HINDUSTAN UNIVERSITY

HINDUSTAN INSTITUTE OF TECHNOLOGY & SCIENCE

(Estd. u/s 3 of the UGC Act, 1956)

Padur, Kancheepuram District - 603 103.

DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING

Regulations Curriculum and Syllabus 2013

M.Tech.
COMPUTER SCIENCE AND ENGINEERING

ACADEMIC REGULATIONS
(M.TECH./ M.B.A. / M.C.A.) (Full - Time / Part - Time)
(Effective 2013-14)

1. Vision, Mission and Objectives

1.1 The Vision of the Institute is "To make every man a success and no man a failure".

In order to progress towards the vision, the Institute has identified itself with a mission to provide every individual with a conducive environment suitable to achieve his / her career goals, with a strong emphasis on personality development, and to offer quality education in all spheres of engineering, technology, applied sciences and management, without compromising on the quality and code of ethics.

1.2 Further, the institute always strives

- To train our students with the latest and the best in the rapidly changing fields of Engineering, Technology, Management, Science & Humanities.
- To develop the students with a global outlook possessing, state of the art skills, capable of taking up challenging responsibilities in the respective fields.
- To mould our students as citizens with moral, ethical and social values so as to fulfill their obligations to the nation and the society.
- To promote research in the field of science, Humanities, Engineering, Technology and allied branches.

1.3 Our aims and objectives are focused on

- Providing world class education in engineering, technology, applied science and management.
- Keeping pace with the ever changing technological scenario to help our students to gain proper direction to emerge as competent professionals fully aware of their commitment to the society and nation.
- To inculcate a flair for research, development and entrepreneurship.

2. Admission

2.1 The admission policy and procedure shall be decided from time to time by the Board of Management (BOM) of the Institute, following guidelines issued by Ministry of Human Resource Development (MHRD), Government of India. The number of seats in each branch of the (M.TECH / M.B.A. / M.C.A.) programme will be decided by BOM as per the directives from Ministry of Human Resource Development (MHRD), Government of India and taking into account the market demands. Some seats for Non Resident Indians and a few seats for foreign nationals shall be made available.

2.2 The selected candidates will be admitted to the (M.TECH / M.B.A. / M.C.A.) programme after he/she fulfills all the admission requirements set by the Institute and after payment of the prescribed fees.

2.3 Candidates for admission to the first semester of the Master's Degree Programme shall be required to have passed an appropriate Degree Examination recognized by Hindustan University.

2.4 In all matters relating to admission to the (M.TECH / M.B.A. / M.C.A.). Programme, the decision of the Institute and its interpretation given by the Chancellor of the Institute shall be final.

2.5 If at any time after admission, it is found that a candidate has not fulfilled any of the requirements stipulated by the Institute, the Institute may revoke the admission of the candidate with information to the Academic Council.

3. Structure of the programme

3.1 The programme of instruction will have the following structure

i) Core courses of Engineering / Technology / Management.

ii) Elective courses for specialization in areas of student's choice

3.2 The minimum durations of the programmes are as given below:

Program	No. of Semesters
M.Tech.(Full-Time)	4
M.Tech.(Part -Time)	6
M.B.A. (Full - Time)	4
M.B.A. (Part - Time)	6
M.C.A.(Full - Time)	6
M.C.A.(Part -Time)	8

Every (M.TECH / M.B.A. / M.C.A.) programme will have a curriculum and syllabi for the courses approved by the Academic Council.

3.3 Each course is normally assigned certain number of credits. The following norms will generally be followed in assigning credits for courses.

- One credit for each lecture hour per week per semester
- One credit for each tutorial hour per week per semester
- One credit for each laboratory practical of three hours per week per semester.
- One credit for 4 weeks of industrial training and
- One credit for 2 hours of project per week per semester.

3.4 For the award of degree, a student has to earn certain minimum total number of credits specified in the curriculum of the relevant branch of study. The curriculum of the different programs shall be so designed that the minimum prescribed credits required for the award of the degree shall be within the limits specified below.

Program	Minimum prescribed credit range
M.Tech. (Full time / Part time)	75 - 85
M.B.A. (Full time / Part time)	85 - 95
M.C.A (Full time / Part time)	115 - 125

3.5 The medium of instruction, examination and the language of the project reports will be English.

4. Faculty Advisor

4.1 To help the students in planning their courses of study and for getting general advice on the academic programme, the concerned Department will assign a certain number of students to a Faculty member who will be called their Faculty Advisor.

5. Class Committee

5.1 A Class Committee consisting of the following will be constituted by the Head of the Department for each class:

(i) A Chairman, who is not teaching the class.

(ii) All subject teachers of the class.

(iii) Two students nominated by the department in consultation with the class.

The Class Committee will meet as often as necessary, but not less than three times during a semester.

The functions of the Class Committee will include:

(i) Addressing problems experienced by students in the classroom and the laboratories.

(ii) Analyzing the performance of the students of the class after each test and finding ways and means of addressing problems, if any.

(iii) During the meetings, the student members shall express the opinions and suggestions of the class students to improve the teaching / learning process.

6. Grading

6.1 A grading system as below will be adhered to.

Range of Marks	Letter Grade	Grade points
95-100	S	10
85 - 94	A	09
75- 84	B	08
65-74	C	07
55-64	D	06
50-54	E	05
< 50	U	00
	I (Incomplete)	–

6.2 GPA & CGPA

GPA is the ratio of the sum of the product of the number of credits C_i of course "i " and the grade points P_i earned for that course taken over all courses "i" registered by the student to the sum of Ci for all "i ". That is,

$$GPA = \frac{\sum_i C_i P_i}{\sum_i C_i}$$

CGPA will be calculated in a similar manner, at any semester, considering all the courses enrolled from first semester onwards.

6.3 For the students with letter grade I in certain subjects, the same will not be included in the computation of GPA and CGPA until after those grades are converted to the regular grades.

6.4 Raw marks will be moderated by a moderation board appointed by the Vice-Chancellor of the University. The final marks will be graded using an absolute grading system. The Constitution and composition of the moderation board will be dealt with separately.

7. Registration and Enrollment

7.1 Except for the first semester, registration and enrollment will be done in the beginning of the semester as per the schedule announced by the University.

7.2 A student will be eligible for enrollment only if he/she satisfies regulation 10 (maximum duration of the programme) and will be permitted to enroll if (i) he/she has cleared all dues in the Institute, Hostel & Library up to the end of the previous semester and (ii) he/she is not

debarred from enrollment by a disciplinary action of the University.

7.3 Students are required to submit registration form duly filled in.

8. Registration requirement

8.1 **(i)** A Full time student shall not register for less than 16 credits or more than 26 credits in any given semester.

8.1 **(ii)** A part time student shall not register for less than 10 credits or more than 20 credits in any given semester.

8.2 If a student finds his/her load heavy in any semester, or for any other valid reason, he/she may withdraw from the courses within three weeks of the commencement of the semester with the written approval of his/her Faculty Advisor and HOD. However the student should ensure that the total number of credits registered for in any semester should enable him/her to earn the minimum number of credits per semester for the completed semesters.

9. Minimum requirement to continue the programme

9.1 For those students who have not earned the minimum required credit prescribed for that particular semester examination, a warning letter to the concerned student and also to his parents regarding the shortage of his credit will be sent by the HOD after the announcement of the results of the university examinations.

10. Maximum duration of the programme

The minimum and maximum period for the completion of various programs are given below.

Program	Min. No. of Semesters	Max. No. of Semesters
M.Tech (Full - time)	4	8
M.Tech (Part - time)	6	10
M.B.A. (Full Time)	4	8
M.B.A. (Part Time)	6	10
M.C.A. (Full - Time)	6	12
M.C.A (Part -Time)	8	14

11. Temporary discontinuation

11.1 A student may be permitted by the Director(academic) to discontinue temporarily from the programme for a semester or a longer period for reasons of ill health or other valid reasons. Normally a student will be permitted to discontinue from the programme only for a maximum duration of two semesters.

12. Discipline

12.1 Every student is required to observe discipline and decorum both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the University.

12.2 Any act of indiscipline of a student reported to the Director (Academic) will be referred to a Discipline Committee so constituted. The Committee will enquire into the charges and decide on suitable punishment if the charges are substantiated. The committee will also authorize the Director(Academic) to recommend to the Vice-Chancellor the implementation of the decision. The student concerned may appeal to the Vice-Chancellor whose decision will be final. The Director (Academic) will report the action taken at the next meeting of the Council.

12.3 Ragging and harassment of women are strictly prohibited in the University campus and hostels.

13. Attendance

13.1 A student whose attendance is less than 75% is not eligible to appear for the end semester examination for that semester. The details of all students who have attendance less than 75% will be announced by the teacher in the class. These details will be sent to the concerned HODs and Director (Academic).

13.2 Those who have less than 75% attendance will be considered for condonation of shortage of attendance. However a condonation of 10% in attendance will be given on medical reasons. Application for condonation recommended by the Faculty Advisor, concerned faculty member and the HOD is to be submitted to the Director (Academic) who, depending on the merits of the case, may permit the student to appear for the end semester examination. A student will be eligible for this concession at most in two semesters during the entire degree programme. Application for medical leave, supported by medical certificate with endorsement by a Registered Medical Officer, should reach the HOD within seven days after returning from leave or, on or before the last instructional day of the semester, whichever is earlier.

13.3 As an incentive to those students who are involved in extra curricular activities such as representing the University in Sports and Games, Cultural Festivals, and Technical Festivals, NCC/ NSS events, a relaxation of up to 10% attendance will be given subject to the condition that these students take prior approval from the officer-in-charge. All such applications should be recommended by the concerned HOD and forwarded to Director (Academic) within seven instructional days after the programme/activity.

14. Assessment Procedure

14.1 The Academic Council will decide from time to time the system of tests and examinations in each subject in each semester.

14.2 For each theory course, the assessment will be done on a continuous basis as follows:

Test / Exam	Weightage	Duration of Test Exam
First Periodical Test*	10%	2 Periods
Second Periodical Test*	10%	2 Periods
Model exam	20%	3 hours
Seminar/ Assignments/Quiz	20%	
End - semester examination	50%	3 Hours

*** Best out of the two tests will be considered.**

14.3 For practical courses, the assessment will be done by the subject teachers as below:

(i) Weekly assignment/Observation note book / lab records - weightage 60%.

(ii) End semester examination of 3 hours duration including viva - weightage 40%

15. Make up Examination/model examination

15.1 Students who miss the end-semester examinations / model examination for valid reasons are eligible for make-up examination /model examination. Those

who miss the end-semester examination / model examination should apply to the Head of the Department concerned within five days after he / she missed examination, giving reasons for absence.

15.2 Permission to appear for make-up examination / model exam will be given under exceptional circumstances such as admission to a hospital due to illness. Students should produce a medical certificate issued by a Registered Medical Practitioner certifying that he/she was admitted to hospital during the period of examination / model exam and the same should be duly endorsed by parent / guardian and also by a medical officer of the University within 5 days.

16. Project evaluation

16.1 For Project work, the assessment will be done on a continuous basis as follows:

Review / Examination	Weightage
First Review	10%
Second Review	20%
Third Review	20%
End semester Examination	50%

For end semester exam, the student will submit a Project Report in a format specified by the Director (Academic). The first three reviews will be conducted by a Committee constituted by the Head of the Department. The end - semester examination will be conducted by a Committee constituted by the Controller of Examinations. This will include an external expert.

17. Declaration of results

17.1 A candidate who secures not less than 50% of total marks prescribed for a course with a minimum of 50% of the marks prescribed for the end semester examination shall be declared to have passed the course and earned the specified credits for the course.

17.2 After the valuation of the answer scripts, the tabulated results are to be scrutinized by the Result Passing Boards of PG programmes constituted by the Vice-Chancellor. The recommendations of the Result Passing Boards will be placed before the Standing Sub Committee of the Academic Council constituted by the Chancellor for scrutiny. The minutes of the Standing Sub Committee along with the results are to be placed before the Vice-Chancellor for approval. After getting the approval of the Vice-Chancellor, the results will be published by the Controller of Examination/ Registrar.

17.3 If a candidate fails to secure a pass in a course due to not satisfying the minimum requirement in the end semester examination, he/she shall register and re-appear for the end semester examination during the following semester. However, the sessional marks secured by the candidate will be retained for all such attempts.

17.4 If a candidate fails to secure a pass in a course due to insufficient sessional marks though meeting the minimum requirements of the end semester examination, wishes to improve on his/ her sessional marks, he/she will have to register for the particular course and

attend the course with permission of the HOD concerned and the Registrar. The sessional and external marks obtained by the candidate in this case will replace the earlier result.

