



**HINDUSTAN
UNIVERSITY**

HINDUSTAN INSTITUTE OF TECHNOLOGY & SCIENCE

Department of Information Technology

**M.Tech. Information Technology with
specialization in Business Analytics**

**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

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)	--

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

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 ≥ 8.0: **First Class with distinction**

6.5 ≤ CGPA < 8.0: **First Class**

5.0 ≤ 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.

CURRICULUM

SEMESTER I

S.No	Course Code	Course Title	L	T	P	C	TCH
Theory							
1	PIT101	Advanced Data Communications	4	0	0	4	4
2	PIT102	Internet Programming	4	0	0	4	4
3	PCE101	Advanced Data Structures and Algorithms	4	0	0	4	4
4	PCE102	Advanced Computer Architecture	4	0	0	4	4
5	PCE103	Advanced Database Management Systems	4	0	0	4	4
6	PMA105	Advanced Mathematics for Computer Science	4	0	0	4	4
Practical							
7	PCE104	Advanced Data Structures and Algorithms Lab	0	0	3	2	3
8	PIT103	Internet Programming Lab	0	0	3	2	3
Total			24	0	6	28	30

SEMESTER II

S.No	Course Code	Course Title	L	T	P	C	TCH
Theory							
1	PIT201	Software Engineering	4	0	0	4	4
2	PIT202	Object Oriented System Design	4	0	0	4	4
3	PIT203	Mobile Computing	4	0	0	4	4
4	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	PIT205	Software Engineering Lab	0	0	3	2	3
8	PIT206	Advanced Operating Systems Lab	0	0	3	2	3
Total			22	0	6	26	28

SEMESTER III

S.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	PIT301	Project Phase I	0	0	12	6	12
Total			9	0	12	15	21

SEMESTER IV

S.No	Course Code	Course Title	L	T	P	C	TCH
Practical							
1	PIT401	Project Phase II	0	0	24	12	24
Total			0	0	24	12	24

ELECTIVE – I

S.No	Course Code	Course Title	L	T	P	C	TCH
1	PIT702	Data Warehousing and Mining ^{\$}	3	0	0	3	3

ELECTIVE - II

S.No	Course Code	Course Title	L	T	P	C	TCH
1	PIT709	Machine Learning ^{\$}	3	0	0	3	3

ELECTIVE - III

S.No	Course Code	Course Title	L	T	P	C	TCH
1	PIT718	Business Intelligence ^{\$}	3	0	0	3	3

ELECTIVE - IV

S.No	Course Code	Course Title	L	T	P	C	TCH
1	PCE710	Cloud Computing ^{*4}	3	0	0	3	3

ELECTIVE - V

S.No	Course Code	Course Title	L	T	P	C	TCH
1	PIT732	Bigdata Analytics ^{\$}	3	0	0	3	3

SEMESTER I

PIT101

ADVANCED DATA COMMUNICATIONS

4 0 0 4

PIT101	ADVANCED DATA COMMUNICATIONS	
GOAL	To provide wide knowledge in the design and implementation of communication systems.	
OBJECTIVES		OUTCOME
<p>The course should enable the students to</p> <ul 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. 		<p>The student should be able to</p> <ul style="list-style-type: none"> • Compare and understand the different network architectures • Implement ATM protocol architecture and services. • Design techniques to control the congestion in the network. • Apply the different routing protocols to find the shortest path. • 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

- Willam Stallings, “High Speed Networks and Internets - Performance and Quality of Service”, 2nd Ed., Pearson Education, 2002.
- Andrew S. Tanenbaum, “ Computer Networks”, 5th Ed., Pearson Education, 2010.
- James F. Kurose, Keith W. Ross, “Computer Networking: A Top-Down Approach featuring the Internet”, 3rd edition, Pearson Education, 2005.
- William Stallings, “Data and Computer Communications”, 10th Ed., Pearson Education, 2013.

