions in C++

An overview of user –defined functions, Functions prototype, Function definition, and Function calls, Flow of controls in function call, return statements, parameters: value parameter, reference parameter, inline function, default arguments, const arguments, function overloading.

UNIT 6

Classes and data abstraction

Abstract data types (ADT), classes, class object class members, class scope, friend member function, constructors and destructors.

UNIT 7

Operator overloading

Introduction, rules for operator overloading, overloading unary and binary operators, overloading binary operators using friend function.

UNIT 8

Inheritance

Introduction, base class derived class, single inheritance, multilevel inheritance, multiple inheritance, hierarchal inheritance, virtual base class, abstract classes, constructor and destructor in derived classes.

UNIT 9

Virtual functions and polymorphism

Introduction, pointers to objects, this pointer, pointer to derived classes, virtual functions, polymorphism.

UNIT 10
Console I/O
Stream, stream classes, unformatted I/O operations, formatted I/O operations, manipulators.

UNIT 11
File I/O
Basics of data files, creating/ opening & closing a file, reading data from file, writing data into file, error-handing functions, random access of data files.

UNIT 12
Templates and exception handing
Introduction, templates, class templates, function templates, member function templates, exception handing.

Recommended Books

- Bjarne Stroustrup, **The C++ Programming Language,** Pearson Education
- E. Balagurusamy**Object Oriented Programming with C++,** Tata McGraw-Hill.
- Herbert Schild, **The Complete Reference C++,** Tata McGraw-HILL.
- Robert Lafore, **The Object Oriented programming with turbo C++**, Techmedia.

MCAD 102 - Computer Organization and Architecture

UNIT 1
Number Systems
Basic concepts of numbers, number base conversion, octal & hexadecimal numbers, Complements-the r's complement the (r—1)'s complement, Subtraction with r's and (r-1)'s complement, Comparison between 1's and 2's complements.
Different binary codes-ASCIL codes, EBCDIC codes, error detection codes, reflected codes, excess-3 codes.

UNIT 2
Data Representation

Integer representation-signed-magnitude representation, 1's complement representation, 2s complement representation. Fixed-point representation, floating-point representation, overflow.

UNIT 3
Logic gates and integrated circuits
Basic logic gates-AND, OR, NOT,X-OR, X-NOR, NAND, NOR gates, universal gates.

UNIT 4
Boolean Algebra
Basic concepts of Boolean Algebra-Axiomatic definitions of Boolean algebra, Basic theorems and properties of Boolean algebra-Duality, complement of a function. Boolean function representations-canonical and standard forms. Boolean function simplification-Algebraic Method, K-map method-two, three, four, six variable maps, SOP and POS simplification. Boolean function implementations-NAND and NOR implementations. Don't care conditions. Tabulation method-determination of prime implicants, selection of prime implicants.

UNIT 5
Realization of Boolean function
Multiplexer, decoder/demultiplexer, encoder, priority encoders, Flip-flop, counters, registers. Basic concepts of Read only memory-combinational logic implementations, Different types of ROMs.

UNIT6
Realization of arithmetic units
Adder- half adder, full adder, decimal adder, binary parallel adder, carry look ahead adder. Subtractor using adder and 2's complement numbers. Multiplier circuits.

UNIT 7
Register Transfer & Micro operations
Register Transfer Language (RTL), Bus and Memory transfer, Arithmetic& logic micro operations, Shift micro operations.

UNIT 8
Central Processing Units
Introduction, general register organizations, control word, stack organization, register stack, memory stack, reverse polish notation, evolution of arithmetic expressions.
Instruction format – three-address instructions, two-address instruction, one address instructions, zero address instructions.

Addressing modes, program control, program interrupt, types of interrupts, RISC and CISC characteristics Booth multiplication algorithm.

UNIT 9
Input-Output Organization
Peripheral devices Input-output interface, I/O versus bus, Isolated versus memory-mapped I/O, Asynchronous data control – strobe control, handshaking, Modes of data transfer, Priority interrupt-Daisy-chaining priority, Parallel priority interrupt, priority encoder, interrupt cycle, Direct Memory Access (DMA)-DMA controller, DMA transfer, Input-Output Processor (IOP), serial and Parallel communications.

UNIT 10
Memory Organization
Memory hierarchies, Main memory – RAM and ROM chips, Auxiliary memory, Associative memory –Hardware organization, match logic, read & write operations.
Cache memory – associate mapping, Direct mapping, Set-associative mapping, Writing into cache. Virtual memory – Address space and Memory space, Address mapping using pages, Page replacement.

Recommended Books:
- Rafiquzzaman and Chandra, Modern Computer Architecture, Galgotia Publication.
- Mano M. Morris, Logic & Computer Design Fundamentals, 2/e Person Education.
- Mano M. Morris, Computer System Architecture, 3/e, Pearson Education.

MCAD 103- Database Management Systems

UNIT 1
Introduction to database system concept
An overview of database system, basic database system terminology, database vs traditional file approach, Data models, schemas and instances. 3-schema architecture and data independence, Database Languages.

UNIT2
ER model
Entity, entity types, attributes and keys, relationship and relationship types and structural constraints. Weak entity types, ER diagrams, Naming conventions and design issues.

UNIT 3
Relational model
Structure of Relational databases, relational algebra, integrity constraints: Domain constraints, referential constraints, functional dependencies.

UNIT 4
Relational query languages
SQL : DDL, constraints and schema changes in SQL, Insert delete and update statements, Views, Aggregate functions, Nested sub queries.
Introduction to SQL *plus, functions procedures triggers etc.

Design theory for relational databases: What constitutes a bad database design, Decomposition, Insert, delete and update anomalies. Normalization using functional dependencies. First, second, third normal forms and BCNF.

UNIT 5
Indexing and hashing:
Hashed files, indexed files Single-level index, multilevel index, dynamic multilevel indexing using B and B+ trees.

UNIT 6
Concurrency control techniques:
Basic Concepts: Items, locks, Deadlocks, serializability, Locking two phase locking & Time stamping ordering protocols.

UNIT 7
Database recovery technique:
Failure classification, recovery concepts, recovery techniques based on deferred and immediate update, Shadow paging.

References

- Database management systems ElmasariNavathe Pearson education
- Database management systems RaghuRamakrishnan Tata McHills
- Database management systems Korth

MCAD 104 - Software Engineering

Unit I
Introduction, Software Model and Process: Software Crisis, Need and Definition of Software Engineering, Software Myths, Process Model: Waterfall Model, V-Model, Incremental Model, Evolutionary Model,

Unit II
Requirement Engineering: Inception, Elicitation, Elaboration, Negotiation, Specification, Validation, Requirements, Analysis& Model: Domain Analysis, Data Flow Modeling, Class-based Modeling, CRC Modeling.

Unit III
Software Design Concepts: Abstraction, Modularity, Cohesion, Coupling, Software Design: Architectural Design, Data Design: Entity Relationship Design, User Interface Design, Object Oriented Design, Web Application Design: Aesthetic Design, Content Design, Navigation Design

Unit IV
Testing and Quality: Software Testing, Verification and Validation, Test Strategy: Unit Testing, Integration Testing, System Testing, User Acceptance Testing: Alpha & Beta Testing, Internal and External View of Testing: White Box Testing, Black Box Testing, Quality Concepts, Garvin's Quality Dimension, McCall's Quality Factors, ISO 9126 Quality Factors

Unit V
Maintenance and Software Metrics: Maintenance: Corrective, Perfective, Adaptive, Metrics: Size Oriented Metrics, Function Point Metrics, CK Metrics suite, Introduction to Risk Management

TEXT BOOKS
- R. S. Pressman, "Software Engineering – A practitioner's approach", 7th Edition, McGraw Hill Int. Ed., 1992.
- K. K. Agarwal and Yogesh Singh, Software Engineering, New Age

REFERENCE BOOKS
- P. Jalote, "An Integrated approach to Software Engineering", Narosa, 1991.
- Stephen R. Schach, "Classical & Object Oriented Software Engineering", IRWIN, 1996.
- James Peter, W Pedrycz, "Software Engineering", John Wiley & Sons

MCAD 106- Communication Skills

UNIT 1
The Sentence: Sentence formation, Types of Sentences (Declarative , Interrogative, Imperative, Exclamatory, simple, Compound and Complex Sentences), Use of Connectives in Complex and Compound sentences, Agreement of Subject and Verb.