17.5 A candidate can apply for the revaluation of his/her end semester examination answer paper in a theory course within 2 weeks from the declaration of the results, on payment of a prescribed fee through proper application to the Registrar/Controller of Examinations through the Head of the Department. The Registrar/ Controller of Examination will arrange for the revaluation and the results will be intimated to the candidate concerned through the Head of the Department. Revaluation is not permitted for practical courses and for project work.

17.6 The weightage for internal marks in finalizing results and grades shall be waived off after completion of 5 semesters.

18. Grade Card

18.1 After results are declared, grade sheet will be issued to each student, which will contain the following details:

(i) Program and branch for which the student has enrolled.

(ii) Semester of registration.

(iii) List of courses registered during the semester and the grade scored.

(iv) Semester Grade Point Average (GPA)

(v) Cumulative Grade Point Average (CGPA).

19. Class / Division

19.1 Classification is based on CGPA and is as follows:

CGPA $\geq$ 8.0 : **First Class with distinction**

6.5 $\leq$ CGPA < 8.0 : **First Class**

5.0 $\leq$ CGPA < 6.5 : **Second Class.**

19.2 (i) Further, the award of 'First class with distinction' is subject to the candidate becoming eligible for the award of the degree having passed the examination in all the courses in his/her first appearance within the minimum duration of the programme.

(ii) The award of 'First Class' is further subject to the candidate becoming eligible to the award of the degree having passed the examination in all the courses within the below mentioned duration of the programme.

Program	No. of Semesters
M.Tech.(Full-Time)	5
M.Tech.(Part -Time)	7
M.B.A. (Full - Time)	5
M.B.A. (Part - Time)	7
M.C.A.(Full - Time)	7
M.C.A.(Part -Time)	9

(iii) The period of authorized discontinuation of the programme (vide clause 11.1) will not be counted for the purpose of the above classification.

20. Transfer of credits

20.1 Within the broad framework of these regulations, the Academic Council, based on the recommendation of the transfer of credits committee so constituted by the Chancellor may permit students to earn part of the credit requirement in other approved institutions of repute and status in the country or abroad.

21. Eligibility for the award of (M.TECH / M.B.A. / M.C.A.) Degree

21.1 A student will be declared to be eligible for the award of the (M.TECH / M.B.A. / M.C.A.). Degree if he/she has

i) registered and successfully credited all the core courses,

ii) successfully acquired the credits in the different categories as specified in the curriculum corresponding to the discipline (branch) of his/her study within the stipulated time,

iii) has no dues to all sections of the Institute including Hostels, and

iv) has no disciplinary action pending against him/her.

The award of the degree must be recommended by the Academic Council and approved by the Board of Management of the University.

22. Power to modify

22.1 Notwithstanding all that has been stated above, the Academic Council has the right to modify any of the above regulations from time to time subject to approval by the Board of Management.

HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
M.Tech. (Computer Science and Engineering)

CURRICULUM 2013-2014

SEMESTER I

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
Theory							
1.	PMA105	Applied Mathematics for Computer Science*	4	0	0	4	4
2.	PCE101	Advanced Data Structures and Algorithms$$	4	0	0	4	4
3.	PCE102	Advanced Computer Architecture***	4	0	0	4	4
4.	PCE103	Advanced Data Base Management Systems$$	4	0	0	4	4
5.	PIT101	Advanced Data Communications$$$	4	0	0	4	4
6.	PIT102	Internet Programming**	4	0	0	4	4
Practical							
7.	PCE104	Advanced Data Structures and Algorithms Lab	0	0	4	2	4
8.	PIT103	Internet Programming Lab$	0	0	4	2	4
		Total				**28**	**32**

SEMESTER II

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
Theory							
1.	PCE201	Advanced System Software	4	0	0	4	4
3.	PCE202	Information Security	4	0	0	4	4
4.	PCE203	Soft Computing	4	0	0	4	4
2.	PIT204	Advanced Operating Systems$	4	0	0	4	4
5.		** Elective-I	3	0	0	3	3
6.		** Elective-II	3	0	0	3	3
Practical							
7.	PCE204	Advanced System Software Lab	0	0	4	2	4
8.	PIT206	Advanced Operating Systems Lab	0	0	4	2	4
		Total				**26**	**30**

SEMESTER III

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
Theory							
1.	**	Elective-III	3	0	0	3	3
2.	**	Elective-IV	3	0	0	3	3
3.	**	Elective-V	3	0	0	3	3
Practical							
4.	PCE301	Project Phase-I	0	0	12	6	12
		Total				**15**	**21**

SEMESTER IV

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
Practical							
1.	PCE401	Project Phase-II	0	0	24	12	24
		Total				**12**	**24**

ELECTIVES

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
Theory							
1	PCE701	Digital Image Processing	3	0	0	3	3
2	PCE702	Cryptography and Network Security	3	0	0	3	3
3	PCE703	Fuzzy Systems	3	0	0	3	3
4	PCE704	Pervasive Computing	3	0	0	3	3
5	PCE705	Grid Computing	3	0	0	3	3
6	PCE706	Natural Language Processing	3	0	0	3	3
7	PCE707	High Performance Computing	3	0	0	3	3
8	PCE708	Pattern Recognition	3	0	0	3	3
9	PCE709	Adhoc and Sensor Networks	3	0	0	3	3
10	PCE710	Cloud Computing	3	0	0	3	3
11	PCE711	Mobile Communications	3	0	0	3	3
12	PCE712	Web Services	3	0	0	3	3
13	PCE713	Service Oriented Architecture*	3	0	0	3	3
14	PCE714	Semantic Web	3	0	0	3	3
15	PCE715	Information Retrieval	3	0	0	3	3
16	PCE716	Security in Data Grid	3	0	0	3	3
17	PIT708	Agent Based Intelligent Systems$	3	0	0	3	3
18	PIT716	Data Warehousing and Data Mining$$	3	0	0	3	3

*- Common to M.Tech. CSE, M.Tech. SE

**- Common to M.Tech. CSE, M.Tech. CCE, M.Tech. IT

***- Common to M.Tech. CSE, M.Tech. CCE, M.Tech. IT, M.Tech. Embedded

$- Common to M.Tech. CSE, M.Tech. IT

$$- Common to M.Tech. CSE, M.Tech. SE, M.Tech. IT

$$$- Common to M.Tech. CSE, M.Tech. SE, M.Tech. CCE, M.Tech. IT, M.Tech. CS

Total Credits : 80

HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

M.Tech. (Computer Science and Engineering)

CURRICULUM 2013-2014

PMA 105 APPLIED MATHEMATICS FOR COMPUTER SCIENCE

L	T	P	C
4	0	0	4

Goal

To create the awareness and comprehensive knowledge in probability functions random processes and queuing theory. Develop the Mathematical models using simulation techniques in practical problems, solve them and physically interpret the results.

Objectives

The course should enable the students to:

1. Understand the concept of random variable, moment generating function and their properties. Learn standard distributions in discrete and continuous cases and their applications.
2. Learn classification of random process and Markov chain processes. Understand Wide sense stationary and ergodic and Poisson processes.
3. Learn the different Markovian models with finite and infinite capacity and understands to classify them.
4. Understand simulation, its different types and their limitations. Learn generation of random numbers.
5. Understand the representation of graphs and the different types of algorithm to find the shortest route, minimal spanning trees and search.

Outcome

The students should be able to:

1. Verify whether a given function is a probability mass or density function. Apply the discrete and continuous distributions for solving practical problems. Evaluates the moments of the distributions using moment generating function. Evaluate the probability using marginal and conditional distributions.
2. Verify whether a process is of first or second order or wide sense or strictly stationary. Classify the properties of Markov processes and verifies the properties of Poisson process.
3. Analyze and classify the models, M / M / 1, M / M / C, finite and infinite capacity and be able solve practical problems related to the queuing models.
4. Apply simulation techniques to generate random numbers and solves queuing problems.
5. Use Kruskal and prim's algorithm to find the minimal spanning tree of a graph. Evaluates the

shortest path of a network using Dijskra's and Floyd algorithm. Use search algorithm to find the death and birth.

UNIT I PROBABILITY AND RANDOM VARIABLE 12

Discrete and Continuous random variables - Moments - Moment generating functions - Standard distributions - Binomial, Poisson, Geometric, Negative Binomial, Uniform, Normal ,Exponential, Gamma and Weibull distributions - Two dimensional random variables - Joint, Marginal and Conditional distributions.

UNIT II RANDOM PROCESSES 12

Classification - Stationary Process - Markov process - Markov Chains - Auto correlation - Cross correlation - Wide Sense Stationary - Ergodic process - Transition Probabilities - Limiting distribution - Poisson process - Properties.

UNIT III QUEUING THEORY 12

Markovian models - Birth and death queuing models - Steady state - Single and Multiple servers - M/M/1 - Finite and infinite capacity - M/M/C - finite and infinite capacity.

UNIT IV SIMULATION AND APPLICATIONS 12

Introduction - Types of simulation - Limitations of simulation techniques - Phases of simulation study - Generation of random numbers - Monte Carlo simulation - Application to queuing problems.

UNIT V GRAPH ALGORITHMS 12

Computer Representation of graphs - Basic graph algorithms - Minimal spanning tree algorithm - Kruskal and Prim's algorithm - Shortest path algorithms - Dijsktra's and Floyd algorithms - DFS and BFS algorithms.

Total : 60

REFERENCE BOOKS

1) Taha, H.A., "Operations Research - An Introduction ", Prentice Hall of India Ltd., 6th Edition, New Delhi, 1997.

2) Dr.A.Singaravelu, Dr.S.Siva Subramanian and Dr.C.Ramachandran, "Probability and Queuing Theory", Meenakshi agency, 20th edition, January 2013.

3) Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, PHI, Unit III - Chapter 11.

4) Kapur, J.N. and Saxena, H.C. "Mathematical Statistics ", S. Chand and Co. Ltd., New Delhi, 1997.

5) Bhat, U.N., " Elements of Applied Stochastic Processes ", John Wiley and Sons, 2nd Edition,New York, 1984.

6) Sharma, S.D., "Operations Research ", Kedar Nath, Ram Nath and Co., Meerut, 12th Edition, 1998.

7) T.Veerarajan, "Probability, Statistics and Random Processes", Tata McGraw-Hill, second edition, 2006.

PCE 101 ADVANCED DATA STRUCTURES AND ALGORITHMS

L	T	P	C
4	0	0	4

Goal

To study advanced concepts in Data structures and algorithm design techniques

Objectives

The course should enable the students to:

1. Learn about the time complexity of algorithms.
2. Understand the representations used in heap data structures.
3. Learn the different types of search structures.
4. Learn various algorithm design techniques.
5. Understand the advanced data structures.

Outcome

The student should be able to :

1. Calculate the time complexity of algorithms and express it using appropriate notations.
2. Compare and implement the different types of heap structures and search structures.
3. Implement the applications of heap and search structures in computer science.
4. Implement the real life problems using suitable algorithm design technique.

UNIT I INTRODUCTION **12**

Abstract Data Types - Time and Space Analysis of Algorithms - Big Oh and Theta Notations - Average, best and worst case analysis - Simple recurrence relations - Mappings.

UNIT II HEAP STRUCTURES **12**

Min-max heaps - Heaps - Leftist heaps -Binomial heaps - Fibonacci heaps - Skew heaps - Lazy-binomial heaps.

UNIT III SEARCH STRUCTURES **12**

Binary search trees - AVL trees - 2-3 trees - 2-3-4 trees - Red-black trees - B-trees - splay trees - Tries.

UNIT IV ALGORITHM DESIGN TECHNIQUES **12**

Divide and Conquer and Greedy : Quicksort - Strassen's matrix multiplication - Convex hull - Tree-vertex splitting - Job sequencing with deadlines - Optimal storage on tapes Dynamic Programming and Backtracking: Multistage graphs - 0/1 knapsack - 8- queens problem - graph coloring.

UNIT V ADVANCED ALGORITHMS **12**

Parallel Algorithms: Basic Techniques- Work & Efficiency - Distributed Computation - Heuristic & Approximation Approaches.

Total : 60

REFERENCE BOOKS

1. E. Horowitz, S.Sahni and Dinesh Mehta, Fundamentals of Data structures in C++, University Press, 2009.
2. E. Horowitz, S. Sahni and S. Rajasekaran, Computer Algorithms/C++, Second Edition, University Press, 2007.
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Third Edition, Pearson Education, Asia.2007.
4. Jean-Paul Tremblay, Paul .G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hill second edition , 1991.
5. Thomas H.Coremen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein , "Introduction to algorithms", Third edition, MIT press.

