Dr. Babasaheb Ambedkar Technological University (Established a University of Technology in the State of Maharashtra)
(under Maharashtra Act No. XXIX of 2014)
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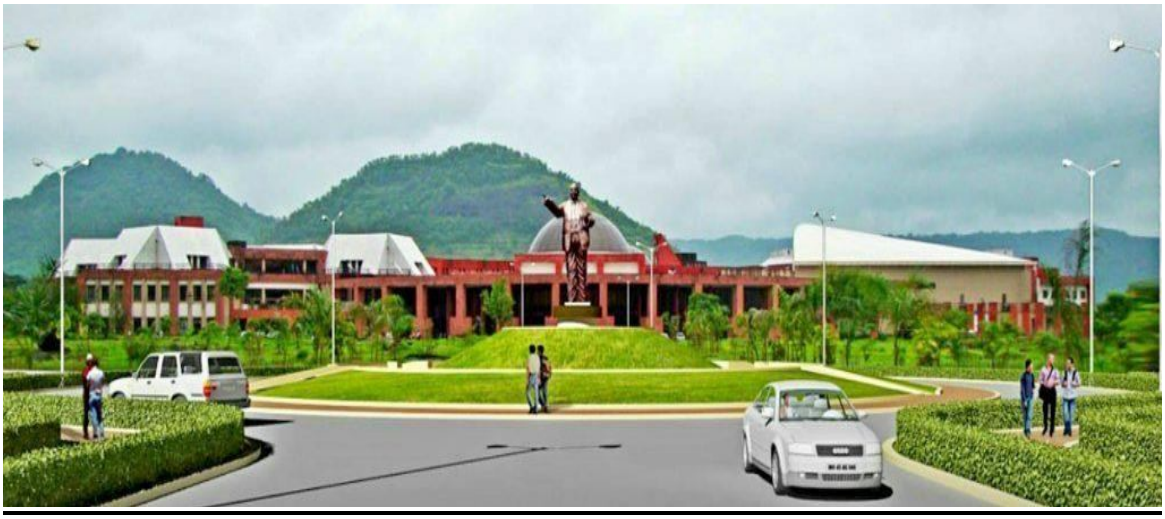
Curriculum POST GRADUATE PROGRAMME for Master OF computers ApplicAtions (MCA)

WITH EFFECT FROM THE ACADEMIC YEAR 2023-2024



Rules and Regulations

1. The normal duration of the course leading to **Master of Computer Application** (MCA) degree will be of FOUR semesters.
2. Each academic year shall be divided into 2 semesters, each of 20 weeks duration, including evaluation and grade finalization, etc. The Academic Session in each semester shall provide for at least 90 Teaching Days, with at least 35 hours of teaching contact periods in a five to six days session per week. The semester that is typically from Mid-July to November is called the ODD SEMESTER, and the one that is from January to Mid-May is called the EVEN SEMESTER. Academic Session may be scheduled for the Summer Session/Semester as well. For 1st year MCA the schedule will be decided as per the admission schedule declared by Government of Maharashtra.
3. The schedule of academic activities for a Semester, including the dates of registration, mid-semester examination, end- semester examination, inter-semester vacation, etc. shall be referred to as the Academic Calendar of the Semester, which shall be prepared by the Dean (Academic), and announced at least TWO weeks before the Closing Date of the previous Semester.
4. The Academic Calendar must be strictly adhered to, and all other activities including co-curricular and/or extra -curricular activities must be scheduled so as not to interfere with the Curricular Activities as stipulated in the Academic Calendar.

REGISTRATION:

1. Lower and Upper Limits for Course Credits Registered in a Semester, by a Full-Time Student of MCA Programme: A full time student of a particular MCA programme shall register for the appropriate number of course credits in each semester/session that is within the minimum and maximum limits specific to that MCA programme as stipulated in the specific Regulations pertaining to that MCA programme.
2. Mandatory Pre-Registration for higher semesters: In order to facilitate proper planning of the academic activities of a semester, it is essential for the every institute to inform to Dean (Academics) and COE regarding details of total no. of electives offered (Course-wise) along with the number of students opted for the same. This information should be submitted within two weeks from the date of commencement of the semester as per academic calendar.

Course Pre-Requisites:

1. In order to register for some courses, it may be required either to have exposure in, or to have completed satisfactorily, or to have prior earned credits in, some specified courses.
2. Students who do not register on the day announced for the purpose may be permitted LATE REGISTRATION up to the notified day in academic calendar on payment of latefee.
3. REGISTRATION IN ABSENTIA will be allowed only in exceptional cases with the approval of the Dean (Academic) /Principal.
4. A student will be permitted to register in the next semester only if he fulfills the following conditions:
   (a) Satisfied all the Academic Requirements to continue with the programme of Studies without termination
   (b) Cleared all Institute, Hostel and Library dues and fines (if any) of the previous semesters;

(c) Paid all required advance payments of the Institute and hostel for the currentsemester;
(d) Not been debarred from registering on any specific ground by the Institute.

EVALUATION SYSTEM:

1. Absolute grading system based on absolute marks as indicated below will be implemented from academic year 2020-21, starting from First Year of MCA Programme.

Percentage of Marks	Letter Grade	Grade Point
91-100	EX	10.0
86-90	AA	9.0
81-85	AB	8.5
76-80	BB	8.0
71-75	BC	7.5
66-70	CC	7.0
61-65	CD	6.5
56-60	DD	6.0
51-55	DE	5.5
40-50	EE	5.0
<40	EF	0.0

2. Class is awarded based on CGPA of all eight semester of MCA Programme.

CGPA for pass class is minimum 5.0	
CGPA upto < 5.50	Pass class
CGPA ≥ 5.50 &< 6.00	Second Class
CGPA ≥ 6.00 &< 7.50	First Class
CGPA ≥ 7.50	Distinction
[Percentage of Marks =(CGPA-0.5)*10.0]	

3. A total of 100 Marks for each theory course are distributed as follows:

1	Mid Semester Exam (MSE) Marks	20
2	Continuous Assessment Marks	20
3	End Semester Examination (ESE) Marks	60

4. A total of 100 Marks for each practical course are distributed as follows:

1.	Continuous Assessment Marks	60
2.	End Semester Examination (ESE)Marks	40

It is mandatory for every student of MCA Programme to score a minimum of 40 marks out of 100, <u>with a minimum of 20 marks out of 60 marksin End Semester Examination for theory course.</u>

This will be implemented from the first year of MCA Programme starting from Academic Year 2023-2024.

5. Description of Grades:

EX Grade: An 'EX' grade stands for outstanding achievement.

EE Grade: The 'EE' grade stands for minimum passing grade.

The students may appear for the remedial examination for the subjects he/she failed for the current semester of admission only and his/her performance will be awarded with EE grade only. If any of the student remain **absent** for the regular examination due to genuine reason and the same will be verified and tested by the Dean (Academics) or committee constituted by the University Authority.

FF Grade: The 'FF' grade denotes very poor performance, i.e. failure in a course due to poor performance .The students who have been awarded 'FF' grade in a course in any semester must repeat the subject in next semester.

6. Evaluation of Performance:

6.1. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

(A) Semester Grade Point Average (SGPA) The performance of a student in a semester is indicated by Semester Grade Point Average (SGPA) which is a weighted average of the grade points obtained in all the courses taken by the student in the semester and scaled to a maximum of 10. (SGPA is to be calculated up to two decimal places). A Semester Grade Point Average (SGPA) will be computed for each semester as follows:

$$SGPA = \frac{[\sum_{i=1}^{n} c_i g_i]}{[\sum_{i=1}^{n} c_i]}$$

Where

'n' is the number of subjects for the semester,

'ci' is the number of credits allotted to a particular subject, and

'gi' is the grade-points awarded to the student for the subject based on his performance asper the above table.

-SGPA will be rounded off to the second place of decimal and recorded as such.

(B) Cumulative Grade Point Average (CGPA): An up to date assessment of the overall performance of a student from the time he entered the Institute is obtained by calculating Cumulative Grade Point Average (CGPA) of a student. The CGPA is weighted average of the grade points obtained in all the courses registered by the student since she/he entered the Institute. CGPA is also calculated at the end of every semester (upto two decimal places).Starting from the first semester at the end of each semester (S), a Cumulative Grade Point Average (CGPA) will be computed as follows:

$$CGPA = \frac{[\sum_{i=1}^{m} c_i g_i]}{[\sum_{i=1}^{m} c_i]}$$

Where

'm' is the total number of subjects from the first semester onwards up to and including the semester S,

'ci' is the number of credits allotted to a particular subject, and

'gi' is the grade-points awarded to the student for the subject based on his/her

performance as per the above table.

#CGPA will be rounded off to the second place of decimal and recorded as such.

ATTENDANCE REQUIREMENTS:

1. All students must attend every lecture, tutorial and practical classes.
2. To account for approved leave of absence (e.g. representing the Institute in sports, games or athletics; placement activities; NCC/NSS activities; etc.) and/or any other such contingencies like Medical emergencies, etc., the attendance requirement shall be a minimum of 75% of the classes actually conducted.
    a) If the student failed to maintain 75% attendance, he/she will be detained for appearing the successive examination.
    b) The Dean (Academics)/ Principal is permitted to give 10% concession for the genuine reasons as such the case may be.
    c) In any case the student will not be permitted for appearing the examination if the attendance is less than 65%.
3. The course instructor handling a course must finalize the attendance 3 calendar days before the last day of classes in the current semester and communicate clearly to the students by displaying prominently in the department and also in report writing to the head of the department concerned.
4. The attendance records are to be maintained by the course instructor and he shall show it to the student, if and when required.

TRANSFER OF CREDITS

The courses credited elsewhere, in Swayam / NPTEL Courses by students during their study period at DBATU may count towards the credit requirements for the award of degree. The guidelines for such transfer of credits are as follows:

a) 20 % of the total credit will be considered for respective calculations.

b) Credits transferred will be considered for overall credits requirements of the programme.

c) Credits transfer can be considered only for the course at same level i.e MCA Programme etc.

d) A student must provide all details (original or attested authentic copies)such as course contents, number of contact hours, course instructor /project guide and evaluation system for the course for which he is requesting a credits transfer. He shall also provide the approval or acceptance letter from the other side. These details will be evaluated by the concerned Board of Studies before giving approval. The Board of Studies will then decide the number of equivalent credits the student will get for such course(s) in DBATU. The complete details will then be forwarded to Dean for approval.

e) A student has to get minimum passing grades/ marks for such courses for which the credits transfers are to be made.

f) Credits transfers availed by a student shall be properly recorded on academic record(s) of the student.

g) In exceptional cases, the students may opt for higher credits than the prescribed.