PIT102

INTERNET PROGRAMMING

4 0 0 4

PIT102	INTERNET PROGRAMMING	4 Credits
GOAL	The purpose of this course is to study the fundamental concepts in web technology and to study the various server side and client side programming languages.	
OBJECTIVES	OUTCOME	
<p>The students should able to learn</p> <ul style="list-style-type: none"> •1 The basics of Internet architecture and basics of web designing •2 Style sheets and client side scripting. •3 Web databases and connectivity. •4 Server Side Programming. •5 PHP programming. 	<p>The student should be able to</p> <ul style="list-style-type: none"> •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.

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 Education Asia, 5th Edition, 2012.
- Elliotte Rusty Herold, “Java Network Programming”, O’Reilly Publications, 4th Edition, 2013.
- Jeffy Dwight, Michael Erwin and Robert Nikes “USING CGI”, PHI Publications, 1997.
- Jason Hunter, William Crawford “Java Servlet Programming” O’Reilly Publications, 2nd Edition, 2001.
- Eric Ladd and Jim O’Donnell, et al, “USING HTML 4, XML, and JAVA1.2”, Prentice Hall, 2003.

PCE101	ADVANCED DATA STRUCTURES AND ALGORITHMS	4 Credits
GOAL	To study advanced representations in Data structures and algorithms	
OBJECTIVES		OUTCOMES
<p>The course should enable the students</p> <ul style="list-style-type: none"> •1 To learn about the time complexity of algorithms. •2 To learn the representations used in heap data structures •3 To learn the different types of search structures. •4 To study various algorithm design techniques •5 To learn the advanced algorithms. 		<p>The student should be able to</p> <ul style="list-style-type: none"> •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 Understand the applications of heap and search structures in computer science •4 Implement the real life problems using suitable algorithm design technique. •5 Understand advanced algorithms

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 - Deaps - 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 using dynamic programming - 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

- E. Horowitz, S.Sahni and Dinesh Mehta, Fundamentals of Data structures in C++, University Press, 2007.
- E. Horowitz, S. Sahni and S. Rajasekaran, Computer Algorithms/C++, Second Edition, University Press, 2007.
- Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, Asia, 1996.
- Jean-Paul Tremblay, Paul .G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hill second edition, 1991.

PCE102 ADVANCED COMPUTER ARCHITECTURE 4 0 0 4

PCE102	ADVANCED COMPUTER ARCHITECTURE	4 Credits
GOAL	To learn the advanced concepts of Computer Architecture	
OBJECTIVES		OUTCOMES
<p>The course should enable the students</p> <ul style="list-style-type: none"> •1 To learn the parallel models and processors •2 To learn Pipelining and scalable architectures •3 To learn the multithreaded and data flow architecture 		<p>The student should be able to</p> <ul style="list-style-type: none"> •1 Identify and understand the parallel computer model •2 Understand the types of processors and memory hierarchy •3 Design the pipeline processor •4 Design a multiprocessor system •5 Understand multithreading

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

- Kai Hwang, “Advanced Computer Architecture”, Parallelism, Scalability, Programmability, McGraw Hill, 1993.
- John L. Hennessy, David A. Patterson, Computer Architecture, Fifth Edition: A Quantitative Approach, Morgan Kaufmann Series in Computer Architecture and Design, 5th Edition, 2011.
- Hwang Briggs, “Computer Architecture and parallel processing”, McGraw Hill, 1984.
- William Stallings, “Computer Organization and Architecture- Designing for Performance”, PHI, 9th Edition, 2012.

PCE103 ADVANCED DATABASE MANAGEMENT SYSTEMS 4 0 0 4

PCE103	ADVANCED DATABASE MANAGEMENT SYSTEMS	4 Credits
GOAL	This course will provide a comprehensive study of Relational, Distributed and Advanced Database technologies	
OBJECTIVES		OUTCOMES
<p>The course should enable the students</p> <ul style="list-style-type: none"> •1 To learn about ER diagrams, their representation in RDBMS •2 To learn the various storage structures for Database •3 To study Distributed and Parallel databases •4 To learn about Object Oriented databases and Web DB’s 		<p>The student should be able to</p> <ul style="list-style-type: none"> •1 Develop the relational database operating models. •2 Design a relational database •3 Utilize the distributed database for applications •4 apply the distributed for the emerging 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 - Modeling 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", Fifth Edition, Pearson Education 2009.
- 2 R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education, 6th Edition, 2010.
- 3 Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Tata McGraw Hill, 6th Edition, 2010.
- 4 C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Pearson Education, 8th Edition, 2003.

