UNIVERSITY OF CALICUT

Regulations, Scheme of Evaluation, Structure Syllabus for

Degree of

MASTER OF COMPUTER APPLICATIONS
(CHOICE BASED CREDIT AND SEMESTER SYSTEM)

(FOR THE STUDENTS ADMITTED FROM THE ACADEMIC YEAR 2018 – 19 ONWARDS)

UNDER THE

FACULTY OF ENGINEERING

REGULATIONS FOR THE DEGREE OF

MASTER OF COMPUTER APPLICATIONS

EFFECTIVE FROM THE ACADEMIC YEAR 2018 –19

1. Programme Duration

The course for the MCA degree shall extend over a period of six semesters. Each semester should have at least 18 weeks. The maximum duration permissible for completing the MCA degree course is fixed as 5 years.

2. Selection and Eligibility for Admission

Candidates for admission to the MCA degree course shall be required to have passed a Bachelor's Degree in any discipline of three-year duration with Mathematics (this does not include Business Mathematics or Business Statistics) as one of the subjects or BCA under University of Calicut or any other University/ Institution, recognized by this University as equivalent thereto with at least 50% marks or equivalent grade. 5% of relaxation in the marks will be allowed in the case of Candidates, belonging to socially and educationally backward classes. Candidates belonging to scheduled caste and scheduled tribe need only a pass in the qualifying examination. Candidates have to qualify the University Level Entrance examination conducted by the University of Calicut. They shall also satisfy the conditions regarding age and physical fitness as prescribed by the University of Calicut.

Criteria for selection and method of admission to seats for MCA degree courses conducted by university Centres /Colleges affiliated to University of Calicut shall be governed by the rules/regulations framed by the University. In all matters related to selection and admission, the decisions of the University shall be final.

3. Programme Structure

3.1. Subjects of Study

The subjects of study both theory practical and project, shall be in accordance with the prescribed scheme and syllabi.

3.2 Attendance

A candidate shall be permitted to appear for the end-semester examinations only if he/she satisfies the following requirements:

a. He/she maintains not less than 80% attendance in the total number of working hours in each semester, all subjects of study in the semester put together.
b. His/her conduct and Progress must be satisfactory.

It shall be open to the Vice Chancellor to grant con donation of shortage of attendance up to 10% on the recommendation of the head of the institution in accordance with the following norms. Shortage shall not be condoned more than twice during the entire course.

Candidate who is not eligible for condonation of shortage of attendance shall repeat the semester.

3.2.1 Duty Leave

Students are eligible for duty leave if they perform certain kinds of duties like representing the college in sports and games, etc. On recommendation from concerned faculty members, Head of Institution/Head of MCA Department shall sanction duty leave for the period of absence. The maximum limit of duty leave that can be granted to a student during a semester is 10% of the number of working hours in that semester. Application for duty leave should be submitted to the Head of Institution/Head of MCA Department preferably before the duty is performed or within ten working days after returning from duty. If duty leave is sanctioned, the student shall meet the faculty members handling classes for him/her in that semester (within 2 weeks after returning from duty), and request them to mark duty leave granted in the record of attendance.

3.2.2. Registration for each Semester

Every candidate should register for all subjects of the end-semester examinations of each semester. A candidate who does not register will not be permitted to attend the end-semester examinations; he/she shall not be permitted to attend the next semester.

A candidate shall be eligible to register for any higher semester, if he/she has satisfactorily completed the course of study and registered for the examination of the immediate previous semester. He/she should register for the semester at the start of the semester before the stipulated date. University will notify the starting and closing dates for each semester.

3.3. Credit System

Each subject shall have a certain number of credits assigned to it depending upon the academic load and the nature and importance of the subject. The credit associated with each subject will be shown in the prescribed scheme and syllabi. Each course shall have an integer number of credits, which reflects its weightage.

3.4. Grading

The university shall award the letter grade to students based on the marks secured by them in both internal assessment and end-semester examinations taken together in the subjects registered. Each letter grade indicates a qualitative assessment of the student's performance and is associated with a specified number of grade points. The grading system along with the grade points for each grade, applicable to passed candidates is shown below. All passed candidate will be allotted a grade S, A, B, C or D according to the total marks scored by him/her.

Total %marks, rounded to two decimal places	Corresponding Grade Allotted	Grade Points
90 – 100	S	10
80 – 89.99	A	9
70 – 79.99	B	8
60 – 69.99	C	7
50 - 59.99	D	6

If a candidate does not pass a subject as per the conditions given in Section (3.7), he/she will be assigned an Unsatisfactory grade 'U' irrespective of his/her total marks. If a student does not pass a subject in two attempts, the maximum grade he/she can get is 'D' when he/she passes the subject in any subsequent examination, whatever be the marks scored by him/her.

A student is considered to have completed a subject successfully and earned the credits if he/she secures a letter grade other than 'U' in that course. Letter grade 'U' has zero grade point and the candidate has to write the examination again to improve the grade. A student's performance is measured by the number of credits that he/she has earned and by the cumulative grade point average (CGPA) maintained by him/her.10. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA).

a) A Semester Grade Point Average (SGPA) shall be computed for all the students for each semester, as follows:

$$SGPA = \frac{(C_1 G_1 + C_2 G_2 + C_3 G_3 + \text{-------} + C_n G_n)}{(C_1 + C_2 + C_3 + \text{-------} + C_n)}$$

where, n is the number of subjects registered during the semester, C_i is the number of credits allotted to i^{th} subject as per the scheme, and G_i is the grade points corresponding to the grade awarded to the student for the subject.

b) A Cumulative Grade Point Average (CGPA) shall be computed for all the students at the end of each semester by taking into consideration their performance in the present and the past semesters as follows:

$$CGPA = \frac{(C_1 G_1 + C_2 G_2 + C_3 G_3 + \text{-------} + C\ m\ G\ m)}{(C_1 + C_2 + C_3 + \text{-------} + Cm)}$$

Where m is the number of courses registered up to that semester, Ci is the number of credits allotted to i^{th} subject as per the scheme, and Gi is the grade points corresponding to the grade awarded to the student for the subject. An up-to-date assessment of overall performance of a student is obtained by calculating CGPA. CGPA is weighted average of the grade points obtained in all the subjects registered by the students since he entered the MCA course.

c) Both the SGPA and CGPA shall be rounded off to the second place of decimal and recorded as such for ease of presentation. Whenever the CGPAs are to be used for the purpose of determining the merit ranking in a group of students, only the rounded off values shall be made use of.

3.5. Electives

All students shall choose three elective subjects, one in the fourth and two in the fifth semesters from a set of elective subjects prescribed in the syllabus and offered by the institution. There should be at least 25% students of the class for an elective subject to be offered. However, any student having a CGPA of not less than 7.0 shall be permitted to select an elective of his/her choice and register under a faculty, subject to the permission from the faculty and Head of Department. The student will have to study this subject on his own (self-study mode) or the classes of this subject shall be taken during off-hours.

New electives may be introduced according to the needs of emerging fields in technology. The name of the elective and its syllabus should be approved by the university before the subject is offered as an elective.

3.6. Pattern of Questions for End-Semester Examinations of Theory Subjects

The question papers of end-semester examinations of theory subjects shall be able to perform achievement testing of the students in an effective manner. The question paper shall be prepared in accordance with the following guidelines:

a. Should contain seven full questions of 20 marks each
b. Each question should have minimum two subdivisions
c. At least one question from each module and not more than two questions from any module
d. Covering all sections of the course syllabus
e. Unambiguous and free from any defects/errors
f. Emphasizing knowledge testing, problem solving & quantitative methods
g. Containing adequate data/other information on the problems assigned
h. Having clear and complete instructions to the candidates.
i. Duration of end-semester examinations will be 3 hours and the maximum mark is 100.

3.7. Minimum for Pass

A candidate who secures not less than 40% marks in a subject at the end-semester examinations and not less than 50% (75 marks out of 150) of the total marks assigned to the subject, shall be declared to have passed the examination in that subject.

The total marks assigned to a subject in the above calculations are the sum of maximum marks assigned to the end-semester examination (ie, 100 marks) and maximum internal assessment marks of that subject (ie,50 marks). Candidates will be assigned grades according to the marks scored.

3.7.1. Term Paper, Project Evaluation and Viva Voce

For Term Paper (5^{th} Semester), Project and Viva Voce (in 6^{th} semester), the minimum for a pass shall be 50% of the total marks assigned to the respective examination. A student who does not secure this pass marks in a subject will have to repeat the respective subject. If a candidate has passed all examinations of MCA Degree course (at the time of publication of results of sixth semester) except Project and Viva-Voce in the sixth semester, a re-examination for the Project and Viva-Voce should be conducted within

one month after the publication of results. Each candidate should apply for this "Save a Semester" examination within one week after the publication of sixth semester results.

3.8. Assessment of Students

Assessment of students for each subject will be done by internal continuous assessment and end semester examinations. Internal assessment shall be conducted throughout the semester. It shall be based on internal examinations, assignments (such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.) as decided by the faculty handling the course, and other measures like regularity in the class. Assignments of every semester shall preferably be submitted in Assignment Book, which is a bound book similar to laboratory record. Course plan for each subject should be prepared by conducting a meeting at the University, inviting all the faculty members handling the subject, before each subject in the new scheme commences for the first time. This is to facilitate uniformity in the teaching and evaluation process.

End-semester examinations of theory subjects will be conducted by the University and those of all practical subjects will be conducted at institution level. Failed candidates will have to appear for the end-semester examinations along with regular students. However, end-semester examinations of fifth semester will be conducted once in every semester. Head of institution should take necessary steps to prevent any malpractices in the end-semester examinations. If any such instances are detected, they should be reported to the University without any delay.

Internal assessment marks of each theory and practical subjects should have a class average limited to 90%. If the class average of internal assessment marks of any subject is greater than 90%, normalization procedure should be applied to limit it to 90%. If the class average is not greater than 90%, absolute marks should be given. Internal assessment marks of theory and practical subjects, both absolute and normalised, should be published in the college 10 days before sending it to the University so as to enable the students to report any corrections.

(a) Assessment in Theory Subjects:

The marks allotted for internal continuous assessment and end-semester university examinations shall be 50 marks and 100 marks respectively with a maximum of 150 marks for each theory subject. The weightage to award internal continuous assessment marks should be as follows:

Sl.No	Components for Continuous Assessment	Marks (Max. Mark-50)
1	Test Paper (Average of minimum two test papers)	30
2	Assignments/Seminar/ GD/Quiz/Home work/ Problem Solving/ literature Survey/ Software Exercises etc.	15
3	Regularity	5

Assignments (minimum two) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises etc.

Full credit for regularity in the class can be given only if the candidate has secured minimum 90% attendance in the subject. Award of marks for attendance should be as follows.

Percentage of Attendance	Marks
90 and above	5
85 to 89.9	4
80 to 84.9	3
75 to 79.9	2
Below 75	1

(b) Assessment in Practical Subjects:

Practical examinations can be conducted internally with internal continuous assessment with 50 marks. Head of the institution/Department shall appoint two examiners for each practical subject in order to conduct end-semester examinations for practical subjects. These examiners should necessarily have minimum two years teaching experience at MCA degree level. It will be the responsibility of Head of Institution/Department to appoint only qualified examiners having prescribed teaching experience and to maintain standard of practical classes and examinations. Award of marks in the practical subjects should be as follows:

Internal Assessment for Practical Exam	Max. Marks (50)
Regularity	10
Evaluation in the lab and Rough Record	10
End-semester Test	15
Viva	5
Fair Record	10

No candidate will be permitted to attend the end-semester test unless he/she produces certified record of the laboratory.

(c) Assessment in Mini Project

A mini-project should be done in the 4th Semester by the students based on concepts they have already learnt in the previous semesters of the MCA programme.

Objectives of the mini project:

Working on Mini project is to get used to the larger project, which will be handled in the 6th Semester. The project work constitutes an important component of the MCA programme of the University and it is to be carried out with due care and should be executed with seriousness by the students. The objective of this mini project is to help the student develop the ability to apply theoretical and practical tools/techniques to solve real life problems related to industry, academic institutions and research laboratories.

Guidelines:

Students are expected to devote about 1-2 months in planning, analysing, designing and implementing the project. The initiation of project should be with the project proposal that is to be treated as an assignment.

Mini-project evaluation:

The evaluation of the mini-project will be based on the project reports submitted by the student, a presentation and a demonstration.

(d) Project Evaluation and Viva Voce.

The student is expected to work on a chosen topic, under the guidance of a supervisor approved by the department, for a period of four full months. The evaluation of project and viva voce will be conducted at the end with 350 marks with the following distribution:

Components for Project Evaluation	Max. Marks
First evaluation after one month of commencement of Project (Internal examiner will evaluate this)	100
Second Evaluation before completion of Project (Internal examiner will evaluate this)	100
Thesis Evaluation and Viva Voce (External Examiner will evaluate this)	125
Viva Voce (Internal Examiner)	25
Total Marks	350

An Evaluation Committee consisting of two faculty members appointed by the University will evaluate the project. Guide will be the Internal Examiner.

3.9. Improvement

Candidates shall not be allowed to improve the grade already obtained. However, cancellation and reappearance will be permitted. Revaluation for each paper is permitted.

4. Examination Monitoring Cell

Head of each institution/Department should formulate an Examination Monitoring Cell at the department level for supervising all examinations, especially the internal examinations. This cell, with a senior staff member as Convener, shall consist of minimum three members (one shall be a lady). A clerical staff having computer skills shall also be assigned for the examination monitoring cell. The collective responsibilities of the examination monitoring cell are

a) Schedule all end-semester practical examinations as per the course calendar
b) Officiate as the examination squad to keep a vigil on all end-semester examinations. If any malpractices are found /reported by invigilators, inform these to the Head of Institution along with a report about the incident. Head of Institution shall forward all such complaints to the University.
c) Schedule all examinations conducted as part of internal assessment of students.
d) To receive any complaint from students regarding issues like out-of-syllabus questions, printing mistakes, etc. of end-semester examinations of theory and practical subjects. The cell shall investigate these complaints and if necessary forward it to university with specific comments.
e) To receive any complaints from students regarding internal examinations, inquire such incidents, and give a report to the Head of Institution/Department for necessary action.
f) In general, to function as an extended wing of the office of the Controller of Examinations of the University, at institution level.