Category – wise total number of credits for MCA

Sr. No	Category	Suggested Breakup of Credits by AICTE	Credits awarded to First year to Final Year	Total
1	Humanities and Social Sciences including Management courses		06	06
2	Basic Science courses		NC	NC
3	Professional core courses		28	28
4	Professional Elective courses relevant to chosen specialization/branch		08	08
5	Open subjects – Electives from other technical and /or emerging subjects		20	20
6	Project work, seminar and internship in industry or elsewhere		18	18
7	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Knowledge Tradition]		NC	NC
	Total		**80**	**80**

**Minor variation is allowed as per need of the respective disciplines.*

Programme Educational Objectives(PEO)

Name of Programme: **Master of Computer Application** (MCA). A Post Graduate in the discipline of Computer Applications is generally expected to have three kinds of knowledge. First, the post graduate should have conceptual knowledge of the core topics of Computer Science. Second, she/hess hould have knowledge of mathematical formalism underlying various programming concepts. Third ,post graduates will be such that he/she can apply the principles of computer science and its applications to solve real-life problems from diverse application domains. The programme of **Master of Computer Application** in at Dr.Babasaheb Ambedkar Technological University (DBATU) essentially aims to meet these broad expectations. At the same time, the program intends to comply with the courses and syllabus available at National Program on Technology Enhanced Learning (NPTEL) and SWAYAM. The following specific educational objective aims to achieve these global and regional expectations**.**

Objective Identifier	Objectives
PEO1	Apply their computing skills to analyse, design and develop innovative software products to meet the industry needs and excel as software professionals.
PEO2	Pursue lifelong learning and do research in the computing field based on solid technical foundations.
PEO3	Communicate and function effectively in teams in multidisciplinary fields within the global, societal and environmental context.
PEO4	Exhibit professional integrity, ethics and an understanding of responsibility to contribute technical solutions for the sustainable development of society.

Programme Outcomes(PO)

After undergoing the learning process off two years, students of **Master of Computer Application** at Dr.Babasaheb Ambedkar Technological University (DBATU) will have an ability to build information systems and provide computer based solutions to real life problems. The graduates of this programme will demonstrate following abilities and skill sets.

OutcomeI dentifier	Outcomes
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, applications fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex technological problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex computer science and technical problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern Science ,engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in public and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the social & technplogical practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

Outcome Identifier	Outcomes
PSO1	Able to select suitable data models, appropriate architecture, and platform to implement a system with good performance.
PSO2	Able to design and integrate various system based components to provide user interactive solutions for various challenges.
PSO3	Able to develop applications for real time environments using existing and upcoming technologies.

Graduate Attributes/ABET's Criteria

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation/NAAC are as follows:

(a) Engineering knowledge: An ability to apply knowledge of mathematics, science and engineering.

(b) Problem analysis: An ability to design and conduct experiments as well as to analyze and interpret data.

(c) Design / development of solutions: An ability to design a system, a component, or process, to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacture ability, and sustainability.

(d) Individual and team work: An ability to function on multi disciplinary teams.

(e) Problem Solving : An ability to identify, formulate and solve engineering problems.

(f) Ethics: An understanding of professional and ethical responsibility.

(g) Communication : An ability to communicate effectively.

(h) Environment and sustainability: The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and social context.

(i) Life-long learning: Recognition of the need for and an ability to engage in life-long learning.

(j) A knowledge of technology: Acknowledge of contemporary issues, and state of art technology

(k) Modern tool usage: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

(l) Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply in multidisciplinary environments.

Mapping of Programme Outcomeswith Graduate Attributes/ABET'sCriteria

	A	B	C	D	E	F	G	H	I	J	K	L
PO1	X									X		
PO2		X			X							
PO3			X		X							
PO4			X		X							
PO5											X	
PO6					X					X		
PO7								X				
PO8						X						
PO9				X								
PO10							X					
PO11												X
PO12									X			

MASTER OF COMPUTER APPLICATION
NEP SYLLABUS
WEF 2023-24
MCA I Year Programme

Semester	Course Code	Course Title	Weakly Teaching Hrs			Evaluation Scheme Credit				Credit
			L	T	P	CA	MSE	ESE	Total	
I	MCAC101	Operating System (OS)	3			20	20	60	100	3
	MCAC102	Data Structure and Algorithms (DSA)	3			20	20	60	100	3
	MCAC103	Data Base Management System (DBMS)	3			20	20	60	100	3
	MCAC104	Probability and Statistics	3			20	20	60	100	3
	MCAC105	Java Programming	3	1		20	20	60	100	4
	MCAL106	Practical I (Java Programming and Web Technology)		1*	4	60		40	100	2
	MCAL107	Practical II (Python Lab and DBMSL)		1*	4	60		40	100	2
	Total Semester-I Credits									**20**
II	MCAC201	Object Design & Agile Development (ODAD)	3			20	20	60	100	4
	MCAC202	Computer Networks (CN)	3			20	20	60	100	3
	MCAC203	Artificial Intelligent (AI)	3			20	20	60	100	3
	MCAE204	Elective I: A) Internet of Things B) Human Computer Interaction C) Advance Database Technologies	3			20	20	60	100	2
	MCAHM205	Elective II: A) Research Methodology B) Cyber laws C) Employability Skill Development	3			20	20	60	100	2
	MCAS206	Technical Seminar -I			2	60		40	100	2
	MCAL207	Practical III (Data Analysis with Python Lab and Advance Database Technologies Lab)	1		4	60		40	100	2
	MCAL208	Practical IV (AIL and ODADL)			4	60		40	100	2
	MCAF209	Field Training / Internship / Industrial Training Evaluation								Audit
	Total II Semester Credits									**20**
	Total I Year MCA Credits									**40**

***** Theory lecture for Web Technology Lab and Python Lab.

MCA II Year Program

Semester	Course Code	Course Title	Weakly Teaching Hrs			Evaluation Scheme Credit				Credit
			L	T	P	CA	MSE	ESE	Total	
III	MCAC301	Full Stack Development (FSD)	3	1		20	20	60	100	4
	MCAC302	Machine Learning (ML)	3			20	20	60	100	3
	MCAC303	Cloud Computing (CC)	3			20	20	60	100	3
	MCAE304	Elective III: A) Big Data Analytics B) Distributed System C) Software Testing and Tools	3			20	20	60	100	2
	MCAE305	Elective VI: A) Cryptography and Network Security B) Block Chain Technology C) Mobile Application Development	3			20	20	60	100	2
	MCAL306	Practical VI (FSDL and Mobile application Development Lab)			4	60		40	100	2
	MCAL307	Practical VI (ML Lab& CC Lab)			4	60		40	100	2
	MCAS308	Project phase – I (In-house)			2	60		40	100	2
	Total I Semester Credits									**20**
IV	MCAC401	MOOC Course – I A) Deep Learning B) Natural Language Processing C) Social Networks)	3			20	20	60	100	3
	MCAC402	MOOC Course – II (Foreign Language Studies)	3			20	20	60	100	3
	MCAP403	Term Paper			1	30		20	100	2
	MCAS404	Project phase – II (In-house) / Internship and Project in the Industry			4	60		40	100	12
	Total II Semester Credits									**20**
	Total I Year MCA Credits									**40**

Note:

1. MOOC Courses will be done using Swayam, NPTEL or as permitted by the University authority platform. However, the student should ensure that the course content has not been already covered by the student himself in his UG or above-mentioned PG courses already completed.
2. MOOC Courses are recommended to be done in subjects that enhance their skill set and contribute to the industrial project undertaken.
3. Term Paper should be published as an article in a reputed UGC Care-listed journal. A minimumof one paper is expected. Guidelines for Paper writing will be provided by the concerned subject teacher.

MCAC101: Operating Systems

[Unit 1] **[7 Hours]**

Introduction and Operating system structures: Definition, Types of Operating system, Real-Time operating system, System Components: System Services, Systems Calls, System Programs, System structure, Virtual Machines, System Design and Implementation, System Generations.

[Unit 2] **[7 Hours]**

Processes and CPU Scheduling: Process Concept, Process Scheduling, Operation on process, Inter-process Communication, Cooperating processes, Threads, Multithreading model, Scheduling criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Scheduling Algorithms evaluation.

[Unit 3] **[7 Hours]**

Process Synchronization: The critical-section problem, Critical regions, Peterson‘s Solution, Synchronization Hardware, Semaphores, Classical Problems of synchronization, and Monitors Deadlocks: Systems Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Combined approach to deadlock Handling.

[Unit 4] **[7 Hours]**

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Continuous Memory Allocation, Fixed and variable partition, Internal and external fragmentation and compaction, Paging: Principle of operation, Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging; Segmentation. Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page / Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used(LRU).

[Unit 5] **[7 Hours]**

File Management: File Concept, Access methods, File types, File operation, Directory and disk structure, File System Structure, File System Implementation, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. Mass-Storage Structure: Disk Structure, Disk attachment, Disk scheduling, Disk management, Swap Space Management.

Text Book:

1. Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Operating System Concepts, Wiley Publication, 8th Edition, 2008.

Reference Books:

1. Andrew S. Tanenbaum, Modern Operating System, PHI Publication, 4th Edition, 2015.
2. D. M. Dhamdhere, Systems Programming and Operating Systems, McGraw-Hill, 2nd Edition, 1996.
3. Garry Nutt, Operating Systems Concepts, Pearson Publication, 3rd Edition, 2003.
4. Harvey M. Deitel, An Introduction to Operating Systems, Addison Wesley Publication, 2nd Edition, 1990.
5. Thomas W. Doeppner, Operating System in Depth: Design and Programming, Wiley Publication, 2011.