UNIT 2

Parts of Speech: Noun, Pronouns, Verb (Verbs classified according to form and types of Verbs), Adjectives and their Usage in Daily Life, Adverbs (type, position and functions of Adverbs), Prepositions , Conjunctions , Interjections, errors of accidence and syntax with reference to Parts of Speech, Articles.

UNIT 3

Tenses, Narration and Voice: Descriptive study of Tenses, real life usage of Tenses, Active and Passive Voice, Conversion of Active voice into Passive voice, Direct speech, Reported speech, Conversion of Direct speech into Indirect speech.

UNIT4

Vocabulary Usage and Technical Writing: Word Formation (by adding suffixes and prefixes), Synonyms, Antonyms, Homophones and Homonyms, One Word Substitutions, Confusing Words, Common Differences between British English and American English, Punctuation, Letter Writing, Paragraph and Essay writing, Interpretation and Use of Charts, Graphs and Tables in technical writing , Comprehension of Unseen Paragraphs.

TEXT BOOKS

- Maison, Margaret M. Examine Your English, Hyderabad: Orient Longman, 1980.
- Sharma, R.S. Technical Writing. Delhi: Radha Publication, 1999.
- Sudarsanam, R. Understanding Technical English. Delhi: Sterling Publishers Pvt. Ltd.,1992

Roy, A. and Sharma P.L., English for Students of Science , Orient Longman, 2008.

MCAD 201- Mathematical Foundations for Computer Applications

UNIT 1

Probability Functions and Distributions

Probability mass, density, and cumulative distribution functions, Parametric families of distributions, Expected value, variance, conditional expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov chains.

UNIT 2

Random Sample Distribution

Random samples, sampling distributions of estimators**,** Methods of Moments and Maximum Likelihood.

UNIT 3

Statistical Models

Statistical inference**,** Introduction to multivariate statistical models: regression and classification problems, principal components analysis**,** The problem of overfitting model assessment.

UNIT 4

Graph Theory

Graph Theory: Isomorphism, Planar graphs, graph colouring, hamilton circuits and euler cycles. Permutations and Combinations with and without repetition. Specialized techniques to solve combinatorial enumeration problems

UNIT 5

Computer Science & Engineering Applications

Computer science and engineering applications**:** Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.

Text/ Reference Books:

- John Vince, Foundation Mathematics for Computer Science, Springer.
- K. Trivedi.Probability and Statistics with Reliability, Queuing, and Computer Science Applications. Wiley.
- M. Mitzenmacher and E. Upfal. Probability and Computing: Randomized Algorithms and
- Probabilistic Analysis.
- Alan Tucker, Applied Combinatorics, Wiley

MCAD 202- Data Structures

UNIT 1

Introduction

Data, Data type, Built-in data type, Abstract data type, Overview of data structures: Linear vs. non-linear data structures, Implementations of data structures.

UNIT 2
Arrays
Static vs. Dynamic memory allocations, Single dimensional vs. multidimensional arrays, Implementations of arrays, Operations on arrays: Traversing, Sorting, searching, Merging, Insertion, Deletion, Memory representation of a matrix for Row-major order and Column-major order, Reference of elements in a matrix for row-major order and column-major order, Sparse matrices: Additions, transpose etc.

UNIT 3
Linked Lists
Single Linked List (SLL): static vs Dynamic representation, Operations on a SLL-Traversing, Insertion, Deletion, Copy, Merging, and searching a particular element in a list; Circular Linked Lists (CLL), Double Linked Lists (DLL), Operations on a DLL-Traversing, Insertion, Deletion, Copy, Merging, a n searching a particular element in a list; Circular Double Linked Lists, Linked List representation of a sparse matrix, Linked List representation of Polynomial.

UNIT 4
Stacks
Introduction, Array representation of stacks, Linked List representation of stacks, Operations on Stacks: Push, Pop and Status; Applications of stacks: Evaluation of arithmetic expressions, conversion of a infix expression to postfix expression, Implementation of recursion, Factorial calculation, Quick sort, tower of Hanoi problem.

UNIT 5
Queues
Introduction, Array representation of Queues, Linked List representation of Queues, Queue structures: Circular queue, Deque, Priority queue, Application of queues: Simulation, CPU scheduling in multiprogramming environment, Round Robin Algorithm.

UNIT 6
Hashing

Introduction, Hash function, Hashing techniques: Division method, Midsquare method, Folding method, Digit analysis method; Rehashing Collision resolution techniques: closed hashing or linear probing method, Open hashing or chaining method.

UNIT 7
Sorting and Searching
Preliminaries, Insertion sort, Shell sort, Heap sort, Merge sort, Quick sort, Bucket sort, Liner vs. binary search.

UNIT 8
Trees
Basic terminologies: Node, parent, child, link, root, leaf, level, height, degree and sibling; Binary trees: full binary tree, completed binary tree, properties of binary trees; Representation of binary tree: linear representation and linked list representations; Operations on binary tree: Insertion, Deletion, Traversal and Merge; Types of binary trees: Expression tree, Binary search tree, Heap tree, Threaded binary tree, Huffman tree, Height balanced tree or AVL tree, and Decision tree. Trees and forests, Introduction of B tree and B+ tree.

UNIT 9
Graph
Introduction, Graph Terminology, Representation of Graph-Set Representation, Linked Representation, Matrix Representation. Operation on Graph.

Recommended Books
- Robert L. Kruse, Bruce P. Leung, Clovis. Tondo, ***Data Structure and Program Design in C,*** Pearson Education.
- D.Samanta***Classic Data Structures,*** Tata McGraw-Hill.
- Langusam, Augentein&Tnenbaum***Data Structures using C/C++***, Pearson Education.

MCAD 203- Java Programming

UNIT 1
Java Basics
Introduction, its features, difference between java and C++ , overview.

UNIT 2
Data types, expressions and control structure

Data types, variables, arrays, type conversion, and casting, type promotion operations, control statements.

UNIT 3
Class and objects
Fundamentals, objects, methods, constructors, finalize () method, Method overloading Argument passing, Recursion, Access control, this static, final nested and inner classes, using command line arguments.

UNIT 4
Inheritance
Inheritance basics, using super order of constructor call, method, overriding, multilevel inheritance, dynamic method dispatch, abstract class, preventing inheritance and overriding.

UNIT 5
String, vector and wrapper classes
Interface: Introduction, extension, Implementation and accession of Interface variable.

UNIT 6
Package: Introduction, java API Package, using system packages, naming conventions, creating package, accessing a package, using a package, adding a class to a package, hiding classes.

UNIT 7
Exception handling
Fundamentals, exception types, uncaught exception, syntax of exception handling code, try catch statement multiple catch statements, nested try statement, throw statement.
Java built in exceptions, creating our own exception subclasses.

UNIT 8
Multithreaded programming.
Introduction, thread model, creating threads, creating multiple threads, extending the thread class, Alive(), Join(), Using thread methods, life cycle of a thread, suspending, blocking, resuming, stopping, thread exceptions, thread priorities, synchronization, interthread communication, implementing the runnable interface.
Using multithreading.