PCE 102 ADVANCED COMPUTER ARCHITECTURE

L	T	P	C
4	0	0	4

Goal

To study the design principles of parallel models and parallel computing architectures.

Objectives

The course should enable the students to:

1. Learn the parallel computer models.
2. Understand the processor technology and memory organizations.
3. Learn pipeline design techniques.
4. Learn the various parallel and scalable architectures.
5. Understand the multithreaded and data flow computing architectures.

Outcome

The student should be able to

1. Identify and understand the parallel computer models.
2. Have thorough knowledge about the types of processors and memory hierarchy.
3. Design various pipeline architectures.
4. Design parallel and scalable architectures.
5. Analyze and understand multithreading and data flow computers.

UNIT I PARALLEL MODELS **12**

Parallel computer models: Multiprocessors and Multicomputer - Multi vector and SIMD computer, PRAM & VLSI models, conditions of parallelism, System interconnect architectures performance, Metrics and Measures.

UNIT II PROCESSORS AND MEMORY HIERARCHY **12**

Advanced processor technology - Super scalar and vector processors - Memory hierarchy technology, virtual memory technology - cache memory organization - shared - memory organization.

UNIT III PIPELINING AND SUPERSCALAR TECHNIQUES **12**

Linear pipeline processors - Nonlinear pipeline processors - Instruction pipeline design Arithmetic pipeline design - Superscalar pipeline design

UNIT IV PARALLEL AND SCALABLE ARCHITECTURE **12**

Multiprocessor system interconnects - Cache coherence, Vector processing principle Compound Vector processing, SIMD computer organization, multiprocessor operating system, multiprocessor examples

UNIT V SCALABLE, MULTITHREADED & DATA FLOW ARCHITECTURE **12**

Latency - Hiding techniques - Principles of Multithreading , Scalable and Multithreaded architectures. Dataflow computer, static data flow computer , Dynamic data flow compiler

Total : 60

REFERENCE BOOKS

1. Kai Hwang, "Advanced Computer Architecture", Parallelism, Scalability, Programmability, McGraw Hill, 2008.
2. Hwang Briggs, "Computer Architecture and parallel processing", McGraw Hill, 1984.
3. William Stallings, "Computer Organization and Architecture- Designing for Performance", Prentice Hall of India, 2009.

PCE103 ADVANCED DATABASE MANAGEMENT SYSTEMS

L	T	P	C
4	0	0	4

Goal

To provide a comprehensive study of Relational, Distributed and Advanced Database technologies.

Objectives

The course should enable the students to:

1. Learn ER model and transaction processing system.
2. Understand various storage structures for Database.
3. Learn the distributed and Parallel database processing.

4. Learn Object Oriented database concepts and models.

5. Understand various advancements in database technology.

Outcome

The student should be able to

1. Construct ER models and explain transaction processing in relational models.

2. Implement database storage models and query optimization techniques.

3. Design a distributed database.

4. Implement the distributed query processing systems.

5. Understood emerging database systems.

UNIT I RELATIONAL MODEL ISSUES 12

ER Model - Normalization - Query Processing - Query Optimization - Transaction Processing - Concurrency Control - Recovery - Database Tuning.

UNIT II DATABASE STORAGE AND SYSTEM DESIGN 12

Storage Structures, Indexing and multi dimensional indexes, Query Processing Algorithms, External Sorting, Query Optimization- Heuristic based optimization- cost based optimization, Buffer Management, Concurrency Control, Recovery.

UNIT III DISTRIBUTED DATABASES 12

Parallel Databases - Inter and Intra Query Parallelism - Distributed Database Features - Distributed Database Architecture - Fragmentation - Distributed Query Processing - Distributed Transactions Processing - Concurrency Control - Recovery - Commit Protocols.

UNIT IV OBJECT ORIENTED DATABASES 12

Introduction to Object Oriented Data Bases - Approaches - Modelling and Design - Persistence - Query Languages - Transaction - Concurrency - Multi Version Locks - Recovery - POSTGRES - JASMINE -GEMSTONE - ODMG Model.

UNIT V EMERGING SYSTEMS 12

Enhanced Data Models - Client/Server Model - Web Databases - Mobile Databases- XML and Web Databases - current issues - Rules - Knowledge Bases - Active and Deductive Databases - Multimedia Databases- - Multimedia Query languages - Spatial Databases.

Total: 60

REFERENCE BOOKS

1. Thomas Connolly and CarlolynBegg, "Database Systems, A Practical Approach to Design, Implementation and Management", Fourth Edition, Pearson Education 2000.

2. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education, 2006.

3. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Sixth Edition, Tata McGraw Hill, 2006.

4. C.J. Date, A. Kannan, S. Swaminathan, “An Introduction to Database systems”, 8th Ed, Pearson Education, 2006.

PIT101 ADVANCED DATA COMMUNICATIONS

L	T	P	C
4	0	0	4

Goal

To provide wide knowledge in the design and implementation of communication systems.

Objectives

The course should enable the students to:

1. Understand the concepts of TCP/IP, UDP and OSI architecture.
2. Understand ATM Services and Connection details.
3. Learn congestion control algorithms.
4. Learn graph methods to find the shortest path among different routing protocols.
5. Learn the key concepts of integrated service architecture and label switching.

Outcome

The student should be able to

1. Compare and understand the different network architectures
2. Implement ATM protocol architecture and services.
3. Design techniques to control the congestion in the network.
4. Apply the different routing protocols to find the shortest path.
5. Design the ISA with the associated protocols.

UNIT I NETWORK ARCHITECTURES **12**

The need for speed and quality of service, Advanced TCP/IP and ATM Networks, The need for a protocol architecture, The TCP/IP protocol architecture, The OSI model, Internetworking, TCP, UDP, Ipv6.

UNIT II ATM NETWORKS **12**

Packet-switching networks, Frame relay networks, ATM protocol architecture, ATM logical connections, ATM cells, ATM service categories, ATM Adaptation Layer (AAL), The emergence of high-speed LANs, Ethernet, Fibre channel, Wireless LANs.

UNIT III TRAFFIC MANAGEMENT **12**

Congestion control in data networks and internets, Effects of congestion, Congestion and control, Traffic management, Congestion control in Packet-Switching networks, Frame relay congestion control, The need for flow and error control, Link control mechanisms, ARQ performance, TCP flow control, TCP congestion control performance of TCP over ATM.

UNIT IV ROUTING PROTOCOLS **12**

Overview of graph theory and least-cost paths, Elementary concepts of graph theory, Shortest path length determination, Internet routing principles, Distance-Vector protocol, RIP, Link-State protocol, OSPF, Path-Vector protocols, BGP and IDRP, Multicasting.

UNIT V ADVANCED NETWORKING CONCEPTS **12**

Integrated Services Architecture (ISA), Queuing discipline, Random early detection, Differentiated services, Real-Time traffic, Resource Reservation : RSVP, Multiprotocol label switching, Real-Time Transport Protocol (RTP).

Total : 60

REFERENCE BOOKS

1. Willam Stallings, "High Speed Networks and Internets - Performance and Quality of Service", 2nd Ed., Pearson Education.
2. Andrew S. Tanenbaum, " Computer Networks", 4th Ed., Pearson Education.
3. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach featuring the Internet", 3rd edition,Pearson Education, 2005.
4. William Stallings, "Data and Computer Communications", 9th Ed., Pearson Education.

PIT102 INTERNET PROGRAMMING

L	T	P	C
4	0	0	4

Goal

To provide knowledge about the fundamental concepts in web technology and also about the various server side and client side programming languages.

Objectives

The course should enable the students to:

1. Learn the basics of Internet architecture and basics of web designing
2. Learn the style sheets and client side scripting.
3. Understand web databases and connectivity.
4. Learn server side programming.
5. Learn PHP programming.

Outcome

The student should be able to

1. Design simple web pages using HTML.
2. Do styling using CSS and do client side validation using java script.
3. Create XML document, present XML using CSS, connect to database using JDBC.
4. Develop web applications using SERVELETS and JSP using IDE.
5. Develop web applications using PHP.

UNIT I INTRODUCTION **12**

Introduction - Network concepts - Web System Architecture - concepts - Internet addresses - URL- System Overview of HTTP - HTTP Request Response - Generation of dynamic web pages - Cookies- Introduction, Basic HTML tags, Formatting and Fonts, Commenting Code, Anchors, Backgrounds, Images, Hyperlinks, Lists, Tables, Frames, simple HTML Forms, XHTML, Introduction to HTML5.

UNIT II STYLING & CLIENT SIDE SCRIPTING **12**

CSS: Introduction, Basic syntax and structure, using CSS, manipulating text, padding, lists, Positioning using CSS. Object model and Event model- Filters and Transitions-Active X Controls - What is JavaScript? How to develop Java Script Simple JavaScript, variables, functions, condition, JavaScript and Objects, JavaScript's own Objects, the DOM and the Web browser Environment, forms and validation.

UNIT III WEB DATABASES AND CONNECTIVITY **12**

XML - Introduction - Structuring Data - XML Namespaces - XML vocabularies - Presenting XML using CSS - Web server- Database Connectivity - Connecting to Databases - JDBC principles - Database access using javax.sql package.

UNIT IV DATABASE CONNECTIVITY AND SERVER SIDE PROGRAMMING **12**

Common Gateway Interface: Introduction to Java Servlets - overview and architecture - Handling HTTP get & post request - session Tracking - Using Servlet context - Dynamic Content Generation - Servlet Chaining and Communications- Demonstration of Java Servlets using Apache Tomcat Server - Demonstration of web development using IDE - - JSP - Overview - Objects - scripting - Standard Actions-Directives.

UNIT V INTRODUCTION TO PHP **12**

Basics- variables - strings - operators - control statements - Arrays - functions - forms - GET & POST - Date - File - Cookies - Sessions - Emails - Errors & Exceptions. PHP Database: Connecting Databases - Executing Queries - Demonstration of PHP using Xampp/Wamp Servers.

Total : 60

REFERENCE BOOKS

1. Deitel, Deitel and Neito, "Internet and World Wide Web - How to program", Pearson Education Asia, 4th Edition, 2009.

2. Elliotte Rusty Herold, "Java Network Programming", O'Reilly Publications, 3rd Edition, 2004.
3. Jeffy Dwight, Michael Erwin and Robert Nikes "USING CGI", PHI Publications, 1997
4. Jason Hunter, William Crawford "Java Servlet Programming" O'Reilly Publications, 2nd Edition, 2001.
5. Eric Ladd and Jim O'Donnell, et al, "USING HTML 4, XML, and JAVA1.2", Prentice Hall, 2003.
6. Bruce Lawson and Remy Sharp, "Introducing HTML5", New Riders; Second edition, 2012

PCE104 ADVANCED DATA STRUCTURES AND ALGORITHMS LAB

L	T	P	C
0	0	4	2

Goal

To implement advanced Data structures and applications using algorithms in C++

Objectives

The course should enable the students to

1. Implement advanced data structures
2. Calculate the time complexity of algorithms and express it using appropriate notations
3. Implement different algorithm design techniques.
4. Implement advanced algorithm concepts.

Outcome

The student should be able to

1. Use the appropriate data structures for applications in computer science.
2. Understand the applications of heap and search structures in computer science.
3. Calculate the time complexity of algorithms.

LIST OF EXPERIMENTS

1. Implement min - max heap and calculate the efficiency of the algorithms.
2. Implement Heap datastructure.
3. Implement splay trees.
4. Implement the insertion of AVL trees with rotations.
5. Implement B-Tree.
6. Implement vertex cover problem using approximate algorithms.

7. Implement and calculate the time complexity of quick sort
8. Implement Convex hull
9. Implement 0/1 Knapsack using Dynamic Programming
10. Implement Graph coloring using backtracking

PIT103 INTERNET PROGRAMMING LAB

L	T	P	C
0	0	4	2

Goal

To understand various Internet Technologies

Objectives

The course should enable the students to:

1. Understand web designing using HTML
2. Understand the usage of CSS
3. Understand the concept of client side validation
4. Understand the concept of database connectivity
5. Understand server side programming

Outcome

The student should be able to

1. Design a HTML web page using dream weaver
2. Apply a thematic design to all the web pages of a web site
3. Do client side validation using java script
4. Connect a java program to a database using JDBC.
5. Do server side programming using java Servlet and PHP.