MCAC102: Data Structures and Algorithms

Unit 01-Introduction to Data Structure [7 Hours]

Data, Data types, Data structure, Abstract Data Type (ADT), representation of Information, characteristics of algorithm, program, analyzing programs. Arrays and Hash Tables Concept of sequential organization, linear and non-linear data structure, storage representation, array processing sparse matrices, transpose of sparse matrices.

Unit 02- Stack and Queues [7 Hours]

Stacks- concept, Primitive operations, Stack Abstract Data Type, Representation of Stacks Using Sequential Organization, stack operations, Applications of Stack- Expression Evaluation and Conversion, Polish notation and expression conversion, Need for prefix and postfix expressions, Postfix expression evaluation, Linked Stack and Operations.
Queue: Representation of Queue using Array, Circular Queue and its implementation

Unit 03-Linked List [7 Hours]

Concept of linked organization Representation of Linked List in Memory Singly, doubly and circular Linked List Operations on singly and Doubly Linked List such as creation, traversing, searching, insertion, deletion. Representation of Stack and Queue using Linked List.

Unit 04- Trees and Algorithms [7 Hours]

Basic Terminology of Trees: Basic terminology of Trees Binary trees and its representation in memory.
Algorithm Design Techniques, Performance Analysis of Algorithms, Types of Algorithm's Analysis, Order of Growth, Asymptotic Notations, Recursion, Recurrences Relation, Substitution Method, Iterative Method, Recursion Tree, Master Theorem.

Unit 05- Types of Algorithms [7 Hours]

Divide and Conquer- Strassen‘s Matrix Multiplication, Backtracking- Backtracking Concept, N–Queens Problem,Sum of Subsets Problem, Branch and Bound: Introduction, Travelling Salesperson Problem, Greedy Algorithms- Optimal Merge Patterns, Huffman Coding, Knapsack Problem, Dynamic Programming- matrix multiplication.

Text Book:

1. T. Cormen, Introduction to Algorithms, PHI Publication, 2nd Edition, 2002.

Reference Books:

1. Aho, Ullman, Data Structure and Algorithms, Addison-Wesley Publication, 1st Edition,1983.
2. Michel Goodrich, Roberto Tamassia, Algorithm Design – Foundation, Analysis & Internet Examples, Wiley Publication, 2nd Edition,2006.
3. George T. Heineman, Gary Pollice, Stanley Selkow, Algorithms in a Nutshell, A Practical Guide, O'Reilly Media, 2nd Edition, 2016.
4. Ellise Horowitz, SartajSahni, S. Rajasekaran, Fundamentals of Computer Algorithms, University Press (India) Private Ltd, 2nd Edition, 2008.
5. Sara Base, Computer algorithms: Introduction to Design and Analysis, Addison-Wesley Publication, 2nd Edition, 1988

MCAC103: Database Management System

[Unit 1] Introduction [7 Hours]

Database System Applications, Purpose of Database Systems, View of Data, Relational Databases, Database Design, Data Storage and Querying, ER model concepts, notation for ER diagram, Constraints, keys, E-R Diagrams, Mapping Cardinality, Concepts of Super Key, candidate key, primary key, weak entity sets, Codd's rules, Extended ER model, Generalization, Aggregation, , Reduction of an ER diagrams to tables.

[Unit 2] Relational Algebra and SQL [7 Hours]

Structure of Relational Databases, Database Schema, Keys Relational algebra: Fundamental Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities.

[Unit 3] Introduction to SQL [7 Hours]

Overview of SQL, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operators, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Modification of the Database Intermediate SQL : Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schema, Authorization, Advanced SQL : Assessing SQL from Programming Language Functions and Procedures, Triggers.

[Unit 4] Relational Database Design and File Organization, Indexing [7 Hours]

Normalization: Features of good relational designs, Functional dependencies, Normal forms, First, Second, Third normal forms, BCNF, Functional Dependency Theory, Multivalued Dependencies, Fourth Normal Form, File Organization, Ordered Indices, B+tree Index files, B Tree Index File.

[Unit 05] Transaction Processing [7 Hours]

Transaction Concept, A simple Transaction Model, Transaction Atomicity and Durability, Transaction Isolation, ACID Properties, Serializability Concurrency Control Techniques: Lock based Protocols, Deadlock handling, Time stamp-Based Protocols.

Text Book:

1. Henry Korth, Abraham Silberschatz& S. Sudarshan, Database System Concepts, McGraw- Hill Publication, 6th Edition, 2011**.**

Reference Books:

1. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, McGraw-HillPublication, 3rd Edition, 2003.
2. Joel Murach, Murach's Oracle SQL and PL/SQL for Developers, Mike Murach& Associates, 2nd Edition, 2014.
3. Wiederhold, Database Design, McGraw-Hill Publication, 2nd Edition, 1983.
4. Navathe, Fundamentals of Database System, Addison-Wesley Publication, 6th Edition, 2012.
5. Mark L. Gillenson, Fundamentals of Database Management System, Wiley Publication, 2ndEdition, 2011.

MCAC104: Probability and Statistics

[Unit 1] Probability Theory [7 Hours]

Definition of probability: classical, empirical and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes‘ theorem of inverse probability, Properties of probabilities with proofs, Examples.

[Unit 2] Random Variable and Mathematical Expectation [7 Hours]

Random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Join and marginal probability distributions, Properties of expectation and variance with proofs. Theoretical Probability Distributions : Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between Poisson and normal distributions, Importance of normal distribution, Examples.

[Unit 3] Correlation [7 Hours]

Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearman‘s rank correlation, Coefficient, Properties of Karl Pearson's correlation coefficient and Spearman‘s rank correlation coefficient, Probable errors.

[Unit 4] Linear Regression Analysis [7Hours]

Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Theorems on regression coefficient, Properties of regression coefficient.

[Unit 5] Estimation and Hypothesis [7Hours]

Estimation, Large Sample Estimation of a Population Mean, Small Sample Estimation of a Population Mean, Large Sample Estimation of a Population Proportion, Sample Size Considerations, Testing Hypotheses, The Elements of Hypothesis Testing, Large Sample Tests for a Population Mean, The Observed Significance of a Test, Small Sample Tests for a Population Mean, Large Sample Tests for a Population Proportion.

Textbook:

1. S. C. Gupta, Fundamentals of Statistics, Himalaya Publishing House, 7th Revied and Enlarged Edition, 2016.

Reference Books:

1. G. V. Kumbhojkar, Probability and Random Processes, C. Jamnadas and Co., 14th Edition, 2010.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.
4. G. Haribaskaran, Probability, Queuing Theory and Reliability Engineering, Laxmi Publications, 2nd Edition, 2009.
5. Murray Spiegel, John Schiller, R. ALU Srinivasan, Probability and Statistics, Schaum's Outlines, 4th Edition, 2013.
6. Kishor S. Trivedi, Probability, Statistics with Reliability, Queuing and Computer Science Applications, Wiley India Pvt. Ltd, 2nd Edition, 2001.

MCAC105: Java Programming

[Unit 1] **[7 Hours]**

Features of Java, the Java Programming environment – (JDK, command line tools), Fundamental Programming structures in Java – (data types, variables, operators, strings, input and output control flow and arrays)

[Unit 2] **[7 Hours]**

Class, Object, Using predefined classes, Defining your own classes, constructors, static data member and methods, inner classes and anonymous classes, introduction to interface, its structure and implementation Inheriting variables and methods in class, inheritance and constructors, abstract class and final class, object wrapper and autoboxing, inheritance and interfaces, introduction to packages.

[Unit 3] **[7 Hours]**

Itroduction, life cycle of a thread, thread states, thread properties, methods in Threads and Runnable, setting priority of threads, synchronization and inter thread communication, introduction to exception handling, predefined and user defined exceptions.

[Unit 4] **[7 Hours]**

Introduction to applet, life cycle of applet, development and execution of simple applet, drawing simple geometry shapes in applet, Introduction to AWT, events, listeners, event handling methods,a small application to demonstrate use of controls – label, button, check box, text, radio button, layout.

[Unit 5] **[7 Hours]**

Introduction to swing, difference between swing and AWT, Japplet class, icons, small application using Jlablecontrol, JtextField, Jbutton, Jcheckbox, Jcombobox, Jradiobutton Database Handling Using JDBC : An Overview of DBMS – JDBC Architecture – Working with JDBC Servlets : Introduction – How to run servlets – The Life – cycle of the servlet – servlet API – Multitier Applications using JDBC from a servlet.

Text Book:

1 Programming with Java, E. Balaguruswamys, TMH.
2 The Complete Reference-Java 2, Schildt, Herbert, TMH
3 P. Radha Krishna, “Object Oriented Programming through Java”, Universities Press (2008)

Reference Books:

1.Cay S. HorstmannGray Cornell, “Core Java – Volume 1 Fundamentals”, Eighth Edition, Pearson Education 2
2. E.Balagurusamy, “Programming with Java”, 3e, TMH (2007)
3. H.M.Deitel, P.J.Deitel, “Java How to Program”, Sixth Edition, Pearson Education (2007)
4. DebasishJana,“Java and Object Oriented Programming Paradigm”, PHI (2005).
5 Java server programming, Ivan Bayross,Shroff Publishers
6. Java Server Programming Java EE 7 (J2EE 1.7) - Black Book, Kogent, DreamtechPressSenn, LA., "Analysis and Design of Information Systems". Tata McGraw Hill Book Company, 1986.

MCAL106:Practical I (Java Programming Lab and Web Technology Lab)

A) Java Programming Lab

List of Experiments:

1. Demonstrate use of
   - Java Classes.
   - Java Packages
   - Java Interfaces
   - Exception handling

2.: Implementation of multithreading.
   - Using matrix manipulation / sorting technique.
   - Creating digital clock.

3.To demonstrate concepts like
   - Thread creation
   - Thread communication.
   - Thread prioritization.

4.AWT Implementation.
   - Creation of calculator.
   - Create GUS for information management & processing (e.g. personal data, admission-process etc.)

5: Applet Handling
   - Implement any problem (e.g. font settings / text formatting) using applets & HTML file for parameter passing.
   - Animation using images / sound / videos.

6: File Handling
   - Command based accepting file name, data from user, doing data updation, deletion, insertion into files.
   - AWT Based – From GUI, accepting data, displaying data, processing data.

