



**HINDUSTAN
UNIVERSITY**

HINDUSTAN INSTITUTE OF TECHNOLOGY & SCIENCE

**Department of Computer Science &
Engineering**

**M.Tech. Computer Science & Engineering
with Specialization in Data Science &
Engineering**

Curriculum & Syllabus

2014 Regulations

**ACADEMIC REGULATIONS
(M.TECH/ M.B.A. / M.C.A.)
(Full - Time / Part – Time)
(Effective 2014-15)**

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 (drawing) of three (two) 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.

6.2 GPA & CGPA

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)	--

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 C_i 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 Dean.

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.

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
with specialisation in DATA SCIENCE AND ENGINEERING
CURRICULUM 2014-2015.

Sl. No	Course Code	Course Title	L	T	P	C	TCH
SEMESTER I							
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	3	1	3
8.	PIT103	Internet Programming Lab\$	0	0	3	1	3
Total						26	30
SEMESTER II							
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	4	0	0	4	4
6.	**	Elective-II	4	0	0	4	4
Practical							
7.	PCE204	Advanced System Software Lab	0	0	3	1	3
8.	PIT206	Advanced Operating Systems Lab	0	0	3	1	3
Total						26	30
SEMESTER III							
Theory							
1.	**	Elective-III	4	0	0	4	4
2.	**	Elective-IV	4	0	0	4	4
3.	**	Elective-V	4	0	0	4	4
Practical							
4.	PCE301	Project Phase-I	0	0	12	6	12
Total						18	24
SEMESTER IV							
Practical							
1.	PCE401	Project Phase-II	0	0	24	12	24
Total						12	24

Total Credits: 82

*- 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

ELECTIVES

Sl. No	Semester	Course Code	Course Title	L	T	P	C	TCH
1	II	PCE501	Data Mining & Warehousing	4	0	0	4	4
2		PCE502	Machine Learning	4	0	0	4	4
3	III	PCE503	Data Analytics & Visualisation	4	0	0	4	4
4		PCE504	Hadoop Administration	4	0	0	4	4
5		PCE505	Geospatial Information Management	4	0	0	4	4

SEMESTER I

PMA105	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		OUTCOMESs
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Understand the concept of random variable, moment generating function and their properties. Learns standard distributions in discrete and continuous cases and their applications. 2. Learn classification of random process and Markov chain processes. Understands 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. Learns 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. 		<p>The students should be able to:</p> <ol style="list-style-type: none"> 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 Dijkstra'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 - Dijkstra'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.

PCE101	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		OUTCOMES
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.		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.

PCE102	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		OUTCOMES
The course should enable the students to:		The student should be able to
<ol style="list-style-type: none"> 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. 		<ol style="list-style-type: none"> 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		OUTCOMES
The course should enable the students to:		The student should be able to
<ol style="list-style-type: none"> Learn ER model and transaction processing system. Understand various storage structures for Database. Learn the distributed and Parallel database processing. Learn Object Oriented database concepts and models. Understand various advancements in database technology. 		<ol style="list-style-type: none"> Construct ER models and explain transaction processing in relational models. Implement database storage models and query optimization techniques. Design a distributed database. Implement the distributed query processing 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.Swamynathan, "An Introduction to Database Systems", Eighth Edition, 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		OUTCOMES
The course should enable the students to:		The student should be able to
<ol style="list-style-type: none"> 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. 		<ol style="list-style-type: none"> 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		OUTCOMES
The course should enable the students to:		The student should be able to
<ol style="list-style-type: none"> Learn the basics of Internet architecture and basics of web designing Learn the style sheets and client side scripting. Understand web databases and connectivity. Learn server side programming. Learn PHP programming. 		<ol style="list-style-type: none"> Design simple web pages using HTML. Do styling using CSS and do client side validation using java script. Create XML document, present XML using CSS, connect to database using JDBC. Develop web applications using SERVELETS and JSP using IDE. 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