UNIT 9
The Java library
String class String handling, java.lang, wrapper class java.util, java.io, managing input output files.

UNIT 10
Applet Programming
Applet basics, applets and application, applet life cycle, security consideration, applet class, methods, ewriting applets, applet tags, passing parameters to applets, getting input from the users, alignment, displaying numerical values. Audioclip Interface, AppletStub Interface.

Recommended Books

- Patrick Naughton, and Herbert Schildt, "The complete reference Java 2", TATA Mc Graw-Hill
- E Balaguruswamy, "programming with java", TATA Mc Graw-Hill.
- Mughal,Programmer's Guide to Java Cerification, Pearson Education
- Deitel and Dietel,Java How to program, Pearson Education

MCAD 204 - Operating Systems

UNIT 1
Introduction
Services Provided, Evolution: Serial, Batch, Multiprogramming, Real & Distributed Operating System, Layered Approach, System Calls, Nucleolus of Operating System,

UNIT 2
Process
Concept, Process Control Block, States, State Transitions Diagram, Operations on Process, Interrupt Processing Swapping , Context Switching, Co-operating Processes, Deadlock Introduction, Examples Indefinite Postponement, Necessary Conditions, Prevention. Avoidance, Detection &Recovdery, Bankers Algorithm, Case Study: UNIX.

UNIT 3
Scheduling

Introduction, Levels of Scheduling, Objectives, Pre-emptive & Non-pre-emptive Scheduling, CPU Scheduling Algorithms: FCFS, RR, SJF, SRT, HRRN, Multi-Level Feedback Queues, Illustrative Examples, Fair share scheduling, Scheduling In Distributed Systems, Case Study: UNIX.

UNIT 4

Process Synchronization

Introduction, Critical Section, Race Conditions, Mutual Exclusion Primitives, Dekker Algorithm, Peterson Algorithm, Bakery Algorithm, Hardware Solution, Semaphores, Classical Problems: Producer Consumer Problem, Sleeping barber Problem, Dinning Philosopher Problem.

UNIT 5

Memory Management

Introduction, Contiguous & Non-Contiguous, Paging, Segmentation, Paging with Segmentation, Virtual Memory Management: Introduction, Demand Paging, Page Replacement, Locality, Working set, Page Fault Frequency.

UNIT 6

Auxiliary Memory Management

File Systems: Introduction, File system Structure, Directory Structure, File system Implementation, Directory Implementation, Allocation Methods, Free space Management, Mass Storage Management: Disk Structure, Disk Scheduling, Disk Management, Swap Space Management.

Recommended Books

- Silberschatz, Galvin, Gagne, ***Operating System Concept,John Willey***
- H.M. Deitel, ***Operating System,Pearson Education***
- Operating System by William Stallings***,Pearson Education***
- Andrew S. Tanenbaum, ***Modern Operation Systems,Pearson Education***
- MilanMilenkovic, ***Operating Systems: Concepts & Design***
- Maurice J. Bach, ***The Design of UNIX Operating System ,Pearson Education***

MCAD 301 - Design and Analysis of Algorithms

UNIT 1
Introduction
Concepts of algorithmic efficiency; Run Time analysis of Algorithms; Order notation – Big O , little o, Theta and Omega and little omega notation.

UNIT 2
Solving recurrences
Substitution, recursion tree and Master's method

UNIT 3
Sorting Algorithms
Best, worst and average case analysis of insertion sort, selection sort, bubblesort, Merge sort, quicksort and heap sort.

UNIT 4
Linear Time sorting
Bucket sort, Radix sort and counting sort.

UNIT 5
Searching in Linear Time
Hashing; open and closed hashing, Hash functions, Universal-Hashing functions.

UNIT 6
Representation of Trees (Advanced data structures)
Heaps and priority Queues, Binomial Heaps: Introduction to binomial trees, properties of binomial trees, Definition of Binomial Heap: Find Minimum, Extract Minimum, Insertion , Deletion, Merging, Decrease Key
Red-Black trees : Introduction , properties of a Red Black trees, Insertion and Deletion.
Range trees, Interval Trees.

UNIT 7
Algorithm Design strategies
Divide and Conquer: Structure of Divide-and-Conquer Algorithms: Example Applications from Binary Search, Integer Multiplication, Strassen's matrix multiplication, Nearest Neighbor, Analysis of Divide-and-Conquer Run-Time Recurrence relations.

UNIT 8
Dynamic programming
Form of Dynamic programming Algorithms; Differences between Dynamic programming and Divide-and-Conquer; Examples from: All pairs shortest path in graphs; Ordering of Matrix Multiplication, Longest Common Subsequence.

UNIT 9
Greedy Approach
Overall View of greedy Paradigm, Example of Exact Optimization Solution (minimum spanning tree) and approximate Solution 0/1 Knapsack Problem.

UNIT 10
Backtracking Approach
The N-Queen's Problem, Graph Coloring,0/1 Knapsack Problem.

UNIT 11
Pattern Matching Algorithms
KMP (Knuth-Morris-Pratt) and BM(Boyer-Moore) Algorithms

UNIT 12
NP-Completeness: Combinatorial Search and Optimization Problems; Informal View of the case NP As problems With Efficient Checking Algorithms; Approaches to tackling the question of P=NP.Informal review of NP-Completeness, Cook's Theorem (Without Proof)

Recommended Books

- Cormen,Leirson,Rivest,Stein, Introduction to Algorithms, PHI
- HorowithzSahni, Analysis and Design of Algorithms
- Aho, HopcraftUlman, Design and Analysis of Algorithms, Pearson education.

MCAD 302 - Artificial Intelligence

UNIT 1
Artificial Intelligence: its roots and scope
Introduction, Intelligent agents

UNIT 2
Representation & Search
Solving Problems By Searching, Informed Search Methods, Adversarial Sea4rch, Symbolic Representation with PROLOG/LISP

UNIT 3
Representation & Intelligence
Logical Agents, First-Order Logic, Inference in First-Order Logic, Rule based systems, Semantic nets, frames, conceptual dependencies.

UNIT 4
Strong Method Problem solving
Rule based Expert Systems, non-monotonic logic, Planning

UNIT 5
Uncertain Knowledge and Reasoning
Uncertainty, Probabilistic Reasoning, Making Simple Decisions, Making Complex Decisions.

UNIT6
Machine Learning
Symbol based, Connectionist, Neural nets, Social and Emergent

UNIT 7
Application of AI
Natural Language processing, vision, Expert
UNIT 8
WrapUp& Project Presentations
Philosophical Foundations, AI: Present and Future, Project Presentations

UNIT 9

Text

George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving (4th ed.), (Pearson Education, New Delhi, 2003)

References

Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, (Prentice Hall India, New Delhi, 2003)

E. Rich & K. Knight, Artificial Intelligence (2nd ed.), (TataMcGraw-Hill, New Delhi, 2000)

P.H. Winston, Artificial Intelligence (3rd ed.), (Addison-Wesley, New Delhi, 1993)

PROGRAM ELECTIVES (PE)

PE - 1

MCAD PE111 - Formal Languages and Automata Theory

Unit – I

INTRODUCTION: Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other.

Unit – II

REGULAR EXPRESSION (RE) AND REGULAR LANGUAGES: Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

Unit – III

CONTEXT FREE GRAMMAR (CFG) AND CONTEXT FREE LANGUAGES (CFL): Definition, Examples, Derivation , Derivation trees, Ambiguity in

Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

Unit – IV

PUSH DOWN AUTOMATA (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.

Unit – V

COMPUTABILITY: Turing Machines: Turing machine as a model of Computation, Universal Turing machine, Language Acceptability, Decidability, Halting Problem.