To conduct all the theory examinations, a Chief Superintendent and an Assistant Chief Superintendent should be appointed by the Head of Institution. At least two external Additional Chief Superintendents should also be appointed by the University as Observers for conducting theory examinations in all affiliated Institutions.

5. Class Committee

Head of institution shall take necessary steps to form a class committee for each class at the start of classes of each semester. This class committee shall be in existence for the concerned semester. The class committee shall consist of the Head of Department, Staff Advisor of the class, a senior faculty member of the department, and three student representatives (one of them should be a girl). There should be at least two meetings of the class committee every semester; it shall be the responsibility of the Head of Department to convene these meetings. The decisions of the Class Committee shall be recorded in a register for further reference. Each class committee will communicate its recommendations to the Head of Institution. The responsibilities of the class committee are:

a) To review periodically the progress and conduct of students in the class.
b) To discuss any problems concerning any subjects in the concerned semester.
c) To identify weaker students of the class and suggest remedial measures.
d) Discuss any other issue related to the students of the class.

6. Eligibility for the Degree

No candidate shall be eligible for the MCA degree unless he/she has undergone the prescribed course of study for a period of not less than three academic years in an institution affiliated to the University of Calicut and has passed all subjects as per the prescribed syllabus.

7. Procedure for completing the course

a. A candidate shall be required to complete the course and pass all the examinations with in a period of 5 years after joining the course.
b. A candidate shall not be allowed to improve the marks already obtained.
c. However, cancellation and reappearance along with the regular examination will be permitted.

8. Classification of Successful Candidates

a) A candidate who qualifies for the degree, passing all the subjects of the six semesters, in 3 academic years after the commencement of his course of study and secures not less than a CGPA of 8.00 of all the semesters shall be declared to have passed the MCA degree examination in ***Distinction.***

b) A candidate who qualifies for the degree, passing all the subjects of the six semesters within 4 academic years after the commencement of his course of study and secures not less than a CGPA of 6.5 of all the semesters shall be declared to have passed the MCA degree examination in ***First Class.***

c) All other candidates who qualify for the degree passing all the subjects of the six semesters and not covered as per Sections 8 (a) and (b) and CGPA not less than 6.5 shall be declared to have passed the MCA examination in ***Second Class***.

9. Grievance Cell

Each college should setup a Grievance Cell with at least four faculty members to look into grievances of the students, if any.

10. Anti-Ragging Cell

Head of Institution shall take necessary steps to constitute anti-ragging committee and squad at the commencement of each academic year. The committee and the squad shall take effective steps as specified by the Honourable Supreme Court of India, to prevent ragging.

11. College Transfer

A candidate shall not be eligible for college transfer and inter university transfer (Not withstanding all that has been stated above, the University has right to modify any of the above regulations from time to time as per University rules.)

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UNIVERSITY OF CALICUT

MASTER OF COMPUTER APPLICATIONS
EFFECTIVE FROM THE ACADEMIC YEAR 2018–19

Programme Structure

Semester -1

	Subject Code	Subject Title	Instructional Hrs/week			Marks			Credit
			L	P	T	E.E	C.E	Total	
1	MCA18 101	Discrete Mathematical Structures	3	0	1	100	50	150	3
2	MCA18 102	Probability and Statistics	3	0	1	100	50	150	3
3	MCA18 103	Programming in C++	3	0	1	100	50	150	3
4	MCA18 104	Digital Fundamentals and Microprocessor	3	0	1	100	50	150	4
5	MCA18 105	Theory of Computation	3	0	1	100	50	150	3
6	MCA18 106 (P)	Practical 1- Programming in C++	0	5	1	-	50	50	3
Total			**15**	**5**	**6**	**500**	**300**	**800**	**19**

Semester – 2

	Subject Code	Subject Title	Instructional Hrs/week			Marks			Credit
			L	P	T	E.E	C.E	Total	
1	MCA18 201	Operating Systems	3	0	1	100	50	150	3
2	MCA18 202	Computer Organization & Architecture	3	0	1	100	50	150	3
3	MCA18 203	Data Structures	3	0	1	100	50	150	3
4	MCA18 204	Computer Networks	3	0	1	100	50	150	4
5	MCA18 205	Java Programming	3	0	1	100	50	150	3
6	MCA18 106 (P)	Practical II- JAVA and Data Structures	0	5	1	-	50	50	3
		Total	**15**	**5**	**6**	**500**	**300**	**800**	**19**

Semester – 3

	Subject Code	Subject Title	Instructional Hrs/week			Marks			Credit
			L	P	T	E.E	C.E	Total	
1	MCA18 301	Database Management System	3	0	1	100	50	150	3
2	MCA18 302	Principles of Compilers	3	0	1	100	50	150	3
3	MCA18 303	Advanced JAVA Programming	3	0	1	100	50	150	4
4	MCA18 304	Software Engineering	3	0	1	100	50	150	3
5	MCA18 305	Numerical analysis and Optimization Techniques	3	0	1	100	50	150	3
6	MCA18 306(p)	Practical III - DBMS and Advanced Java	0	5	1	-	50	50	3
Total			**15**	**5**	**6**	**500**	**300**	**800**	**19**

Semester – 4

	Subject Code	Subject Title	Instructional Hrs/week			Marks			Credit
			L	P	T	E.E	C.E	Total	
1	MCA18 401	Cryptography and Network Security	3	0	1	100	50	150	3
2	MCA18 402	Design and Analysis of Algorithm	3	0	1	100	50	150	4
3	MCA18 403	Computational Intelligence	3	0	1	100	50	150	3
4	MCA18 404	Accounting and Financial Management	3	0	1	100	50	150	3
5	MCA18 405	Elective I	3	0	1	100	50	150	3
6	MCA18 406 (P)	Mini Project	0	5	1	-	50	50	3
		Total	**15**	**5**	**6**	**500**	**300**	**800**	**19**

Semester – 5

	Subject Code	Subject Title	Instructional Hrs/week			Marks			Credit
			L	P	T	E.E	C.E	Total	
1	MCA18 501	Computer Graphics	3	0	1	100	50	150	4
2	MCA18 502	Wireless Communication	3	0	1	100	50	150	3
3	MCA18 503	Web Programming	3	0	1	100	50	150	3
4	MCA18 504	Elective II	3	0	1	100	50	150	3
5	MCA18 505	Elective III	3	0	1	100	50	150	3
6	MCA18 506(P)	Practical V-Web Programming	0	4	1	-	50	50	2
7	MCA 18 507(T)	Term Paper	0	1	0	-	50	50	1
		Total	**15**	**5**	**6**	**500**	**350**	**850**	**19**

Semester- 6

	Subject Code	Subject Title	Instructional Hrs/week			Marks			Credit
			L	P	T	E.E	C.E	Total	
1	MCA18 601	Main Project and Viva Voce	-	30	-	125	225	350	15
		Total		**30**		**125**	**225**	**350**	**15**

List of Electives

Elective I (Semester 4)	
MCA 18 405A	Information Retrieval
MCA 18 405B	Android Application Programming
MCA 18 405C	Operations Research
MCA 18 405D	Cloud Computing
MCA 18 405E	Software Testing and Quality Assurance
Elective II (Semester 5)	
MCA 18 504A	Big Data Technologies
MCA 18 504B	Digital Image Processing
MCA 18 504C	Cyber Security
MCA 18 504D	Mobile Computing
MCA 18 504E	Introduction to Soft Computing Techniques
Elective III (Semester 5)	
MCA 18 505A	Internet of Things
MCA 18 505B	Advanced JAVA Mobile Programming
MCA 18 505C	Pattern Recognition
MCA 18 505D	Natural Language Processing
MCA 18 505E	Bio Informatics
MCA 18 506F	Machine Learning

* L- Lecture Hours, P- Practical Hours, T- Tutorial, E.E- External Evaluation, I.E- Internal Evaluation.

SEMESTER-1

MCA 18 101 DISCRETE MATHEMATICAL STRUCTURES

Objectives

- *To introduce discrete mathematics concepts necessary to understand basic foundation of Computer Science.*

Module I

Set theory: Sets operations, Types of sets, Principles of inclusion and exclusion. Functions-types, Function composition, Inverse functions. Relations-closure. Composition of relations, Equivalence relations.

Module II

Mathematical logic: Propositional calculus -Statement connectives, Conditional and Biconditional, Equivalence formula, Well-formed formula, Tautologies, Duality law, Normal forms, Theory of inference for statement calculus. Predicate calculus-statement functions, Variables and Quantifiers.

Module III

Partial ordered set- Hasse Diagram. Lattices and Boolean Algebra. Principles of Duality, Properties of Lattices. Types of lattices. Boolean functions and Boolean Expressions.

Module IV

Binary operations- Properties, Groups and subgroups, Cyclic groups Isomorphism, Homomorphism, Rings.

Module V

Graph theory -Introduction, Directed and Undirected graph, path, cycles and connectivity. Subgraph, Bipartiate graph, Isomorphic Graph, Circuits, Dijkstras Algorithm, Bellmann Ford Algorithm, Floyed-Warshall Algorithm, Eulerian and Hamiltonian Paths, Trees-Spanning Trees. Minimum Spanning Trees-Prim's and Kruskal's Algorithm.

References:

1. J.K Sharma, Discrete Mathematics .4th Ed.Macmillan Publishers India Limited
2. J.P.Trembley and Manohar, Discrete Mathematical Structures with Application to Computer Science. TMH
3. Kolman &Busby R.C Discrete Mathematical Structures for Computer Science. Prentice Hall of India
4. Ralph P Grimaldi, Discrete and Computational Mathematics: An Applied Introduction. Pearson Education, 2007
5. Clark J & Holton D A, A first look at Graph Theory, Allied Publishers. Allied Publishers.

MCA 18 102 PROBABILITY AND STATISTICS

Objectives

- *This course is objected to inculcate the students an adequate understanding of the basic concepts of probability theory and statistics to make them develop an interest in the area which may find useful to pursue their studies.*

Module I

Probability distributions: - Random variables, Binomial distribution, Hyper geometric distribution; Mean and variance of probability distribution, Chebysheve's theorem, Poisson approximation to the Binomial, Poisson processes, Geometric distribution, Normal distribution, Normal approximation to Binomial distribution, Uniform distribution, Log- Normal Distribution, Gamma distribution, Beta distribution, Weibull distribution.

Module II

Sampling Distributions and Inference concerning Means: - Population and Samples, The Sampling distribution of the mean (Sigma known and Sigma unknown), Sampling distribution of variance, Point estimation, Bayesian estimation, Tests of Hypotheses, the null hypotheses and the significance tests, Hypotheses concerning one mean, operating characteristic curves, Inference concerning two means.

Module III

Inference concerning Variances and Proportions: - Estimation of variances, Hypotheses concerning one variance, Hypothesis concerning two variances, Estimation of proportions, Bayesian estimation, Hypotheses concerning one proportion, Hypotheses concerning several proportions, Analysis of r x c tables, Goodness of fit

Module IV

Correlation and regression analysis: Curve fitting, the method of least squares, inference based on the least square estimators, curvilinear regression, correlation, Fisher's transformation, inference concerning correlation coefficient.

Module V

Analysis of Variance: - General principles, Completely randomized designs, Randomized Block diagram, Multiple comparisons, Some further experimental designs, Analysis of co variance.

References:

1. Johnson R A, Miller and Freund’s Probability for Engineers
2. Levin R I & Rubin DS, Statistics for Management, PHI
3. J S Milton, Jose C Arnold, Probabilities in engineering and Computing Science, McGraw Hill
4. S M Rose, Introduction to Probability and Statistics for Engineers and Scientists, John Wiley
5. Harry Frank and Steven C, Statistics concepts and application, Cambridge University Press

MCA 18 103 PROGRAMMING IN C++

Objectives

- *To impart knowledge about the software development. To develop a software by using programming languages. To give the concept of object oriented programming.*

Module I

Programming and problem solving - Computer organization - Steps involved in computer programming - Developing algorithms and flow charts - Efficiency of algorithms - Running, debugging and testing of programs – Program design methods - Top-down and Bottom up modular programming approaches.

Module II

Introduction to object oriented programming, Principles of OOP, Procedural Vs Object oriented programming, Variables, Data types, Operators in c++. Control flow statements-decision making statement, looping statement, Branching statement.

Functions-Call by Reference, Call by Value, Inline functions, friend function, Virtual functions, Arrays, Strings- Array of strings, String manipulation using library functions.

Module III

Classes and Objects-Specifying a class, syntax for creating a class, Defining member functions, Access modifiers, Comparison of class with structure, Arrays within a class, Static data members, Static member functions, Pointers-pointer declaration and access. Pointers and arrays, pointer to pointer, pointer to functions, this pointer, memory management -new and delete, storage class in C++.

Module IV

Constructors and Destructors-Parameterized constructor, constructor with default arguments, Copy constructor, Destructors, Polymorphism-Function over loading, Operator over loading, Over loading unary operator, Over loading Binary operator, Type Conversions-Basic to class. Inheritance-Introduction, Defining Derived class, Types of Inheritance-Single, Multiple, Multi-level, Hierarchical, and Hybrid inheritance.

Module V

Console i/o operations- Formatted i/o operations, Unformatted i/o operations, Templates-Class templates, Function Template, working with Files-Classes for file stream operations, Opening and closing a file. Exception Handling.