7: JDBC & Networking
   - Create a database (e.g. collage / student / shop) Execute DDL/DML queries

8: Web Application
   - Design a static website using HTML elements to show the use of table, links, client side image maps and form elements.
   - Write external, internal and inline CSS to design the web pages
   - Write Java Script functions to validate form controls using regular expressions.

B) Web Technology Lab

[Unit 1]

Web Site development Essentials: Overview of Web Design Concepts, Web Project Management Fundamentals, Web Site Development Process, HTML and the Evolution of Markup languages, HTML basic tags, Web Page Layout and Elements, Create Hyperlinks, Create Tables, Create Web Forms, Image Inserting Techniques, Create Frames, GUI HTML Editors, Site Content and Metadata.

[Unit 2]

Cascading Style Sheets: Cascading Style Sheets for Web page design, Creating CSS rules, Format Text with CSS, Use of CSS Selectors, Embed Style Sheets, and Attach External Style Sheets. Using CSS with Tables: Insert and Styling Tables, Import Table Data, Style Tables with CSS, Sort Data in Table.

[Unit 3]

Introduction to JavaScript, Variables, Basic in JavaScript — Numbers and operators, Handling text — Strings in JavaScript, Useful string methods, Arrays, Troubleshooting JavaScript;
Programming fundamentals: If...Else Statements, Else...If Statements, For Loops, While Loops, Breaking Out Of Loops, Switch Statements, Functions; JavaScript Events, Selecting HTML elements using get Element ById().

[Unit 4]

PHP: Basic Syntax, Defining variable and constant, PHP Data type, Operator and Expression, Handling Html Form with PHP: Capturing Form Data, Dealing with Multi-value filed, redirecting a form after submission, PHP Session.

[Unit 5]

JQuery: Introduction to JQuery, Validation using JQuery, JQuery Forms, JQuery Examples
AJAX: Introduction to AJAX, PHP with AJAX Introduction to RDBMS: Connection with MySQL Database, Performing basic database operation (DML)(Insert, Delete, Update, Select)

List of Experiments:

1. Design an html form for displaying information using interactive css including images, tables.
2. Create a webpage with HTML describing your department with following specification:

A. Change the background color of the page. At the bottom create a link to take user to the top of the page.
B. Insert an image and create a link such that clicking on image takes user to other page.
C. Also apply font styling like italics, underline and two other fonts to words you find appropriate. Also use header tags.

3. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
4. Write a JavaScript to validate the following fields of employee on html form: email, name, mobile no., address, salary.
5. Develop and demonstrate a HTML file that includes JavaScript script that uses functions for the following problems:
    a. Parameter: A string Output: Length of the String
    b. Parameter: A number Output: The number with its digits in the reverse order
6. Develop and demonstrate a HTML file that includes JavaScript for the following problems:
    c. Input: A starting and ending number
    d. Output: find all the prime numbers between starting and ending number.

7. Write a PHP program to display a digital clock which displays the current time of the server.
8. Write a PHP program to implement sign-In and Sign-out functionality.
9. Write a PHP program to keep track of the number of visitors visiting the Web page and to display this count of visitors, with proper headings.
10. Write a PHP code to implement AJAX functionality.
11. Write a PHP program to perform search operation on the student records using AJAX.
12. Write a PHP program to sort the student records which are stored in the database using ascending/descending order.

Text Book:

1. HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, Ajax, PHP and jQuery, 2ed (English, Paperback, DT Editorial Services).

Reference Books:

1. Robin Nixon, Learning PHP, MySQL & JavaScript with j Query, CSS & HTML5 Paperback by Orielly Pub**.**
2. E. Robson, E. Freeman, Head First HTML & CSS, O'Reilly Media, 2nd Edition, 2012.

MCAL107: Practical II (Python Lab and DBMS Lab)

A) Python Lab

List of Experiments:

1 . Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
2. Scientific problems using Conditionals and Iterative loops.
3. Linear search and Binary search
4. Selection sort, Insertion sort
5. Merge sort, Quick Sort
6. Implementing applications using Lists, Tuples.
7. Implementing applications using Sets, Dictionaries.
8. Implementing programs using Functions.
9. Implementing programs using Strings.
10. Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy)
12. Implementing real-time/technical applications using Exception handling.
13. Creating and Instantiating classes

B) DBMS Lab

List of Experiments:

1. Using SQL prompt create database and use of SQL commands (DDL, DML and DCL).
2. Using SQL to Create Table and Rename table for suitable database schema also apply database constraint like primary key, foreign key and NOT Null. Then design at least ten SQL queries SQL DML statements: Insert, Select, Update, Delete using distinct and count clause.
3. Consider the suitable database schema and design five SQL Nested Queries with/without Where clause.
4. Write a stored procedure to insert and retrieve data from database table.
5. Write a PLSQL procedure for cursor and trigger.
6. Write SQL to apply Aggregating Data using Group functions
7. Design a query for suitable database application using SQL DML statements: all types of Joins, Views.
8. Install MongoDB and perform CRUD operations using MongoDB.
9. Implement small database system for office automation or hotel management or hospital management.

MCAC201: Object Design & Agile Development

[Unit 1] **[7 Hours]**

Review of programming practices and code-reuse; Object model and object-oriented concepts; Object-oriented programming languages and implementation. Object-oriented analyses and design using UML structural, behavioral and architectural modeling. Unified development process, Software reuse design patterns, components and framework;

[Unit 2] **[7 Hours]**

Distributed object computing, interoperability and middle ware standards COM/DCOM and CORBA; Object-oriented database system data model, object definition and query language, object relational system.

[Unit 3] **[7 Hours]**

Introduction Need of Agile software development, History of Agile, Agile context– manifesto, principles, methods, values. The benefits of agile in software development. Agile Design Methodologies Fundamentals, Design principles–Single responsibility, Open-closed, Liskov-substitution, Dependency inversion, Interface-segregation.

[Unit 4] **[7Hours]**

Scrum Introduction to scrum framework, Roles: Product owner, team members and scrum master, Events: Sprint, sprint planning, daily scrum, sprint review, and sprint retrospective, Artifacts: Product backlog, sprint backlog and increments. User stories- characteristics and contents.

[Unit 5] **[7 Hours]**

Kanban Introduction to Kanban framework, Workflow, Limit the amount of work in progress, pulling work from column to column, Kanban board, Adding policies to the board, The Agile lifecycle and its impact on testing, Test driven development– Acceptance tests and verifying stories, writing a user acceptance test, Developing effective test suites, Continuous integration, Code refactoring. Risk based testing, Regression tests, Test automation.

Suggested Readings/ Books:

1. Object Oriented System Analysis, Sally Shlaer, Prentice Hall PTR.
2. Object Oriented System Analysis and Design using UML, Simon Bennett, McGraw-Hill.
3. Ken Schawber, Mike Beedle, “Agile Software Development with Scrum”, Pearson.
4. Robert C. Martin, “Agile Software Development, Principles, Patterns and Practices”, Prentice Hall.
5. Mike Cohn, “User Stories Applied: For Agile Software Development”, Addison Wesley Signature Series.
6. Lisa Crispin, Janet Gregory, “Agile Testing: A Practical Guide for Testers and Agile Teams”, Addison Wesley.
7. Paul VII, “Agile: The Complete Overview of Agile Principles and Practices (Agile Product Management)”.
8. Robert Martin, “Agile Software Development, Principles, Patterns, and Practices”, Pearson New International Edition. Greene Jennifer,” Learning Agile”, O’Reilly Series.

MCAC202: Computer Networks

[Unit 1] Introduction [7 Hours]

Applications of computer networks, Network hardware, Network software: Protocol Hierarchy, Design Issue, connection oriented vs. connectionless, Service Primitives, Reference models: OSI and TCP/IP, Example networks: Internet, Network standardization, Performance: Bandwidth and Latency, Delay and bandwidth product, High- Speed Network, Application Performance Needs.

[Unit 2] LAN Technologies [7 Hours]

X5, Frame relay, ATM, Ethernet (802.3), FDDI, Token Rings, Resilient Packet Rings, Wireless LANs: Wi-Fi (802.11), Cell Phone Technologies, Broadband Wireless: Wi-MAX (802.16), Bluetooth (802.15.1),RFID.

[Unit 3] Data Link Layer [7 Hours]

Introduction, functions. Design Issues: Services to Network Layer, Framing.ARQ strategies: Error detection and correction, Parity Bits, Hamming Codes (11/12-bits) and CRC. Flow Control Protocols: Unrestricted Simplex, Stop and Wait, Sliding Window Protocol.WAN Connectivity: PPP and HDLC. MAC Sub layer: Multiple Access Protocols: Pure and Slotted ALOHA, CSMA, WDMA, CSMA/CD, CSMA/CA, Binary Exponential Back-off algorithm, Introduction to Ethernet IEEE 802.3, IEEE 802.11 a/b/g/n, IEEE 802.15 and IEEE 802.16 Standards.

[Unit 4] Network Layer and Congestion Control [7 Hours]

IPv4/IPv6, Routers and Routing Algorithms distance vector link state. TCP UDP and sockets, General principles, Congestion prevention policies, Load shading, Jitter control, Quality of service: Packet scheduling, Traffic shaping, integrated Services, **Routing Protocols**: RIP, OSPF, BGP, MPLS. **Routing in MANET**: AODV, DSR, Mobile IP.

[Unit 5] Application Layer Protocols [7 Hours]

DNS, SMTP, POP, FTP, HTTP. Network Security: Authentication, Basics of public key and private key cryptography, digital signatures and certificates, firewalls.

Text Book:

1. A. Tanenbaum, Computer Networks, PHI Publication, 5th Edition, 2011.

Reference Books:

1. B. Forouzan, Data Communications and Networking, McGraw Hill Publication, 5th Edition, 2013.
2. Larry Peterson and Bruce Davie, Computer Networks: A Systems Approach, Morgan Kufman Publication, 5th Edition, 2012.
3. S. Keshav, An Engineering Approach to Computer Networking, Addison-WesleyProfessional.
4. D. Comer, Computer Networks and Internet, Pearson Education, 6th Edition, 2014.
5. M. Gallo, W. Hancock, Computer Communications and Networking Technologies, Brooks/Cole Publisher, 2001. 6. Natalia Olifer, Victor Olifer, Computer Networks: Principles, Technologies and Protocols for Network Design, Wiley Publication, 2005

MCAC203:Artificial Intelligent

[Unit 1] **[7 Hours]**

AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

[Unit 2] **[7 Hours]**

Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

[Unit 3] **[7 Hours]**

Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Baye's probabilistic interferences and dempstershafer theory.