TEXTBOOKS

- P. Linz, *An Introduction to Formal Languages and Automata*, 5th Edition, Jones Barlett, 2011.
- John E. Hopcroft, Rajeev Motwani& Jeffery D. Ullman, *Introduction to Automata Theory, Languages and Computation*, 3rd Edition, Pearson Education, 2007.

REFERENCE BOOKS

- John C. Martin, *Introduction to Languages and the Theory of Computation*, 4th edition, TMH, 2011.
- Daniel I. A.Cohen, *Introduction to Computer Theory*, **2**nd edition, John Wiley, 1997.
- Harry R. Lewis, Christos H. Papadimitriou, *Elements of the Theory of Computation*, 2nd edition, Pearson Education, 1998.

MCAD PE112 - Compiler Design

Unit- I: Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX- compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG

Unit- II: Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing

tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.

Unit-II: Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.

Unit- III: Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors

Unit- IV: Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.

Textbooks: 1. Aho, Sethi& Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education 2. V Raghvan, " Principles of Compiler Design", TMH 3. Kenneth Louden," Compiler Construction", Cengage Learning. 4. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson Education

References: 1.K. Muneeswaran,CompilerDesign,FirstEdition,Oxford University Press. 2.J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill,2003. 3.HenkAlblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.

MCAD PE113 - Distributed systems

Unit – I: Introduction to Distributed Database Management System Architecture

INTRODUCTION: Distributed data processing; What is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and computer network concepts

DISTRIBUTED DATABASE MANAGEMENT SYSTEM ARCHITECTURE: Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues

Unit – II: Distributed Database Design

DISTRIBUTED DATABASE DESIGN: Alternative design strategies; Distributed design issues; Fragmentation; Data allocation

SEMANTICS DATA CONTROL: View management; Data security; Semantic Integrity Control

QUERY PROCESSING ISSUES: Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data

Unit – III: Distributed Query Optimization

DISTRIBUTED QUERY OPTIMIZATION: Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms

TRANSACTION MANAGEMENT: The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models

CONCURRENCY CONTROL: Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management

Unit – IV: Reliability

RELIABILITY: Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols

Unit – V: Parallel Database Systems

PARALLEL DATABASE SYSTEMS: Parallel architectures; parallel query processing and optimization; load balancing

Unit – VI: Advanced Topics

ADVANCED TOPICS: Mobile Databases, Distributed Object Management, Multi-databases.

Text/ Reference Books:

- Principles of Distributed Database Systems, M.T. Ozsu and P. Valduriez, Prentice-Hall, 1991.
- Distributed Database Systems, D. Bell and J. Grimson, Addison-Wesley, 1992.

PE – 2

MCAD PE221 - Data Science

Unit – I: Introduction to core concepts and technologies

Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.

Unit – II: Data collection and management

Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources

Unit – III: Data analysis

Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance,Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

Unit – IV: Data Visualisation

Data visualisation: Introduction, Types of data visualisation,Data for visualisation:Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.

Unit – V: Applications of Data Science

Applications of Data Science,Technologies for visualisation, (Python)

Unit – VI: Recent trends

Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

Text/ Reference Books:

- Joel Grus, Data Science from Scratch: First Principles with Python, O'Reilly Media
- Jake VanderPlas, Python Data Science Handbook: Essential Tools for Working with Data, O'Reilly Media
- Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly.

Jure Leskovek, AnandRajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press

MCAD PE222 - Data Mining

Unit-I

DATA WAREHOUSING: Basic concepts in data warehousing, Collecting the requirements of data warehouse, Data Warehouse Architecture, Design, Implementation & Maintenance, OLAP in data warehouse, Data warehousing and the web, Data Cube Technology, From Data Warehousing to Data Mining.

Unit-II

DATA MINING CONCEPTS: Data mining primitives, Basics of data mining, Query language, Architectures of data mining system

Unit-III

MINING ASSOCIATION RULES IN LARGE DATABASES: Association Rule Mining, Mining Single Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint Based Association Mining.

Unit-IV

CLASSIFICATION AND PREDICTION: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods, Prediction, Classifier Accuracy.

Unit-V

CLUSTER ANALYSIS IN DATA MINING: Types of Data in Cluster Analysis. A Categorization of Major Clustering Methods, Partitioning Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Outlier Analysis.

MINING COMPLEX TYPES OF DATA: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time Series and Sequence Data, Mining Text Databases.

TEXTBOOKS

- Alex Berson& Stephen J. Smith, *Data Warehousing, Data Mining & OLAP*, Tenth Reprint, TMH, 2007.
- Jiawei Han & Micheline Kamber, *Data Mining Concepts and Techniques*, 2nd Edition, Elsevier, 2007.

REFERENCE BOOKS

- Pang-Ning Tan, Michael Steinbach &Vipin Kumar, *Introduction To Data Mining*, Pearson Education, 2007.
- G. K. Gupta, *Introduction to Data Mining with Case Studies*, Easter Economy Edition, PHI, 2006.
- Daniel T. Larose, *Data Mining Methods and Models*, Wile-Interscience, 2006.

MCAD PE223 - Knowledge Discovery

Unit – I: Introduction KDD and Data Mining

Data Mining and Machine Learning, Machine Learning and Statistics, Generalization as Search, Data Mining and Ethics

Unit – II: Knowledge Representation

Decision Tables, Decision Trees, Classification Rules, Association Rules, Rules involving Relations, Trees for Numeric Predictions, Neural Networks, Clusters

Unit – III: Decision Trees

Divide and Conquer, Calculating Information, Entropy, Pruning Estimating Error Rates, The C4.5 Algorithm **Evaluation of Learned Results**- Training and Testing, Predicting Performance, Cross- Validation

Unit – IV: Classification Rules

Inferring Rudimentary Rules, Covering Algorithms for Rule Construction, Probability Measure for Rule Evaluation, Association Rules, Item Sets, Rule Efficiency

Unit – V: Numeric Predictions

Linear Models for Classification and Numeric Predictions, Numeric Predictions with Regression Trees, Evaluating Numeric Predictions

Unit – VI: Artificial Neural Networks

Perceptrons, Multilayer Networks, TheBackpropagation Algorithm

Clustering - Iterative Distance-based Clustering, Incremental Clustering, The EM Algorithm

Text/ Reference Books:

- Data mining and knowledge discovery handbook by Maimon, oded(et al.)
- Data Cleansing: A Prelude to knowledge Discovery

PE – 3

MCAD PE331 Soft Computing

Unit – I: Introduction To Soft Computing And Neural Networks

INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

Unit – II: Fuzzy Logic

FUZZY LOGIC: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

Unit – III: Neural Networks

NEURAL NETWORKS: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks

Unit – IV: Genetic Algorithms

GENETIC ALGORITHMS: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition

Unit – V: Matlab/Python Lib

Matlab/Python Lib: Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic

Unit – VI: Recent Trends in Deep Learning

Recent Trends in deep learning, various classifiers, neural networks and genetic algorithm.
Implementation of recently proposed soft computing techniques.

Text/ Reference book:

- Jyh:Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, Neuro:Fuzzy and Soft Computing, Prentice:Hall of India, 2003.
- George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic:Theory and Applications, Prentice Hall,1995.
- MATLAB Toolkit Manual

MCAD PE332 Machine Learning

Unit – I: Supervised Learning

Supervised Learning (Regression/Classification) - Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes - Linear models: Linear Regression, Logistic Regression, Generalized Linear Models; Support Vector Machines, Nonlinearity and Kernel Methods; Beyond Binary Classification: Multi-class/Structured Outputs, Ranking.

Unit – II: Clustering

Clustering: K-means/Kernel K-means; Dimensionality Reduction: PCA and kernel PCA; Matrix Factorization and Matrix Completion; Generative Models (mixture models and latent factor models).

Unit – III: Evaluating Machine Learning

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests).