References:

1. Object oriented programming with C++. E.Balaguruswamy
2. Data structures and algorithm analysis in C++,Third edition, Pearson
3. Mastering C++, K.R. Venugopal, Rajkumar, T.Ravishankar
4. C++ - The Complete reference, Herbert Schilbt
5. Thinking in C++, Bruce Eckel, 2/edition

MCA 18 104 DIGITAL FUNDAMENTALS AND MICROPROCESSOR

Objectives

- *To introduce the features and properties of digital devices and circuits.*
- *To familiarize the student with the internals of a microprocessor with a wide range of processing capabilities. Also to give a fair idea of various interfacing devices, along with important design issues.*

Module I

Number Systems and codes - 1's and 2's Complement Representation of Signed Numbers - Binary Arithmetic - Logic gates – Universal property of NAND and NOR gates – Boolean Algebra - Simplification using Boolean Algebra - Standard forms of Boolean Expressions – Sum of Products and Product of Sums - Karnaugh Maps.

Module II

Analysis and design of Combinational logic circuits - Adders - Decoders and Encoders – Code converters - Multiplexers and Demultiplexers. Sequential Logic circuits: Flipflops - Synchronous and Ripple Counters – Shift Registers.

Module III

Historical Background of microprocessors – Architecture of 8086 - Addressing modes - Instruction set - Assembly Language Programming with MASM.

Module IV

Minimum mode and maximum mode systems-Maximum mode interface signals-Minimum mode interface signals-Types of input output-memory devices and subsystem design- LSI peripheral devices - 8255 PPI - 8254 PIT - 8237 DMA controller - 8250 UART – 8279 Keyboard and display controller-Interrupt interface of 8086-8259 PIC.

Module V

Hardware and Software Interrupts of 8086 and 8088- 8259 PIC.

References:

1. Digital Fundamentals - T.L.Floyd and R.P.Jain
2. The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware and Applications, Walter A Triebel and Avtar Singh
3. The 8051 Micro Controller, Kenneth J Ayala.
4. Microprocessor and Interfacing: Programming and Hardware. - D.V Hall
5. Microcomputer Systems: The 8086/8088 Family, Architecture, Programming, and Design - Yu-Cheng Liu and Glenn A. Gibson, Prentice Hall, Inc.

MCA 18 105 THEORY OF COMPUTATION

Objectives

- *To provide the students with an understanding of basic concepts in the theory of computation.*

Module I

Preliminaries: Review of proof techniques - Mathematical induction - Basic concepts of languages automata and grammar– Alphabet, languages and grammars, productions and derivation. Regular languages: Finite deterministic and non-deterministic automata – Regular grammar. Equivalence between NFA and DFA.NFA with and without epsilon moves. Closure properties regular languages – DFA state minimization – Pumping lemma and proof for existence of nonregular languages. Regular Expressions.

Module II

Context-Free Grammars (CFG) – Derivations –Sentential forms – Parse tree - Ambiguity in grammars and Languages - Applications of CFG – Simplification of Context free Grammars –Normal forms: Chomsky Normal form (CNF) and Greibach Normal form (GNF).

Module III

Pushdown Automata (PDA) – Formal definition – Language accepted by PDA – Deterministic and Non Deterministic PDA-Pumping lemma for CFLs, Closure properties of CFLs - Decision properties of CFL. Context-sensitive languages: Context-sensitive grammars (CSG) and languages, LBA .

Module IV

Turing Machines - Transition Diagram – The language of a Turing Machine – Variants of TMs – Multitape TMs, Nondeterministic TMs. Universal Turing Machines- Closure properties of recursive and recursively enumerable language -Church thesis. Chomsky Hierarchy.

Module V

Computability and decidability– Undecidability - Halting problem – Reductions – Complexity: Complexity Classes - Class P - Class NP Problems.

References:

1. Linz: P. An Introduction to Formal Languages and Automata, Narosa, 1998.
2. Hoporoft J.E.and Ullman J.D.Introduction to Automata Theory Languages andcomputation arosa,1998.
3. H.R.Lewis and C.H.Papadimitriou, Elements of the Theory of Computation, Prentice Hall ofIndia,1996.
4. Martin J.C., Introduction to Languages and the Theory of Computation, Tata McTraw Hill, 1997.
5. J.E.Sagage, Models of Computation, exploring the power of Computing, Addison Wesley, 1998.
6. Michael Sipser : Introduction to theory of Computation , Cenage Learning, Indian Edition
7. Introduction To Automata Theory And Formal Languages-Adesh K. Pandey.

MCA 18 106 (P) - PRACTICAL I- Programming in C++

Lab assignment shall be carried out to include the following features of C++

1.Program using inline function.

2. Program using friend function.

3. Programs on concept of classes and objects.

4. Programs using inheritance.

5. Programs using static polymorphism.

6. Programs on dynamic polymorphism.

7. Programs on operator overloading.

8. Programs on dynamic memory management using new, delete operators.

9. Programs to implement different types of constructors and usage of assignment operator.

10. Programs on exception handling.

11.Programs on generic programming using template function & template class.

12. Programs on file handling.

SEMESTER - II

MCA 18 201 OPERATING SYSTEM

Objectives

- *Introduce the underlying principles of an operating system.*
- *Exposure of multi programming, virtual memory and resource management concepts.*
- *Case study of public and commercially available operating systems.*

Module 1

Introduction :-Different types of Operating system, Overview of Operating systems- Operating system structures -Process management: Processes, Process Scheduling – Inter Process communication - Communication in client server systems, Threads: Processes Vs Threads, Types of threads, Multicore and Multithreading.

Module II

CPU Scheduling: Scheduling algorithms, Multiple Processor Scheduling, Algorithm Evaluation- Advanced CPU scheduling. Process synchronisation: – Critical section Problem, Mutual Exclusion, Requirements, Semaphores, Monitors, Producer Consumer Problem, Readers Writers Problem, Deadlock Prevention, Detection and Recovery.

Module III

Memory management: Address binding, Logical versus Physical Address Space, Dynamic loading, Dynamic linking and shared libraries, Overlays, Swapping Contiguous memory allocation, Memory protection and Allocation, Paging and Segmentation, Virtual memory, Demand Paging, Page Replacement, Thrashing.

Module IV

File systems concept, Directory Structure, Access methods, File system Mounting, File sharing, Protection, File system implementation, Directory implementation, Allocation Methods, Free space Management, Efficiency, Performance, and Recovery, Log Structured file system.

Module V

Protection and Security: Goals of Protection, Access matrix- Security Problem, Computer Security Classifications, User Authentication -Program threats and Systems threats, Securing systems and Facilities. Characteristics of Real time OS, Scheduling, Deadline scheduling, Priority inversion, Mobile operating systems- Features of iOS and Android.

References:

1. Abaham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concepts,9th Edition, John Wiley & Sons.
2. William Stallings, Operating Systems, Internals and Design Principles, 7th Edition Pearson,
3. Dhamdhere . D.M, Operating Systems-A concept based approach, Third Edition, McGraw-Hill .
4. SibsankarHaldar ,Alex a Aravind, “Operating Systems”, Pearson Education India, Second impression.
5. Andrew S.Tanenbaum , Albert S.Woodhull, “The Minix Book- Operating Systems Design and Implementation”, 3rd Edition Pearson(2016).

MCA 18 202 COMPUTER ORGANIZATION AND ARCHITECTURE

Objectives

- *To familiarize with the digital fundamentals, computer organization, computer architecture and assembly language programming.*

Module I

Introduction – Functional components of a computer system, Computer generations, The hardware software interface, Stored program concept, Performance of a computer system: Throughput, Response time, Amdahl's law, Clocking and Timing, Princeton and Harvard architectures, Benchmarks.

Module II

Number representation – Signed number representations, Fixed point and Floating point representation, Floating point operations. Instructions: Instruction types and formats, opcode, operands, addressing modes, instruction cycle, execution of a complete instruction, Micro operations, Register transfer language, Fast addition and multiplication.

Module III

Processing unit – Registers: general purpose, special purpose, ALU, Control unit, Clocking, Data path: data path elements, Microprogrammed control unit, Hardwired control unit. Buses: Types, Bus arbitration schemes, Bus interface unit, Multiple bus organization, Introduction to pipelining, Superscalar processors, Parallel and vector processors, VLIW. Case study: MIPS single cycle data path.

Module IV

Memory subsystem: Memory hierarchy, Memory operations, RAM: internal structure, types of RAM, Case study: DDR4, ROM: Internal structure and types. Cache memory: concepts, cache mapping, cache replacement policies. Virtual memory: address translation, Memory management unit, Memory interleaving.

Module V

Input/output organization: Characteristics of I/O devices Accessing I/O devices, Programmed I/O, Interrupt initiated I/O, DMA, Synchronous and asynchronous data transfer, I/O interfaces: Serial port, Parallel port, PCI bus, SCSI bus, USB.

References:

1. David A Patterson, John L Hennessy: Computer Organization and Design 5th Ed., Elsevier New Delhi.
2. Morris Mano: Digital Logic and Computer Design Pearson Education, 1st Edition (2004).
3. William Stallings: Computer Organization and Architecture Pearson Education (9th Edition or 2014 Indian Sub-Continent Edition).
4. J.P. Hayes: Computer Architecture and Organization, McGraw-Hill
5. Floyd Thomas L: Digital Fundamentals, Pearson Education, 10th Edition (2011).

MCA 18 203 - DATA STRUCTURES

Objectives

- *To develop about fundamental sorting and searching methods*
- *To impart the concepts of linear and nonlinear data structures.*

Module 1

Introduction of data structures, Abstract data Types, performance Analysis: Space complexity, Time complexity, Asymptotic Notations (Big O, Omega, Theta), Arrays: Definition, Representation in memory, Operations, Applications, Sparse matrices and their manipulation.

Module II

Linear Data Structures :Stack - Definition, Operations, Implementation(arrays and linked list),applications – evaluation of postfix expression, Balancing of parenthesis, Queues – Definition ,Operations , Implementation(arrays and linked list), applications, Types of queues (Circular queue, Priority queue and double ended queue) and their implementation, Linked list – Definition ,Concept, Types of lists (Singly, Doubly and Circular linked list)and their Operations (insert, delete, traverse, count, search).Polynomial representation using linked list.

Module III

Nonlinear Data Structures: trees - definition and Concepts, binary trees- definition concepts, various operations, various traversals (recursive, nonrecursive, using father field, using the concept of threaded binary trees), Expression tree, Huffman tree. Binary Search Trees and their operations. Introduction to AVL trees

Module IV

Graphs Definition, operations, Representation Networks, Traversals of graph, Minimum spanning tree, Kruskals Algorithm, Prim's Algorithm, Shortest path algorithm –Dijisktra's algorithm. Hashing - Different hashing techniques, Address calculation Techniques, Common hashing functions, Collision resolution techniques.

Module V

Sorting Algorithms-Bubble Sort, insertion sort, Radix sort, Quick sort, Merge Sort, Heap Sort, Selection Sort, Shell sort, Bucket sort, Comparison of various sorting techniques, Introduction to external sorting techniques, searching Algorithms-Linear Search, Indexed Sequential Search, Binary search.

References

1. Richard F Gilberg, Behrous A Forouzan," Data Structure A Pseudocode Approach with C", Cengage Learning ISBN: 9788131503140.
2. Yedidyah Langsam, Moshe J.Augenstein, Aaron M.Tenenbaum, "Data Structures using C and C++", Preintice Hall of India
3. Schaum's outlines, "Data Structure", Seymour Lipschutz TMH
4. Michael T Goodrich, "Data Structures and Algorithms in C++", Wiley Publications

MCA 18 204 COMPUTER NETWORKS

Objectives

- *To provide the student a top down approach of networking starting from the application layer.*
- *To introduce computer networking in the back drop of Internet protocol stack.*

Module I

Introduction: - Data Communication-Components. Network criteria-applications-protocols and standard. Standard organisations. Basic concepts: - Line Configuration-Topology-Transmission mode. OSI model functions of OSI layers. Categories of networks-LAN-WAN-MAN project 802. Ethernet, token ring, FDDI, DQDB Wireless LAN- Wi-Fi, WiMAX, Bluetooth.

Module II

Error Detection and correction: - Types of errors. Detection-VRC, LRC, CRC, Checksum. Error Correction- Single bit error correction, Hamming code, Burst error correction. Line discipline. Flow control, error control. Switching: - Circuit switching, packet switching, message switching, cell switching-ATM, ATM architecture, switching ATM Layers.

Module III

Repeaters, Bridges, routers, gateways. Routing algorithm: - the optimality principle, shortest path routing, flooding, Distance vector routing, Link state routing, Hierarchical routing, Broadcast routing, Multicast routing, Routing for mobile hosts, Routing for Ad hoc networks.

Module IV

IPV4, IP address, Subnetting, Subnet Mask, CIDR (classless inter domain Routing), ICMP, ARP, RARP, IGMP, OSPF- the interior Gateway routing protocol. BGP - The external gateway routing protocol. Internet multicasting, IPV6.

Module V

Transport Layer - duties connection establishment, connection termination. Transport classes. Transport protocol data unit - connection oriented and connectionless services. TCP, ODP. Upper OS1Layers- Session layer, presentation layer and application layer.

References:

1. Behrouz A Forouzan, Data Communication and Networking, 4Th Ed Tata McGrow Hrill
2. Andrew S Tanenbaum , Computer Network, 4th Ed. Preintice Hall of India
3. Larry L Peterson and Bruce S Davie, Computer Networks - A System Approach, 5th Ed Elsevier New Delhi.

MCA 18 205 JAVA PROGRAMMING

Objectives

- *To develop about fundamental concepts in Java.*
- *To give strong foundation for developing interest in students in programming.*

Module I

Object Oriented fundamentals: Object Oriented programming, Encapsulation, Inheritance, Polymorphism. Java Fundamentals: Java features, JVM, Java program structure, keywords, Identifiers, Literals, Operators, Separators, Declaring a variable, Scope and lifetime of variables, Data types, Arrays, Strings.