LIST OF EXPERIMENTS

1. Design a web for mail authentication using HTML to demonstrate the use of Frames, Forms, Tables and Images.
2. Design a web page for a university which contains links for each department, also design separate web pages of every department. Follow same color theme for all the web pages. Use CSS for styling the web page.
3. Design a web page for an online job portal registration and validate the inputs for mandatory fields including the format of the email id using java script.
4. Write a Servlet program to read the roll no of a student and display all the details along with the photograph of the student, use LONGBLOB data type to store images in database.

5. Write a program using java Servlet to publish university exam results in internet.
6. Write a Program using JSP to register a new customer in your online shopping database.
7. Create a table in PHP and embed it in a web page.
8. Create a used id authentication form using PHP. Use calendar function, time function, session variable and bring the session data in all the pages.
9. Write a program to retrieve the data from database and display it in the table format using PHP

PCE201 ADVANCED SYSTEM SOFTWARE

L	T	P	C
4	0	0	4

Goal

To provide a sound technical exposure to the concepts, principles, methods, and best practices in the design of system software.

Objectives

The course should enable the students to:

1. Learn the basic concepts of compilers and device drivers.
2. Study symbol table structure and intermediate code optimization techniques.
3. Understand memory optimization and code sharing.
4. Understand virtual machine concept.
5. Learn emulation techniques and binary translations.

Outcome

The student should be able to

1. Explain fundamental concepts of compilers.
2. Construct symbol table.
3. Implement various optimization techniques.
4. Design Virtual machine.
5. Develop small compiler and device drivers.

UNIT I INTRODUCTION TO ADVANCED SYSTEM SOFTWARE 12

Basic Compiler Functions - Grammars - Lexical Analysis - Syntactic Analysis - Code Generation - Heap Management - Parameter Passing Methods - Semantics of Calls and Returns - Implementing Subprograms - Stack Dynamic Local Variables - Dynamic binding of method calls to methods - Overview of Memory Management, Virtual Memory, Process Creation - Overview of I/O Systems, Device Drivers, System Boot.

UNIT II SYMBOL TABLE MANGEMENT AND INTERMEDIATE CODE 12

Introduction and Overview - Symbol table structure - Local and Global Symbol table management Intermediate representation - Issues - High level, medium level, low level intermediate languages - MIR, HIR, LIR - ICAN for Intermediate code - Optimization -Early optimization-loop optimization.

UNIT III CODE OPTIMIZATION 12

Procedure optimization - in-line expansion - leaf routine optimization and shrink wrapping - register allocation and assignment - graph coloring - data flow analysis - constant propagation - alias analysis - register allocation - global references - Optimization for memory hierarchy - Code Scheduling - Instruction scheduling - Speculative scheduling - Software pipelining - trace scheduling - Run-time support - Register usage - local stack frame - run-time stack - Code sharing - position-independent code.

UNIT IV VIRTUAL MACHINE 12

Introduction to Virtual Machines (VM) - Pascal P-Code VM - Object-Oriented VMs - Java VM Architecture - Common Language Infrastructure - Dynamic Class Loading - Security - Garbage Collection - Optimization.

UNIT V EMULATION AND BINARY TRANSLATION 12

Emulation - Interpretation and Binary Translation - Instruction Set Issues - Process Virtual Machines - Profiling - Migration - Grids - Examples of real world implementations of system software.

Total : 60

REFERENCE BOOKS

1. Steven S. Muchnick, "Advanced Compiler Design Implementation", Morgan Koffman, 2004.
2. James E Smith and Ravi Nair, "Virtual Machines", Elsevier, 2005.
3. Robert W. Sebesta, "Concepts of Programming Languages", 8th, Pearson Education, 2009.
4. Alfred V Aho, Ravi Sethi, Jeffrey D Ullman, "Compilers: Principles, Techniques and Tools ", 2nd edition, Pearson Education.

PCE202 INFORMATION SECURITY

L	T	P	C
4	0	0	4

Goal

To study the critical need for ensuring Information Security in Organizations

Objectives

The course enable the student to:

1. Learn the basics of Information Security
2. Understand legal, ethical and professional issues in Information Security
3. Understand the aspects of risk management

4. Learn various security standards.

5. Learn the technological aspects of Information Security

Outcome

The student should be able to

1. Understand the basics of information security

2. Explain the legal, ethical and professional issues in Information Security

3. Explain Risk management

4. Design the logic of various standards

5. Implement Information Security procedures.

UNIT I INTRODUCTION **12**

History, What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC.

UNIT II SECURITY INVESTIGATION **12**

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues.

UNIT III SECURITY ANALYSIS **12**

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk.

UNIT IV LOGICAL DESIGN **12**

Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity.

UNIT V PHYSICAL DESIGN **12**

Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel.

Total : 60

REFERENCE BOOKS

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, New Delhi, 2003.

2. Micki Krause, Harold F. Tipton, " Handbook of Information Security Management", Vol 1-3 CRC Press LLC, 2004.

3. Stuart Mc Clure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw-Hill, 2003.

4. Matt Bishop, " Computer Security Art and Science", Pearson/PHI, 2002.

PCE203 SOFT COMPUTING

L	T	P	C
4	0	0	4

Goal

To provide knowledge about soft computing techniques.

Objectives

The course should enable the students to:

1. Learn the concepts of fuzzy sets, fuzzy logic and heuristics based on human experience.
2. Understand neural network techniques.
3. Learn the mathematical background for carrying out optimization associated with neural network learning.
4. Learn genetic algorithms and random search procedures.
5. Learn the methodologies to illustrate the intelligent behaviour of programs based on soft computing

Outcome

The student should be able to

1. Apply concepts of fuzzy sets, fuzzy logic and heuristics based systems.
2. Derive appropriate rules for inference systems.
3. Have understood the mathematical background to optimize neural network learning.
4. Implement optimization algorithms and random search procedures useful to seek global optimum in self-learning.
5. Develop case studies to illustrate the intelligent behaviour of programs based on soft computing

UNIT I FUZZY SET THEORY **12**

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.

UNIT II OPTIMIZATION **12**

Derivative-based Optimization - Descent Methods - The Method of Steepest Descent - Classical Newton's Method - Step Size Determination - Derivative-free Optimization - Genetic Algorithms - Simulated Annealing - Random Search - Downhill Simplex Search- Particle Swarm Techniques - Ant Colony Optimization.

UNIT III NEURAL NETWORKS **12**

Supervised Learning Neural Networks - Perceptrons - Adaline - Backpropagation Mutilayer Perceptrons

- Radial Basis Function Networks - Unsupervised Learning Neural Networks - Competitive Learning Networks - Kohonen Self-Organizing Networks - Learning Vector Quantization - Hebbian Learning.

UNIT IV NEURO FUZZY MODELING **12**

Adaptive Neuro-Fuzzy Inference Systems - Architecture - Hybrid Learning Algorithm - Learning Methods that Cross-fertilize ANFIS and RBFN - Coactive Neuro Fuzzy Modeling - Framework Neuron Functions for Adaptive Networks - Neuro Fuzzy Spectrum.

UNIT V APPLICATIONS OF COMPUTATIONAL INTELLIGECE **12**

Printed Character Recognition - Inverse Kinematics Problems - Automobile Fuel Efficiency Prediction - Soft Computing for Color Recipe Prediction.

Total : 60

REFERENCE BOOKS

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", Pearson Education 2004.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 2009.
4. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
5. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.

PIT204 ADVANCED OPERATING SYSTEMS

L	T	P	C
4	0	0	4

Goal

To provide a wide knowledge in the design and implementation of distributed operating systems.

Objectives

The course should enable the students to:

1. Learn the architecture, theoretical foundations and mutual exclusion concepts.
2. Understand the concept of deadlock and various protocols.
3. Learn load distribution and error recovery.
4. Understand fault tolerance and security mechanisms.
5. Learn multiprocessor architecture and database operating systems.

Outcome

The student should be able to

1. Design distributed operating system.
2. Detect, prevent and avoid the deadlocks in distributed environment.
3. Explain the need for load distribution and the corresponding techniques.
4. Design security mechanisms for distributed operating system.
5. Analyze and find out the requirements to construct a database operating systems

UNIT I DISTRIBUTED OPERATING SYSTEM 12

Synchronization Mechanisms: Introduction - concept of a process - concurrent process - the critical section problem - Synchronization problems - language mechanisms for synchronization: Monitors. System Architecture types - issues in distributed operating systems - communication networks - communication primitives. Theoretical Foundations: inherent limitations of a distributed system - lamports logical clocks - vector clocks - casual ordering of messages - global state - cuts of a distributed computation - termination detection.

UNIT II DISTRIBUTED DEADLOCK DETECTION 12

Deadlock handling strategies in distributed systems - issues in deadlock detection and resolution - control organizations for distributed deadlock detection - centralized and distributed deadlock detection algorithms -hierarchical deadlock detection algorithms. Agreement protocols - introduction-the system model, a classification of agreement problems, solutions to the Byzantine agreement problem, applications of agreement algorithms.

UNIT III DISTRIBUTED SHARED MEMORY 12

Architecture- algorithms for implementing DSM - memory coherence and coherence protocols - design issues. Distributed Scheduling: introduction - issues in load distributing - components of a load distributing algorithm - stability - load distributing algorithm - performance comparison - selecting a suitable load sharing algorithm - requirements for load distributing -task migration and associated issues. Failure Recovery and Fault tolerance: introduction - basic concepts - classification of failures - backward and forward error recovery approaches - recovery in concurrent systems - synchronous and asynchronous check pointing and recovery - check pointing for distributed database systems - recovery in replicated distributed databases systems.

UNIT IV MULTIPROCESSOR OPERATING SYSTEM 12

Basic multiprocessor system architectures - basic multiprocessor system architecture - inter connection networks for multiprocessor systems - caching - hypercube architecture - structures of multiprocessor operating system - operating system design issues - threads - process synchronization - processor scheduling - Memory management. The mac OS.

UNIT V DATABASE OPERATING SYSTEM 12

Requirements of a database operating system Concurrency control : theoretical aspects - introduction, database systems - a concurrency control model of database systems- the problem of concurrency

control - Serializability theory- distributed database systems, concurrency control algorithms - introduction, basic synchronization primitives, lock based algorithms-timestamp based algorithms, optimistic algorithms - concurrency control algorithms, data replication.

Total : 60

REFERENCE BOOKS

1. Mukesh Singhal, NiranjanG.Shivaratri, "Advanced concepts in operating systems: Distributed, Database and multiprocessor operating systems", TMH, 2001
2. Abraham Silberschatz, Peter B. Galvin, G. Gagne, "Operating System Concepts", Nineth Edition, Addison Wesley Publishing Co., 2013.
3. Andrew S.Tanenbaum, "Modern operating system", PHI, 3rd edition,2008
4. PradeepK.Sinha, "Distributed operating system-Concepts and design", PHI, 2003.
5. Andrew S.Tanenbaum, "Distributed operating system", Pearson education, 2003

PCE204 ADVANCED SYSTEM SOFTWARE LAB

L	T	P	C
0	0	4	2

Goal

To implement various phases of Compilers.

Objectives

The course should enable the students to

1. Implement Lexical analyser with /without using lex tool.
2. Implement the parser with/without using yacc tool.
3. Implement various intermediate representation in ICAN.
4. Implement simple virtual machine.

Outcome

The student should be able to

1. Design lexical analyser with/without using Lex tool.
2. Design parser with/without using the tool Yacc.
3. Understand the various IRs in ICAN.
4. Design a Virtual machine..

LIST OF EXPERIMENTS

1. Design a simple Lexical analyzer.
2. Implement the lexical analyzer using Lex, flex or other lexical analyzer generating tools.
3. Design predictive parser for the given language

4. Design a LALR bottom up parser for the given language
5. Convert the BNF rules into Yacc form and write code to generate abstract syntax tree.
6. Write a program to represent HIR,MIR and LIR in ICAN.
7. Create a simple Virtual Machine.

SYSTEM REQUIREMENTS

1. Intel based desktop PC of 166MHz or faster processor with at least 64 MB RAM and 100 MB free disk space.
2. C++ compiler and JDK kit.

PIT206 ADVANCED OPERATING SYSTEM LAB

L	T	P	C
0	0	4	2

Goal

To design and implement distributed operating systems.

Objectives

This course should enable the students to

1. Implement Semaphores.
2. Implement Multithreading concepts.
3. Develop Network Operating System
4. Develop Real Time Operating System
5. Develop Database Operating System.