Unit – IV: Sparse Modeling & Estimation

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning

Unit – V: Scalable Machine Learning

Scalable Machine Learning (Online and Distributed Learning A selection from some other advanced topics, e.g., Semi-supervised Learning, Active

Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference.

Unit – VI: Recent Trends in various learning technique

Recent trends in various learning techniques of machine learning and classification methods for IOT applications. Various models for IOT applications.

Text/ Reference Books:

- Tom M. Michell, Machine Learning, McGraw Hills
- AurÈlienGÈron, Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems, Orielly Publications
- Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
- Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)
- Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007

MCAD PE333 - Cryptography and Network Security

Unit 1: Security in Computing Environment: Need for Security; Security Attack – Threats, Vulnerabilities, and Controls, Types of Threats (Attacks); Security Services – Confidentiality, Integrity, Availability; Information Security; Methods of Protection.

Unit 2: Basics of Cryptography: Terminologies used in Cryptography; Substitution Techniques – The Caesar Cipher, One-Time Pads, The Vernam Cipher, Book Cipher; Transposition Techniques – Encipherment/Decipherment Complexity, Digrams, Trigrams, and Other Patterns.Encryption and Decryption: Characteristics of Good Encryption Technique; Properties of Trustworthy Encryption Systems; Types of Encryption Systems – Based on Key, Based on Block; Confusion and Diffusion; Cryptanalysis.

Unit-3: Network Security: Network Concepts; Threats in Networks – Who Attacks Networks? Threats in Transit: Eavesdropping and Wiretapping, Protocol Flaws, Impersonation; Network Security Controls – Architecture, Encryption, Virtual Private Networks, Public Key Infrastructure (PKI) and Certificates.

Unit 4 : IP Security: Overview of IP Security (IPSec); IP Security Architecture; Modes of Operation; Security Associations (SA) – Security Parameter Index (SPI), SA Management, Security Policy; Authentication Header (AH); Encapsulating Security Payload (ESP); Internet Key Exchange.Web Security: Web Security Requirements; Secure Socket Layer (SSL) – SSL Architecture, SSL Protocol; Transport Layer Security (TLS); Secure Electronic Transaction (SET) – Features, Components, Dual Signature, Purchase Request.

Unit5: Firewalls: Firewalls – Types – Packet Filtering Gateway, Stateful Inspection Firewall, Application Proxy, Guard, Personal Firewalls; Comparison of Firewall Types; Firewall Configurations.

Text Books:

- William Stallings, “Cryptography and Network Security”
- Alfred J. Menezes, Paul C. van Oorschot, Scott A. Vanstone, “Handbook Of Applied Cryptography”
- Charlie Kaufman, Radia Perlman, Mike Speciner, “Network Security: Private Communication in a Public World”

Skill Enhancement Electives (SEE)

MCAD SEE311 Android Programming

Unit- I: Java introduction • OOPs Concepts • Abstract class & Interface • Exception handling • Multi threading(Thread class & Runnable Interface) Why Android? • Android Run Time • Android Studio • Introduction to Gradle.Basic Building blocks – Activities, Services, Broadcast Receivers & Content providers

• UI Components- Views & notifications • Components for communication - Intents & Intent Filters • Android API levels(versions & version names)

Unit- II: Application Structure • AndroidManifest.xml • uses-permission • Activity/services/receiver declarations • Resources & R.java • Layouts &Drawable Resources • Activities and Activity lifecycle Emulator • Launching emulator • Editing emulator settings • Emulator shortcuts • Logcat usage • Introduction to Android Device Monitor (ADM) • File explorer Intents • Explicit Intents • Implicit intents. Basic UI design, Styles & Themes - Form widgets • Text Fields • Layouts o RelativeLayout ,TableLayout, FrameLayout, LinearLayout, Nested layouts o [dip,dp,sip,sp] versus px o styles.xml o drawable resources for shapes,gradients(selectors) o Style attribute in layout file • Applying themes via code and manifest file • AlertDialogs& Toast\ • Time and Date • Images and media Menu • Option menu And Action Bar(menu in action bar) • Context menu and contextual action mode • Popup menu • menu from xml • menu via code • Linkify • MatchFilter&TransformFilter

Unit – III: ArrayAdapters • BaseAdapters • ListView and ListActivity • Custom listview • GridView using adapters • Gallery using adapters • Android Session and Session management Content Providers • SQL • DML & DDL Queries in brief • SQLiteDatabse • SQLiteOpenHelper • Cursor • SQLite Programming • Reading and updating Contacts • Android Debug Bridge(adb) tool • Broadcast Receivers • Services Notifications • Alarm • Via service Customize • Toast • Dialogs • Tabs • Animated popup panels • Grid view • Spinner • Thread. • AsynTask • XML Parsing • Android JSON parsing using Volley • How to create REST API for Android app using PHP • Mysql • Accessing Phone services(Call,SMS)

Unit- IV: Fragments - Introduction to fragments • Fragments Life Cycle • Fragments in Activity • Google Maps V2 using Fragments • Develop Fragment based UI designs (Fragment Tabs,ListViewetc) • Location based Services • GPS • Geocoding • Network connectivity services • Sensors(Accelerometer, Gyroscope). • Using Wi-Fi& Bluetooth. • Google Cloud Messaging for Android. • App Widgets.

MCAD SEE312 Linux and Unix Programming

UNIT – I INTRODUCTION TO LINUX AND LINUX UTILITIES: A brief history of LINUX, architecture of LINUX, features of LINUX, introduction to vi editor. Linux commands- PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin.Text Processing utilities and backup utilities , tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio

UNIT - II Introduction to Shells: Linux Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization. Filters: Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, Comparing Files.

UNIT - III Grep: Operation, grep Family, Searching for File Content. Sed :Scripts, Operation, Addresses, commands, Applications, grep and sed. UNIX FILE STRUCTURE: Introduction to UNIX file system, inode (Index Node), file descriptors, system calls and device drivers. File Management :File Structures, System Calls for File Management – create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir, umask.

UNIT - IV PROCESS AND SIGNALS: Process, process identifiers, process structure: process table, viewing processes, system processes, process scheduling, starting new processes: waiting for a process, zombie processes, orphan process, fork, vfork, exit, wait, waitpid, exec, signals functions, unreliable signals, interrupted system calls, kill, raise, alarm, pause, abort, system, sleep functions, signal sets. File locking: creating lock files, locking regions, use of read and write with locking, competing locks, other lock commands, deadlocks.

UNIT - V INTER PROCESS COMMUNICATION: Pipe, process pipes, the pipe call, parent and child processes, and named pipes: fifos, semaphores: semget, semop, semctl, message queues: msgget, msgsnd, msgrcv, msgctl, shared memory: shmget, shmat, shmdt, shmctl, ipc status commands.

TEXT BOOKS: 1. W. Richard. Stevens (2005), Advanced Programming in the UNIX Environment, 3rd edition, Pearson Education, New Delhi, India. 2. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson.