Module II

Operators, Control Structures, Classes: creating objects, methods and classes, Constructors, Method Overloading, Static Classes, Inheritance, Method overriding, Final variables, Abstract methods and classes, Packages and Interfaces.

Module III

Exception Handling: Exception hierarchy, Try, Catch, Finally, Throw, Throws. Multithreading: Creating threads, Thread life cycle, Thread priority, thread Exceptions, Synchronization.

Module IV

I/O streams: java I/O Streams, Filtered Streams, Buffered Streams, Random access file, GUI: Introduction to AWT Programming, Window fundamentals, Container Class, creating a frame window, Layouts, Event handling, Drawing lines, Arcs, Rectangles, Polygon, Ellipse. Applets: Applets class, Applet life cycle, Working with applets.

Module V

Database handling using JDBC: JDBC architecture, Steps connecting to JDBC and Working with connection interface-drivers, connection, statements, result set. Networking: Networking basics, InetAddress, TCP/IP Client and Server Sockets, URL, Datagrams.

References:

1. Patrick N & Schildt H, Java 2 The Complete Reference, Tata McGraw Hill
2. Patrick Naughton, Java Handbook, Tata McGraw Hill
3. H.M.Dietel & P J Deitel, Java : How to program, PHI
4. Jamie Jaworski, Java 2 Platform Unleashed: The comprehensive solution, SAMS Techmedia

MCA 18 206 (P) PRACTICAL – II

List of Sample Programs- JAVA

1. Simple Java programs like computing formulas expressions.
2. Programs involving loops and decisions like generating Fibonacci, prime, strange series.
3. Illustrate method overloading.
4. Illustrate single level inheritance.
5. Illustrate multiple inheritances using interface.
6. String sorting, pattern matching etc.
7. Illustrate threads and thread priorities.
8. Illustrate the use of Packages.
9. Exception handling (user-defined).
10. Method overriding.
11. Illustrate usage of Applets like moving ball, face etc.
12. Create an AWT application for a simple calculator.
13. Frame application to illustrate the window events.
14. Create a JDBC application to add the details of a student into a table (Use MySQL as the RDBMS).
15. Socket Programming.

List of Sample Programs- Data Structures and Algorithms

1. Implementation of stacks using arrays.
2. Implementation of queues, circular queue using arrays.
3. Implementation of sequential search and binary search techniques.
4. Implementation of linked lists and operations (add, insert, delete, search) on linked lists.
5. Implementation of stacks using linked list.
6. Implementation of queues using linked list.
7. Implementation of doubly linked list.
8. Implementation of circular linked list.
9. Implementation of binary tree and traversals.
10. Implementation of Binary search trees and perform the operations on BST.
11. Implementation of various sorting algorithms.
12. Conversion of an infix expression to the postfix form using stacks.
13. Evaluation of a postfix expression.
14. Implementation of graphs and graph traversals.
15. Implementation of heap tree and operations.

SEMESTER III

MCA 18 301 DATABASE MANAGEMENT SYSTEMS

Objectives

- *To introduce the basic concepts of data bases connected with software engineering techniques and background information useful for the management of data bases. The syllabus includes the file organization, database design and transaction processing techniques.*

Module I

Introduction – concept, characteristics and need of DBMS-comparison with file based system –database architecture-– data models-schemes – instances – data independence-database languages and interfaces – data modelling using ER and EER

Module II

Database design – functional dependencies – normal forms – general definition of second and third normal forms – Boyce-Codd normal form– multi-valued dependencies and fourth normal form join dependencies and fifth normal form – inclusion dependencies – practical database design tuning – database design process relational model concepts – relational algebra operations – queries in SQL – insert – delete and update statements in SQL – views in SQL.

Module III

Transaction processing – desirable properties of transaction, schedules and recoverability – serializability of schedules concurrency control – locking techniques – time stamp ordering multi version concurrency control – granularity of data items.

Module IV

Database recovery techniques based on deferred up data and immediate updating – shadow pages – ARIES recovery algorithm – database security and authorization – security issue access control based on granting/revoking of privileges – introduction of statistical database security

Module V

OODBMS – concepts – needs - issues. Distributed database – design - transaction and protocols.

References:

1. Elmasri and Navathe, Fundamentals of Database Systems, Addison Wesley
2. Silberschatz A, Korth H.F and Sudarshan S, Database System Concepts, Tata McGrawHill
3. Ramakrishnan R.& Gehrke J., Database Management Systems, Third edition, 2003, McGraw Hill
3. S K Singh, Database Systems-Concepts, Design and Applications, Pearson Education, 2006

MCA 18 302 PRINCIPLES OF COMPILERS

Objectives

- *To introduce the various techniques involved in the translation of source programs into object programs by a compiler.*
- *To understand the inner working of a compiler using the various data structures used in the translation process.*

Module I

Introduction to compiling - definition of compiler, translator, interpreter, analysis of the source program, the phases of a compiler, compiler construction tools - programming language basics -lexical analysis – role of lexical analyser –input buffering - specification of tokens – recognition of tokens using finite automata - regular expressions and finite automata -from NFA to DFA - Regular Expression to an NFA

Module II

Syntax analysis –role of parser–error handling and recovery –definitions of parsing, top -down parsing and bottom-up parsing-context free grammars –derivations -parse tree–ambiguity–associativity and precedence of operators -recursive descent parsing-LL (1) Grammars–non-recursive predictive parsing-reductions–handle pruning–shift reduce parsing-operator precedence parsing, simple LR parsing.

Module III

Syntax Directed translation: Syntax Directed definitions- S-Attributed definitions- L-Attributed definitions – Bottom up and top down translations. Type checking, Type systems, specification of a type checker and symbol table. Intermediate code generation –DAG–three address code–addresses and instructions –quadruples –triples–Indirect triples

Module IV

Run time environments – storage optimization – static Vs dynamic allocation – stack allocation of space - activation trees and records – calling sequences – access to non-local data on the stack – data access without nested procedures – issues with nested procedures – heap management – the memory manager – the memory hierarchy.

Module V

Code generation – issues in the design of a code generator – the target language – a simple target machine model – the program and instruction costs – address in the target code – static allocation – stack allocation– run-time address for names –basic blocks and flow graphs – representation of flow graphs. Code optimization - the principal sources of optimization – data flow analysis – abstraction – data flow analysis schema – data flow schemas on basic blocks – reaching definitions – live variable analysis – available expressions. Region based analysis – regions – region hierarchies for reducible flow graphs – overview of a region based analysis.

References:

1. Aho, A. V, Sethi, R. and Ullman, J. D. Compilers: Principles, Techniques and Tools, Addison Wesley,
2. Steven S Muchnick, Advanced Compiler Design Implementation.
3. Steven Muchnick. Advanced Compiler Design Implementation, Morgan
4. Allen I Holub, Compiler Design in C, 1st Edition, PHI Learning Pvt Ltd.
5. Tremblay and Sorenson, The Theory and Practice of Compiler Writing, 1st Ed. BSP Books Pvt Ltd
6. Torben Ægidius Mogensen, Basics of Compiler Design, Department of Computer Science, University of Copenhagen (Online Edition).

MCA 18 303 ADVANCED JAVA PROGRAMMING

Objectives

- *To learn the advanced features of Java programming language that equip the students to develop web based applications with RDBMS.*

Module I

Introduction to Enterprise Java Programming: Distributive Systems, Multi-Tier Architecture of J2EE, Clients and Client Tier, Web Tier, EJB Tier, EIS Tier, J2EE best practices - Enterprise Applications Strategy - Session Management.

Module II

Database Programming in Java: Overview of the JDBC Process - JDBC Concepts - JDBC Driver types, Database Connection- JDBC/ODBC Bridge, Statement Objects, The Connection Interface - Result Set, Interacting with the database - Transaction Processing.

Module III

Java Remote Method Invocation (RMI): Distributed Application Architecture, Client proxy and Server Proxy, Remote Interface and Passing Objects, RMI process - Defining and using Remote objects - Remote Object Activation - Object Serialisation and RMI.

Module IV

Java Servlets: Basics, Benefits of Servlets - Initialization, Deployment, Reading Client Data, Reading HTTP Request Headers, Cookies - Session Tracking, Database Connections. Java Server Pages (JSP) - Overview - JSP tags - Components of a JSP page - Expressions, Scriptlets, Directives, Declarations - Working with JSP- JSP and JDBC.

Module V

JQuery: Introduction, Adding JQuery to Webpages- JQuery Editor, JQuery Selectors and Elements, Animations and Events handling in JQuery. AJAX: Overview- AJAX and JQuery- Java ME- Java for Mobile Devices.

References:

1. Jim Keogh, “The Complete Reference J2EE”, Tata McGraw-Hill
2. Cay S.Hortsmann , Gary Cornell, “Core Java Volume II”- Advanced features, Pearson, 9th Edition
3. Subrahmanyam Alamaraju and RIC Buest- “Professional Java Server Programming- J2EE”, Apress Publication, 1.3 Edition

MCA 18 304 SOFTWARE ENGINEERING

Objectives

- *To give an overview of the development of methodologies and steps to be followed in software development and to apply these concepts and theoretical principles in designing a quality software.*
- *To assist the student in understanding the basic theories of software engineering*
- *To give the basic concepts of unified modeling language.*

Module I

Introduction -what is software Engineering-why it is needed? -importance of software engineering--Software lifecycle – The Software process- Software Process Models - Predicative and Adaptive based Methodologies: Waterfall model, Iterative Models, Incremental Models, RAD Principles-Agile view of process- XP Model, ASD, DSDM, Scrum Frame work – About Scrum, Scrum Process- Sprint planning, Product Backlog- Burn down chart. - CASE tools.

Module II

Software Requirements and Specification: Functional and Non-Functional Requirements, User and System Requirements, Requirements Gathering, Prototyping Approach, Requirements Engineering process: Feasibility study, Elicitation and Analysis, requirements Validation, Requirements Management, SRS. Formal System Specification. System Models: Context oriented Models, Flow Oriented Models, Data Oriented Models – Object Oriented Models. Design Process and Design Strategies: Design by Template and Design Reuse, The Design Pattern, Software Architectural Design: About Software Architecture, Architectural Styles, Architectural Design, Modular decomposition and Domain Specific Architectures

Module III

Object Oriented Design- Objects and Classes- objects-module-cohesion-coupling Functional Independence. Object modelling using UML – Use case Model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams – Deployment Diagrams – Data Flow Diagrams. Reusability, portability & interoperability- Design with reuse concepts, Component-Level Design: About the Component, Designing Class-Based Components. Component based development- User Interface Design-Design Principles-Interface Evaluation. – COTS.

Module IV

Software Quality and Software Testing- Software quality concepts and attributes- Software Quality Assurance- SQA Activities-Software Reviews-Software Inspections- Verification and Validation-Clean Room Approach Testing: Testing Strategies, Different types and Levels of Testing, Black Box and White Box testing, testing object Oriented applications, Testing Web applications. - Software Maintenance and evolutions- Software Re-engineering. Software Configuration Management & Release Management.

Module V

Software Project Management-Planning and Scheduling, Staffing and Group working, People Capability Maturity Model, Process and Product Quality, Process measurement, Process CMM, Software Costing and Pricing, Cost Estimation Techniques, COCOMOEmerging Trends in Software Engineering: Continuous Integration (CI) Introduction to DevOps , Software Engineering Methodologies for Mobile and Cloud Environments.

References:

1. Ian Sommerville, ‘Software Engineering’. 7th Ed., Addison Wesley
2. Pressman, R.S., “Software Engineering: A Practitioner's Approach”,McGraw Hill SE, 7th Edition
3. Waman S Jawadekar, ‘Software Engineering Principles and Practice’, Tata McGraw Hill
4. Robert C. Martin, “Agile Software Development, Principles, Patterns and Practices”Prentice Hall Imprint, Pearson Education,2nd Edition (2002)
5. Ken Schwaber, Mike Beedle, “Agile Software Development with Scrum”, Pearson (2008).

MCA 18 305 NUMERICAL ANALYSIS AND OPTIMIZATION TECHNIQUES

Objectives

- *This course is indented to familiarize the learners with the various techniques in numerical analysis.*
- *to introduce the concept of optimization via standards methods for solving linear programming and allied problems*
- *to understand how to assess and check the feasibility and optimality of a particular solution to a general constraint optimisation problem.*

Module I

Errors and Approximations, Nonlinear equations – Bisection Method, Regula-FalsiMethod,Secant Method, Newton-Raphson method, Graeffe's Root squaring Method, Muller's Method, Bairstow Iterative Method.

Module II

Finite Differences and Interpolation, Interpolation with Unequal-spaced Points, Newton's Fundamental Formula, Lagrange's Interpolation Formula, Inverse Interpolation, Chebyshev Polynomials, Interpolation by Spline Functions.

Module III

Eigen values and eigenvectors - Power Method, Jacobi Method, Householder's Method. System of Linear equations- Cramer's Rule, Gauss Elimination Method, Gauss-Jordan Method, Jacobi's Method, Gauss –Seidel method.

Module IV

Numerical Differentiation – Based on equal-interval Interpolation, Derivatives using Newton's backward difference formula, Derivatives using central difference formula (Bessel's and Stirling's formula).

Numerical Integration – Trapezium rule, Trapezoidal rule, Simpson's rule, Romberg integration, Gauss quadrature formula.

Module V

Differential equations – Preliminaries, Taylor series method, Picard's method, Euler's method, Runge-Kutta methods. Statistical description and modeling of data, Fast Fourier Transform.