[Unit 4] **[7 Hours]**

First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning,Decisiontrees,Explanationbasedlearning,Statistical Learning methods ,Reinforcement Learning.

[Unit 4] **[7 Hours]**

Expert systems:- Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems works, problem areas addressed by expert systems, expert systems success factors, types of expert systems, expert systems and the internet interacts web, knowledge engineering, scope of knowledge, difficulties, in knowledge acquisition methods of knowledge acquisition, machine learning, intelligent agents, selecting an appropriate knowledge acquisition method, societal impacts reasoning in artificial intelligence, inference with rules, with frames: model based reasoning, case based reasoning, explanation & meta knowledge inference with uncertainty representing uncertainty

Reference Books:-

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", SecondEdition, Pearson Education
2. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press.
3. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problemsolving", Fourth Edition, Pearson Education.
4. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.

MCAE204: (A) Internet of Things

Unit 1: Introduction **[7 Hours]**

What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.

Unit 2: Smart Objects **[7 Hours]**

The “Things” in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.

Unit 3: IP as the IoT Network Layer **[7 Hours]**

IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods

Unit 4: Data and Analytics for IoT **[7 Hours]**

Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT. Attacks on IoT Devices.

Unit 5: Case Studies **[7 Hours]**

An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples.An IoTStrategy for healthcare System. An IoT Strategy for smart agriculture System.

Text Books

1.David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the
2. Internet of Things”, 1stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 9789386873743) 2. Srinivasa K G, “Internet of Things”, CENGAGE Leaning India, 2017

Reference Books

1.Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-on-Approach)”, 1stEdition, VPT, 2014. (ISBN: 978-8173719547)
2. Raj Kamal, “Internet of Things: Architecture and Design Principles”, 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)

MCAE204: (B)Human Computer Interaction

Unit 1: Fundamentals: **[7 Hours]**
The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies.

Unit 2: Design & Software Process **[7 Hours]**
Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design

Unit 3: Models & Theories **[7 Hours]**
HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.

Unit 4: Mobile HCI **[7 Hours]**
Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. - Case Studies

Unit 5: WEB INTERFACE DESIGN **[7 Hours]**
Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies

TEXT BOOKS:
1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ―Human Computer Interaction‖, 3rd Edition, Pearson Education, 2004 (UNIT I, II & III)
2. Brian Fling, ―Mobile Design and Development‖, First Edition, O‘Reilly Media Inc., 2009 (UNIT – IV)
3. Bill Scott and Theresa Neil, ―Designing Web Interfaces‖, First Edition, O‘Reilly, 2009. (UNIT-V)

MCAE204: (C) Advance Database Technologies

[Unit 1] **[7 Hours]**
Distributed Systems – Introduction – Architecture – Distributed Database Concepts – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing

[Unit 2] **[7 Hours]**
Active Databases Model – Design and Implementation Issues - Temporal Databases - Temporal Querying - Spatial Databases: Spatial Data Types, Spatial Operators and Queries – Spatial Indexing and Mining – Applications -– Mobile Databases: Location and Handoff Management, Mobile Transaction Models – Deductive Databases - Multimedia Databases.

[Unit 3] **[7 Hours]**
NoSQL – CAP Theorem – Sharding - Document based – MongoDB Operation: Insert, Update, Delete, Query, Indexing, Application, Replication, Sharding–Cassandra: Data Model, Key Space, Table Operations, CRUD Operations, CQL Types – HIVE: Data types, Database Operations, Partitioning – HiveQL – OrientDB Graph database – OrientDB Features

[Unit 4] **[7 Hours]**
Structured, Semi structured, and Unstructured Data – XML Hierarchical Data Model – XML Documents – Document Type Definition – XML Schema – XML Documents and Databases – XML Querying – XPath – XQuery

[Unit 5] **[7 Hours]**
IR concepts – Retrieval Models – Queries in IR system – Text Preprocessing – Inverted Indexing – Evaluation Measures – Web Search and Analytics – Current trends.

Text book:
1.Abraham Silberschatz, Henry F Korth, S. Sudharshan, “Database System Concepts”, Seventh Edition, McGraw Hill, 2019.
2. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education/Addison Wesley, 2017.
3. Guy Harrison, “Next Generation Databases, NoSQL, NewSQL and Big Data”, First Edition, Apress publishers, 2015

References:
1.Jiawei Han, MichelineKamber, Jian Pei, “Data Mining: Concepts and Techniques”, Third Edition, Morgan Kaufmann, 2012.
2. Brad Dayley, “Teach Yourself NoSQL with MongoDB in 24 Hours”, Sams Publishing, First Edition, 2014.
3. C. J. Date, A. Kannan, S. Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006 Database Systems: Concepts, Design and Applications, 2nd edition

MCAHM205: (A) Research Methodology

[Unit 1] **[7 Hours]**

Foundations of Research: Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method - Understanding the language of Research - Concept, Construct, Definition, Variable. Research Process.

[Unit 2] **[7 Hours]**

Problem Identification & Formulation - Research Question - Investigation Question - Measurement Issues - Hypothesis - Qualities of a good Hypothesis,Null Hypothesis & Alternative Hypothesis. Hypothesis Testing - Logic & Importance.

[Unit 3] **[7 Hours]**

Research Design: Concept and Importance in Research - Features of a good research design - Exploratory Research Design - concept, types and uses, Descriptive Research Designs - concept, types and uses. Experimental Design: Concept of Independent & Dependent variables. Qualitative and Quantitative Research: Qualitative research - Quantitative research - Concept of measurement, causality, generalization, replication. Merging the two approaches.

[Unit 4] **[7 Hours]**

Measurement: Concept of measurement- what is measured? Problems in measurement in research- Validity and Reliability. Levels of measurement,Nominal, Ordinal, Interval, Ratio. Sampling: Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample- Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample, Data Analysis: Data Preparation - Univariate analysis (frequency tables, bar charts, pie charts, percentages),

[Unit 5] **[7 Hours]**

Interpretation of Data and Paper Writing- Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism. Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline. Use of tools I techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/ Mendeley, Software for paper formatting like LaTeX/ MS Office, Software for detection of Plagiarism

Reference Book:-

1. Business Research Methods- Donald Cooper & Pamela Schindler, TMGH, 9th editions.
2. Business Research Methods- Alan Bryman& Emma Bell, Oxford University Press.
3. Research Methodology- C. R. Kothari
4. Select references from the Internet

MCAHM205: (B): Cyber Laws

[Unit 1] **[7 Hours]**

Internet, E-Commerce And E-Governance With Reference To Free Market EconomyUnderstanding Computers, Internet and Cyber Laws, Conceptual Framework of E-commerce:E-governance, The Role of Electronic Signatures in E-commerce with Reference to FreeMarket Economy in India.

[Unit 2] **[7 Hours]**

Law Relating To Electronic Records And Intellectual Property Rights In India Legal Aspectsof Electronic Records/Digital Signatures, The Rules and Regulations of CertifyingAuthoritiesin India, Protection of Intellectual Property Rights in Cyberspace in India.

[Unit 3] **[7 Hours]**

International Efforts Relating To Cyberspace Laws And Cyber Crimes International EffortsRelated to Cyberspace Laws, Council of Europe (COE) Convention on Cyber Crimes.

[Unit 4] **[7 Hours]**

Penalties, Compensation And Offences Under The Cyberspace And Internet In IndiaPenalties, Compensation and Adjudication of Violations of Provisions of IT Act and JudicialReview Some Important Offences under the Cyberspace Law and the Internet in India, OtherOffences under the InformationTechnology Act in India.

[Unit 5] **[7 Hours]**

Miscellaneous Provisions Of It Act And Conclusions The Role of Electronic Evidence andthe Miscellaneous Provisions of the IT Act, Information Technology Act as Amended up to2008, The Information Technology (Certifying Authorities) Rules, 2000, The InformationTechnology (Certifying Authorities) Rules, 2000, Ministerial Order on Blocking of Websites.

Reference Books:

1. Harish Chander, Cyber Laws and It Protection, PHI Publication.
2. FaiyazAhamad, KLSI, Cyber Law and Information Security, Dreamtech Press.
3. Murray, Information Technology Law: Law and Society, 3rd Edition, OxfordUniversity Press Oxford 2016.
4. SunitBelapure Nina Godbole, Cyber Security, Wiley India Pvt. Ltd.
5. VivekSood, Cyber Law Simplified, McGraw-Hill Publication.

MCAHM205: (C): Employability and Skill Development

[Unit 1] Soft Skills & Communication basics: [7 Hours]

Soft skills Vs hard skills, Skills to master, Interdisciplinary relevance, Global and national perspectives on soft skills, Resume, Curriculum vitae, How to develop an impressive resume, Different formats of resume Chronological, Functional, Hybrid, Job application or cover letter, Professional presentation- planning, preparing and delivering presentation, Technical writing.

[Unit 2] Arithmetic and Mathematical Reasoning and Analytical Reasoning and Quantitative Ability: [7 Hours]

Aspects of intelligence, Bloom taxonomy, multiple intelligence theory, Number sequence test, mental arithmetic (square and square root, LCM and HCF, speed calculation, reminder theorem). Matching, Selection, Arrangement, Verifications (Exercises on each of these types). Verbal aptitude (Synonym, Antonym, Analogy).

[Unit 3] Grammar and Comprehension: [7 Hours]

English sentences and phrases, Analysis of complex sentences, Transformation of sentences, Paragraph writing, Story writing, Reproduction of a story, Letter writing, précis writing, Paraphrasing and e-mail writing.

[Unit 4] Skills for interviews: [7 Hours]

Interviews- types of interviews, preparatory steps for job interviews, interview skill tips, Group discussion- importance of group discussion, types of group discussion, difference between group discussion, panel discussion and debate, personality traits evaluated in group discussions, tips for successful participation in group discussion, Listening skills- virtues of listening, fundamentals of good listening, Non-verbal communication-body movement, physical appearance, verbal sounds, closeness, time.