MCAD SEE313 ASP.Net Programming

Unit- I: Exploring the .NET Framework File I/O• Resource management with try/finally/using•Using XML serialization• Introducing assembly resolution• Deploying dependent assembly probing• Using a config file to control probing•ArrayList•Hashtable•SortedList• Stack and Queue• 13. Windows Form Introduction to Windows Form•Form Controls• User Define Controls•

Unit- II:ADO.NET Connected Architecture• Disconnected Architecture• Working with Transaction• 15. Windows Presentation Foundation(WPF) Windows Application using WPF• Data Binding• Data Template• Styles• Commands• 16. ASP.NET Web Application using ASP.NET• ASP.NET Architecture• Control-based Programming• User Interface Elements• Deployment•Web Sites, Applications, and Virtual Directories in IIS ASP.NET Diagnostics and Health Monitoring•

Unit- III;ASP.NET Working With Data Data Binding• State Management• Validation• Caching• 18. ASP.NET 3.5 Security IIS 6•& IIS7 URL Authorization Forms authentication• Role-based authorization• Trimming site maps with roles•Config file encryption• ASP.NET Membership• Resources and Internationalization• 19. ASP.NET 3.5 Advanced Topics HTTP Pipeline• Custom Controls• Web Parts• Web Services•

Unit-IV: ASP.NET AJAX ASP.NET Ajax Introduction• ASP.NET Ajax Server Controls• ASP.NET Ajax Server Data• ASP.NET Ajax Client-side Library• ASP.NET Ajax Control Toolkit• 21. ASP.NET MVC Web Application using MVC Pattern• Razor View• Controller• Model• 22. Entity Framework Introducing the Entity Framework• Code First Approach•

Unit- V: Windows Communication Foundation(WCF) WCF Configuration• Hosting WCF Services in Windows Services• Hosting WCF Services in IIS• Building RESTful services with WCF• 24. Windows Workflow Foundation(WF) Introducing Windows Workflow Foundation• Programming workflows in WF• Writing custom activites in WF•

OPEN ELECTIVES (OE)

MCAD OE311 E-Governance and Smart City

UNIT-I: E- GOVERNANCE - The concept of management, concept of e-management & e-business, e-Government Principles, Form e-Government to e-governance, e-governance and developing countries, Designing and Implementing e-Government Strategy, E governance: Issues in implementation.

Interactions in e-Governance, Advantages of e-Governance, e-Governance Initiatives, The National e-Governance Plan (NeGP), e-Kranti – Electronic Delivery of Services

UNIT- II: Understanding – Dimensions – Global experience, Global standards and performance bench marks, Practice codes. India 100 smart cities policy and mission, Smart city planning and development, Financing smart cities development, Governance of smart cities.

UNIT III: GREEN BUILDING CONCEPTS AND SUSTAINABLE DEVELOPMENT - Green projects in smart cities, sustainability – green building – Rating system – Energy efficient building – energy saving systems. SMART URBAN TRANSPORT SYSTEMS -Elements of Infrastructure (Physical, Social, Utilities and services), Basic definitions, concepts, significance and importance; Data required for provision and planning of urban networks and services; Resource analysis, Provision of infrastructure. Role of transport, types of transport systems, evolution of transport modes, transport problems and mobility issues. Urban form and Transport patterns, land use – transport cycle, concept of accessibility. Hierarchy, capacity and geometric design elements of roads and

intersections. Basic principles of Transport infrastructure design. Urban transport planning process –Transport, environment and safety issues. Principles and approaches of Traffic Management, Transport System Management.

UNIT IV Water – sources of water, treatment and storage, transportation and distribution, quality, networks, distribution losses, water harvesting, recycling and reuse, norms and standards of provision, institutional arrangements, planning provisions and management issues. Sanitation – points of generation, collection, treatment, disposal, norms and standards, grey water disposal, DEWATS, institutional arrangements, planning provisions and management issues. Municipal and other wastes –generation, typology, quantity, collection, storage, transportation, treatment, disposal, recycling and reuse, wealth from waste, norms and standards, institutional arrangements, planning provisions and management issues. Power – Sources of power procurement, distribution networks, demand assessment, norms and standards, planning provisions and management issues Mission Mode Project Smart Cities

Innovation economy (Innovation in industries, clusters, districts of a city; Knowledge workforce: Education and employment; Creation of knowledge-intensive companies); Urban Infrastructure (Transport, Energy/ Utilities, protection of the environment and safety); Governance (Administration services to citizens, participatory and direct democracy, services to the citizen, quality of life).

MCAD OE312 Cyber physical system and IoT

Unit-I: Introduction to Cyber-Physical Systems: Standards, Topologies, Network Hardware, Network Standardization, Transmission Principles 2. Networked Systems and Internet structure: Introduction to the Internet and Cyber-Physical application interface, basic concepts of the Internet Services and Protocols, higher level protocols 3. System Architecture of the Cyber-Physical Systems (CPS)

Unit- II: Edge connectivity and protocols - Collaborative outsourcing in CPS, Sockets and Client/Server structures and wireless and wired P2P existing architectures 4. Hybrid and purely Mobile Peer-to-Peer Communication and principles, supported protocols and communication pros and cons 5. Wireless systems and CPS configuration and supported foundations and architectures

Unit-III: Cognitive CPS: efficiency, and resource manipulation 7. Wireless Sensor Network (WSN), life cycle, energy efficiency, lifetime of WSNs, energy conservation 8. Internet of Things (IoT) in the smart spaces Era 9. Enabling Multimedia applications in Cyber-Physical Systems 10. Resource Sharing schemes and protocols 11. Cloud Computing paradigm and the state-of-the-art methodologies 12. CPS and Edge Computing as a novel paradigm-Case studies

Unit- IV: Internet of Things (IoT) and Cyber-Physical Systems (CPS) concepts 2. IoT and CPS platforms (Google Glass, Google Nest Thermostat, Google Watch, MS Kinect, iRobot Create, etc.) 3. Software architecture of IoT and CPS devices 4. Hardware architecture of IoT and CPS devices 5. Distributed networking concepts in IoT and CPS platforms 6. Fundamental security services 7. Confidentiality, integrity, authentication in IoT and CPS 8. Access control, non-repudiation, availability in IoT and CPS 9. Key management in IoT and CPS 10. Intrusion detection and prevention in IoT and CPS 11. Malicious software in IoT and CPS 12. Digital forensics in IoT and CPS 13. Energy-efficient design principles in Iot and CPS 14. Privacy-preserving operations in IoT and CPS

MCAD OE313 Sustainable Development and Green Computing

UNIT I INTRODUCTION TO SUSTAINABLE DEVELOPMENT: Definitions and principles of Sustainable Development - History and emergence of the concept of Sustainable Development - Environment and Development linkages- Globalization and environment – Millennium Development Goals: Status (global and Indian) - Impacts on approach to development policy and practice in India, future directions.

UNIT II ENVIRONMENTAL SUSTAINABILITY: Land, Water and Food production - Moving towards sustainability: Energy powering Sustainable Development - Financing the environment and Sustainable Development. Empowerment of Women, Children, Youth, Indigenous People, Non-Governmental Organizations, Local Authorities, Business and Industry - Sustainability indicators – Hurdles to sustainability-Operational guidelines-Interconnected prerequisites for sustainable development - Science and Technology for sustainable development - Performance indicators of sustainability and Assessment mechanism – Constraints and barriers for sustainable development.

UNIT-III: Overview and Issues: Problems: Toxins, Power Consumption, Equipment Disposal, Company's Carbon Footprint: Measuring, Details, reasons to bother, Plan for the Future, Cost Savings: Hardware, Power. Initiatives and Standards: Global Initiatives: United Nations, Basel Action

Network, Basel Convention, North America: The United States, Canada, Australia, Europe, WEEE Directive, RoHS, National Adoption, Asia: Japan, China, Korea.

UNIT IV: URBAN PLANNING AND ENVIRONMENT: Environment and Resources, Sustainability Assessment, Future Scenarios, Form of Urban Region, Managing the change, Integrated Planning, Sustainable Development

UNIT-V: Greening Your Information Systems: Initial Improvement Calculations, Selecting Metrics, Tracking Progress, Change Business Processes, Customer Interaction, Paper Reduction, Green Supply Chain, Improve Technology Infrastructure, Reduce PCs and Servers, Shared Services, Hardware Costs, Cooling.

Academic Delivery

The entire delivery of the program is through **Online and Offline interaction with faculties**. The method of instruction is learner-oriented, andthestudenthastobeanactiveparticipantintheteaching-learningprocess.