References:

1. Sastry S.S., Numerical Analysis, Prentice Hall India
2. Froberg, Introduction to Numerical Analysis, Addition Wesley
3. Salvadori & Baron, Numerical Methods in Engineering, Prentice Hall India
4. Gerald, Applied Numerical Analysis, Addison Wesley
5. Grawin W.W., Introduction to Linear Programming, McGraw Hill
6. Gass S.I., Introduction to Linear Programming, Tata McGraw Hill

MCA 18 306 (P) – PRACTICAL – III

Lab assignment shall be carried out to include the following:

DBMS:

- SQL: Data definition in SQL, basic data retrieval, condition specification, arithmetic and aggregate operators, SQL join, set manipulation, categorization, updates, views, views and updates.
- The student is required to develop database design for the given problem.
- The logical design performs the following tasks: 1) Map the ER/EER diagrams to a relational schema. Identify primary keys, include all necessary foreign keys and indicate referential integrity constraints. 2) Identify the functional dependencies in each relation, 3) Normalize to the highest normal form possible.
- Perform DML and DLL using PL/SQL for the above problems.

Advanced JAVA Programming

- Programming with JDBC API to create, insert into, update, and query tables.
- Programming using JNDI as naming and directory service.
- RMI client/server programming
- CORBA client/server programming.
- Server side programming using Servlet
- Development and deployment of EJB
- Implement JQuery Events

SEMESTER 4

MCA 18 401 CRYPTOGRAPHY AND NETWORK SECURITY

Objectives

- *To introduce the principles and practices of cryptography and network security.*
- *To discuss algorithms and schemes to handle the security issues.*
- *To introduce web security.*

Module I

Introduction to cryptography: services, mechanisms and attacks- The OSI security architecture- A model for network security, Classical Encryption Techniques: Symmetric cipher Model-Substitution techniques-transposition Techniques-Rotor machine- steganography,

Module II

Divisibility: gcd and lcm, prime numbers, Fermat's theorem- Euler theorem, testing of primality, Chinese remainder theorem, discrete logarithms fundamental theorem of arithmetic, modular arithmetic.

Module III

Modern Techniques: Simplified DES- DES- block cipher principles- cryptanalysis- block cipher design principles. Triple DES- AES, IDEA- blowfish. Confidentiality: placement of encryption function- traffic confidentiality- key distribution- random number generation. Public key encryption: RSA algorithm- key management and exchange

Module IV

Message Authentication: requirements- functions and codes- hash functions- security of hash functions and MACS. Hash Algorithms: MD5 message digest algorithm- secure hash algorithm. Digital Signatures: authentication protocols- digital signature standard. Authentication Applications: Kerberos.

Module V

Electronic Mail Security: Pretty Good Privacy – S/MIME, Web Security: SSL and Transport Layer Security- Secure electronic transaction, Firewalls: Design Principles- Trusted Systems, intruders, malicious software.

References:

1. W. Stallings, Cryptography and Network Security, Principles and Practices, Pearson Education Asia
2. C.Y Hsiung , Elementary Theory of Numbers, Allied Publishers (World Scientific), New Delhi, 1992.
3. Niven and H.S .Zuckerman, An introduction to the Theory of Numbers, 3/e, John Wiley and Sons, New York , 1992
4. B. Schiner, Applied Cryptography: Protocols, Algorithms, and Source code in C, 2/e, John Wiley and Sons, New York, 1996.

MCA 402 DESIGN AND ANAYSIS OF ALGORITHM

Objectives

- *To introduce the concept of algorithmic approach for solving real life problems*
- *To teach basic principles of computational complexity.*
- *To familiarize the algorithms.*

Module I

Algorithm: - Introduction, Steps in developing, Methods of specifying an algorithm, Model of computation - RAM and PRAM model, Time and space complexity, Growth of functions, Asymptotic notations.

Module II

Algorithm Analysis-Importance, Solving Recurrences - Iteration method, Substitution method, The recursion tree method, Masters theorem - case 1, case 2, case 3, Analysis of Stressens algorithm for matrix multiplication.

Module III

Algorithm design techniques: - Divide - and - conquer approach, Dynamic programming, Branch and bound technique, Greedy approach, Backtracking

Module IV

Complexity- Complexity classes: P, NP, NP Hard, NP Complete problems, Traveling salesman problem, Hamiltonian cycle, Approximation algorithm- subset sum problem.

Module V

Analysing parallel algorithms: Cost, Number of processors, Complexity, speed up, Efficiency, scalability, Amdahl's Law, Parallel merging and sorting, Euler tour technique, Parallel prefix computation.

References.

1. Thomas H Cormen, Introduction to algorithms, 3rd edition. MIT Press
2. Alfred V. Aho, John E. Hopcroft and Jeffery D Ullman, The Design and Analysis of Computer Algorithm, 1st edition, Addison Wesley.
3. Pallaw, V K, Design and Analysis of Algorithms , Asian Books Private Ltd, 2012,
4. Sanjay Razdan, Fundamentals of Parallel Computing , Narosa Publishing House, 2014
5. Pandey H M, Design and Analysis of Algorithms , University Science Press, 2013,
6. Upadhyay N, Design and Analysis of Algorithms , SK Kataria & Sons, 2008.

MCA 18 403 COMPUTATIONAL INTELLIGENCE

Objectives

- *To introduce concepts of Artificial Intelligence and Machine Learning.*

Module I

Introduction - Artificial Intelligence - problems, scope and applications, problem space and search - production system- characteristics - the predicate calculus, inference rules, structures and strategies for state space search, strategies for space search, using state space to represent reasoning with the predicate calculus.

Module II

Heuristics Search: control and implementation of state space search, generate and test, hill climbing, Best– first search, problem reduction, constraint satisfaction, means-ends analysis, heuristic in games, complexity issues.

Module III

Knowledge representation issues, representation and mappings, representing simple facts in logic, representing instances and ISA relationships, computable functions and predicates, resolution, natural deduction, knowledge representation using rules, logic programming, forward versus backward reasoning, symbolic reasoning under uncertainty- nonmonotonic reasoning, depth first search, breadth first search.

Module IV

Game playing – the Minimax search procedure, adding Alpha-beta cutoffs, additional refinement, iterative deepening, planning system and its components, understanding, understanding as constrained satisfaction. Slot and filler structures: semantic nets, frames, conceptual dependency, scripts. Definition and characteristics of expert system, representing and using domain knowledge, expert system shells.

Knowledge engineering, knowledge acquisition, expert system life cycle & expert system tools, MYCIN & DENDRAL examples of expert system.

Module V

Machine learning – rote learning, learning by taking advice, learning in problem solving, learning from examples, explanation based learning, analogy, formal learning theory, connectionist models - hopfield networks, learning in neural networks, back propagation, the genetic algorithm, classifier systems and genetic programming, artificial life and society based learning.

References:

1. Elaine Rich, Kevin Knight and Shivshankar B. Nair, Artificial Intelligence , 3 rd Edition, Tata – McGraw Hill, New Delhi, ISBN: 0070087709.
2. V S Janakiraman, K Sarukesi and P Gopalakrishnan, Foundations of ArtificialIntelligence and Expert System , Macmillan India Limited, ISBN: 0333926250.
3. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach , 3 rdEdition, Prentice Hall, ISBN: 0136042597.
4. G. F. Luger and W.A Stubblefield, Artificial Intelligence – Structures and Strategies for Complex Problem Solving , Addison-Wesley, 6 th Edition, ISBN: 9780321545893.
5. P. H. Winston, Artificial Intelligence , Addison-Wesley, 3 rd Edition, ISBN: 0201533774.
6. 6.Nils J. Nilsson, Artificial Intelligence, A New Synthesis , 1 st Edition, MorganKaufmann Publishers, Inc,

MCA 404 PRINCIPLES OF ACCOUNTING AND FINANCIAL MANAGEMENT

Objectives

- *To enables students to familiarize with the basic concepts in accounting and Financial Management (focus must be laid on fundamental principles rather than doing complicated problems)*

Module I

Financial accounting-scope and functions-accounting conventions and concepts-recording of business transactions-— Ledger accounts, books of prime entry - and journals— Recording transactions and events -Trial Balance. Role of computers in financial accounting.

Module II

Preparation of final Accounts-Trading account, Profit and loss account and Balance sheet with Adjustments-Depreciation methods of providing depreciation- Accounting standards in India.

Module III

Analysis and interpretation of financial statements- Importance and purpose of analysis of financial statements — Ratios — Analysis of financial statements.

Module IV

Financial Management-Nature scope and objectives-overcapitalization and undercapitalization –cost of capital- working capital-factors affecting working capital-operating cycle.

Module V

Cost concepts-elements of cost-cost sheet -Marginal costing-practical applications in business decisions -Cost volume profit Analysis-Break Even Analysis-Budgetary control-nature & Scope. Nature and scope of standard costing-variance Analysis-Capital market-mutual funds market

Note: Sixty percent questions should be from problem and remaining forty percent from theory part.

References:

1. Ashoka Banerjee, Financial Accounting, Excel Publications
2. Ambariosh Gupta, Financial accounting and Management - Pearson Education
3. Gupta, R.L. and Radhaswamy, Advanced Financial Accounting
4. Narayana Swamy, Fundamentals of Financial Accounting:
5. Jain S.P, Narang K L, Financial Accounting, Kalyani Publishers, Delhi.
6. Man Mohan & Goyal, Management Accounting, Sultan Chand &Co.
7. S. N. Maheswari, Management Accounting
8. I.M. Pandey, Management Accounting
9. I.M.Pandey, Financial Management

ELECTIVES

MCA 18 405 A INFORMATION RETRIEVAL

Objectives

- *This course aims at introducing the area of information retrieval and examining the theoretical and practical issues involved in designing, implementing and evaluating IR systems.*

Module I

Concepts of IR, Data Retrieval & Information Retrieval, IR system block diagram. Automatic Text Analysis, Luhn's ideas, Conflation Algorithm, Indexing and Index Term Weighing, Probabilistic Indexing, Automatic Classification. Measures of Association, Different Matching Coefficient, Classification Methods, Cluster Hypothesis. Clustering Algorithms, Single Pass Algorithm, Single Link Algorithm, Rochhio's Algorithm and Dendograms

Module II

File Structures, Inverted file, Suffix trees & suffix arrays, Signature files, Ring Structure, IR Models, Basic concepts, Boolean Model, Vector Model, and Fuzzy Set Model. Search Strategies, Boolean search, serial search, and cluster-based retrieval, Matching Function.

Module III

Performance Evaluation- Precision and recall, alternative measures reference collection (TREC Collection), Libraries & Bibliographical system- Online IR system, OPACs, Digital libraries - Architecture issues, document models, representation & access, Prototypes, projects & interfaces, standards

Module IV

Taxonomy and Ontology: Creating domain specific ontology, Ontology life cycle. Distributed and Parallel IR: Relationships between documents, identify appropriate networked collections, Multiple distributed collections simultaneously, Parallel IR - MIMD Architectures, Distributed IR – Collection Partitioning, Source Selection, Query Processing.

Module V

Multimedia IR models & languages- data modeling, Techniques to represent audio and visual document, query languages Indexing & searching- generic multimedia indexing approach, Query databases of multimedia documents, Display the results of multimedia searches, one dimensional time series, two dimensional colour images, automatic feature extraction.

References:

1. Yates & Neto, "Modern Information Retrieval", Pearson Education.
2. I. Witten, A. Moffat, and T. Bell, “Managing Gigabytes”
3. D. Grossman and O. Frieder “Information Retrieval: Algorithms and Heuristics”
4. Mark leven,“Introduction to search engines and web navigation”, John Wiley & Sons Inc.
5. V. S. Subrahamanian, Satish K. Tripathi “Multimedia information System”, Kluwer Academic Publisher
6. Chabane Djeraba,” Multimedia mining A highway to intelligent multimedia documents”, Kulwer Academic Publisher.

MCA 18 405 B ANDROID APPLICATION PROGRAMMING

Objectives

- *This course introduces mobile application development for the Android platform.*

Module I

Getting Started with Android Programming - Android SDK installation and configuration, Anatomy of an Android application, Activities, Fragments and Intents-Understanding Activities, Linking Activities using intents, Fragments, Calling Built in applications using intents, Displaying Notifications.

Module II

The Android User Interface- Understanding the components of a screen, adapting to display orientation, managing changes to screen orientation, Creating the user interface programmatically, Listening for UI notifications, Designing User Interface with Views- Using basic views, Using Picker Views, Understanding, Specialized fragments.

Module III

Data Persistence – Saving and Loading User Preferences, Persisting Data to Files, Creating and sing Databases. Content Providers - Sharing Data in Android, using a Content Provider, Creating Your Own Content Providers.

Module IV

Messaging – SMS Messaging, Sending Email. Location-Based Services – Displaying Maps, Getting Location Data, Monitoring a Location.

Module V

Networking – Consuming Webservices using HTTP, Consuming JSON Services, Sockets Programming, Developing Android Services – Creating Your Own Services, Establishing Communication between a service and an activity, Binding Activities to Services, Understanding Threading, Publishing Android Applications.

References:

1. Wei-MengLee," Beginning Android 4 Application Development", Wrox publications, 2012
2. The Android Developer's Cookbook: Building Applications with the Android SDK James Steele, Nelson to Addison Wesley Publications 2010 First Edition.
3. Professional Android Application Development. Reto Meier, Wrox publications, 2009, Second Edition

MCA 18 404 C OPERATIONS RESEARCH

Objectives

- *To give an exposure for the student to the area of modeling techniques ,numerical methods and algorithms.*
- *To realize the importance of various aspects of optimization techniques in industries like IT.*
- *To implement the knowledge of optimization techniques in real life problems.*

Module I

Linear programming - Mathematical Model, assumptions of linear programming, Solutions of linear programming problems – Graphical Method, Simplex method, Artificial Variable Methods - Two phase Method, Big M Method. Duality, Dual simplex method

Module II

Special types of Linear programming problems- Transportation Problem – Mathematical formulation of Transportation Problem, Basic feasible solution in TP, Degeneracy in TP, Initial basic feasible solutions to TP, Matrix Minima Method, Row Minima Method, Column Minima Method, Vogel's Approximation Method, Optimal Solution to TP - MODI Method, Stepping Stone Method, Assignment problems – Definition, Mathematical Model - Hungarian Method.