PMA105	APPLIED MATHEMATICS FOR COMPUTER SCIENCE	4 Credits
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		OUTCOMES
<p>The course should enable the students to:</p> <ul 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> <ul 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., 9th Edition, New Delhi, 2010.
- 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.

PCE104 ADVANCED DATA STRUCTURES AND ALGORITHMS LAB 0 0 3 2

PCE104	ADVANCED DATA STRUCTURES AND ALGORITHMS LAB	2 Credits
GOAL	To implement advanced Data structures and applications using algorithms in C++	
OBJECTIVES		OUTCOME
The course should enable the students to		The student should be able to
<ol style="list-style-type: none">1. Implement advanced data structures2. Calculate the time complexity of algorithms and express it using appropriate notations3. Implement different algorithm design techniques.4. Implement advanced algorithm concepts.		<ol 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 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	2 Credits
GOAL	To understand various technologies involved in internet	
OBJECTIVES		OUTCOMES
<p>The course should enable the students to</p> <ul style="list-style-type: none"> • Understand web designing using HTML • Understand the usage of CSS • Understand the concept of client side validation • Understand the concept of database connectivity • Understand server side programming 		<p>The student should be able to</p> <ul style="list-style-type: none"> • Design a HTML web page using dream weaver • Apply a thematic design to all the web pages of a web site • Do client side validation using java script • Connect a java program to a database using JDBC. • 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

SEMESTER – II

PIT201

SOFTWARE ENGINEERING

4 0 0 4

PIT201	SOFTWARE ENGINEERING	4 Credits
GOAL	To give a knowledge for maintaining ,developing and testing a software	
OBJECTIVES		OUTCOME
The course should enable the student : <ul style="list-style-type: none">•1 To learn about the process model, cost estimation and planning.•2 To learn the various analysis models.•3 To learn about design and its models.•4 To study the various testing strategies and the application of software engineering technologies for Web-based software systems by combining classical software engineering and knowledge engineering techniques with domain-specific solutions.•5 This ranges from foundational frameworks for Web-based software development to domain-specific software development techniques and methods.		The students should be able to: <ul style="list-style-type: none">•1 Develop the software based on life cycle model.•2 Apply the testing strategies in software.•3 Be aware of estimating software cost and maintenance.•4 Test a simple product and assure its quality.

UNIT I INTRODUCTION

12

A Generic View Of Processes – Process Maturity – Process Models – Agile Process And Models – Software Cost Estimation –Risk Analysis – Software Project Planning & Scheduling.

UNIT II REQUIREMENT ANALYSIS

12

System Engineering Hierarchy – Requirement Engineering: Tasks, Initiating The Process, Eliciting Requirements, Developing Use Cases – Negotiating Requirements – Validating Requirements – Building The Analysis Models: Concepts – Object Oriented Analysis – Scenario Based Modeling – Data & Control Flow Oriented Model – Class Based Model – Behavioral Model.

UNIT III SOFTWARE DESIGN

12

Design Concepts – Design Models – Pattern Based Design – Architectural Design – Component Level Design – Class Based And Conventional Components Design – Real-time System Design - User Interface : Analysis And Design.

UNIT IV SOFTWARE TESTING

12

Software Testing – Strategies – Issues – Test Strategies For Conventional And Object Oriented Software – Validation And System Testing - Testing Tactics: White Box Testing, Basis Path Testing – Control Structure Testing – Black Box Testing - Object Oriented Testing – Testing

GUI – Testing Client/Server – Test Documentation.

UNIT V SOFTWARE QUALITY ASSURANCE

12

Software Quality Concepts – Quality Assurance – Software Technical Reviews – Formal Approach To Software Quality Assurance - Reliability – Quality Standards – Software Quality Assurance Plan – Software Maintenance - Software Configuration Management –Reverse Engineering & Reengineering – Use of CASE Tools.