[Unit 5] Problem Solving Techniques: [7 Hours]

Problem solving model: 1. Define the problem, 2. Gather information, 3. Identify various solution, 4. Evaluate alternatives, 5. Take actions, 6. Evaluate the actions.
Problem solving skills: 1. Communicate. 2. Brain storming, 3. Learn from mistakes.

Text Book:

1. R. Gajendra Singh Chauhan, Sangeeta Sharma, ―Soft Skills- An integrated approach to maximize personality‖, ISBN: 987-81-265-5639-7, First Edition 2016

Reference Books:

1. Wiley Wren and Martin, "English grammar and Composition", S. Chand publications.
2. R. S. Aggarwal, "A modern approach to verbal reasoning", S. Chand publications.
3. Philip Carter, "The Complete Book of Intelligence Test", John Willey & Sons Ltd.
4. Philip Carter, Ken Russell, "Succeed at IQ test", Kogan Page.
5. Eugene Ehrlich, Daniel Murphy, "Schaum;s Outline of English Grammar", McGraw Hills.
6. David F. Beer, David A. McMurrey, ―A Guide to Writing as an Engineer, ISBN: 978- 1-118-30027-5 4th Edition, 2014, Wiley.

MCAS206:Technical Seminar –I

The student shall study in (individual) on some special topic beyond the scope of the syllabus under the subjects of Computer Science Engineering ,recent research topic or inter discipline branch from current literature, by referring the current technical journal or reference books, under the guidance of the teacher. The students shall prepare his report and deliver talk on the topic for other students of his class in the presence of his guide and internal examiner. The student is permitted to use audio-visual aids or any other such teaching aids

Continues Assessment: The Continues Assessment for this head will consists of the report written in a technical reporting manner and presentation of the talk on the subject and will be assessed by the internal examiner appointed by the HOD of concern department of the institution.

MCAL207:Practical III (Data Analysis with Python andAdvance Database Techniques Lab)

A) Data Analysis with PythonLab

List of Experiments:

1. Working with NumPy Array
2. Working with Pandas frame, The measures of central tendency
3. Basic plots using matplotlib
4. Plots with Seaborn
5. Measure of Dispersion Standard Deviation,Frequency distribution, Average, Variability, Normal distribution.
6. Hypothesis Testing:z-Test and T-test
7. Leven's Test
8. ANOVA
9. Correlation Test
10. Regression with SciPy

B) ADT Lab

List of Experiments:

1.NOSQL Exercises

a. MongoDB – CRUD operations, Indexing, Sharding

b. Cassandra: Table Operations, CRUD Operations, CQL Types

c. HIVE: Data types, Database Operations, Partitioning – HiveQL

d. OrientDB Graph database – OrientDB Features

2. MySQL Database Creation, Table Creation, Query

3. MySQL Replication – Distributed Databases

4. Spatial data storage and retrieval in MySQL

5. Temporal data storage and retrieval in MySQL

6.Object storage and retrieval in MySQL

7. XML Databases , XML table creation, XQuery FLWOR expression

8. Mobile Database Query Processing using open source DB (MongoDB/MySQL etc)

MCAL208:Practical IV (AI Lab and ODAD Lab)

A) AI Lab

List Experiment

1.Study of Lisp/ PROLOG/Python/Java
2. Existing AI Application (e.g. Recommendation system, Carpooling, OTT channels etc.)
3. Solve any problem using depth first search.
4. Solve any problem using breadth first search.
5. Solve 8-puzzle problem using best first search.
6. Write a program to solve Tic-Tac-Toe using Min-Max search.
7. Solve traveling salesman problem.
8. Write a program for Alpha–Beta Pruning.
9. Write a program to solve 8 queens problem.
10. Write a program to solve map coloring problem using CSP.

B) ODAD Lab

List of Experiments:

1.Study of OpenProj or similar software related to measure the UML.
2. Usage of OpenProj or similar software to draft the diagrams for object oriented analysis and design.
3. Getting familiar with the importance of UML compilers and its benefits.
4. Design and draft the Class Modeling for Railway reservation etc.
5. Design and draft the State Modeling for Library management system etc.
6. Design and draft the Interaction Modeling for Online mobile recharge etc.
7. Getting familiar and hands on practice with tools like Plant UML, Argo UML etc

MCAF209: Field Training / Internship / Industrial Training

Guidelines for Field Training / Internship / Industrial Training Industrial Training:

1. To apply for a suitable Industrial Training, submit an application form to respective organization concerned one semester before the Industrial Training Programme commences.
2. Student can also apply through online platforms such as Internshala for industrial training.
3. Submit one copy of the offer letter for the Industrial Training to the Head of the department or Faculty coordinator (Industrial Training).
4. To complete the Industrial Training process within the specified time based on the Industrial Training Programme schedule.
5. Assessment within the Industrial Training context aims to evaluate the student's work quality and appropriateness to the field of study with reference to the learning outcomes of the Industrial Training Programme.
6. Evaluation of the students' performance should be done in the next upcoming semester.
7. Those students who fails, they can also complete online certification courses which are available at free of cost on various MOOC platforms.

MCAC301:Full Stack Development

Unit 1 : Introduction to Front-End Development [7 Hours]
HTML5 and CSS3,JavaScriptFundamentals,Front-End Frameworks (e.g., React, Angular, Vue.js),Responsive Web Design and CSS Preprocessors (e.g., Sass, Less)

Unit 2: Back-End Development [7 Hours]
Introduction to Back-End Development,Server-Side Programming (e.g., Node.js, Python, Java),Web APIs and RESTful ServicesDatabases and SQL (e.g., MySQL, PostgreSQL),NoSQL Databases (e.g.MongoDB),Serverless Computing (e.g., AWS Lambda, Azure Functions)

Unit 3: Version Control and Collaboration Tools [7 Hours]
Git and GitHub/GitLab,Code Reviews and Collaboration Workflows,Issue Tracking and Project Management (e.g., Jira, Trello)

Unit 4: DevOps Principles and Practices [7 Hours]
Introduction to DevOps and CI/CD,Continuous Integration (CI) and Automated Testing,Continuous Delivery (CD) and Deployment Infrastructure as Code (IaC) with Tools like Terraform or CloudFormation,Containerization and Docker,Orchestration with Kubernetes.

Unit 5: Cloud Platforms and Services & Security Best Practices [7 Hours]
Introduction to Cloud Computing (e.g., AWS, Azure, Google Cloud),Cloud Deployment and Scaling Strategies Cloud Services (e.g., AWS EC2, S3, Lambda, Azure App Service), Monitoring and Logging in the Cloud Environment , Web Application Security Fundamentals, Authentication and Authorization, Secure Coding Practices, Network Security and Encryption, DevSecOps and Security in CI/CD Pipelines.

Unit 6: Performance Optimization [7 Hours]
Front-End Performance Optimization, Back-End Performance Optimization, Caching Strategies, Load Balancing and Scalability.

TextBooks:-

1. Colin Ihrig, Full Stack JavaScript Development With MEAN: MongoDB, Express, AngularJS, and Node.JS, SitePoint; 1st Edition.
2. https://www.w3schools.com/whatis/whatis_fullstack.asp**.**
3.Robin Nixon, Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites, O'Reilly Media; 3rd edition,
4. Callum Macrae, Learning from jQuery, O'Reilly Media.

MCAC302: Machine Learning

[Unit 1] **[7 Hours]**

Well-posed learning problems, Designing a Learning System, Perspectives and Issues in Machine learning, Basic definitions, types of learning, Concept Learning and General-to-specific Ordering: A concept learning task, Concept learning as Search, Finding a maximally specific hypothesis, Version Spaces and Candidate elimination algorithm, Inductive Bias. hypothesis space and inductive bias, evaluation, cross-validation.

[Unit 2] **[7 Hours]**

Supervised Learning, Classsification& Regression, Performance Metrics for Classification Problems, Performance Metrics for Regression Problems.Linear regression, Decision trees, over fitting,

[Unit 3] **[7 Hours]**

Bayesian Learning: Bayes theorem and concept learning, Maximum likelihood and least square error hypotheses, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naive Bayes classifier,

Computational Learning Theory: Probably learning an approximately correct hypothesis, PAC learnability, The VC dimension, the mistake bound model for learning.

[Unit 4] **[7 Hours]**

Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM.

Ensemble Learning, Bagging, Random Forest, Boosting, AdaBoost, Stacking Perceptron, multilayer network, back propagation, introduction to deep neural network.

[Unit 5] **[7 Hours]**

Clustering k-means, adaptive hierarchical clustering, Gaussian mixture model.

Association Rules Mining and Recommendation Systems.

What are Association Rules, Association Rule Parameters, Calculating Association Rule Parameters, Recommendation Engines, Recommendation Engines working, Collaborative Filtering ,Content Based Filtering.

Text Books:

1.Ethem Alpaydın, Introduction to Machine Learning, PHI, Third Edition, ISBN No. 978-81-203-5078-6

2.Christopher M. Bishop, Pattern Recognition and Machine Learning, Mcgraw-Hill, ISBN No. 0- 07-115467-1

3.Tom Mitchell, Machine Learning, Mcgraw-Hill, First Edition, ISBN No. 0-07-115467-1.

4.Giuseppe Bonaccorso, “Machine Learning Algorithms”, Packt Publishing Limited, ISBN10: 1785889621, ISBN-13: 978-1785889622

Reference Books:

1. Miroslav, Kubat. “An Introduction to Machine Learning”, Springer Publishing.

2. Conway, Drew and White, John Myles, “Machine Learning for Hackers”, O'Reilly Media, February 2012.

3.Segaran, Toby. “Programming Collective Intelligence- Building Smart Web 2.0 Applications”, O’Reilly Media, August 2007.

MCAC303: Cloud Computing

[[Unit 1]
Introduction to Cloud [7 Hrs]
Cloud Computing at a Glance, the Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments.
Virtualization: Introduction, Characteristics of Virtualized Environment, Taxonomy of Virtualization Techniques, Virtualization and Cloud computing, Pros and Cons of Virtualization, Technology Examples- VMware and Microsoft Hyper-V.
Before the Move into the Cloud: Know Your Software Licenses, The Shift to a Cloud Cost Model, Service Levels for Cloud Applications.