Module III

Integer Programming: Pure Integer Programming, Mixed Integer Programming, Solution Methods – Cutting plane method, branch and bound method. Binary Integer Linear programming- Travelling salesman problems – Iterative method, Branch and bound method.

Module IV

Dynamic programming, Properties of Dynamic programming, Bellman's Principle optimality, Deterministic and Probabilistic Dynamic programming. Linear programming by dynamic programming approach.

Module V

Queuing Model: Elements and characteristics of queuing systems, classification of queuing system structures of Basic Queuing System, Definition and classification of stochastic processes- discrete- time Markov Chains – Continuous Markov Chains- The Classical System-Poisson Queuing System – M/M/1: ∞/FIFO, M/M/1: ∞/SIRO Birth Death Process, Pure Birth system, Pure Death system.

References:

1. JK Sharma, "Operations Research – Theory and Applications", 4 th Ed, Mc Millan Publishing, 2009
2. Hamdy A Taha, 'Operations Research', 9 th Ed., Mc Millan Publishing Company, 2010
3. Kantiswaroop, PK Guptha, Manmohan,"Operation Research", 13 th Ed, Sulthan Chand & Sons 2007.
4. Ronald L Rardin, 'Optimisation in Operation Research', 2 nd Ed., 2016.
5. Mc Millan Claude Jr, 'Mathematical Programming', 2 nd Ed. Wiley Series, 1979.
6. *Srinath L.S, 'Linear Programming', East-West, New Delhi.*

MCA 18 404 D CLOUD COMPUTING

Objectives:

- *To impart knowledge on Introduction to Cloud Computing, The Evolution of SaaS, The Anatomy of Cloud Infrastructure, Workflow Management Systems and Clouds.*
- *Understand the technical capabilities and business benefits of visualization and cloud computing.*
- *Describe the landscape of different types of visualization and understand the different types of cloud.*

Module I

Introduction to Cloud Computing: Roots of Cloud Computing – Layers and Types of Cloud - Features of a Cloud-Infrastructure Management- Infrastructure as a Service Providers-Platform as a Service Providers-Challenges and Risks. Broad Approaches to Migrating into the Cloud - Seven Step Model of Migration into a Cloud.

Module II

The Evolution of SaaS-The Challenges of SaaS Paradigm- Approaching the SaaS Integration Enigma-New Integration Scenarios- The Integration Methodologies- SaaS Integration Products, Platforms and Services- B2Bi Services -. Background of Enterprise cloud computing paradigm- Issues for Enterprise Applications on the Cloud- Transition Challenges- Enterprise Cloud Technology and Market Evolution-Business drivers toward a marketplace for Enterprise cloud computing- The Cloud Supply Chain.

Module III

The Anatomy of Cloud Infrastructure- Distributed Management of Virtual Infrastructures- Scheduling Techniques for Advance Reservation of Capacity- RVWS Design - Cluster as a Service: The Logical Design -Cloud Storage: from LANs TO WANs- Technologies for Data Security in Cloud Computing.

Module IV

Workflow Management Systems and Clouds - Architecture of Workflow Management Systems – Utilizing Clouds for Workflow Execution- A Classification of Scientific Applications and Services in the Cloud- SAGA based Scientific Applications that Utilize Clouds.MapReduce Programming Model- Major MapReduce Implementations for the Cloud- MapReduce Impacts and Research Directions. A Model for Federated Cloud Computing - Traditional Approaches to SLO Management- Types of SLA -Life Cycle of SLA - SLA Management in Cloud- Automated Policy based Management.

Module V

Grid and Cloud- HPC in the Cloud: Performance related Issues -Data Security in the Cloud- The Current State of Data Security in the Cloud- Homo Sapiens and Digital Information- Risk- Identity- The Cloud,Digital Identity and Data Security - Content Level Security :Pros and Cons- Legal Issues in Cloud Computing - Data Privacy and Security Issues- Cloud Contracting models- Case Studies : Aneka and CometCloud.

References:

1. Rajkumar Buyya, James Broberg, and Andrzej Goscinski, “Cloud Computing - Principles and Paradigms”, 2011.
2. George Reese, “Book for Reference Cloud Application Architectures, Shroff /O'Reilly, 2009.
3. Toby Velte, Robert Elsenpeter and Anthony Velte, “Cloud Computing, A Practical Approach”, TMH.
4. George Reese, “Cloud Application Architectures”, 1st Edition, Shroff /O'Reilly,
5. Ravi Nair and Jim Smith, “Virtual Machines: Versatile Platforms for Systems and Processes”, 1st Edition, Elsevier Science / Morgan Kaufmann

MCA 18 404 E SOFTWARE TESTING AND QUALITY ASSURANCE

Objectives:

- *To impart knowledge on software testing, quality assurance and various quality standards.*

Module I

Software, Criteria for the success of a software project, Phases in Software Development Life Cycle, Testing Overview, Purpose of Software Testing, Software Quality-The meaning of Quality, the quality challenge, Cost of Quality, Quality control vs. Quality Assurance at each phase of SLDC, Quality Assurance in Software Support projects.

Module II

Levels of testing, Testing Approaches, Testing Techniques- Black-Box Testing, White-Box Testing, Gorilla testing, Beta testing, Field trial, Performance Testing, Stress testing, Acceptance Testing, Gray Box Testing, Extreme testing, Manual versus Automated Testing, Static versus Dynamic Testing, Taxonomy of Software Testing Techniques.

Module III

Test plan, Testing team and Development team, Criteria for completion of Testing, Software testing Trends, Manual Testing and its Limitations, Use of Software Testing Tools, Software Testing Tools- WinRunner, Silk Test.

Module IV

Software Quality Assurance- Software Quality Assurance Background issues, SQA Activities, Formal Approaches to SQA, Formal Technical Reviews, Software Reliability – Measures of Reliability and Availability, Software Safety, The SQA plan, Product Quality and process Quality, Software Measurement and Metrics.

Module V

Quality Management Systems, Quality Standards, ISO 9000 Series Standards, Software CMM and other process improvement models: CMM for software- an overview. Types of CMMs, CMM-Integrated model, Process Change Management.

References:

1. Dr.KVKK Prasad, Software Testing Tools, Dream Tech press,2005
2. William E Lewis Software Testing and Continuous Quality Improvement Third Edition, Auerbach Publications, 2009
3. Aditya P. Mathur, Foundations of Software Testing Second Edition, Pearson 2014
4. Anirban Basu, Software Quality Assurance, Testing and Metrics by, Prentice-Hall of India Pvt.Ltd, 2015
5. Roger S. Pressman, 'Software Engineering: A practitioner's Approach, 6th Edition (International Edition, 2005) Tata McGraw-Hill

MCA 18 406 (P) – Mini Project

A mini-project should be done by the students based on concepts they have already learnt in the previous semesters of the MCA programme. It may be based on database concepts, object oriented concepts, computational intelligence, optimization tools, compiler design, Android application programs, information retrieval etc.

SEMESTER V

MCA 18 501- COMPUTER GRAPHICS

Objectives:

- *To understand the fundamentals of modern computer graphics including algorithms for drawing 2D, 3D object transformations.*
- *To understand basics of computer animation.*

Module I

Introduction – Application of computer graphics, Video Display Devices- refresh CRT, raster and random scan display, color CRT, flat panel, LCD, LED, DVST. Raster -Scan Systems-video controller, display processor, Random-Scan Systems.

Module II

Output primitives and its algorithms: Points and Lines, Line drawing algorithms – DDA, Bresenham's drawing algorithm – Midpoint Circle drawing algorithm, Mid point ellipse algorithm – Filled Area primitives-Scan line polygon fill algorithm, Inside outside tests, boundary fill algorithm, floodfill algorithm.Character Generation.

Module III

2D Transformations and Clipping: Basic transformations -translation, rotation, scaling, shearing and reflection. Matrix representation and homogeneous Coordinates, composite transformations. 2D Viewing –the viewing pipeline, window-to- viewport coordinate transformation. Clipping-point clipping, Cohen Sutherland line clipping, Sutherland Hodgeman polygon clipping, text clipping.

Module IV

3D Concepts: Three Dimensional Display Methods. 3D Transformations- translation, rotation, scaling, shear and reflection. 3D Viewing-viewing pipeline, viewing coordinates, projections- parallel projection-orthographic and oblique projections, Perspective projections- concept of vanishing points . Visible Surface detection - Back face detection, Depth buffer method, A-buffer method.

Module V

Computer Animation: Design of animation sequences, Raster animations, Computer animation languages, Key-frame systems- Morphing, Simulating Accelerations. Motion Specification- Direct motion specification, Goal directed systems, Kinematics and dynamics.

References:

1. Donald Hearn and M. Pauline Baker "Computer Graphics", 2nd Edition: Prentice hall India
2. Foley J D, Van Dam A, Feineer S K & Hughes J F, Computer Graphics Principles and Practices,Addison Wesley
3. Rogers D. F, Procedural Elements for Computer Graphics, McGraw Hill.
4. Steven J Gortler , Foundations of 3D Computer Graphics, The MIT Press

MCA 18 502 WIRELESS COMMUNICATION

Objectives

- *To understand the fundamental concepts of wireless and mobile networks.*
- *To familiarize with wireless application Protocols to develop mobile content applications.*
- *To understand about the security aspects of wireless networks.*

Module I

Introduction, wireless transmission – History,1G,2G,3G,4G, and above 4G frequencies for radio transmission - signals - antennas - signal propagation - multiplexing - modulation - spread spectrum - medium access control - specialized MAC - SDMA - FDMA - TDMA - aloha - CSMA - collision avoidance - polling - CDMA - comparison of S/T/F/CDMA

Module II

Telecommunication systems - mobile services -3G and 4G Wireless Standards-GSM, GPRS, WCDMA, LTE, WiMAX system architecture - radio interface - protocols - localization and calling - handover - security - satellite systems- GPS broadcast systems - digital audio broadcasting - digital video broadcasting, WDM Optical networks.

Module III

Mobile network layer - mobile IP - packet delivery - registration - tunnelling and encapsulation - optimizations - reverse tunneling - dynamic host configuration protocol-Mobile Transport Layer-TCP-Indirect TCP-Snooping TCP-Mobile TCP-retransmission-recovery-transaction oriented TACP

Module IV

Wireless LAN-Infra red Vs radio transmission -infra structure and adhoc networks-IEEE 802.11 b/a/g-IEEE 802.16, adhoc networks - routing - algorithms -- case study: emergent Wireless Lan Technologies.

Module V

WAP-Design and principles of operations, WAP architecture Overview-WAP model-WAP architecture components-WAE overview-WWW model-WAE model-WTA architecture overview-Wireless session protocol specifications-Wireless transaction protocol specification Wireless transport layer security specification-Wireless datagram protocol-wireless control message protocol specification.

References:

1. Schiller J.Mobile Communications, 2/e, Pearson Education, 2003. 2. Gray.S.Rogers,John Edwards An Introduction to Wireless Technology, Pearson Education
2. S.G. Glisic, “Advanced Wireless Communications”, 4G Technologies, Wiley, 2004.
3. C.Siva Ram Murthy, Ad Hoc Wireless Networks: Architectures and Protocols, Pearson Education, 2004.
4. Singhal et.al S., The Wireless Application Protocol, Addison Wesley
5. C. Siva Ram Murthy, WDM Optical Networks: Concepts, Design, and Algorithms, Pearson Education

MCA 503 WEB PROGRAMMING

Objectives

- *To familiarize the concepts of PHP and Python programming*

Module I

Internet and WWW, HTML, Introduction to XHTML, Dynamic HTML, Cascading Style Sheets.

Module II

PHP – designing dynamic web pages using PHP - defining PHP variables – variable types – operators – control flow constructs in PHP – passing form data between pages - establishing connection with MySQL database Overview of content management system - coding for reusability (header.php) – user management - article publishing - additional CMS features.

Module III

Introduction to Python – installation – Python interpreter – usage and customization – editor setup – variables, expressions and statements – functions. Strings – lists –list comprehensions – stacks – queues – tuples – sequences – sets – dictionaries –sets - modules, I/O and exception handling - modules – search path – compiled modules – standard modules – packages – input and output functions – files – read and write – exception – handling and raising – user defined exceptions.

Module IV

Server side programming using Python - server side scripting - CGI - role of Web server – Apache web server – Python server side script – developing Python Server Side Pages (PSP) – capturing form data – validation – processing data – exchange of data between form and server.

Module V

Python-SQLite integration - features of SQLite, data types, introduction to SQL commands - SELECT, DELETE, UPDATE, INSERT. Python functions for SQLite operations – database connection, database and table creation, selection, query, fetching results - insertion and deletion of data using Python - displaying data from SQLite in webpage. Case study - server MVC design pattern – Django.

References:

1. H. M. Deitel, P. J. Deitel and T. R. Nieto, Internet and World Wide Web: How to Program, Pearson Education, 2000.
2. Harvey Deitel, Paul Deitel, Tem Nieto, Complete Internet & World Wide Web Programming Training Course, Student Edition, 2/e, Prentice Hall, 2002
3. Allen Downey, Jeffrey Elkner and Chris Meyers, How to Think Like a Computer Scientist: Learning with Python, Createspace, 2009.
4. Wesley J Chun, Core Python Programming, 2nd Edition, Pearson Education.