- Deitel, Deitel and Neito, "Internet and World Wide Web–How to program", Pearson, 4th Ed, 2009.
- Elliotte Rusty Herold, "Java Network Programming", O'Reilly Publications, 3rd Edition, 2004.
- Jeffy Dwight, Michael Erwin and Robert Nikes "USING CGI", PHI Publications, 1997
- Jason Hunter, William Crawford "Java Servlet Programming" O'Reilly, 2nd Edition, 2001.
- Eric Ladd and Jim O'Donnell, et al, "Using HTML 4, XML, and JAVA1.2", Prentice Hall, 2003.
- 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	3	1
GOAL	To implement advanced Data structures and applications using algorithms in C++				
OBJECTIVES			OUTCOMES		
The course should enable the students to <ul style="list-style-type: none"> 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. 			The student should be able to <ul style="list-style-type: none"> 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 data structure.
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 3 1
GOAL	To understand various technologies involved in internet	
OBJECTIVES	OUTCOMESs	
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 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 	<p>The student should be able to</p> <ol style="list-style-type: none"> 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 user 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

SEMESTER II

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		OUTCOMES
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 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. 		<p>The student should be able to</p> <ol style="list-style-type: none"> 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		OUTCOMESs
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		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 1 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, 2012.
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		OUTCOMES
The course should enable the students to: <ol style="list-style-type: none"> 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 		The student should be able to <ol style="list-style-type: none"> 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 – Back propagation Multilayer 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 INTELLIGENCE

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, 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, 2009.
4. S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 2003.

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		OUTCOMES
The course should enable the students to: <ol style="list-style-type: none"> 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. 		The student should be able to <ol style="list-style-type: none"> 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 mach 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, NiranjanaG.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", Ninth Edition, Addison Wesley Publishing Co., 2013.
3. Andrew S.Tanenbaum, "Modern operating system", PHI, 3rd edition,2008
4. Pradeep K.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 3 1
GOAL	To implement various phases of Compilers.	
OBJECTIVES		OUTCOMES
The course should enable the students to <ol style="list-style-type: none"> 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. 		The student should be able to <ol style="list-style-type: none"> 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 SYSTEMS LAB	L T P C 0 0 3 1
GOAL	To design and implement distributed operating systems.	
OBJECTIVES		OUTCOMES
<p>The course should enable the students to</p> <ol style="list-style-type: none"> 1. Implement Semaphores. 2. Implement Multithreading concepts. 3. Develop Network Operating System 4. Develop Real Time Operating System 5. Develop Database Operating System 		<p>The students should be able to</p> <ol style="list-style-type: none"> 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

ELECTIVES

SEMESTER II

PCE501	DATA MINING AND WAREHOUSING	<table border="1" style="margin: auto;"> <tr> <td>L</td> <td>T</td> <td>P</td> <td>C</td> </tr> <tr> <td>4</td> <td>0</td> <td>0</td> <td>4</td> </tr> </table>	L	T	P	C	4	0	0	4
L	T	P	C							
4	0	0	4							
GOAL	To impart the knowledge about the fundamentals of data mining functionalities and its application in various business and social domains.									
OBJECTIVES		OUTCOMES								
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.		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

12

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

12

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

12

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

12

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

12

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

Total 60

REFERENCE BOOKS

1. Jiawei Han and Micheline Kamber “Data Mining Concepts and Techniques” 2nd 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.

PCE502	MACHINE LEARNING	L T P C 4 0 0 4
GOAL	To learn Machine learning, a branch of artificial intelligence, concerns the construction and study of systems that can learn from data.	
OBJECTIVES	OUTCOMESs	
<p>The course should enable the students to</p> <ol style="list-style-type: none"> 1. Learn the basics and types of machine learning algorithms 2. Study the supervised learning algorithms 3. Study unsupervised learning algorithms 4. Learn evolutionary learning methods. 5. Learn the models 	<p>The students should be able to</p> <ol style="list-style-type: none"> 1. Have understood the basics of machine learning 2. Apply supervised machine learning methods. 3. Apply unsupervised machine learning methods. 4. Use Genetic algorithm and reinforced learning for appropriate applications 5. Have learnt machine learning tools in MATLAB, Python programming for ML 	

UNIT I INTRODUCTION

12

Learning - Types of machine learning - supervised learning - The brain and the neurons , Linear Discriminants -Perceptron - Linear Separability -Linear Regression,The multilayer perceptron - Back propagation of error - The multi-layer perceptron in practice - Examples of using MLP - Deriving backpropagation.