TOTAL: 60

REFERENCE BOOKS

- 1 Roger S.Pressman., Software Engineering:A Practitioner’s Approach, 7th Edition, McGraw Hill, 2010.
- 2 I.Sommerville, Software Engineering, 9th Edition: Addison Wesley, 2010.
- 3 Pankaj Jalote- An Integrated Approach to Software Engineering, Springer Verlag, 3rd Edition, 2005.
- 4 James F Peters and Witold Pedryez, “Software Engineering – An Engineering Approach”, John Wiley and Sons, New Delhi, 2000.
- 5 Fairely, “Software Engineering Concepts”, McGraw Hill, 1995.

PIT202 OBJECT ORIENTED SYSTEM DESIGN 4 0 0 4

PIT202	OBJECT ORIENTED ANALYSIS AND DESIGN	4 Credits
GOAL	To understand the concepts of object oriented analysis and design.	
OBJECTIVES		OUTCOME
<p>The course should enable the student :</p> <ul style="list-style-type: none"> ●1 To understand the object oriented life cycle. ●2 To know how to identify objects, relationships, services and attributes through UML. ●3 To understand the use-case diagrams. ●4 To know the Object Oriented Design process. ●5 To know about software quality and usability. 		<p>The students should be able to:</p> <ul style="list-style-type: none"> ●1 Approach new complex software development with confidence ●2 Capture requirements through the utilization of Use Cases ●3 Utilize the UML diagrams that “best fit” in an organization ●4 Implement the software based on the design ●5 Establish a software development methodology for in-house development

UNIT I OBJECT ORIENTED DESIGN FUNDAMENTALS

12 The Object Model – Classes And Objects - Complexity Of Software – Classification – Notation – Process – Pragmatics – Binary And Entity Relationship – Object Types – Object State – OOSD Life Cycle.

UNIT II OBJECT ORIENTED METHODOLOGIES AND UML

12

Object Oriented Methodology: Rumbaugh, Booch, Jacobson, Shaler/Mellor, Coad/Yardon –

Patterns – Frame Works – The Unified Approach – UML.

UNIT III OBJECT ORIENTED ANALYSIS

12

Identify Use Cases – Use Case Model – Documentation – Classification – Identifying Classes – Noun Phrases Approach – Common Class Pattern Approach – Use Case Driven Approach – Identifying Object Relationship, Attributes And Models.

UNIT IV OBJECT ORIENTED DESIGN

12

Design Process – Design Axioms – Designing Classes – Access Layer Design – View Layer Design.

UNIT V MANAGING OBJECT ORIENTED DEVELOPMENT

12

Managing Analysis And Design – Evaluation Testing – Coding – Maintenance – Metrics – Case Study: Foundation Class Library – Client/Server Computing.

TOTAL : 60

REFERENCE BOOKS

- 1 Ali Bahrami, Object Oriented System Development, Mc Graw Hill International Edition, 1999.
- 2 Larman, Applying UML & Patterns: An Introduction to Object Oriented Analysis and Design, Pearson Education, 2nd Edition, 2003.
- 3 Bernd Bruegge, Allen H. Dutoit, “Object Oriented Software Engineering using UML, Patterns and Java”, Pearson Education 2nd Edition 2004.

PIT203

MOBILE COMPUTING

4 0 0 4

PIT203	MOBILE COMPUTING	4 Credits
GOAL	To provide the concepts for various techniques in Mobile Communications and Mobile content services.	
OBJECTIVES		OUTCOME
<p>The course should enable the student :</p> <ul style="list-style-type: none"> • To learn the Wireless voice and data communications technologies. • To study the working knowledge on various telephone and satellite networks. • To study the working principles of wireless LAN and its standards. • To build knowledge on various Mobile Computing algorithms. • To build skills in working with Wireless 		<p>The students should be able to:</p> <ul style="list-style-type: none"> •6 Understand the frequency spectrum and its applications. •7 Understand the wireless network concepts(GSM,GPRS) •8 Understand the various types of broadcasting techniques. •9 Implement Understand the various wireless protocol applications. •10develop mobile content applications

UNIT I INTRODUCTION**11**

Medium Access Control : Motivation for Specialized MAC- SDMA- FDMA- TDMA- CDMA- Comparison of Access mechanisms – Tele communications : GSM- DECT- TETRA – UMTS- IMT-2000.