ELECTIVES

MCA 18 504 A - BIG DATA TECHNOLOGIES

Objectives

- *To understand the basic concepts of Big Data.*
- *To familiarize with Big Data technology and tools.*
- *To cover the basics of R Programming.*

Unit I

Introduction to Big Data – definition & importance of Big Data - four dimensions of Big Data - volume, velocity, variety, veracity – importance of big data – structured data, unstructured data - the role of a CMS in big data management - integrating data types into a big data environment - Distributed computing and Big Data. Technology Foundation for Big Data. Big Data stack – layer 0,1 ,2,3and 4 – Big Data Applications-Understanding the Basics of Virtualization-The cloud and Big Data- Big Data management – operational databases – relational databases – non relational databases – NoSQL - key-value pair databases – document databases - columnar databases - graph databases - spatial databases.

Unit II

Big Data analysis - basic analytics – advanced analytics-operationalized analytics –monetizing analytics- modifying business intelligence products to handle Big Data - Big Data analytics examples - Analytics solutions - text analytics - exploring unstructured data - understanding text analytics - analysis and extraction techniques - the extracted information - text analytics tools for Big Data – New models and Approaches to support Big Data– Characteristics - Google Prediction API - Characteristics of a Big Data Analysis Framework.

Unit III

Introduction to R Programming – Evolution – Features –Basic Syntax – Data Types – Variables – Operators – Decision Making Loops – Functions – Strings – Vectors – Lists – Matrices – Arrays – Factors – Data Frames – Web Data – Databases - Pie Charts – Bar Charts – Boxplots – Histograms – Line graphs – Scatterplots – Linear Regression – Multiple Regression – Normal Distribution – Binomial Distribution – Time Series Analysis.

Unit IV

Hadoop – history – components – Hadoop Distributed File System –Analyzing Data with Hadoop - Application Development in Hadoop – Hadoop Streaming - getting our data into Hadoop - Map Reduce Basics – origins of MapReduce - map function – reduce function – putting them together– Map Reduce Applications – How Map Reduce Works – Map Reduce Types And Formats – Map Reduce Features.

Unit V

Application of Big Data Using Pig and Hive – Data Processing Operators in Pig – Hive Services – HiveQL _Querying Data in Hive – Fundamentals of HBase and Zookeeper – Visualization – Visual data analysis Techniques, interaction techniques; Systems and applications.

References:

1. Hurwitz, Alan Nugent, Fern Halper and Marcia Kaufman, Big Data for Dummies.
2. Bill Franks Taming the Big Data Tidal wave: Finding Opportunities in Huge Data Streams with Advanced Analytics ,John Wiley & sons, 2012.
3. Chris Elaton, Derk Deroos, Tom Deutsch, George Lapis and Pual Zikopoulos, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGrawHill, 2012
4. Garry Turkington, Hadoop Beginner's Guide, Packt Publishing Ltd.
5. Tom White, Hadoop: The Definitive Guide, 3rd Edition,2012.
6. Pete Warden, Big Data Glossary, 2011

MCA 18 504 B- DIGITAL IMAGE PROCESSING

Objectives

- *To be familiar with processing of the images, recognition of the pattern and their applications.*

Module I

Introduction, Digital Image Fundamentals: elements of visual perception, light and electromagnetic spectrum, image sensing and acquisition, image sampling and quantization, some basic relationship between pixels. Intensity Transformations: Basics of intensity transformations, some basic intensity transformation functions, histogram processing.

Module II

Spatial Filtering: fundamentals of spatial filtering, smoothing and sharpening filters. Frequency domain Filtering: Background, preliminary concepts, sampling, Fourier transforms and DFT, 2-D DFT and properties, frequency domain filtering, low pass filters, high pass filters, implementation.

Module III

Image restoration and Reconstruction: Noise models, restoration in the presence of noise, linear-positive invariant degradations, inverse filtering, Wiener filtering, constrained least square filtering, geometric mean filter.

Module IV

Image Compression: fundamentals, basic compression methods. Morphological Image Processing: preliminaries, erosion and dilation, opening and closing, basic morphological algorithms.

Module V

Image Segmentation: fundamentals, point, line and edge detection, thresholding, region based segmentation, use of motion in segmentation.

References:

1. Digital Image Processing, by Rafael C. Gonzalez & Richard E. Woods, 3rd edition, PHI 2008
2. Fundamentals of Digital Image Processing, by Anil K. Jain, Prentice Hall, 1995.
3. Digital Image Processing, by William K. Pratt, John Wiley & Sons Inc., 3rd edition, 2001.
4. Milan Sonka, Vaclav Hlavac and Roger Boyle, Image Processing Analysis and Machine Vision, 3rd Edition, Ceneage Learning India Pvt Ltd

MCA 18 504 C– CYBER SECURITY

Objectives

- *To give an overview of security issues. Also give an overview in cloud and biometric security.*

Module I

Security Elements: Authorization and Authentication - types, policies and techniques – Security certification - Security monitoring and Auditing - Security Requirements Specifications - Security Policies and Procedures, Firewalls, IDS, Log Files, Honey Pots Human factors – Security awareness, training , Email and Internet use policies. Web application security- Key Problem factors – Core defense mechanisms- Handling user access- handling user input- Handling attackers Fundamental security mechanism Off-the shelf Technologies: Bluetooth security, Wi-Fi security, Wi-Max security, Security in mobile telecommunication network

Module II

Emerging Technologies- Security in Next Generation Mobile network, Security of IP-based network, security in Adhoc network, key management in Adhoc network. Research direction in security and privacy of mobile networks, Applying trust in mobile and wireless network, mobile security Internet Security Systems, Intrusion Detection Systems, Firewall Security Systems, Storage Area Network Security Systems, Network Disaster Recovery Systems, Public Key Infrastructure Systems, Wireless Network Security Systems, Satellite Encryption Security Systems, Instant Messaging (IM) Security Systems, Net Privacy Systems, Identity Management Security Systems, Identity Theft.

Module III

Secure Coding: Buffer Overrun, Format String Problems, Integer Overflow, and Software Security Fundamentals, Ethical Hacking: Hacking Fundamentals, Reconnaissance, Scanning and Enumeration, Sniffers, ARP poisoning and MAC Flooding, Denial of Service, Session Hijacking, Social Engineering Web server-working, vulnerability and attack, Web Application Penetration Testing, Structure of Penetration Testing, reverse engineering (using debuggers such ollydbg or immunity debugger)

Module IV

Web application and Cloud Security: Web Application Technologies-HTTP protocol, Attacking, Session Management- Weaknesses in Session Token Generation, Weaknesses in Session Token Handling, Securing Session Management, Attacking Access Controls-vulnerabilities, attacks and countermeasures, Attacking Application Logic- Fooling a Password Change Function, Abusing a Search Function, Cloud architecture model – Cloud delivery model, SPI framework, SaaS, PaaS, Iaas, Deployment models – Public, community, Private, Hybrid Cloud, Cloud security design principles, Secure cloud software requirements, Secure development practice, Virtualization security Management- virtual threats, VM security recommendations, VM security techniques – hardening, securing VM remote access

Module V

Biometric Security: Biometric Security: The Need for Strong Authentication. The role of Strong Authentication with Single Sign-On (SSO), Biometric Technologies: Finger-representation of finger image, types of algorithms for interpretation, Face- representation of face image, types of algorithms for interpretation, Voice- voice capturing, types of algorithms for interpretation, Iris capturing iris image, types of algorithms for interpretation, general spoofing techniques.

References:

1. Kaveh Pahlavan, Prashant Krishnamurthy., Principles of Wireless Networks. - Pearson Edu.2002
2. Stallings, William., Wireless Communications and Networks.- Pearson Education, 2002. 3. T. S
3. John R. Vacca, Computer Forensics: Computer Crime Scene Investigation, 2nd Edition
4. Howard, LeBlanc, and Viega, “24 Deadly Sins of Software Security
5. CEH: Certified Ethical Hacker Study Guide, Kimberly Graves, SERIOUS SKILLS.
6. D. Stuttard and M. Pinto, "The Web Application Hacker's Handbook", Wiley, 2008
7. Biometrics and Network Security, Paul Reid, Prentice Hal,
8. Ronald L. Krutz, Russell Dean Vines, Cloud Security, Wiley publication, 2010

MCA 18 504 D MOBILE COMPUTING

Objectives

- *To give an overview of mobile architecture and communication principles. To introduce mobile computing application development.*

Module I

Cellular architecture, Mobile computing issues and challenges, architecture issues, communication issues, bandwidth management issues, energy issues, information management issues, reliability issues, security issues, social issues, trust management and anonymity issues, applications (horizontal and vertical), wireless mobile network characteristics, portable characteristics, mobility characteristics.

Module II

Wireless Communication principles: Multiplexing (SDM, FDM, TDM, CDM), modulation, hidden terminal, exposed terminal Channel allocation: Fixed channel allocation, dynamic channel allocation, hybrid channel allocation, flexible channel allocation.

Module III

Location Management: Location management problem, location management update principles (no, update, full, update, lazy, update, selective, update), location management architecture (two tier, tree, based, hierarchical etc.), location management algorithms (two locations, reporting cell, profile, based)

Module IV

Mobility Model: Individual mobility model (random walk, random way-point, random-direction, smooth random, gauss-markov model), group-based mobility model (column, nomadic, pursue, reference point group, mobility model). Mobile Protocols: Mobile, IPv.4, Ipv.6, Mobile TCP (m-TCP) Information Dissemination: Information dissemination through wireless medium, broadcasting, Push- Pull Periodic, on-demand, real-time, variable-sized data broadcasting schemes 17Mobile Payment Models: Payments in Mobile environment, E-cash, M-pay, Pay-box, EMPS, E-Ticket.

Module V

Mobile Computing application development using J2ME platform. Sensor Network: wireless sensor network, WSN applications, sensor network issues and challenges, energy management in WSN, sensor network routing protocols (data aggregation, clustering, data fusion).

References:

1. Jochen Schiller , Mobile Communications , Pearson Publications
2. Tomasz Imielinski & Henry F. Korth, Kluwer, Mobile Computing, Academic Publishers
3. Asoke Talukder, Roopa Yavagal, Mobile Computing – Technology, Application & Service Creation, McGraw Hill Publications.
4. Mohammad Ilyas, Mobile Computing Hand Book, Auerbuch Publications
5. C. S. Raghavendra, Krishna M. Sivalingam, Taieb F. Znati, Wireless Sensor Networks, Springer Publications, 2004

MCA 18 504 E- INTRODUCTION TO SOFT COMPUTING TECHNIQUES

Objectives

- *To give a broad, yet in-depth overview of the field of soft computing techniques.*

Module I

Soft Computing: Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing. Soft Computing Constituents –From Conventional AI to Computational Intelligence-Adaptive Networks – Feed forward Networks – Supervised Learning.

Module II

Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

Module III

Artificial intelligence systems– Neural networks, genetic algorithms. Artificial neural networks: Biological neural networks, model of an artificial neuron, Activation functions, architectures, characteristics-learning methods, brief history of ANN Research-Early ANN architectures (basics only)-McCulloch & Pittsmodel, Perceptron, ADALINE, MADALINE

Module IV

Backpropagation networks: architecture, multilayer perceptron, backpropagation learning-input layer, hidden layer, output layer computations, calculation of error, training of ANN, BP algorithm, momentum and learning rate, Selection of various parameters in BP networks. Variations in standard BP Algorithms-Adaptive learning rate BP, resilient BP, Levenberg-Marquardt, and conjugate gradient BP algorithms (basic principle only)-Applications of ANN.

Module V

Genetic algorithms – basic concepts, encoding, fitness function, Reproduction-Roulette wheel, Boltzmann, tournament, rank, and SteadyState selections, Elitism. Inheritance operators, Crossover-different types, Mutation, Bit-wise operators, Generational cycle, Convergence of GA, Applications of GA – case studies.

References:

1. R. Rajasekaran and G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic, and Genetic Algorithms:Synthesis and applications, Prentice Hall of India, New Delhi, 2003
2. L. Fausett,Fundamentals of Neural Networks, Prentice Hall, Upper Saddle River, N.J,1994.
3. Digital Neural Network ,S.Y Kung , Prentice Hall of India
4. D. E. Goldberg, Genetic Algorithms in Search, Optimisation, and Machine Learning, Addison-Wesley, Reading, MA, 1989
5. M. T. Hagan, H. B. Demuth, and M. H. Beale, Neural Network Design, PWSPublishing, Boston, MA, 1996

MCA 18 505 A - INTERNET OF THINGS

Objectives

- *This course presents the communication technologies used in IoT, Web of Things, Structural models and applications of IoT*

Module I

Introduction: Internet Layers - Protocols - Packets - Services - Performance parameters - Peer-topeer networks - Sensor networks - Multimedia - IOT Definitions and Functional Requirements – Motivation – Architecture - Web 3.0 View of IoT– Ubiquitous IoT Applications – Four Pillars of IoT – DNA of IoT - The Toolkit Approach for End-user Participation in the Internet of Things. Middleware for IoT: Overview – Communication middleware for IoT –IoT Information Security.

Module II

IoT protocols: Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – point-to-point protocols - Ethernet protocals - cellular Internet access protocal - Machine-to-machine protocal - Modbus – KNX – Zigbee Architecture – Network layer – APS layer – Security.

Module III

Web of Things: Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture.

Module IV

Integrating IOT: Integrated Billing Solutions in the IoT, Business Models for the IoT - Network Dynamics: Population Models – Information Cascades – Network Effects - Network Dynamics: Structural Models - Cascading Behavior in Networks - The Small World Phenomenon.

Module V

Applications: The Role of the IoT for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging - Case studies: Sensor body-area-network and Control of a smart home.

References:

1. Honbo Zhou, The Internet of Things in the Cloud:A Middleware Perspective-CRC Press 2012.
2. Dieter Uckelmann; Mark Harrison; Florian Michahelles- (Eds.), Architecting the Internet of Things –– Springer – 2011
3. David Easley and Jon Kleinberg, Networks, Crowds, and Markets: Reasoning About a Highly Connected World, Cambridge University Press - 2010.
4. Olivier Hersent, Omar Elloumi and David Boswarthick , The Internet of Things: Applications to the Smart Grid and Building Automation, Wiley -2012
5. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012.