UNIT II DECISION TREES

12

Support Vector Machine - Optimal Separation - Kernels, Learning with trees: Using Decision trees - Constructing decision trees - Classification of regression trees - Regression example . Probability and Learning: Turning data into probabilities - Some basic statistics - Gaussian mixture models - Nearest Neighbor methods

UNIT III UNSUPERVISED LEARNING

12

The k-Means algorithm - Vector Quantizations - The self organising feature map Dimensionality reduction, Linear Discriminant Analysis - Principal component analysis - Factor Analysis - Independent component analysis -Locally Linear embedding – Isomap. Optimisation and Search : Going downhill - Least squares optimisation - conjugate gradients - Search - Exploitation and exploration -simulated annealing

UNIT IV EVOLUTIONARY LEARNING

12

The Genetic algorithm - Genetic operators - Using genetic algorithms -Genetic programming - Combining sampling with genetic programming, Reinforcement Learning: Example - Markov Decision Process - values - uses of reinforced learning, Markov Chain Monte Carlo methods: sampling - Monte carlo - Proposal distribution

UNIT V GRAPHICAL MODELS AND PROGRAMMING

12

Baysean Networks - Markov Random moFields - Hidden Markov Models -Tracking methods Python: Installation - Python for MATLAB AND R users -Code Basics - Using NumPy and MatPolitB

TOTAL 60

REFERENCE BOOKS

1. Stephen Marsland , "Machine Learning: An Algorithmic Perspective 1st Edition" ,CRC, 2009.
2. Ethem Alpydin, " An Introduction to Machine Learning", 2nd edition, MIT press, 2010

SEMESTER III

PCE503	DATA ANALYTICS AND VISUALISATION	L T P C 4 0 0 4
GOAL	To learn data analysis and visualisation wherein large volume of temporal data can be analyzed and visualized for easy interpretation and decision making.	
OBJECTIVES		OUTCOMESs
The course should enable the students to <ol style="list-style-type: none"> 1. Display data using appropriate visualization techniques (e.g., x-y line plots, bar charts, pie charts, scatter plots, histograms). 2. Understand and use basic statistical indicators (e.g., mean, median, standard deviation, maximum, minimum, tests of significance). 3. Use variables, conditionals, loops, functions, and logical indexing in scripts to analyze data. 4. Choose appropriate methods to solve problems. 5. Draw conclusions and formulate hypotheses from data presented graphically. 		The students should be able to <ol style="list-style-type: none"> 1. Understand and apply principles of data visualization 2. Acquire, parse, and analyze abstract data sets 3. Design and implement standard visualization techniques 4. Quantitatively and qualitatively evaluate existing visualizations 5. Rapidly prototype visualizations.

UNIT I INTRODUCTION	12
Introduction - Terminology - Basic Charts and Plots, - Multivariate Data Visualization - Principles of Perception,- Color, Design, and Evaluation.	
UNIT II DATA VISUALISATION-I	12
Text Data Visualization - Interactivity and Animation - Temporal Data Visualization	
UNIT III DATA VISUALISATION-II	12
Geospatial Data Visualization - Visualization Case Studies.	
UNIT IV DATA VISUALISATION-III	12
Redesign Principles and Design Dimensionality - Hierarchical Data Visualization - Network Data Visualization.	
UNIT V DATA VISUALISATION TOOLS	12
Introduction to R, Python, and D3 for data visualization, Statistical visualizations (histograms, scatterplots) and times series data. Introduction to web-based visual displays for broad and deep visualizations. Introduction to the D3 javascript framework. Introduction to ManyEyes and Bubble charts.	

Total 60

REFERENCES

1. Ben Fry "Visualizing Data: Exploring and Explaining Data with the Processing Environment" O'Reilly Media, 2007.
2. Scott Murray "Interactive Data Visualization for the Web" O'Reilly Media, 2012.
3. Edward Tufte "The Visual Display of Quantitative Information" 2001.
4. Few, S, Information dashboard design: The effective visual communication of data Sebastopol: O'Reilly, 2006.
5. Provost, F. & Fawcett, T. (in-press). Towards data science: Fundamental Principles of data mining and data-analytic thinking.