[Unit 2] Cloud Computing Architecture [7 Hrs]
Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Interoperability and Standards, Scalability and Fault Tolerance.
Ready for the Cloud: Web Application Design, Machine Image Design, Privacy Design, Database Management, Data Security, Network Security, Host Security, Compromise Response.

[Unit 3] Data Storage and Security [7 Hrs]
Data Storage: Introduction to Enterprise Data Storage, Direct Attached Storage, Storage Area Network, Network Attached Storage, Data Storage Management, File System, Cloud Data Stores, Using Grids for Data Storage. Cloud Storage: Data Management, Provisioning Cloud storage, Data Intensive Technologies for Cloud Computing. Cloud Storage from LANs to WANs: Cloud Characteristics, Distributed Data Storage.
Risks in Cloud Computing, Data Security in Cloud, Cloud Security Services:

[Unit 4] Cloud Platforms and Cloud Applications [7 Hrs]
Amazon Web Services (AWS): Amazon Web Services and Components, Amazon Simple DB, Elastic Cloud Computing (EC2), Amazon Storage System, Amazon Database services (Dynamo DB). Microsoft Cloud Services: Azure core concepts, SQL Azure, Windows Azure Platform Appliance. Cloud Computing Applications: Healthcare: ECG Analysis in the Cloud, Biology: Protein Structure Prediction, Geosciences: Satellite Image Processing, Business and Consumer Applications: CRM and ERP, Social Networking, Google Cloud Application: Google App Engine. Overview of OpenStack architecture.

[Unit 5] Advanced Techniques in Cloud Computing [7 Hrs]
Future Tends in cloud Computing, Mobile Cloud, Automatic Cloud Computing: Comet Cloud. Multimedia Cloud: IPTV, Energy Aware Cloud Computing, Jungle Computing, Distributed Cloud Computing Vs Edge Computing, Containers, Docker, and Kubernetes, Introduction to DevOps. IOT and Cloud Convergence: The Cloud and IoT in your Home, The IOT and cloud in your Automobile, PERSONAL: IoT in Healthcare.

Text Book:

1. RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 2011.
2. A. Srinivasan, J. Suresh, “Cloud Computing: A Practical Approach for Learning and Implementation”, Pearson, ISBN: 978-81-317-7651-3

Reference Books:

1. Gautam Shroff, Enterprise Cloud Computing - Technology, Architecture, Applications; Cambridge University Press, 2010.

2. Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2010.
3. Ronald L. Krutz, Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley-India, 2010.
4. Anthony T. Velte, Toby J. Velte and Robert E, Cloud Computing – A Practical Approach, TMH, 2010
5. Tim Mather, Subra K, ShahidL.,"Cloud Security and Privacy", Oreilly, ISBN-13 978-81-8404-815-5
6. Rishabh Sharma, "Cloud Computing: Fundamentals, Industry Approach and Trends", Wiley publication, ISBN:

NPTEL Course: 1. Cloud Computing, Prof. SoumyaKanti Ghosh, Department of Computer Science and Engineering, IIT Kharagpur

MCAE304: (A)Big Data Analytics

[Unit 1]Introduction to Big Data **[7 Hours]**
Why Big Data and Where did it come from?, Characteristics of Big, Challenges and applications of Big Data,Enabling Technologies for Big Data, Big Data Stack, Big Data distribution packages.

[Unit 2] Big Data Platforms **[7 Hours]**
Overview of Apache Spark, HDFS, YARN, MapReduce, MapReduce Programming Model with Spark,MapReduce Example: Word Count, Page Rank etc, CAP Theorem, Eventual Consistency, Consistency TradeO-s, ACID and BASE, Zookeeper and Paxos, Cassandra, Cassandra Internals, HBase, HBase Internals.

[Unit 3] Big Data Streaming Platforms **[7 Hours]**
Big Data Streaming Platforms for Fast Data, Streaming Systems, Big Data Pipelines for Real-Timecomputing, Spark Streaming, Kafka, Streaming Ecosystem.

[Unit 4] Big Data Applications **[7 Hours]**
Overview of Big Data Machine Learning, Mahout, Big Data Machine learning Algorithms in Mahoutkmeans, Naive Bayes etc. Machine learning with Spark, Machine Learning Algorithms in Spark, SparkMLlib, Deep Learning for Big Data, Graph Processing: Pregel, Giraph, Spark GraphX.

[Unit 5] Database for the Modern Web **[7 Hours]**
Introduction to mongoDB key features, Core server tools, MongoDB through the JavaScript‘ sshell, Creatingand querying through Indexes, Document-oriented, principles of schema design, Constructing queries ondatabases, collections and documents, MongoDB query language.

Text Book:
1. Bart Baesens ―Analytics in a Big Data World: The Essential Guide to Data Science andits Applications‖, Wiley and SAS Business Series.

Reference Books:

1. RajkumarBuyya, Rodrigo N. Calheiros, Amir M VahidDastjerdi, Morgan Kaufmann, ―Big Data Principals and Paradiagram‖, Elsevier, ISBN: 978-0-12-805394-2
2. Kyle Banker, Peter Bakkum and Shaun Verch, ―MongoDB in Action‖, 2nd Edition Dreamtech Press, ISBN: 978-9351199359.
3. AnandRajaraman, Jeffrey D. Ullman, ―Mining of Massive Datasets‖, 3rd edition, Cambridge University Press
4. Sima Acharya, SubhashiniChhellappan, ―BIG Data and Analytics‖, Willey publication,ISBN: 978-8126554782.

MCAE304: (B)Distributed Computing

[Unit 1] **[7 Hours]**

Evolution of Distributed Computing Systems, System models, issues in design of Distributed-computing environment, web based distributed model, computer networks related to distributed systems and web based protocols

[Unit 2] **[7 Hours]**

Inter process Communication, Desirable Features of Good Message-Passing Systems, Issues in IPC by Message, Synchronization, Buffering, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication

[Unit 3] **[7 Hours]**

The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Communication Protocols for RPCs, Complicated RPCs, Complicated RPCs, ClientServer Binding, Exception Handling, Security, Some Special Types of RPCs, Lightweight RPC, Optimization for Better Performance

[Unit 4] **[7 Hours]**

Design and Implementation Issues of DSM, Granularity, Structure of shared memory space, Consistency Models, replacement Strategy, Thrashing, Other Approaches to DSM, Advantages of DSM **,** Clock Synchronization, Event Ordering, Mutual Exclusion, Election Algorithms.

[Unit 5] **[7 Hours]**

Desirable Features of a good global scheduling algorithm, Task assignment approach, Load Balancing approach, Load sharing approach, Process Migration, Desirable Features of a good Distributed File Systems, File Models, File-Accessing Models, File-sharing Semantics, File-caching schemes, File Replication, Fault Tolerance,

Reference Books:

1. Distributed OS by Pradeep K. Sinha (PHI)
2. TanenbaumS. : Distributed Operating Systems, Pearson Education
3. Tanenbaum S. Maarten V.S.: Distributed Systems Principles and Paradigms. (Pearson Education)
4. George Coulouris, Jean Dollimore, Tim Kindberg: Distributed Systems concepts and design

MCAE304: (C)Software Testing and Tools

[Unit 1] **[7 Hours]**

Human and errors, Testing and Debugging, Software Quality, Requirement Behavior and Correctness, Fundamentals of Test Process, Psychology of Testing, General Principles of Testing, Test Metrics

[Unit 2] **[7 Hours]**

Review of software development models (Waterfall Models, Spiral Model, W Model, V Model) Agile Methodology and Its Impact on testing, Test Levels (Unit, Component, Module, Integration, System, Acceptance, Generic)Static Testing Structured Group Examinations Static Analysis Control flow & Data flow, Determining Metrics

[Unit 3] **[7 Hours]**

Dynamic Testing Black Box Testing Equivalence Class Partitioning, Boundary Value Analysis, State Transition Test, Cause Effect Graphing and Decision Table Technique and Used Case Testing and Advanced black box techniques White Box Testing Statement Coverage, Branch Coverage, Test of Conditions, Path Coverage, Advanced White Box Techniques, Instrumentation and Tool Support Gray Box Testing, Intuitive and Experience Based Testing

[Unit 4] **[7 Hours]**

Test Organization Test teams, tasks and Qualifications Test Planning Quality Assurance Plan, Test Plan, Prioritization Plan, Test Exit Criteria Cost and economy Aspects Test Strategies Preventive versus Reactive Approach, Analytical versus heuristic Approach Test Activity Management, Incident Management, Configuration Management Test Progress Monitoring and Control Specialized Testing: Performance, Load, Stress & Security Testing.

[Unit 5] **[7 Hours]**

Automation of Test Execution, Requirement tracker, High Level Review Types of test Tools Tools for test management and Control, Test Specification, Static Testing, Dynamic Testing, Non functional testing Selection and Introduction of Test Tools Tool Selection and Introduction, Cost Effectiveness of Tool . Introduction to OO testing concepts, Differences in OO testing

References:

1. Software Testing Foundations, Andreas Spillner, Tilo Linz, Hans Schaefer, Shoff Publishers and Distributors
2. Software Testing: Principles and Practices by Srinivasan D and Gopalswamy R, PearsonEd, 2006
3. Foundations of Software Testing by Aditya P. Mathur – Pearson Education custom edition 2000
4. Testing Object Oriented Systems: models, patterns and tools, Robert V Binder, Addison Wesley, 1996
5. Software Engineering – A practitioner's approach by Roger S. Pressman, 5th Edition, McGraw Hill 6. The art of software testing by GJ Myers, Wiley.

MCAE305: (A)Cryptography and Network Security

[Unit 1] **[7 Hours]**

Introduction and Mathematical Foundations: Introduction, Overview on Modern Cryptography, Number Theory, Probability and Information Theory. Classical Cryptosystems: Classical Cryptosystems, Crypt-analysis of Classical Cryptosystems, Shannon‘s Theory.

[Unit 2] **[7 Hours]**

Symmetric Key Ciphers: Symmetric Key Ciphers, Modern Block Ciphers (DES), Modern Block Cipher (AES).Crypt-analysis of Symmetric Key Ciphers: Linear Crypt-analysis, Differential Crypt-analysis, other Crypt-analytic Techniques, Overview on S-Box Design Principles, Modes of operation of Block Ciphers.