MCA 18 505 B- ADVANCED JAVA MOBILE PROGRAMMING

Objectives

- *To learn the advanced features of java programming language that equip the students to develop web based applications to develop web based applications.*

Module I

J2ME Overview: Inside J2ME ,J2ME and Wireless Devices, Small Computing Technology: Wireless Technology-Mobile Radio Networks, Messaging, PDAs, Mobile Power, set Top Boxes, smart cards. J2ME Architecture and Development Environments: J2ME Architecture, Small computing Device Requirements, MIDlet programming, J2ME Software Development Kits, Helloworld J2ME Style, J2ME Wireless Toolkit.

Module II

J2ME Best Practices and Patterns, Commands, Items and Event Processing: J2ME User Interfaces-Display class, Command Class, Item Class, Exception handling. High-Level Display: Screens: Alert Class, Form Class, Item Class, List Class, Text Box Class.Low-Level Display: Canvas: The Canvas, User Interactions, Graphics

Module III

Record Management System: Record Storage, Writing and Reading Records, Sorting and Searching Records.J2ME Database Concepts: Database Schema, Foreign keys, The Art of Indexing-Drawbacks of Using an Index. JDBC Objects

Module IV

JDBC and Embedded SQL; tables, Indexing, Inserting Data into Tables-Insert a Row, Selecting Data from a Table-Select All data, Request One column and multiple columns, Request Rows, Request Rows and Columns. Metadata, Updating and Deleting Data from a table. Views: Rules for using Views Create a view, Group and Sort Views:

Module V

Personal Information Manager: PIM Databases, The Contact databases, The Event databases, Error Handling. Introduction to Web services: Basics, J2EE Multitier Web Services Architecture, Inside WSDL, J2ME MIDlets and Web services, RMI Concept, SOAP Basics, WSDL and SOAP.

Reference:

1. J2ME- The Complete Reference- James Keogh- TATA McGRAW-HILL

MCA 18 505 C- PATTERN RECOGNITION

Objectives

- *To understand different pattern recognition methods which can be adopted in web access and image processing.*

Module I

Introduction and General Pattern Recognition Concerns: Pattern Recognition, Classification and Description, Patterns and Feature extraction with examples, Training and Learning in PR Systems, Pattern recognition Approaches, Other Approaches to PR, Overview to PR Literature and Recourses.

Module II

Statistical Pattern Recognition: Introduction to Statistical Pattern Recognition, The Gaussian Case and Class Dependence, Discriminant functions, Additional examples, Extensions, Classifier Performance , Risk, and Errors Supervised Learning (Training) Using Parametric and Nonparametric Approaches: Introduction, Parametric Estimation and Supervised Learning, Maximum Likelihood (ML) Estimation, The Bayesian Parametric Estimation Approach Supervised Learning Using Nonparametric Approaches, Parzen Windows, K-NN Nonparametric Estimation.

Module III

Linear discriminant Functions and The discrete and Binary Feature Cases: Introduction, Discrete and Binary Classification Problems, Techniques to directly Obtain Linear Classifiers Unsupervised Learning and Clustering: Formulation of Unsupervised learning Problems, Clustering for Unsupervised Learning And Classification.

Module IV

Introduction to neural Pattern Associators and Matrix Approaches: Neural Network- Based Pattern Associators, matrix Approaches (Linear Associative mappings) and examples, Feed forward networks and Training by Back propagation: Multilayer, Feed forward Network Structure, training the Feed forward Network: The Delta rule (DR) and Generalized Delta Rule (GRD), Extension of the DR for Units in the Hidden Layers [The Generalized Delta Rule (GRD)], Extended Example: Pattern Associator for Character Classification.

Module V

Content Addressable Memory Approaches and Unsupervised Learning in NeurPR: Introduction, The Hopfield Approach to Neural Computing, Additional Examples of CAM Applications in PR, Unsupervised Learning in NeurPR: Self-Organizing Networks.

References:

1. Lawrence Rabiner, Biing-Hwang Juang, Fundamentals of Speech Recognition, Prentice Hall
2. Robert Schalkoff, Pattern Recognition, Willey 1992.
3. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, Willey

MCA 18 505 D NATURAL LANGUAGE PROCESSING

Objectives

- *To give an overview of natural language processing based on various probabilistic language models.*

Module I

Natural Language Processing: Introduction and Overview, Ambiguity and uncertainty in language, Regular Expressions, Chomsky hierarchy, Regular languages and their limitations, Finite-state automata, Practical regular expressions for finding and counting language phenomena, Morphology, Inflectional Morphology, Derivational Morphology, Finite-State Morphological Parsing, Combining an FST Lexicon and Rules, Porter Stemmer, Exploring a large corpus with regex tools.

Module II

Context Free Grammars, CFG definition, use and limitations, Chomsky Normal Form, Top- down parsing, bottom-up parsing, and the problems with each. The desirability of combining evidence, from both directions Non-Probabilistic Parsing Efficient CFG parsing with CYK, Earley parser, Designing a little grammar and parsing with it on some test data.

Module III

Probabilistic language modeling and its applications, Markov models, N-grams, Estimating the probability of a word and smoothing, Generative models of language, Part of Speech Tagging and Hidden Markov Models, Viterbi Algorithm for Finding Most Likely HMM Path, Dynamic programming with Hidden Markov Models and its use for part-of-speech tagging.

Module IV

Probabilistic Context Free Grammars, Weighted context free grammars, Weighted CYK, Pruning and beam search, Parsing with PCFGs, Probabilistic version of CYK, Modern parsers, Maximum Entropy Classifiers, Maximum entropy principle and its relation to maximum likelihood, Maximum entropy classifiers and their application to document classification, sentence segmentation and other language processing tasks.

Module V

Maximum Entropy Markov Models & Conditional Random Fields, Part-of-speech tagging, noun-phrase segmentation and information extraction models that combine maximum entropy and finite-state machines, State-of-the-art models for NLP, Lexical Semantics, Mathematics of Multinomial and Dirichlet distributions, Dirichlet as a smoothing for multinomials, Information Extraction & Reference Resolution, Various methods, Machine learning methods for coreference.

References:

1. D. Jurafsky and J. Martin, Speech and Language Processing: An Introduction to Natural Language processing, Computational Linguistics and Speech Recognition, 2 Ed, Prentice Hall
2. C. Manning and H. Schutze, Foundations of Statistical Natural Language Processing", MIT
3. James Allen, Natural Language Understanding, The Benajmins/Cummings Publishing Company
4. Cover, T. M. and J. A. Thomas, Elements of Information Theory. Wiley.
5. Charniak, E, Statistical Language Learning, The MIT Press.
6. James Allen. Natural Language Understanding, Addison Wesley, 1994.

MCA 18 505 E - BIO INFORMATICS

Objectives

- *Expose students to the popular genomic and proteomic databases and to impart knowledge in processing and analysing genomic data.*
- *Introduce advanced topics in Bioinformatics.*

Module I

Bioinformatics - introduction to - nature and scope of computational biology and Bioinformatics. Cells - prokaryotes and eukaryotes - DNA double helix – central dogma – RNA, Amino acids, Proteins - string representations. A glossary of Bioinformatics terms - file format for bio-molecular sequences, sequence alignment, phylogeny, gene finding, microarray analysis, homology and evolutionary relationships.

Module II

Basic algorithms in Computational Biology - exhaustive search methods and their applications in Computational Biology - string matching algorithms. Motif finding - tandem repeats – concept of dynamic programming - graph algorithms – clustering algorithms.

Module III

Sequence alignment - pair-wise sequence alignment, need of scoring schemes -penalizing gaps, scoring matrices for amino acid sequence alignment, PAM probability matrix and log odds matrix, BLOSUM, Dot-plot visualization, Needleman- Wunsch algorithm- effect of scoring schemes – evalues - BLAST and FASTA, Smith – Waterman algorithm for local alignment.

Module IV

Multiple sequence alignment - sequence alignment using dynamic programming, N-dimensional dynamic programming. Tools for MSA - muscle and T-Coffee. Phylogenetic algorithms - evaluation of phylogenetic trees, significance.

Module V

Introduction to the major resources - NCBI, EBI and ExPASy - nucleic acid sequence databases - GenBank, EMBL, DDBJ – Protein sequence databases – SWISS-PROT, TrEMBL, PIR_PSD - genome databases at NCBI, EBI, TIGR, SANGER – procedures to access these databases and to make use of the tools available.

References:

1. Mount D, Bioinformatics: Sequence & Genome Analysis, 2 nd Ed, Cold spring Harbor Press.
2. Dan Gusfield, Algorithms on Strings Trees and Sequences, 1 st Ed, Cambridge University Press.
3. Pevzner P A, Computational Molecular Biology: An Algorithmic Approach, MITPress, Cambridge, MA.
4. Jeremy J. Ramsden, Bioinformatics: An Introduction, Springer.
5. Sushmita M and Tinku A, Data Mining: Multimedia, Soft Computing and Bioinformatics, Wiley-Interscience.

MCA 18 505 F - MACHINE LEARNING

Objectives

- *Be able to formulate machine learning problems corresponding to different applications.*
- *Understand a range of machine learning algorithms along with their strengths and weaknesses.*
- *Understand the basic theory underlying machine learning.*
- *Be able to apply machine learning algorithms to solve problems of moderate complexity.*
- *Be able to read current research papers and understand the issues raised by current research.*

Module I

Introduction to Machine Learning: Concept of learning task, inductive learning and the concepts of hypothesis space, introduction to different types of machine learning approaches, examples of machine learning applications, different types of learning; supervised learning, unsupervised learning, reinforcement learning. Setting up your machine learning platform; training, validation and testing, over-fitting and under-fitting, different types of error calculation.

Module II

Supervised Learning: Introduction, learning a class from example, learning multiple classes, model selection and generalization, linear regression and feature selection, Bayesian and Decision Tree learning; classification tree and regression tree, multivariate methods for learning; multivariate classification and regression.

Module III

Unsupervised Learning: Introduction, clustering; mixture densities, k-means clustering, expectation maximization algorithm, mixture latent variable models, Latent Dirichlet Allocation, spectral and hierarchical clustering, Dimensionality reduction; principal component allocation, linear discriminant analysis, canonical correlation analysis.

Module IV

Introduction to Artificial Neural Network: Understanding brain, perceptron, Multi-Layer perceptron as universal approximator, general architecture of artificial neural network, feed forward and back-propagation, different linear and nonlinear activation functions for binary and multi class classification.

Module V

Introduction to Deep Learning: Fundamentals of deep learning, Deep Feedforward Networks, Regularization for Deep Learning, Optimization for Training Deep Models, Introduction to Convolutional Networks, Sequence Modeling using Recurrent Nets, overview of LSTM, fundamentals of Generative adversarial network.

References:

1. Ethem Alpaydin, Introduction to Machine Learning- 3rd Edition, PHI.
2. Tom M. Mitchell, Machine Learning, McGraw-Hill
3. Ian Goodfellow and Yoshua Bengio and Aaron Courville, Deep Learning (Adaptive Computation and Machine Learning), MIT Press, 2016.
4. Kuntal Ganguly, Learning Generative Adversarial Networks, Packt Publishing, 2017

MCA 18 506 (P) - Practical V

Web Programming

1. Write a python program to reverse a string and check the given string is palindrome or not.
2. Insert n elements to a list using python
   a) Find the third highest element from the list
   b) Find the length of the list
   c) Sort the list
3. Write a python program to append text to a file and display the text. Count the number of lines in the appended text file.
4. Write a python function to multiply all numbers in a list.
5. Accept a number using textbox and print its factorial on clicking the button using python script.
6. Create two textboxes and accept the upper limit and lower limit. List the Fibonacci numbers between these values on clicking the button.
7. Create a text area. Enter some text into it. Print the number of words in the text on clicking the button.
8. Create a database with a table having fields username and password.
   a. Insert values to the table
   b. Create a login page with two textboxes and a button.
   c. Redirect to a home page on successful login.
9. Using Python and SQL, develop a program to accept book information viz. acc_no, title and author from a web page and store the information in a database. Search for a book with title specified by the user and display the search results with proper headings.
10. Using python and sql, develop a program to accept student information viz. id_no, name , mark1,mark2 and mark3 from a web page and store the information in a database. Create another web page with a textbox accepting id_no and on clicking the button calculate the average of three marks and grade of the student. Print results.
    Grade: >80 : A >60 : B >40 : C else D

MCA L 18 507 (T) - Term Paper

- The student is expected to do an extensive literature survey and analysis in an area related to computer science, chosen by him/her, under the supervision of a faculty member from the department. Evaluation of term paper should be done internally. A faculty member can be appointed as a guide/ supervisor.
- The student has to choose an area for his/her work after due consultation and approval from the guide. The study should preferably result in a critical review of the present works/design ideas/ designs/ algorithms/ theoretical contributions in the form of theorems and proofs/ new methods of proof/new techniques or heuristics with analytical studies/implementations and analysis of results.
- Articles from ACM/IEEE/INFLIBNET Journals/Conference Proceedings and/or equivalent documents, standard textbooks and web based material, approved by the supervisor.
- The student should submit a technical report and report should be prepared in TEX in IEEE conference style format.

General Pattern of Question Paper

Core and Elective courses in MCA

(with effect from 2018 Admission)

Reg. No:……..

Code: Name :……

First Semester MCA Degree Examination – 2018

Course Code: (eg: MCA 18 101)

Course : (Eg: Discrete Mathematical Structures)

Time: 3 Hours Total Marks: 100

Answer five full questions; Each Question carries 20 marks.

Question Numbers 1 to 7 Total Marks = 5 x 20 Marks = 100 Marks

NOTE: Minimum one question from each of the five modules. Remaining two questions can be from any module. There should not be more than two questions from the same module.