Outcome

The students should be able to

1. Design and implement algorithms used in the OS.

LIST OF EXPERIMENTS

1. Semaphores -Multiprocessor Operating System
2. Multithreading - Multiprocessor Operating System
3. Multiple Sleeping Barbers - Multiprocessor Operating System
4. Network Operating System
5. Real Time Operating System
6. Transactions and Concurrency - Database Operating System
7. Deadlocks in Distributed Operating System

PCE701 DIGITAL IMAGE PROCESSING

L	T	P	C
3	0	0	3

Goal

To provide knowledge about the use of computer algorithms to perform image processing on digital images.

Objectives

The course should enable the students to:

1. Learn the image fundamentals and mathematical transforms necessary for image processing.
2. Learn the image enhancement techniques.
3. Learn the image restoration procedures.
4. Learn the image compression techniques.
5. Learn the image segmentation and representation techniques.

Outcome

The student should be able to

1. Understand the image fundamentals a mathematical transforms.
2. Implement the image enhancement techniques in spatial and frequency domain
3. Implement the image restoration procedure
4. Implement lossy and lossless compression techniques.
5. Demonstrate the image segmentation and representation methods.

UNIT I DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS 9

Elements of visual perception - Image sampling and quantization -Basic relationship between pixels - Basic geometric transformations-Introduction to Fourier Transform and DFT - Properties of 2D Fourier Transform - FFT - Separable Image Transforms -Walsh - Hadamard - Discrete Cosine Transform, Haar, Slant - Karhunen - Loeve transforms.

UNIT II IMAGE ENHANCEMENT TECHNIQUES 9

Spatial Domain methods: Basic grey level transformation - Histogram Processing - Image subtraction - Image averaging -Spatial filtering: Smoothing- Sharpening filters - Frequency Domain Methods: Introduction to the Fourier Transform -Frequency domain filters: Smoothing - Sharpening filters - Homomorphic filtering.

UNIT III IMAGE RESTORATION 9

Model of Image Degradation/restoration process - Noise models - Restoration in the Presence of Noise Only Spatial Filtering -Periodic Noise Reduction by Frequency Domain Filtering-Linear, Position-Invariant Degradations- Estimating the Degradation Function- Inverse filtering -Minimum Mean Square

Error (Wiener) Filtering-Least mean square filtering - Constrained least mean square filtering - Blind image restoration - Pseudo inverse - Singular value decomposition.

UNIT IV IMAGE COMPRESSION **9**

Fundamentals- Image Compression Models-Elements of Information Theory-Lossless compression: Variable length coding - LZW coding - Bit plane coding- predictive coding-DPCM. Lossy Compression: Transform coding - Wavelet coding - Basics of Image compression standards: JPEG, MPEG,Basics of Vector quantization.

UNIT V IMAGE SEGMENTATION AND REPRESENTATION **9**

Detection of Discontinuities-Edge Linking and Boundary Detection-- Thresholding - Global Thresholding-Adaptive Thresholding-Region Based segmentation - Boundary representation chair codes- Polygonal approximation - Boundary segments - boundary descriptors: Simple descriptors-Fourier descriptors - Regional descriptors -Simple descriptors- Texture.

Total : 45

REFERENCE BOOKS

1. Rafael C Gonzalez, Richard E Woods, "Digital Image Processing", 3nd Ed., Pearson Education 2007.
2. William K Pratt, "Digital Image Processing". John Willey,4th edition, 2007.
3. MillmanSonka, Vaclav Hlavac, Roger Boyle, Broos/colic, "Image Processing Analysis and Machine Vision", Thompson Learniy, 2007.
4. A.K. Jain, "Fundamentals of Digital Image Processing", PHI, 1998.
5. Chanda Dutta Magundar, "Digital Image Processing and Applications", PHI, 2000.

PCE702 CRYPTOGRAPHY AND NETWORK SECURITY

L	T	P	C
3	0	0	3

Goal

To make the student to understand the mathematical foundations of cryptography, symmetric and public key cryptographic algorithms, authenticators, network security protocols and system level security.

Objectives

The course should enable the students to:

1. Understand the number theory basics.
2. Learn various symmetric and public key ciphers and their security analysis.
3. Understand authentication requirements and the hash algorithms for generating authenticators.
4. Realize the significance of existing network security protocols.
5. Understand the concepts of system level security.

Outcome

The student should be able to

1. Relate the concepts of number theory to network security.
2. Develop a security model to prevent, detect and recover from attacks.
3. Encrypt and decrypt messages using existing ciphers.
4. Generate the digital signature and perform security analysis.
5. Demonstrate the technologies used to protect cipher space against security threats.

UNIT I INTRODUCTION **12**

OSI Security Architecture - Classical Encryption techniques - Cipher Principles - Data Encryption Standard - Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES - AES Cipher - Triple DES - Placement of Encryption Function - Traffic Confidentiality

UNIT II PUBLIC KEY CRYPTOGRAPHY **12**

Key Management - Diffie-Hellman key Exchange - Elliptic Curve Architecture and Cryptography - Introduction to Number Theory - Confidentiality using Symmetric Encryption - Public Key Cryptography and RSA.

UNIT III AUTHENTICATION AND HASH FUNCTION **12**

Authentication requirements - Authentication functions - Message Authentication Codes - Hash Functions - Security of Hash Functions and MACs - MD5 message Digest algorithm - Secure Hash Algorithm - RIPEMD - HMAC Digital Signatures - Authentication Protocols - Digital Signature Standard.

UNIT IV NETWORK SECURITY **12**

Authentication Applications: Kerberos - X.509 Authentication Service - Electronic Mail Security - PGP - S/MIME - IP Security - Web Security.

UNIT V SYSTEM LEVEL SECURITY **12**

Intrusion detection - password management - Viruses and related Threats - Virus Counter measures - Firewall Design Principles - Trusted Systems.

TOTAL : 60

REFERENCE BOOKS

1. William Stallings, "Cryptography And Network Security - Principles and Practices", Prentice Hall of India, Third Edition, 2003
2. Atul Kahate, "Cryptography and Network Security", Tata McGraw-Hill, 2003.
3. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2001.
4. Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Third Edition, Pearson Education, 2003.

PCE703 FUZZY SYSTEMS

L	T	P	C
3	0	0	3

Goal

To provide the knowledge about the theory of Fuzzy Logic and the corresponding techniques.

Objectives

The course should enable the students to:

1. Understand the importance of classical and fuzzy sets.
2. Realize the classical relations and fuzzy relations.
3. Learn Fuzzy-to-Crisp Conversions.
4. Learn Fuzzy Simulations.
5. Understand Fuzzy Pattern Recognition.

Outcome

The student should be able to

1. Differentiate between the Classical sets and Fuzzy Sets
2. Implement Classical and Fuzzy Relations.
3. Design the Conversions procedure.
4. Do fuzzy simulation.
5. Implement fuzzy Pattern Recognition.

UNIT I FUZZY SET **9**

Uncertainty and Imprecision - Statistics and Random Processes - Uncertainty in Information - Fuzzy Sets and membership - Chance versus Ambiguity. - Classical Sets and Fuzzy Sets: Classical Sets - Fuzzy Sets - Sets as Points in Hyper cubes - Classical Relations and Fuzzy Relations: Cartesian Product - Crisp Relations - Fuzzy Relations - Tolerance and Equivalence Relations - Fuzzy Tolerance and Equivalence Relations, Membership Functions.

UNIT II FUZZY ARITHMETIC **9**

Fuzzy-to-Crisp Conversions: Lambda-Cuts for Fuzzy Sets - Lambda-Cuts for Fuzzy Relations - Defuzzification Methods, Fuzzy Arithmetic, Numbers, Vectors, and the Extension Principle: Extension Principle - Fuzzy Numbers - Interval Analysis in Arithmetic - Approximate Methods of Extension - Fuzzy Vectors.

UNIT III CLASSICAL AND FUZZY LOGIC **9**

Classical Logic and Fuzzy Logic: Classical Predicate Logic - Fuzzy Logic - Approximate Reasoning - Fuzzy Tautologies, Contradictions, Equivalence, and Logical Proofs - Other Forms of the Implication Operation - Other Forms of the Composition Operation. Fuzzy Rule-Based Systems: Natural Language - Linguistic Hedges - Rule-Based Systems - Graphical Techniques of Inference.

UNIT IV FUZZY SIMULATIONS **9**

Fuzzy Nonlinear Simulation: Fuzzy Relational Equations - Partitioning - Nonlinear Simulation Using Fuzzy Rule-Based Systems - Fuzzy Associative Memories (FAMs). Fuzzy Decision Making: Fuzzy Synthetic Evaluation - Fuzzy Ordering - Preference and Consensus - Multiobjective Decision Making - Fuzzy Bayesian Decision Method - Decision Making under Fuzzy States and Fuzzy Actions.

UNIT V FUZZY CLASSIFICATION **9**

Fuzzy Classification: Classification by Equivalence Relations - Cluster Analysis - Cluster Validity - Classification Metric - Hardening the Fuzzy- Similarity Relations from Clustering. Fuzzy Pattern Recognition: Feature Analysis - Partitions of the Feature Space - Single Sample Identification - Multifeature Pattern Recognition - Image Processing - Syntactic Recognition.

Total : 45

REFERENCE BOOKS

1. Timothy Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill Publications, 1995
2. Li-Xin Wang, "A Course in Fuzzy Systems and Control", Prentice-Hall International, Inc.,1997
3. J. Yen, R. Langari, "Fuzzy Logic, Intelligence, Control, and Information", Prentice Hall 1999.
4. I.S.R. Jang, C.T. Sun, E. Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall, 1997.

PCE704 PERVASIVE COMPUTING

L	T	P	C
3	0	0	3

Goal

To study pervasive computing techniques and its application.

Objectives

The course should enable the students to:

1. Learn the basic concepts of pervasive computing.
2. Understand various device technologies.
3. Learn device connectivity and Web Application Concepts.
4. Analyze WAP and voice technologies in detail.
5. Understand pervasive web application architecture.

Outcome

The student should be able to

1. Explain the history of pervasive computing and its applications.
2. Implement the hardware, software and interfaces.
3. Develop the web architecture for pervasive computing.

4. Design and develop WAP architecture, infrastructure and the security issues.

5. Have an understanding the PDA device categories, characteristics, software, browsers and various mobile applications.

UNIT I PERVASIVE COMPUTING **9**

Pervasive Computing: Past, Present and Future Pervasive Computing - Pervasive Computing Market - m-Business - Application examples: Retail, Airline check-in and booking - Sales force automation - Health care - Tracking - Car information system - E-mail access via WAP.

UNIT II DEVICE TECHNOLOGY **9**

Device Technology: Hardware - Human Machine Interfaces - Biometrics - Operating Systems - Java for Pervasive devices.

UNIT III DEVICE CONNECTIVITY AND WEB APPLICATION CONCEPTS **9**

Device Connectivity: Protocols - Security - Device Management Web Application Concepts: WWW architecture - Protocols - Transcoding - Client authentication via internet.

UNIT IV WAP AND VOICE TECHNOLOGY **9**

WAP and Beyond: Components of the WAP architecture - WAP infrastructure - WAP security issues - WML - WAP push - Products - i-Mode - Voice Technology: Basics of Speech recognition- Voice Standards - Speech applications - Speech and Pervasive Computing.

UNIT V PDA AND PERVASIVE WEB APPLICATION ARCHITECTURE **9**

PDA: Device Categories - PDA operation Systems - Device Characteristics - Software Components - Standards - Mobile Applications - PDA Browsers Pervasive Web Application architecture: Background - Scalability and availability - Development of Pervasive Computing web applications - Pervasive application architecture.

Total : 45

REFERENCE BOOKS

1. Jochen Burkhardt, Horst Henn, Stefan Hepper, Thomas Schaech & Klaus Rindtorff "Pervasive Computing, Technology and Architecture of Mobile Internet Applications", Pearson Education, 2009.

2. Frank Adelstein, Sandeep KS Gupta, Golden Richard III, Loren Schwiebert, "Fundamentals of Mobile and Pervasive Computing", McGraw Hill edition, 4th ed., 2008.

PCE705 GRID COMPUTING

L	T	P	C
3	0	0	3

GOAL

To impart knowledge on genesis and applications of Grid computing.

Objectives

The course should enable the students to:

1. Understand the basic concepts of grid computing.
2. Learn the monitoring tools of grid computing.
3. Understand the security requirement and resource management techniques of grid computing.
4. Learn the data management challenges and portals.
5. Learn various grid applications.

Outcome

The student should be able to

1. Apply the basics of Grid computing.
2. Use grid monitoring tools.
3. Have understanding about the security issues
4. Implement scheduling techniques of Grid computing.
5. Solve the challenges in data management of grid computing.
6. Create simple grid applications.