[Unit 3] **[7 Hours]**

Stream Ciphers and Pseudo-randomness: Stream Ciphers, Pseudo-random functions. Hash Functions and MACs: Hash functions: The MerkleDamgard Construction, Message Authentication Codes (MACs).

[Unit4] **[7 Hours]**

Asymmetric Key Ciphers: Construction and Crypt-analysis: More Number Theoretic Results, The RSA Cryptosystem, Primality Testing, Factoring Algorithms, Other attacks on RSA and Semantic Security of RSA, The Discrete Logarithm Problem (DLP) and the Diffie-Hellman Key Exchange algorithm, The ElGamal Encryption Algorithm, Crypt-analysis of DLP.

[Unit 5] **[7 Hours]**

Digital Signatures: Signature schemes: I, Signature schemes: II. Modern Trends in Asymmetric Key Cryptography: Elliptic curve based cryptography: I, Elliptic curve based cryptography: II. Network Security: Secret Sharing Schemes, A Tutorial on Network Protocols, Kerberos, Pretty Good Privacy (PGP), Secure Socket Layer (SSL), Intruders and Viruses, Firewalls.

Text Book:

1. Douglas Stinson, "Cryptography Theory and Practice", 2nd Edition, Chapman & Hall/CRC.

Reference Books:

1. B. A. Forouzan, "Cryptography & Network Security", McGraw Hill Publication.
2. William Stallings, "Cryptography and Network Security", Pearson Education.
3. Dr. B. B. Meshram, TCP/IP & Network Security, SPD Publication.
4. Wenbo Mao, "Modern Cryptography, Theory & Practice", Pearson Education.
5. Hoffstein, Pipher, Silvermman, "An Introduction to Mathematical Cryptography", Springer.
6. Alang.Konheim, Computer Security and Cryptography, Wiley Publication.
7. A. Joux, "Algorithmic Crypt-analysis", CRC Press.
8. S. G. Telang, "Number Theory", McGraw Hill.
9. Matt Bishop, "Computer Security", Pearson Education.

MCAE305: (B)Block Chain Technology

Unit 1:Introduction **[7 Hours]**

Introduction to Blockchain, How Blockchain works, Blockchain vs Bitcoin, Practical applications, public and private key basics, pros and cons of Blockchain, Myths about Bitcoin.

Unit 2: Blockchain: **[7 Hours]**

Architecture,versions, variants , use cases, Life use cases of blockchain, Blockchain vs shared Database, Introduction to cryptocurrencies, Types, Applications.

Unit 3: Concept of Double Spending **[7 Hours]**

Concept of Double Spending, Hashing, Mining, Proof of work. Introduction to Merkel tree, Privacy, payment verification, Resolving Conflicts, Creation of Blocks

Unit 4: Introduction to Bitcoin **[7 Hours]**

Introduction to Bitcoin, key concepts of Bitcoin, Merits and De Merits Fork and Segwits, Sending and Receiving bitcoins, choosing bitcoin wallet, Converting Bitcoins to Fiat Currency.

Unit 5 : Introduction to Ethereum **[7 Hours]**

Introduction to Ethereum, Advantages and Disadvantages, Ethereum vs Bitcoin, Introduction to Smart contracts, usage, application, working principle, Law and Regulations. Case Study.

Textbooks

1. Beginning Blockchain: A Beginner's Guide to Building Blockchain Solutions by Arshdeep Bikramaditya Signal, Gautam Dhameja (PriyansuSekhar Panda., APress).
2. Blockchain Applications: A Hands-On Approach by Bahga, Vijay Madisetti
3. Blockchain by Melanie Swan, OReilly

References

1. Bitcoin and Cryptocurrency Technologies by Aravind Narayan. Joseph Bonneau, princton
2. Bitcoin and Blockchain Basics: A non-technical introduction for beginners by Arthu.T Books.

MCAE305: (C)Mobile Application Development

[Unit 1] **[7 Hours]**

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.

[Unit 2] **[7 Hours]**

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

[Unit 3] **[7 Hours]**

Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

[Unit 4] **[7 Hours]**

Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

[Unit 5] **[7 Hours]**

Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World

TEXT BOOKS:

1. T1. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education, 2nd ed. (2011)

REFERENCE BOOKS:

1. R1. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd
2. R2. Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd 3. R3. Android Application Development All in one for Dummies by Barry Burd, Edition: I

MCAL306: Practical V (FSD Lab and Mobile Application Development Lab)

A) FSD Lab

List of Experiment:

1. Create a form and validate the contents of the form using JavaScript.
2. Get data using Fetch API from an open-source endpoint and display the contents in the form of a card.
3. Create a NodeJS server that serves static HTML and CSS files to the user without using Express.
4. Create a NodeJS server using Express that stores data from a form as a JSON file and displays it in another page. The redirect page should be prepared using Handlebars.
5. Create a NodeJS server that creates, reads, updates and deletes event details and stores them in a MySQL database. The information about the user should be obtained from a HTML form.
6. Create a counter using ReactJS
7. Create a Todo application using ReactJS. Store the data to a JSON file using a simple NodeJS server and retrieve the information from the same during page reloads.
8. Create a simple Sign up and Login mechanism and authenticate the user using cookies. The user information can be stored in either MongoDB or MySQL and the server should be built using NodeJS and Express Framework.
9. Create a docker container that will deploy a NodeJS ping server using the NodeJS image.

B) Mobile application Development Lab

List of Experiment:

1.Implement mobile applications using UI toolkits and frameworks.
2. Design an application that uses.Layout Managers and event listeners
3.Design a mobile application that is aware of the resource constraints of mobile devices.
4. Design an application that uses Dynamic Linking
5.Develop an application that makes use of mobile database
6. Implement an android application that writes data into the SD card.
7. Develop a web based mobile application that accesses internet and location data.
8. Develop an android application using telephony to send SMS.

MCAL307: Practical VI (ML Lab& CC Lab)

A) ML Lab

List of Experiment:

1. Write a program to Perform Exploratory Data Analysis and Data Visualization in Python.
2. Write a program to Perform Data Preprocessing through various feature-engineering algorithms by python.
3. Write a program to implement the Implement Simple Linear Regression and Multiple Linear Regression for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets and Visualize model with Python.
4. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample and Visualize model with Python.
5. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Compute the accuracy of the classifier, considering few test data sets and Visualize model with Python.
6. Write a program to implement the Naïve Bayes algorithm for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets with Python.
7. Write a program to implement the Kernel Logistic Regression Algorithm for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets and Visualize model with Python.
8. Write a program to implement the Kernel SVM Algorithm for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets and Visualize model with Python.
9. Write a program to implement the Random Forest Algorithm for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets and Visualize model with Python.
10. Write a program to implement the AdaBoost Algorithm for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets and Visualize model with Python.
11. Write a program to implement the K-means Clustering Algorithm for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets and Visualize model with Python.
12. Write a program to implement the Hierarchical Agglomerative Clustering Algorithm for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets and Visualize model with Python.
13. Write a program to implement the Apriori Algorithm with Python.
14. Write a program to implement the Market Basket Analysis. with Python.
15. Create the Model Evaluation for a real life training data set stored as a .CSV file and by computing accuracy for different model proposed the best suitable machine learning algorithm for problem or Solve the any real life problem suggested by Hackerearth site.

(First 3practicaland 15 are compulsory, Choose any 4 from practical 4 to 10, Any one from Practical11 and 12&One from Practical 13& 14)

B) CC Lab

List of Experiment:

1.Write a client and server program to calculate the value of PI, in which server calls the remote procedure of the client side (C programming)

2. Create an word document of your class time table and store locally and also on cloud and share it (use www.zoho.com , docs.google.com)

3. Create your resume in a neat format using google and zoho cloud Programs on PaaS

4. Discuss processor virtualization, memory virtualization, I/O virtualization in VMWare

5. Set up Azure DevOps, Import Code and Create the Azure DevOps Build Pipeline

6.Working in Codenvy to demonstrate Provisioning and Scaling of a website.
7. Implement and configure Google App Engine to deploy Python Program application. 8. Installation and configuration of virtual machine with guest OS.
9. Demonstrate the use of map and reduce tasks. 8. Implementation of SOAP Web services in C#/JAVA Applications

MCAS308: Project phase – I (In-house)

Guidelines for the project phase – I:
The project should enable the students to combine the theoretical and practical conceptsstudied in his / her academics. The project work should enable the students to exhibit their ability to work in a team, develop planning and execute skills and perform analyzing and trouble shooting of their respective problem chosen for the project. The students should be able to write technical report, understand the importance of teamwork and group task. The students will get knowledge about literature survey, problem definition, its solution, and method of calculation, trouble shooting, costing, application and scope for future development.

Project work:
The project work is an implementation of learned technology. The knowledge gained bystudying various subjects separately supposed to utilize as a single task. A group of 03/04 students will have to work on assigned work. The topic could be a product design, specific equipment, live industrial problem etc. The project work involves experimental/theoretical/computational work. It is expected to do necessary literature survey by referring current journals belonging to Information Technology reference books and internet. After finalization of project, requisites like equipment's, data, tools etc. should be arranged.

Project Activity:
The project groups should interact with guide, who in turn advises the group to carry variousactivities regarding project work on individual and group basis. The group should discuss theprogress every week in the project hours and follow further advice of the guide to continueprogress. Guide should closely monitor the work and help the students from time to time. The guide should also maintain a record of continuous assessment of project work progress on weekly basis.

Phase - I:
1. Submission of project/problem abstract containing problem in brief, requirements, broad area, applications, approximate expenditure if required etc.
2. Problem definition in detail.
3. Literature survey.
4. Requirement analysis.
5. System analysis (Draw DFD up to level 2, at least).
6. System design, Coding/Implementation (30 to 50%).

MCAS404: Project phase – II (In-house) / Internship and Project in the Industry

In this course, it is expected that students will go to industry for internship for one semester and do industry-based project in that period. Student will be assigned one dept. one Industry guide to monitor progress of the student. After, completion of the Internship student will submit project report to the dept. and project examination will be conducted in consultation with the industry guide. In case, if student not opting / not doing Internship in the Industry, such students can do project work in the dept.