PCE504	HADOOP ADMINISTRATION	L T P C 4 0 0 4
GOAL	To study the concepts of Big Data Analytics.	
OBJECTIVES		OUTCOMES
The course should enable the students to: 1. Learn the concepts of MapReduce. 2. Understands the file system and application of Hadoop. 3. Study about the formats of MapReduce. 4. Learn Hadoop Administration. 5. Learn the tools.		The student should be able to 1. Understand the MapReduce concepts 2. Understand the Hadoop File System. 3. Use the features of MapReduce. 4. Setup and manage Hadoop Clusters. 5. Work in tools.

UNIT I : MAP REDUCE

12

Data Storage and Analysis – Apache Hadoop and the Hadoop Ecosystem – Analyzing the data with Hadoop – Scaling Out – Hadoop Streaming – Hadoop Pipes.

UNIT II: HADOOP

12

The Hadoop Distributed Filesystem – Hadoop I/O –Developing a MapReduce Application.

UNIT III: MAPREDUCE FORMATS AND FEATURES

12

MapReduce Types – Input Formats – Output Formats – Counters – Sorting – Joins – Side Data Distribution – MapReduce Library Classes.

UNIT IV : HADOOP ADMINISTRATION

12

Setting Up a Hadoop Cluster – Administrating Hadoop.

UNIT V : TOOL

12

Hive- Installing Hive, An Example, Running Hive. HBase – Hbasics, Concepts, Installation, Clients, Example. – ZooKeeper – Sqoop.

Total 60

REFERENCES

1. Tom White, “Hadoop: The Definitive Guide”, 3rd Ed., O’Reilly Media.
2. Shumin Guo, Hadoop Operations and Cluster Management Cookbook, Safari, 2013.

PCE505	GEOSPATIAL INFORMATION MANAGEMENT	L T P C 4 0 0 4
GOAL	To learn information management which contains techniques and standards to manage the information owned by an organisation.	
OBJECTIVES	OUTCOMESs	
The course should enable the students to 1. Define Geographic Information Systems (GIS) 2. Identify, compare and contrast vector and raster GIS 3. List and evaluate the capabilities of various GIS programs. 4. Explain uncertainty as it relates to scale, resolution and projection; discuss uncertainty propagation within a GIS 5. Apply cartographic principles of scale, resolution, projection and data management to a problem of a geographic nature. 6. Apply spatial analysis functions on a GIS to a Geospatial problem.	The students should be able to 1. Have understood the fundamentals of geospatial 2. Have understood the data representation of geospatial data 3. Have learnt the file formats of geospatial data 4. Do the analysis of spatial data	

UNIT I INTRODUCTION TO GIS

12

The use and the science of GIS - Components of a GIS - - Using GIS to solve problems at multiple scales - Vector and raster systems - Scale, resolution, map projection Coordinate systems - Role of GIS in studying food, agricultural, and environmental systems.

UNIT II GEOSPATIAL DATA

12

Georeferencing & Global Positioning Systems (GPS) - Representing fields: raster, TIN, quadtrees, polygons - Uncertainty propagation

UNIT III SPATIAL DATA BASICS

12

Understanding spatial data models and file formats - Representing geographic entities in data form: raster and vector data models - Understanding the data structure: coordinate values and attribute tables - Common file formats used in GIS - Management of spatial data - Converting between file formats - Joins and relates - Working with attribute tables (selecting data, summarizing data, field calculator)

UNIT IV SPATIAL ANALYSIS I

12

Common vector-based functions - Selection and classification - Aggregation of data (dissolving boundaries) - Buffers - Spatial overlay: clips, intersects, and unions

UNIT V SPATIAL ANALYSIS II

12

Common raster-based functions - Concept of “map algebra” - Reclassifying and smoothing data - Raster “overlay” - Working with raster and vector data together

Spatial modeling: Integrating analyses into a spatial model - Definition - Types of models and examples relevant to agriculture, food, and the environment - data flow diagrams to plan a modeling project - Principles of Cartography

TOTAL 60

REFERENCE BOOKS

1. GIS Fundamentals: A First Text on Geographic Information Systems Paul Bolstad, 4th edition, Eider Press. <http://www.atlasbooks.com/marktplc/00729.htm>

2. Thakur, J.K., Singh, S.K., Ramanathan, A., Prasad, M.B.K., Gossel, W. (Eds), *Geospatial Techniques for Managing Environmental Resources*, Springer, 2012.
3. Sample, John T., Ioup, Elias, *Tile-Based Geospatial Information Systems Principles and Practices*, Springer, 2010.