UNIT I CONCEPTS AND ARCHITECTURE **9**

Introduction - Parallel and Distributed Computing-Cluster Computing-Grid Computing Anatomy and Physiology of Grid-Review of Web Services-OGSA-WSRF.

UNIT II GRID MONITORING **9**

Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- GridICE- JAMM - MDS-Network Weather Service-R-GMA-Other Monitoring Systems- Ganglia and GridMon.

UNIT III GRID SECURITY AND RESOURCE MANAGEMENT **9**

Grid Security-A Brief Security Primer-PKI-X509 Certificates-Grid Security-Grid Scheduling and Resource Management-Scheduling Paradigms- Working principles of Scheduling - A Review of Condor, SGE, PBS and LSF-Grid Scheduling with QoS.

UNIT IV DATA MANAGEMENT AND GRID PORTALS **9**

Data Management-Categories and Origins of Structured Data-Data Management - Challenges-Architectural Approaches-Collective Data Management Services-Federation - Services-Grid Portals-First-Generation Grid Portals-Second-Generation Grid Portals.

UNIT V GRID APPLICATIONS **9**

GT3 use cases - Resource management use cases - Grid portal use cases - Workflow management Discovery net use case - Semantic grid myGrid use case.

Total : 45

REFERENCESBOOKS

1. Maozhen Li, Mark Baker, “The Grid Core Technologies”, John Wiley & Sons ,2005.
2. Ian Foster & Carl Kesselman, “The Grid 2 - Blueprint for a New Computing Infrastructure”, Morgan Kaufman - 2nd edition, 2004.
3. Joshy Joseph & Craig Fellenstein, "Grid Computing", Pearson Education 2004.
4. Fran Berman, Geoffrey Fox, Anthony J.G. Hey, "Grid Computing: Making the Global Infrastructure a reality", John Wiley and sons, 2003.

PCE706 NATURAL LANGUAGE PROCESSING

L	T	P	C
3	0	0	3

GOAL

To provide an overview about statistical and empirical methods in Natural Language Processing and unified vision of speech and language processing.

Objectives

The course should enable the students to:

1. Learn the models, methods, and algorithms of statistical Natural Language Processing.
2. Understand the linguistic phenomena .
3. Learn grammars and parsing techniques.
4. Learn natural language processing grammar.
5. Learn ambiguity resolution methods.

Outcome

The student should be able to

1. Have an understanding about the models, methods, and algorithms of statistical Natural Language Processing (NLP) for common NLP tasks, such as speech recognition, machine translation, spam filtering, text classification, and spell checking.
2. Apply core computer science concepts and algorithms, such as dynamic programming.
3. Posses the knowledge about the linguistic phenomena and explore the linguistic features relevant to each NLP task.
4. Apply the methods to new NLP problems.
5. Implement machine translation schemes.

UNIT I INTRODUCTION TO NATURAL LANGUAGE UNDERSTANDING 9

The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.

UNIT II SEMANTIC REPRESENTATION 9

Introduction to semantics and knowledge representation, Some applications like machine translation, database interface.

UNIT III GRAMMARS AND PARSING 9

Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.

UNIT IV GRAMMARS FOR NATURAL LANGUAGE 9

Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context - Free Grammars, Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.

UNIT V AMBIGUITY RESOLUTION 9

Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.

Total : 45

REFERENCE BOOKS

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, "Natural Language Processing: A Paninian Perspective", Prentice Hall, New Delhi,1996
2. James Allen, "Natural Language Understanding", 2nd edition, Pearson Education.
3. D. Jurafsky, J. H. Martin, "Speech and Language Processing", 2nd edition,Pearson Education
4. L.M. Ivansca, S. C. Shapiro, "Natural Language Processing and Language Representation" T. Winograd, Language as a Cognitive Process, Addison-Wesley,1999

PCE707 HIGH PERFORMANCE COMPUTING

L	T	P	C
3	0	0	3

Goal

To provide introduction to parallel computing and Quantum computing.

Objectives

The course should enable the students to:

1. Learn parallel processing concepts.
2. Understand the models of parallel programming
3. Realize the issues in parallel programming.
4. Know the limitations of parallel computing.
5. Learn the advances in parallel computing.

Outcome

The student should be able to

1. Develop parallel processing models and architecture.
2. Have understanding on processor architecture and programming models.
3. Perform analysis of parallel algorithms.
4. Analyze the limitations of parallel computing.
5. Have understanding on advances in parallel computing models.

UNIT I PARALLEL PROCESSING CONCEPTS **9**

Levels of parallelism (instruction, transaction, task, thread, memory, function) -Models (SIMD, MIMD, SIMT, SPMD, Dataflow Models, Demand-driven Computation etc) - Architectures: N-wide superscalar architectures, multi-core, multi-threaded.

UNIT II PARALLEL PROGRAMMING MODELS **9**

Processor Architecture, Interconnect, Communication, Memory Organization, and Programming Models in high performance computing architectures: (Examples: IBM CELL BE, Nvidia Tesla GPU, Intel Larrabee Microarchitecture and Intel Nehalem microarchitecture) - Memory hierarchy and transaction specific memory design - Thread Organization.

UNIT III FUNDAMENTAL DESIGN ISSUES IN PARALLEL COMPUTING **9**

Synchronization - Scheduling - Job Allocation - Job Partitioning - Dependency Analysis - Mapping Parallel Algorithms onto Parallel Architectures - Performance Analysis of Parallel Algorithms .

UNIT IV FUNDAMENTAL LIMITATIONS FACING PARALLEL COMPUTING **9**

Bandwidth Limitations - Latency Limitations - Latency Hiding/Tolerating Techniques and their limitations - Power-Aware Computing and Communication - Power-aware Processing Techniques - Power-aware Memory Design - Power-aware Interconnect Design - Software Power Management.

UNIT V ADVANCED TOPICS **9**

Petascale Computing - Optics in Parallel Computing - Quantum Computers - Recent developments in Nanotechnology and its impact on HPC.

Total : 45

REFERENCE BOOKS

1. George S. Almasi and Alan Gottlieb, "Highly Parallel Computing" ,Benjamin - Cummings Publishiing company
2. Kai Hwang, "Advanced Computer Architecture: Parallelism, Scalability, Programmability", McGraw Hill 1993
3. David E.Culler, Jaswinder Pal Singh, "Parallel Computer Architecture: A hardware/Software Approach", Morgan Kaufmann Publishers, 1998.
4. Kai Hwang, "Scalable Parallel Computing", McGraw Hill 1998.
5. William James Dally and Brian Towles, "Principles and Practices on Interconnection Networks", Morgan Kauffman, 2004.
6. Hubert Nguyen, GPU Gems 3, Microsoft Research.
7. Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, "Introduction to Parallel Computing", 2nd edition, Addison-Welsey, 2003.
8. David A. Bader (Ed.), "Petascale Computing: Algorithms and Applications", Chapman & Hall/CRC Computational Science Series, 2007.

PCE708 PATTERN RECOGNITION

L	T	P	C
3	0	0	3

Goal

To impart knowledge of pattern recognition algorithms and machines, including statistical and structural methods.

Objectives

The course should enable the students to:

1. Study the basics of pattern recognition.
2. Learn various parameter estimation methods.
3. Learn Markov models and PCA.
4. Learn Non-parametric techniques for density estimation..
5. Understand pattern classification methods.

Outcome

The student should be able to

1. Design and construct a pattern recognition system.
2. Have understanding on major approaches in statistical and syntactic pattern recognition.
3. Analyze the theoretical issues involved in pattern recognition system design such as the curse of dimensionality.
4. Implement pattern recognition techniques.

UNIT I BASICS OF PATTERN RECOGNITION 9

Bayesian decision theory - Classifiers - Discriminant functions -Decision surfaces - Normal density and discriminant functions - Discrete features.

UNIT II PARAMETER ESTIMATION METHODS 9

Maximum-Likelihood estimation - Gaussian mixture models - Expectation-maximization method - Bayesian estimation.

UNIT III SEQUENTIAL PATTERN CLASSIFICATION 9

Discrete hidden Markov models - Continuous density hidden Markov models - Dimension reduction methods - Fisher discriminant analysis - Principal component analysis (PCA).

UNIT IV NON-PARAMETRIC TECHNIQUES FOR DENSITY ESTIMATION 9

Parzen-window method - K-Nearest Neighbour method - Linear discriminant function based classifiers - Support vector machines.

UNIT V PERCEPTRON 9

Non-metric methods for pattern classification - Non-numeric data or nominal data - Decision trees - Unsupervised learning and clustering - Criterion functions for clustering - Algorithms for clustering: K-means, Hierarchical and other methods - Cluster validation.

Total : 45

REFERENCE BOOKS

1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001.
2. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009.
3. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006.

PCE709 ADHOC AND SENSOR NETWORKS

L	T	P	C
3	0	0	3

Goal

To provide diverse literature on ad-hoc/sensor networks and the fundamental issues in designing and analyzing ad-hoc/sensor network systems.

Objectives

The course should enable the students to:

1. Understand the major issues associated with ad-hoc networks.
2. Learn various protocols for adhoc routing.
3. Sensor network architecture and the MAC protocols.
4. Realize issues in WSN routing localisation.
5. Learn mesh network architecture and its applications in WSN.

Outcome

The student should be able to

1. Have understanding on the issues in ad-hoc networks and various MAC protocols.
2. Have understanding on adhoc network routing and TCP.
3. Implement sensor network architecture.
4. Implement WSN routing and quality of service in WSN.
5. Have understanding on mesh network architecture and various mesh models.

UNIT I ADHOC MAC **9**

Introduction - Issues in Ad-Hoc Wireless Networks. MAC Protocols - Issues, Classifications of MAC protocols, Multi channel MAC and Power control MAC protocol.

UNIT II ADHOC NETWORK ROUTING AND TCP **9**

Issues - Classifications of routing protocols - Hierarchical and Power aware. Multicast routing - Classifications, Tree based, Mesh based. Ad Hoc Transport Layer Issues. TCP over Ad Hoc - Feedback based, TCP with explicit link, TCP-BuS, Ad Hoc TCP, and Split TCP.

UNIT III WSN -MAC **9**

Introduction - Sensor Network Architecture, Data dissemination, Gathering. MAC Protocols - self-organizing, Hybrid TDMA/FDMA and CSMA based MAC.

UNIT IV WSN ROUTING, LOCALIZATION AND QOS **9**

Issues in WSN routing - OLSR, AODV. Localization - Indoor and Sensor Network Localization. QoS in WSN.

UNIT V MESH NETWORKS **9**

Necessity for Mesh Networks - MAC enhancements - IEEE 802.11s Architecture - Opportunistic routing - Self configuration and Auto configuration - Capacity Models - Fairness - Heterogeneous Mesh Networks - Vehicular Mesh Networks.

Total : 45

REFERENCE BOOKS

1. C.Siva Ram Murthy and B.Smanoj, " Ad Hoc Wireless Networks - Architectures and Protocols", Pearson Education, 2004.
2. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks", Morgan Kaufman, 2004.
3. C.K.Toh, "Ad Hoc Mobile Wireless Networks", Pearson Education, 2002.
4. Thomas Krag and Sebastin Buettrich, "Wireless Mesh Networking", O'Reilly, 2007.

PCE710 CLOUD COMPUTING

L	T	P	C
3	0	0	3

Goal

To provide an introduction to the cloud computing basics and related techniques.

Objectives

The course should enable the students to:

1. Learn fundamental concepts of cloud.
2. Understand different types of services in cloud.
3. Understand cloud computing environment .
4. Learn scheduling in cloud
5. Learn cloud collaboration methods.

Outcome

The student should be able to

1. Have an understanding on the concepts of cloud architecture.
2. Design and develop a cloud
3. Design cloud services.
4. Have an understanding on different uses of Cloud computing.
5. Have an understanding on advancement in cloud services.

UNIT I UNDERSTANDING CLOUD COMPUTING **9**

Cloud Computing - History of Cloud Computing - Cloud Architecture - Cloud Storage - Why Cloud

Computing Matters - Advantages of Cloud Computing - Disadvantages of Cloud Computing - Companies in the Cloud Today - Cloud Services.

UNIT II DEVELOPING CLOUD SERVICES **9**

Web-Based Application - Pros and Cons of Cloud Service Development - Types of Cloud Service Development - Software as a Service - Platform as a Service - Web Services - On-Demand Computing - Discovering Cloud Services - Development Services and Tools - Amazon Ec2 - Google App Engine - IBM Clouds.