UNIT II WIRELESS NETWORKS**12**

Wireless LAN: Infrared Vs Radio Transmission – Infrastructure Networks- Ad hoc Networks- IEEE 802.11 – HIPERLAN – Bluetooth- Wireless ATM: Working Group- Services- Reference Model – Functions – Radio Access Layer – Handover- Location Management- Addressing Mobile Quality of Service- Access Point Control Protocol.

UNIT III MOBILE NETWORK LAYER**18**

Mobile IP : Goals – Assumptions and Requirement – Entities – IP packet Delivery- Agent Advertisement and Discovery – Registration – Tunneling and Encapsulation – Optimization – Reverse Tunneling – IPv6 – DHCP- Ad hoc Networks Routing Protocols - Destination Sequenced Distance Vector (DSDV) - Wireless Routing Protocol (WRP) - Cluster Switch Gateway Routing (CSGR) - Source-Initiated On-Demand Approaches - Ad Hoc On-Demand Distance Vector Routing (AODV) - Dynamic Source Routing (DSR) -Temporally Ordered Routing Algorithm (TORA) - Signal Stability Routing (SSR) -Location-Aided Routing (LAR) - Power-Aware Routing (PAR) - Zone Routing Protocol (ZRP).

UNIT IV MOBILE TRANSPORT LAYER**7**

Traditional TCP- Indirect TCP- Snooping TCP- Mobile TCP- Fast retransmit/ Fast Recovery- Transmission/ Timeout Freezing – Selective Retransmission- Transaction Oriented TCP.

UNIT V WAP**12**

Architecture – Datagram Protocol- Transport Layer Security- Transaction Protocol- Session Protocol- Application Environment-Wireless Telephony Application.

TOTAL : 60**REFERENCE BOOKS**

- J.Schiller, Mobile Communication, Addison Wesley, 2nd Edition, 2003.
- C. Siva Ram Murthy and B.S. Manoj “Ad Hoc Wireless Networks: Architectures and Protocols”, Prentice Hall, 1st Edition, 2012.
- William Stallings, Wireless Communication and Networks, Pearson Education, 2nd Edition, 2004.
- Singhal, WAP-Wireless Application Protocol, Pearson Education, 2003.
- Lothar Merk, Martin. S. Nicklaus and Thomas Stober, Principles of Mobile Computing, Second Edition, Springer, 2003.
- William C.Y.Lee, Mobile Communication Design Fundamentals, John Wiley, 1993.

PIT204	ADVANCED OPERATING SYSTEMS	4 Credits
GOAL	To provide exposure to various advanced operating systems concepts	
OBJECTIVES		OUTCOME
The course should enable the student : <ul style="list-style-type: none"> •1 To study various operating systems. •2 To learn process, memory and file system management. •3 To study the concepts of Distributed Operating systems. 		The students should be able to: <ul style="list-style-type: none"> •11 Compare the various operating systems. •12 Identify and recover from deadlock. •13 Manage memory and files efficiently. •14 Handle the various issues in distributed operating system.

UNIT I INTRODUCTION**12**

Main frame Systems, Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems – Real Time systems – Hand held Systems, Operating Systems Structures: System Components – Operating System Services - System calls - System Programs – System Design and Implementation – CPU scheduling: Basic Concepts – Scheduling Algorithms.

UNIT II PROCESS MANAGEMENT**12**

Process Concepts - Process Scheduling - Operation on Process - Co-Operating process - Inter Process Communication - Threads: Multithreading Models – Process Synchronization: The Critical Section Problem – Synchronization Hardware - Semaphores – classical problem of Synchronization – Monitors - Deadlock: Deadlock Characterization - Methods for handling Deadlocks - Deadlock Prevention – Deadlock Avoidance - Deadlock Detection – Recovery from Deadlock.