Self - Instructional Printed Study Material

Self-Instructional Printed Study Material (SIM) is a very important form of instructional material. Improvement in quality is ensured through SIMs because no single textbook can cover the course content appropriately. Also SIMs is designed to make the subject matter self-explanatory and easy-to-understand. These are supplied to the learners in the form of books. Each book is divided into blocks consisting of several units.

Study Material

The students shall be provided with access to self-instructional materials to help learners become proficient in a variety of courses. It helps students stay focused and achieves their learning goals successfully. Learners can get updated content in the study material. They can study according to theirconvenience.

Counseling Sessions

Counseling sessions support the self-learning study materials. Schedules for these sessions are intimated at the beginning of the semester to candidates. These are forums for interactive education and enrich learners' knowledge by directing it to practice. Students can attend these sessions at regular interval. The power point presentation of counseling sessions will be available at online platform. Should any learner miss their class on any given day, they may view the session at online platform in a physical format at any time as per their convenience later. These counseling sessions shall be conducted over the weekends (Sundays or Saturdays) and Public holidays.

Students will also be provided with Counseling sessions and faculty interaction for better understanding of the various topics of the course/subject, thus improving the overall learning experience. The objectives of these interactions are mentionedbelow:

- To tap the in-depth understanding of the subjects and supplement the self-instructional printed study material
- To provide learning through case study, industry based assignments and interactive interactions with experts from the corporate sector
- To enhance retention, recall value of key concepts for learners aimed at making learning an enjoyableexperience

COST SHEET OF MCA DISTANCE PROGRAMME

SEMESTER - WISE COST / BENEFIT STRUCTURE

Recurring Expenses (A)	
Number of Courses	8
Number of Counseling Sessions	10 to 12
Cost Per Counselling Session	Rs.1000.00/hour/Session
Cost Per Course – Counselling Charges	10,000 - 12,000
Total cost of Counseling Sessions for 8 courses	80,000 - 96,000
Administrative Expenditure per Semester	20,000/month
Total Administrative Expenditure / Semester	1,20,000
Total Recurring Expenses (A)	**2,16,000**
Fixed Cost (B) Study Material Development	
Course Development /Course	65,000
Course Development for 36 courses (Writing/editing/vetting Cost)	23,40,000
Total Courses writing for 3year	7,80,000
Total Cost for SLM per student (including course writing and printing)	**4920**

TOTAL COST MBA DISTANCE (PROGRAM)

All Sessions Counselling (A*4 Semester)	3,20,000 - 3,84,000
Office Expenditure	4,80,000
Total Recurring Expenses (A)	**8,64,000**
Total cost of counseling class per student	**8,640**
Cost of one semester Per Student	**13,590**

PROPOSED FEE STRUCTURE

Expected Admissions per semester	100
Fees per semester / per student	23,000
Total Revenue in one Semester	**23,00,000**

MODE OF PROGRAM

Admission in a year	Two Batches
First Admission	Jan- June
Second Admission	July-Dec

Total Admission in a Year	200
Total Revenue	**46,00,000**

FEEDBACK OF THE ODL LEARNERS TO MONITOR QUALITY OF STUDENT SUPPORT SERVICES PROVIDED TO THE LEARNERS

We are obtaining a feedback from you for improving quality of the academic programmes we offer and also to improve the quality of student support services provided to you at Jamia Hamdard. We request you to please provide the following information related to your studies at Jamia Hamdard in the ODL Programme. The feedback given by you would help us in improving quality of academic programmes on offer and the student support services.

The filled – in feedback form may be submitted to the undersigned by post / in – person at the School of Open and Distance Learning, First Floor, Hamdard Convention Centre, Jamia Hamdard, New Delhi – 110 062. Scanned copy of the filled – in feedback form can also be sent to me at sodl@jamiahamdard.ac.in.

ACADEMIC SESSION: _____

S No	Feedback Questions	Answers & Remarks
1	Your Name	
2	Your Programme	
3	Your Enrollment Number	
4	Year of Study: Mention – I, II, III, IV, V, VI Semester / 1st, 2nd , 3rd Year	
5	Your Mobile Number:	
6	Your Email ID	
7	Are you in service / employed? Mention – Yes / No	
8	Have you received your Identity Card in time? Mention - Yes / No	
8	Have you received your study material? Mention - Yes / No	
10	Have you received your study material in time? Mention - Yes / No	
11	Have you gone through your study material thoroughly? Mention - Yes / No:	
12	How do you rate quality of the study material? Mention - Excellent / Good / Poor:	
13	Did you attend the Induction Meeting? Mention – yes / No	

14	Have you attended the counselling session? Mention - Yes / No:	
15	If yes, how many counselling sessions you have attended? Mention the number:	
16	Are the counselling sessions conducted as per the schedule? Mention - Yes / No	
17	How do you rate quality of the counselling sessions conducted? Mention - Excellent / Good / Poor:	
18	Have you attended the practical sessions? Mention - Yes / No, if applicable:	
19	How many practical sessions you have attended? Mention number, if applicable:	
20	Are the practical sessions conducted as per the schedule? Mention - Yes / No	
21	How do you rate quality of the practical sessions conducted? Mention - Excellent / Good / Poor	
22	How do you rate ambiance and physical upkeep of the class rooms / laboratories where your counselling / practical sessions were held? Mention - Excellent / Good / Poor	
23	Have you submitted Assignments / Projects? Mention - Yes / No	
24	Are you satisfied with the evaluation of your Assignments / Projects? Mention - Yes / No	
25	Are you receiving feedback from your academic counsellors on your assignment responses? Mention – Yes / No	
26	Have you availed Library Services of Jamia Hamdard? Mention - Yes / No	
27	If No, then why? (You may add additional sheet, if required)	
28	If Yes, how do you rate the quality of library services at Jamia Hamdard? Mention - Excellent / Good / Poor	
29	Have you appeared in the examinations conducted by SODL, Jamia Hamdard?	

	Mention - Yes / No	
30	If Yes, mention the quality of conduct of the examinations. Mention - Excellent / Good / Poor	
31	Are you satisfied with evaluation of your examination papers? Mention - Yes / No	
32	If No, mention reason thereof! Attach additional sheet if required.	
33	Are you getting result in time? Mention - Yes / No	
34	Are you receiving your mark sheets in time? Mention - Yes / No	
35	Are your grievances redressed satisfactorily at SODL? Mention Yes / No	
36	Are your emails responded at SODL in a reasonable time? Mention - Yes / No	
37	How do you rate the quality of responses given to your emails / grievances at SODL? Mention - Excellent / Good / Poor	
38	Have you visited SODL for queries / redress of your grievances? Mention - Yes / No	
39	Are you satisfied with the responses given to you at SODL? Mention - Yes / No	
40	How do you rate the quality of responses given to you at SODL? Mention - Excellent / Good / Poor	
41	How frequently do you visit website of Jamia Hamdard www.jamiahamdard.edu to check for updated information about your studies? Mention – Regularly / Frequently / Never	
42	How do you rate the information given on the website about your studies at Jamia Hamdard? Mention - Excellent / Good / Poor	
43	How frequently do you receive emails alerts from SODL / Programme Coordinators about your studies at Jamia Hamdard? Mention – Regularly / Frequently / Never	
44	How do you rate behavior of teachers of Jamia Hamdard? Mention – Excellent / Good / Poor	
45	How do you rate behavior of staff of Jamia Hamdard? Mention – Excellent / Good / Poor	

46	Are you satisfied studying at Jamia Hamdard? Mention – Yes / No	
47	Will you recommend your friends and relatives to get enrolled for ODL Programmes of Jamia Hamdard? Mention – Yes / No	
48	Would you like to continue your studies at Jamia Hamdard? Mention Yes / No	
49	In which Programme / Course you would like to get enrolled?	
50	Mention the market need – based Programmes / Courses Jamia Hamdard should offer through distance mode	1.
		2.
		3.
		4.
		5.