UNIT III CLOUD COMPUTING FOR EVERYONE **9**

Centralizing Email Communications - Collaborating on Schedules - Collaborating on To-Do Lists - Collaborating Contact Lists - Cloud Computing for the Community - Collaborating on Group Projects and Events - Cloud Computing for the Corporation.

UNIT IV USING CLOUD SERVICES **9**

Collaborating on Calendars, Schedules and Task Management - Exploring Online Scheduling Applications - Exploring Online Planning and Task Management - Collaborating on Event Management - Collaborating on Contact Management - Collaborating on Project Management - Collaborating on Word Processing - Collaborating on Databases - Storing and Sharing Files.

UNIT V OTHER WAYS TO COLLABORATE ONLINE **9**

Collaborating via Web-Based Communication Tools - Evaluating Web Mail Services - Evaluating Web Conference Tools - Collaborating via Social Networks and Groupware - Collaborating via Blogs and Wikis.

Total : 45

REFERENCE BOOKS

1. Michael Miller, “Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online”, Que Publishing, August 2008.
2. Haley Beard, “Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs”, Emereo Pty Limited, July 2008.

PCE711 MOBILE COMMUNICATIONS

L	T	P	C
3	0	0	3

Goal

To provide the student with knowledge and skills about a new trend in computing, creating a ubiquitous environment that combines processors, RFID's and sensors with network technologies and intelligent software to create an congenial environment.

Objectives

The course should enable the student to

1. Learn mobile computing architecture.
2. Learn various wireless technologies.
3. Learn Different techniques at MAC layer.
4. Learn various mobile network layer technologies.
5. Understand mobile database management systems.

Outcome

The students should be able to

1. Have an understanding on the various mobile architectures.
2. Have the broad education to understand different wireless architecture.
3. Have an understanding on wireless MAC layer protocols.
4. Have an understanding on mobile network layer protocols.
5. Demonstrate mobile database applications.

UNIT I INTRODUCTION **9**

Introduction to Mobile Computing, Mobile Computing Architecture, Cellular Mobile Wireless Networks: Systems and Design Fundamentals, Propagation Models, Description of cellular system, Propagation Models for Wireless Networks, Overview 1G, 2G, 2.5G, 3G and 4G technologies.

UNIT II WIRELESS ARCHITECTURES **9**

Global System for Mobile Communication (GSM): System architecture, Radio interface, Protocols, Localization and calling, Handover, Security GPRS: GPRS System Architecture and Protocol layers. Introduction to EDGE. Emerging wireless networks: Ultra wide band(UWB)- Free space optics(FSO)-Mobile ad-hoc network(MANET)-Wireless sensor networks-OFDM and Flash OFDM.

UNIT III WIRELESS MAC **9**

Infrared vs. Radio transmission, Infrastructure and Ad hoc Networks, IEEE 802.11 WLAN: System architecture, Physical layer, Medium access control layer, MAC management HIPERLAN: Protocol architecture, Physical layer, Channel access control. Sub layer, Medium access control Sub layer,

Information bases And Networking; BLUETOOTH: User scenarios, Physical layer, MAC layer, Networking. Security, Link Management.

UNIT IV MOBILE NETWORK LAYER **9**

Mobile IP: Goals, assumptions and requirements, Entities and Terminology, IP packet delivery, Agent advertisement and discovery, Registration, Tunnelling and Encapsulation, Optimizations, Reverse tunnelling, Ipv6; Dynamic host configuration protocol, Ad hoc .networks: Routing Destination sequence distance vector, Dynamic source routing, Hierarchical algorithms, and Alternative metrics.

UNIT V MOBILE DATABASE MANAGEMENT **9**

Data Caching, Transaction Models, Query processing, Data recovery process, Issues relating to quality of service. WIRELESS INTERNET - Web services and mobile web services-Wireless middleware-wireless gateway and mobile application servers-Wireless Access Protocol(WAP)-WAP protocol layers.

Total : 45

REFERENCE BOOKS

1. Raj Kamal, "Mobile Computing", Oxford University Press, 2007.
2. Jochen Schiller, "Mobile Communications", Pearson Education Limited, 2003.
3. Asoke Talukder, Roopa Yavagal, "Mobile Computing", Tata Mc-Graw Hill, 2006.
4. Amjad Umar, "Mobile Computing and Wireless Communications", NGE Solutions, 2004.
5. William C Y Lee,"Mobile Communication Engineering", Tata Mc-Graw Hill, 2008.

PCE712 WEB SERVICES

L	T	P	C
3	0	0	3

Goal

To provide a wide knowledge in the design and implementation of Web Services.

Objectives

The course should enable the student to

1. Learn the Web Service architecture.
2. Realize the concepts of SOAP.
3. Understand the web service life cycle and the method of describing a Web Service.
4. Understand the concept of interoperability and web service security.
5. Realize the role of J2EE.

Outcome

The student should be able to

1. Design web services and Service Oriented Architecture.
2. Develop and deploy simple web services.
3. Have an understanding on the concept of SOAP.
4. Have an understanding on the importance of WSDL and UDDI.
5. Implement the web service security.

UNIT I INTRODUCTION **9**

Evolution and Emergence of Web Services - Evolution of distributed computing, Core distributed computing technologies - client/server, CORBA, JAVA RMI, Micro Soft DCOM, MOM, Changes in Distributed Computing, role of J2EE and XMS in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA).

UNIT II WEB SERVICE ARCHITECTURE **9**

Introduction to Web Services - The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services - Web Service Architecture - Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, basic steps of implementing web services, developing web services enabled applications.

UNIT III SIMPLE OBJECT ACCESS PROTOCOL **9**

Core Fundamentals of SOAP - SOAP Message Structure, SOAP encoding, SOAP message exchange models, SOAP communication and messaging, SOAP security - Developing Web Services using SOAP - Building SOAP Web Services, developing SOAP Web Services using Java, limitations of SOAP.

UNIT IV DESCRIBING WEB SERVICES **9**

WSDL - WSDL in the world of Web Services, Web Services life cycle, anatomy of WSDL definition document, WSDL bindings, WSDL tools, limitations of WSDL - Discovering Web Services - Service discovery, role of service discovery in a SOA, service discovery mechanisms, UDDI - UDDI Registries, uses of UDDI Registry, Programming with UDDI, UDDI data structures, support for categorization in UDDI Registries, Publishing API, Publishing information to a UDDI Registry, searching information in a UDDI Registry, deleting information in a UDDI Registry, limitations of UDDI.

UNIT V WEB SERVICE INTEROPERABILITY **9**

Means of ensuring Interoperability, Overview of .NET and J2EE, Web Services Security - XML security frame work, XML encryption, XML digital signature, XKMS structure, guidelines for signing XML documents.

Total : 45

REFERENCE BOOKS

1. R. Nagappan, R. Skoczylas, R.P. Sriganesh, "Developing Java Web Services", Wiley India, 2009.
2. S. Chatterjee, J.Webber, "Developing Enterprise Web Services", Pearson Education 2008
3. F.P. Coyle, "XML, Web Services, and the Data Revolution", Pearson Education,2002.
4. S. Graham and others, "Building Web Services with Java", 2nd Edition, Pearson Edn 2008.
5. D.A. Chappel & T. Jewell, "Java Web Services", 2nd editionO'Reilly, SPD.
6. McGovern, Et al., "Java Web Services Architecture", Morgan Kaufmann Publishers, 2005.
7. Richard Monson and Haefel, "J2EE Web Services", Pearson Education,2003.
8. G. Alonso, F.Casati and others, "Web Services", Springer, 2005.

PCE713 SERVICE ORIENTED ARCHITECTURE

L	T	P	C
3	0	0	3

Goal

To provide an insight into the impact of Service Oriented Architecture (SOA) on software quality, efficiency, security, performance and flexibility.

Objectives

The course should enable the students to :

1. Learn the fundamentals of SOA and Web Services.
2. Understand the basics of web services policy and framework.
3. Learn the SOA life cycle model.
4. Learn service oriented design principles.
5. Understand the web service security.

Outcome

The student should be able to

1. Have an understanding of SOA values.
2. Have an understanding of the model of SOA management.
3. Posses the comprehensive knowledge and broad perspective of this important trend in software engineering.
4. Develop and deploy web services using different design tools.

UNIT I SOA AND WEB SERVICES FUNDAMENTALS 9

Fundamentals of SOA - Characteristics - Common misperception - Benefits - Pitfalls of adopting SOA - Transition from XML to web service to SOA - Reshaping of XML and web service through

SOA - Standards for SOA - Comparison of SOA vs Past architecture - Web services frame work - Service description - Messaging with SOA.

UNIT II SECOND GENERATION WEB SERVICES 9

Activity management and comparison - Message exchange patterns - Service activity - Coordination - Atomic transactions - Business activities - Business protocols - Process definitions - Process services - Orchestration and coordination - Collaboration. Addressing - Reliable messaging - WS policy framework - Policy assertions and alleviates policies relationship to activity management - Metadata exchange security - WS notification and eventing.

UNIT III SERVICE ORIENTATION 9

Service oriented architecture - Components - Common principles of service - Orientation - Interrelationship among principles - Service orientation versus object orientation - Service layers - Different services layers - Configuration scenarios of service layers. SOA delivery life cycle phases - Agile strategy - SOA analysis - Service modeling - guidelines - Classifications of service models.

UNIT IV TECHNOLOGIES AND DESIGN FOR SOA 9

Service oriented design - Web service description language (WSDL) - Related XML schema - WSDL language basis - SOAP language basis - Service interface design tools - SOA comparison guide lines - Industry standards - XML AWSOA - WSDL and SOA - SOAPAWAOA - SOA extension.

UNIT V SERVICE DESIGN AND SECURITY 9

Service design - Guidelines - Business process design - WS - BPEL language basics - WS - BPEL elements - WS co ordination - Service oriented process design - WS addressing language and messaging basis - WS - Meta data exchange - Security language basis - WSOA platform - SOA support in J2EE and .NET.

Total : 45

REFERENCE BOOKS

1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology & Design", Pearson Education, 2005.
2. Thomas Erl, "Service-Oriented Architecture: A Field Guide to Integrating XML and Web Services ", The Prentice Hall, Service-Oriented Computing Series, 2004.
3. Thomas Erl, "SOA Principles of Service Design", Prentice Hall Service-Oriented Computing Series, 2007.
4. Shankar Kambhampaty, "Service Oriented Architecture for Enterprise Applications", 1st edition, Wiley India Private Limited, 2008.
5. Mike Rosen, Boris Lublinsky, Kevin T. Smith and Marc J. Balcer, "Applied SOA Service Oriented Architecture And Design Strategies", Wiley India, 2008.
6. Eric Newcomer Greg Lomow, "Understanding SOA with Web Services", Pearson Education, 2nd edition, 2008.
7. Paul. C. Brown, "Implementing SOA Total Architecture in Practice", Pearson Edu, 2009.
8. Nicolai M. Josuttis, "SOA in Practice: The Art of Distributed System Design", 2nd Ed., 2008

PCE714 SEMANTIC WEB

Goal

To understand the fundamentals of ontologies and the role of ontologies in the web. The course also outlines the issues and languages of semantic web.

Objectives

The course should enable the students to:

1. Learn the fundamentals of ontologies and Semantic Web.
2. Learn the methodologies used for ontology learning for semantic web.
3. Understand the ontology management and tools used for Ontology annotation.
4. Learn the role of semantics in web services and to discuss some of the security issues.
5. Understand the fundamentals of semantic web services.

Outcome

The student should be able to

1. Have an understanding of the fundamentals of ontologies and Semantic Web.
2. Apply methodologies used for ontology construction for semantic web.
3. Posses the knowledge about the ontology management tools used for Ontology annotation.
4. Comprehend the role of semantics in web services some of the security issues.
5. Demonstrate the applications of semantic web services.

UNIT I INTRODUCTION **9**

Components - Types - Ontological Commitments - Ontological Categories - Philosophical Background - Knowledge Representation Ontologies - Top Level ontologies - inguistic Ontologies - Domain Ontologies - Semantic Web - Need - Foundation - Layers - Architecture.

UNIT II LANGUAGES FOR SEMANTIC WEB AND ONTOLOGIES **10**

Web Documents in XML - RDF - Schema - Web Resource Description using RDF- RDF Properties - Topic Maps and RDF - Overview - Syntax Structure - Semantics - Pragmatics - Traditional Ontology Languages - LOOM- OKBC - OCML - Flogic Ontology Markup Languages - SHOE - OIL - DAML + OIL- OWL.