UNIT III MEMORY MANAGEMENT**12**

Background – Swapping - Contiguous Memory Allocation - Paging - Segmentation – Segmentation with paging - Virtual Memory: Demand paging - Page Replacement - Thrashing.

UNIT IV FILE SYSTEMS**12**

File Concepts - Access methods - Directory Structure - File Protection - File System Implementation: File System Structure and Implementation – Directory Implementation – Allocation methods Free Space Management – Recovery – Disk Structure – Disk Scheduling.

UNIT V DISTRIBUTED OPERATING SYSTEM**12**

Design issues in distributed operating system-Distributed file systems - Naming and Transparency-Remote File Access-Stateful versus Stateless service – Distributed Coordination-Event Ordering-Mutual Exclusion- Atomicity- Concurrency Control- Deadlock Handling-Election Algorithms-Case Study-Linux.

TOTAL : 60

REFERENCE BOOKS

- Silberschatz, Galvin, Gagne, “Operating System Concepts” 9th Edition, 2012.
- Pradeep K.Sinha, “Distributed OS concepts and Design”, IEEE computer Society Press, 1998.
- Andrew S. Tanenbaum , “Modern Operating Systems”, 3rd Edition, PHI, 2007.
- Achut S. Godbole and Kahate Atul, “Operating Systems and Systems Programming”, Tata Mcgraw Hill, 3rd Edition, 2010.
- Charles Crowley, “Operating systems: A Design Oriented Approach”, Tata McGraw Hill, 2001.

PIT205

SOFTWARE ENGINEERING LAB

0 0 3 2

PIT205	SOFTWARE ENGINEERING LAB	2 Credits
GOAL	To give a practical knowledge about software development and testing	
OBJECTIVES		OUTCOME
The course should enable the student : <ul style="list-style-type: none"> •1 To understand the practical difficulties for developing software. •1 To understand the applications of software. •1 To understand the various principles of software testing. 		The students should be able to: <ul style="list-style-type: none"> •1 Develop small application software easily. •2 Apply the testing methods in software development. •1 Be aware of software design and it applications.

List of Experiments

1. Prepare the following documents for two or three of the experiments listed below and develop the software engineering methodology.
2. Program Analysis and Project Planning.
3. Thorough study of the problem – Identify project scope, Objectives, Infrastructure.
4. Software requirement Analysis
5. Describe the individual Phases / Modules of the project, Identify deliverables.
6. Data Modeling
7. Use work products – Data dictionary, Use diagrams and activity diagrams, build and test lass diagrams, Sequence diagrams and add interface to class diagrams.
8. Software Development and Debugging
9. Software Testing
10. Prepare test plan, perform validation testing, Coverage analysis, memory leaks, develop test case hierarchy, Site check and Site monitor.

PIT206	ADVANCED OPERATING SYSTEM LAB	2 Credits
GOAL	To have a thorough knowledge of processes, scheduling concepts, memory management, I/O and file systems in an operating system	
OBJECTIVES		OUTCOME
The course should enable the student : <ul style="list-style-type: none"> •1 To know the components of an operating system. •2 To have a thorough knowledge of process management •3 To have a thorough knowledge of storage management •2 To know the concepts of I/O and file systems. 		The students should be able to: <ul style="list-style-type: none"> •2 Understand the process management •3 Understand the concept of Storage management •4 Understand the concept of file systems

List of Experiments

1. Implement the following CPU Scheduling Algorithms.
i) FCFS ii) Round Robin iii) Shortest Job First
2. Implement the Mutual Exclusion Problem Using Dekker's Algorithm.
3. Implement Inter Process Communication Problem (Producer-Consumer / Reader- Writer Problem) Using Semaphores.
4. Implement Best fit, First Fit Algorithm for Memory Management.
5. Implement Memory Allocation with Pages.
6. Implement FIFO page Replacement Algorithm.
7. Implement LRU page Replacement Algorithm.
8. Implement the creation of Shared memory Segment.
9. Implement File Locking.
10. Implement Banker's algorithm.