GENERAL REMARKSAND SUGGESTIONS FOR IMPROVEMENT: (Attach additional sheet, if required)

_____
_____
_____
_____
_____
_____

Date: _____

SIGNATURE OF THE LEARNER

FEEDBACK OF ACADEMIC COUNSELLORS FOR IMPROVING QUALITY OF THE ODL PROGRAMMES AND THE STUDENT SUPPORT SERVICES

We are obtaining feedback from you to improving the quality of ODL Programmes on offer and also to improve the quality of support services provided to the learners. May I requesting you to kindly provide the following information as your feedback on the academic programme you are associated with at the School of Open and Distance learning, Jamia Hamdard. This feedback would help us for improving quality of the academic programmes and quality of the academic support services provided to learners of your programme.

The filled – in feedback form may please be submitted to the undersigned at the School of Open and Distance Learning, First Floor, Hamdard Convention Centre, Jamia Hamdard, New Delhi – 110 062. Scanned copy of the feedback form can also be sent to me at sodl@jamiahamdard.ac.in.

ACADEMICSESSION: …….

S No	Feedback Questions	Answers
1	Your Name	
2	Your Programme	
	Courses approved for conducting the academic counselling	1.
		2.
		3.
		4.
		5.
3	Have you received a set of study material? Mention – Yes / No	
4	How many sessions you have conducted in the current academic session. Mention the number	
5	Have you conducted the counselling sessions as per the schedule notified on the website / Notice Board? Mention – Yes / No	
6	How do you rate quality of the study material? Mention – Excellent / Good / Poor	
7	Do you feel syllabus / study material of your Programme needs revision / updating? Mention – Yes / No	
8	Would you like to be a course writer for updating the study material? Mention – Yes / No	
9	Mention the courses / subjects of your choice for wring the study material.	1.
		2.
		3.
		4.
		5.
10	Are learners of your course attending the counselling sessions regularly? Mention – Yes / No	
11	How many learners attend your counselling sessions? Mention an average number.	
12	Do they come prepared for attending the counselling sessions?	

	Mention – Yes / No	
13	Do the learners seek clarifications and participate in discussions during the counselling sessions? Mention – Yes / No	
14	How do you rate participation of the learners during the counselling sessions? Mention – Excellent / Good / Poor	
15	Do the learners approach you on non – counselling days for clarification of their doubts / queries? Mention - Yes / No	
16	Do you evaluate assignments / projects of the learners? Mention – Yes / No	
17	How do you rate quality of the assignments / projects submitted by the learners? Mention – Excellent / Good / Poor	
18	Do you evaluate examination answer books of the learners? Mention – Yes / No	
19	How do you rate quality of response of the learners in their examination papers? Mention – Excellent / Good / Poor	
20	Are you satisfied with the amount of remuneration being paid for conducting the counselling sessions? Mention - Yes / No	
21	Mention the expected amount of remuneration for conducting the counselling sessions	
22	Please suggest new market need – based programmes to offer through distance mode.	1..
		2
		3.
		4.
		5.

23. GENERAL REMARKS AND SUGGESTIONS FOR IMPROVEMENT (Attach additional sheet if required)

_____
_____
_____
_____

Date: _____

SIGNATURE OF THE ACADEMIC COUNSELLOR

List of Academic Counselors for MCA Programme

S No	Name of the Academic Counsellor	Designation	Qualifications	Experience in Teaching / Research	Area of Specialization	Courses Recommended for Academic Counselling	Mobile Number & Email ID
1.	Dr. Safdar Tanweer	Assistant Professor	Ph.D. (CSE)	13 years	Computer Science & Engineering	BCAD - 601 Project Work	9810465885 safdartanweer@yahoo.com
2.	Dr. Md. Tabrez Nafis	Assistant Professor	Ph.D. (CSE)	11 years	Computer Science & Engineering	BCAD - 103 Computer Mathematics	9953448275 tabrez.nafis@jamiahamdard.ac.in
3.	Dr. Siddhartha Sankar Biswas	Assistant Professor	Ph.D. (CSE)	10 years	Computer Science & Engineering	BCAD - 503 Operating System Administration With Windows 2000	9910115368 ssbiswas1984@gmail.com
4.	Mr. Syed Sibtain Khalid	Assistant Professor	M. Tech. (ECE)	06 years	Electronics and Communication Engineering	BCAD - 601 Project Work	9818719677 Sibtain1977@gmail.com
5.	Mr. Samar Wazir	Assistant Professor	M. Tech. (CSE)	06 years	Computer Science & Engineering	BCAD - 404 Web Technologies	samar.wazir786@gmail.com
6.	Mr. Nafisur Rahman	Assistant Professor	M. Tech. (CSE)	05 years	Computer Science & Engineering	BCAD-202 Operating System	8376026512 nafiis@gmail.com
7.	Mr. Anil Kumar Mahto	Assistant Professor	M. Tech. (CSE)	06 years	Information Technology	BCAD-501 Software Engineering	anil.fiem16@gmail.com
8.	Mr. Tabrej Ahmad Khan	Assistant Professor	M. Tech. (Information Security), Ph.D. (CS) Pursuing	06 years	Information Security	BCAD-302 Objective Oriented Programming in C++ BCAD-401 Numerical and Statistical analysis	9718129289 tabrejsmvdu@gmail.com
9.	Dr. Naseem Rao	Assistant Professor	Ph.D. (ECE)	12 years	Electronics and Communication Engineering	BCAD-104 Principle of Management BCAD-301 Computer System Architecture BCAD-403 Computer Networks	9811468973 naseemjmi0786@gmail.com
10.	Mr. Javed Azmi	Research Scholar	MCA, Ph.D. (CS) Pursuing	05 years (SODL)	Computer Science	BCAD-203 Programming in 'C' BCAD-303	9868063832 jazmi@jamiahamdard.ac.in

						System Analysis and Design	
11.	Mr. Md. Onais Ahmad	Research Scholar	M.Tech. (CSE), Ph.D. (CSE) Pursuing	05 years (SODL)	Computer Science & Engineering	BCAD-105 Lab-I (PC Software) BCAD-201 Programming Fundamentals BCAD-305 Lab-I (C++ Application Development	9910690317 oahmad@jamiahamdard.ac.in
12.	Mr. Md. Rahbre Islam	Technical Assistant	M. Tech. (CSE)	05 years (SODL)	Computer Science & Engineering	BCAD-205 Lab-II (Programming in 'C') BCAD-405 Lab-II: Implementation data structures in C BCAD-505 Lab-I: (Website Development)	9873201515 rislam@jamiahamdard.ac.in
13.	Mr. Abdul Majid Farooqi	Research Scholar	M.Tech. (CSE), Ph.D.(CSE) Pursuing	01 years (SODL)	Computer Science & Engineering	BCAD-101 Computer Fundamentals BCAD - 402 Data Structures in C BCAD -502 Java Programming	9891958565 abdulmajidfarooqi_sch@jamiahamdard.ac.in
14.	Ms. Roshan Jameel	Research Scholar	M.Tech. (CSE), Ph.D.(CSE) Pursuing	04 months	Computer Science & Engineering	BCAD-102 PC Software BCAD - 504 Advanced Web Development	9717168058 roshijameel@gmail.com
15.	Mr. Mehtab Alam	Research Scholar	M. Tech. (CSE), Ph.D.(CSE) Pursuing	----------	Computer Science & Engineering	BCAD - 204 Business System BCAD - 304 Database Application in MS Access	9582232786 mahiealam@gmail.com