UNIT III ONTOLOGY LEARNING FOR SEMANTIC WEB **10**

Taxonomy for Ontology Learning - Layered Approach - Phases of Ontology Learning - Importing and Processing Ontologies and Documents - Ontology Learning Algorithms - Evaluation .

UNIT IV ONTOLOGY MANAGEMENT AND TOOLS **9**

Overview - need for management - development process - target ontology - ontology mapping - skills management system - ontological class - constraints - issues.

Evolution - Development of Tools and Tool Suites - Ontology Merge Tools - Ontology based Annotation Tools. Case study : web 3.0

UNIT V APPLICATIONS **7**

Web Services - Semantic Web Services - Case Study for specific domain - Security issues - current trends.

Total : 45

REFERENCE BOOKS

1. Asuncion Gomez-Perez, Oscar Corcho, Mariano Fernandez-Lopez, "Ontological Engineering: with examples from the areas of Knowledge Management, e-Commerce and the Semantic Web", Springer, 2004.
2. Grigoris Antoniou, Frank van Harmelen, "A Semantic Web Primer (Cooperative Information Systems)", The MIT Press, 2004.
3. Alexander Maedche, "Ontology Learning for the Semantic Web", Springer; 1 edition, 2002.
4. John Davies, Dieter Fensel, Frank Van Harmelen, "Towards the Semantic Web: Ontology - Driven Knowledge Management", John Wiley & Sons Ltd., 2003.
5. Dieter Fensel (Editor), Wolfgang Wahlster, Henry Lieberman, James Hendler, "Spinning theSemantic Web: Bringing the World Wide Web to Its Full Potential", The MIT Press, 2002/
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PCE715 INFORMATION RETRIEVAL

L	T	P	C
3	0	0	3

Goal

To provide knowledge about the fundamentals of Information Retrieval Systems its techniques, data structures and algorithms.

Objectives

The course should enable the students to:

1. Learn the information retrieval systems development.
2. Understand classification and clustering.
3. Learn different data structures support in IR.
4. Learn algorithms for retrieval of information.
5. Understand sample applications through case studies.

Outcome

The student should be able to

1. Develop an information retrieval system.
2. Design different IR techniques.
3. Have an understanding of different data structures.
4. Possess the knowledge about the existing algorithms in IR process.
5. Demonstrate simple IR models.

UNIT I IR SYSTEMS **9**

Historical Development, Sophistication in technology, Information explosion and challenges in IR systems, Conceptual Information Retrieval from multimedia documents, self recovery and fast/ meaningful (Intelligent/ Efficient) IR systems for very large archives.

UNIT II IR TECHNIQUES **9**

Case based reasoning, Rule based reasoning, Constraint satisfaction and search, Classification and clustering using statistical methods, Market - Basket analysis, filtering and simplification, Content based approach, parser free techniques for NLP, Neural networks, Genetical algorithms, rough sets and fuzzy logic, Activation networks and thesaurus based approach, wavelets etc. Improvement in efficiency.

UNIT III DATA STRUCTURES **9**

Inverted files, signature files, PAT trees PAT arrays, file organization for optical disks, lexical analysis and stop lists.

UNIT IV ALGORITHMS **9**

Stemming algorithms, thesaurus construction, string searching algorithms, relevance feedback and query modification techniques - Boolean operations and extended Boolean methods, hashing, ranking, clustering algorithms, Parallel information retrieval algorithms

UNIT V CASE STUDY **9**

Diet expert system, pattern recognition and digital image processing, speech recognition, scheduling problem, NLP - Translation, Question answering, summarising etc. Software agent and personal agent- Concept, need and requirement, Implementation issues.

Total : 45

REFERENCE BOOKS

1. W.Frake,Yates, "Information retrieval - Data structures and algorithms", 1992, Prentice Hall.
2. Karen Sparck Jones and Willett, "Readings in IR, Morgan Kaufmann, 1997.
3. Oddy,Robertson and Rijsbergen, "IR research", Butterworth, 1984.
4. Pal, Dey and Das; Advances in Pattern recognition and Digital Technology", Narosa, 2002.
5. Ramani, Anjeneyelu and Sasikuma, "Proceedings of KBCS", 1998-99, Narosa.

PCE716 SECURITY IN DATA GRID

L	T	P	C
3	0	0	3

Goal

To provide the knowledge about the data grid architecture, security analysis and approaches, quality and assurance.

Objectives

The course should enable the student to:

1. Learn the architecture of data grid and its services.
2. Learn data grid security framework components and approaches.
3. Understand the quality of service and evaluation methodology.
4. Realize data assurance and validation mechanism.

Outcome

The student should be able to

1. Have an understanding of the data grid architecture.
2. Design security framework components.
3. Evaluate quality of service.
4. Posses knowledge about security requirements in data grid.

UNIT I DATA GRID ARCHITECTURE **9**

Data Grid, BOINC infrastructure, Volunteer storage systems, Typical data grid architecture, Basic elements, Services.

UNIT II SECURITY ANALYSIS **9**

Data security, Security framework components, Security issues related to desktop data grids, security analysis.

UNIT III DATA GRID SECURITY APPROACHES **9**

Cryptographic approach, Information Dispersal Algorithm, Fragmentation of data.

UNIT IV QUALITY OF SECURITY (QoSEC) APPROACH **9**

Quantifying QoSec, The Reference Evaluation Methodology- Policy formalization - The evaluation technique.

UNIT V DATA ASSURANCE **9**

Distribution assurance, Data assurance on QoSec, QoSec validation mechanism.

Total : 45

REFERENCE BOOKS

1. Chien-Min Wang; Hsi-Min Chen; Chun-Chen Hsu; Chi-Chang Huang; , "FedMi: A Federation Middleware for Integrating Heterogeneous Data Grids," Parallel and Distributed Processing with Applications (ISPA), 2011 IEEE 9th International Symposium on , vol., no., pp.127-134, 26-28 May 2011. doi: 10.1109/ISPA.2011.41.

   URL:http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5951894&isnumber=5951872

2. Luna, J.; Dikaiakos, M.; Marazakis, M.; Kyprianou, T.; , "Data-Centric Privacy Protocol for Intensive Care Grids," Information Technology in Biomedicine, IEEE Transactions on , vol.14, no.6, pp.1327-1337, Nov. 2010, doi: 10.1109/TITB.2010.2073478.

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3. Luna, J.; Flouris, M.; Marazakis, M.; Bilas, A.; , "Providing security to the Desktop Data Grid," Parallel and Distributed Processing, 2008. IPDPS 2008. IEEE International Symposium on , vol., no., pp.1-8, 14-18 April 2008, doi: 10.1109/IPDPS.2008.4536443.

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4. Berkeley open infrastructure for network computing. http://boinc.berkeley.edu/, 2007.

5. BOINC: Security issues in volunteer computing.

   http://boinc.berkeley.edu/trac/wiki/SecurityIssues, 2007

6. Mei, L. V. Mancini, and S. Jajodia. Secure dynamic fragment and replica allocation in large-scale distributed file systems. IEEE Trans. Parallel Distrib. Syst., 14(9):885-896,2003.

7. V. Casola, A. Mazzeo, N. Mazzocca, and V. Vittorini. A policy-based methodology for security evaluation: A security metric for public key infrastructures. Journal of Computer Security, 15(2):197-229, 2007.

8. Francesco Marchioni, Manik Surtani, "Infinispan Data Grid Platform", PACKT Publising, 2012.

PIT708 AGENT BASED INTELLIGENT SYSTEMS

L	T	P	C
3	0	0	3

Goal

To impart the knowledge about agent based intelligent systems.

Objectives

The course should enable the student to:

1. Learn concepts of agent technology.
2. Understand the fundamentals of Knowledge based agents.
3. Learn the steps to define the behaviour of agents.
4. Learn the methods to deal with uncertainty.
5. Understand the features of communicative agents.

Outcome

The student should be able to

1. Have the knowledge about how intelligent agents solve complex problems.
2. Do planning for agents.
3. Describe the reasons for uncertainty
4. Apply the knowledge how to deal with uncertainty.
5. Have the understanding of the concepts of learning agents and their applications.

UNIT I INTRODUCTION **9**

Definitions - History - Intelligent agents - Structure - Environment - Basic problem solving agents - Complex problem solving - Formulating - Search strategies - Intelligent search - Game playing as search.

UNIT II KNOWLEDGE BASED AGENTS **9**

Representation - Logic - First order logic - Reflex agent - Building a knowledge base - General ontology - Inference - Logical recovery.

UNIT III PLANNING AGENTS **9**

Situational calculus - Representation of planning - Partial order planning - Practical planners - Conditional planning - Preplanning agents.

UNIT IV AGENTS AND UNCERTAINTY **9**

Acting under uncertainty - Probability Bayes rule and use - Belief networks - Utility theory - Decision network - Value of information - Decision theoretic agent design.

UNIT V HIGHER LEVEL AGENTS **9**

Learning agents - General model - Inductive learning - Learning decision trees - Reinforcement learning - Knowledge in learning - Communicative agents - Types of communicating agents - Future of AI.

Total : 45

REFERENCE BOOKS

1. Zhang, Zili Zhang, "Agent-Based Hybrid Intelligent Systems", Vol. 2938, Chengqi (editions.) 2004.
2. Stuart Russell and Peter Norvig, " Artificial Intelligence - A Modern Approach", Prentice Hall, 1995.
3. Patrick Henry Winston, "Artificial Intelligence", 3rd edition, AW, 1999.
4. Nils.J.Nilsson,"Principles of Artificial Intelligence", Narosa Publishing House, 1992.

PIT716 DATA WAREHOUSING AND DATA MINING

L	T	P	C
3	0	0	3

Goal

To impart the knowledge about the fundamentals of data mining functionalities and its application in various business and social domains.

Objectives

The course should enable the student to

1. Learn data warehousing components and data models for big data.
2. Understand the fundamentals of data mining and its functionalities
3. Realize the issues regarding classification and prediction.
4. Concepts of cluster and cluster analysis.
5. Application of data mining in different domains.

Outcome

The student should be able to

1. Have an understanding of data warehousing and big data models.
2. Posses a knowledge about the principles of data mining the techniques.
3. Implement classification and prediction techniques.
4. Have an understanding of various cluster analysis method.
5. Demonstrate data mining in different domains.

UNIT I DATA WAREHOUSING AND BUSINESS ANALYSIS 9

Data warehousing Components -Building a Data warehouse - Mapping the Data Warehouse to a Multiprocessor Architecture - DBMS Schemas for Decision Support - Data Extraction, Cleanup, and Transformation Tools -Metadata - reporting - Query tools and Applications - Online Analytical Processing (OLAP) - OLAP and Multidimensional Data Analysis. Big data : A new paradigm for Big Data -Data model for Big Data.

UNIT II DATA MINING 9

Data Mining Functionalities - Data Preprocessing - Data Cleaning - Data Integration and Transformation - Data Reduction - Data Discretization and Concept Hierarchy Generation. Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods - Mining Various Kinds of Association Rules - Association Mining to Correlation Analysis - Constraint-Based Association Mining.

UNIT III CLASSIFICATION AND PREDICTION 9

Issues Regarding Classification and Prediction - Classification by Decision Tree Introduction - Bayesian Classification - Rule Based Classification - Classification by Back propagation - Support Vector Machines - Associative Classification - Lazy Learners - Other Classification Methods - Prediction -

Accuracy and Error Measures - Evaluating the Accuracy of a Classifier or Predictor - Ensemble Methods - Model Section.

UNIT IV CLUSTER ANALYSIS **9**

Types of Data in Cluster Analysis - A Categorization of Major Clustering Methods - Partitioning Methods - Hierarchical methods - Density-Based Methods - Grid-Based Methods - Model-Based Clustering Methods - Clustering High- Dimensional Data - Constraint-Based Cluster Analysis - Outlier Analysis.

UNIT V MINING OBJECT, SPATIAL, MULTIMEDIA, TEXT AND WEB DATA **9**

Multidimensional Analysis and Descriptive Mining of Complex Data Objects - Spatial Data Mining - Multimedia Data Mining - Text Mining - Mining the World Wide Web.

Total : 45

REFERENCE BOOKS

1. Jiawei Han and Micheline Kamber "Data Mining Concepts and Techniques" Second Edition, Elsevier, Reprinted 2008.
2. Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw Hill Edition, Tenth Reprint 2007.
3. K.P. Soman, Shyam Diwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
4. G. K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2007.
6. Nathan Marz, Samuel E. Ritchie "Big Data Principles and best practices of scalable real time data systems", Manning Publications Company, 2013.