ELECTIVE - I

PIT702 DATA WAREHOUSING AND DATA MINING 3 0 0 3

PIT702	DATA WAREHOUSING AND DATA MINING	3 Credits
GOAL	To understand the fundamentals of data mining functionalities and its application in various business and social domains.	
OBJECTIVES		OUTCOMES
<p>The course should enable the student to learn</p> <ul style="list-style-type: none"> •1 Data warehousing components and data models for big data. •2 the fundamentals of data mining and its functionalities •3 Issues regarding classification and prediction. •4 Concepts of cluster and cluster analysis. •5 Application of data mining in different domains. 		<p>The student should be able to</p> <ul style="list-style-type: none"> •1 Develop data warehousing and big data models. •2 Apply principles of data mining techniques in problem solving. •3 Demonstrate data mining in various 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, 3rd Revised Edition 2011.
- 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.

ELECTIVE - II

PIT709 MACHINE LEARNING 3 0 0 3

PIT709	MACHINE LEARNING	3 Credits
GOAL	To study the concepts of Machine Learning.	
OBJECTIVES		OUTCOME
The course should enable the students to: <ul style="list-style-type: none">•1 Learn the concepts of Machine learning.•2 Understand the artificial neural networks.•3 Study about learning process.•4 Learn about algorithms used.•5 Understand about Genetic Algorithm.		The student should be able to <ul style="list-style-type: none">• Understand the machine learning concepts• Understands the concepts of artificial neural networks.• Use the learning models.• Use the algorithms.• Understands Genetic Algorithm.

UNIT I INTRODUCTION

Learning Problems – Designing learning system – Perspectives and issues in learning system – concept learning – concept learning as search – Decision Tree learning.

UNIT II ARTIFICIAL NEURAL NETWORKS

Introduction – Neural Networks representations- perceptions – Back propagation problems – Advanced topics in ANN – Hypotheses.

UNIT III LEARNING

Bayesian Learning – Maximum likelihood – Gibbs Algorithm – EM Algorithm – Computational Learning theory – Complexity of Finite and Infinite Hypothesis spaces.

UNIT IV INSTANCE AND REINFORCEMENT ALGORITHM

k – Nearest neighbor learning – locally weighted regression – Case based reasoning – Learning sets of rules – First order rules – Reinforcement learning – Q learning.

UNIT V GENETIC ALGORITHMS

Genetic algorithms – Hypothesis space searching – Genetic programming- Evolution and learning – Analytical learning – Inductive and Deductive learning.

REFERENCES

- Mitchell, Tom. Machine Learning. New York, NY: McGraw-Hill, 1997.
- Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995.
- Duda, Richard, Peter Hart, and David Stork. Pattern Classification. 2nd ed. New York, NY: Wiley-Interscience, 2000.
- Hastie, T., R. Tibshirani, and J. H. Friedman. The Elements of Statistical Learning: Data Mining, Inference and Prediction. New York, NY: Springer, 2001.
- MacKay, David. Information Theory, Inference, and Learning Algorithms. Cambridge, UK: Cambridge University Press, 2003.
- Ethem Alpaydin, Introduction To Machine Learning 2 Edition, MIT, 2010
- Richard Sutton and Andrew Barto, Reinforcement Learning: An introduction. MIT Press,

1998.

ELECTIVE - III

PIT718 BUSINESS INTELLIGENCE 3 0 0 3

PIT718	BUSINESS INTELLIGENCE	3 Credits
Goal	To provide wide knowledge in Business Intelligence.	
OBJECTIVES		OUTCOME
The course should enable the students to: <ul style="list-style-type: none"> •1 Learn the concepts of Business Intelligence. •2 Learn the business data management. •3 Learns the handling of real time data. •4 Learn the implementation of BI. •5 Learn the case studies of IBM COGNOS. 		The student should be able to <ul style="list-style-type: none"> • Design the various models and architectures of BI. • Manage business data. • Differentiate Real time data in BI • Implement BI. • Work on IBM COGNOS.

UNIT I INTRODUCTION TO BI 9

Business Intelligence: Introduction and models- BI architectures- Agile development - BI life cycle- Requirement gathering- Deployment- Environment and risk.

UNIT II BUSINESS DATA MANAGEMENT 9

Business Performance Management- The role of enterprise performance management- EPM life cycle and methodology- tools- deployment and maintenance.

UNIT III REAL TIME DATA 9

Real-time BI- unstructured data- the enterprise data warehouse and change- the data life cycle- time variance of data.

UNIT IV BUSINESS INTELLIGENCE IMPLEMENTATION 9

Implementing BI – Integration – Connecting BI systems to Databases and other Enterprise Systems –Ondemand BI – Issues of legality, privacy and ethics – the futures of BI.

UNIT V IBM COGNOS CASE STUDIES 9

IBM Cognos BI tools - Creating analytic content- reports and dashboards- case studies in retail and financial applications

REFERENCE BOOKS

- 1 Efraim Turban, Ramesh Sharda, Jay E. Aronson, David King, “Business Intelligence, A Managerial Approach” , 2nd edition, Pearson education.
- 2 Dean Browne, Brecht Desmeijter, Rodrigo Frealdo Dumont, Armin Kamal, John Leahy, Scott Masson, Ksenija Rusak, Shinsuke Yamamoto, Martin Kee, IBM Cognos Business Intelligence, IBM Redbook Publication, 2010.
- 3 Howard Dresner , “The Performance Management Revolution: Business Results Through

- Insight and Action” , Wiley 2007.
- 4 Cindi Howson, “Successful Business Intelligence: Secrets to Making BI a Killer App”, McGraw-Hill,2008.
 - 5 Swain Scheps,” Business Intelligence For Dummies”, Wiley Publishing Inc., 2007.

ELECTIVE – IV

PCE710 CLOUD COMPUTING

3 0 0 3

PCE710	CLOUD COMPUTING	3 Credits
GOAL	To provide an introduction to cloud computing and its techniques.	
OBJECTIVES	OUTCOMES	
<p>The student should be able to learn</p> <ul style="list-style-type: none"> •1 Fundamental concepts of cloud. •2 Different types of services of cloud. •3 Cloud computing environment. •4 Scheduling over cloud. •5 Various collaboration methods. 	<p>The student should be able to</p> <ul style="list-style-type: none"> •1 Analyze the concepts in cloud architecture. •2 Identify the importance of web services. •3 Create cloud community environment. •4 Use the cloud computing for various services. •5 Develop new concepts 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 Rajkumar Buyya, James Broberg, Andrej M.Goscinski, “Cloud Computing : Principles and Paradigms” Wiley, 2011.
- 2 Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.
- 3 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.

ELECTIVE V

PIT732

BIG DATA ANALYTICS

3 0 0 3

PIT732	BIG DATA ANALYTICS	3 Credits
GOAL	To study the concepts of Big Data Analytics.	
OBJECTIVES	OUTCOME	
The course should enable the students to: <ul style="list-style-type: none"> • Learn the concepts of Big Data. • Understands the MapReduce. • Learn MapReduce Programming. • Learn HBase. • Learn the tools. 	The student should be able to <ul style="list-style-type: none"> • Develop the Big Data concepts. • Design the architecture of MapReduce. • Write MapReduce programs. • Work in HBase. • Work in tools. 	

UNIT I INTRODUCTION TO BIGDATA

9

Big data – 3Vs - Analytics with BigSheets - Data at rest analytics - Data in motion, real-time analytics – Bigdata Analytics in Industry verticals.

UNIT II MAPREDUCE

9

Introduction - Traditional Systems - Why Big Data - Why Hadoop - Hadoop Basic Concepts/Fundamentals - Hadoop in the Enterprise - Where Hadoop Fits in the Enterprise- Architecture - Hadoop Architecture - Building Blocks – HDFS – MapReduce - MapR Hadoop CLI –

UNIT III MAPREDUCE PROGRAMMING

9

Fundamentals - Anatomy of MapReduce Job Run - Job Scheduling - Sample Code –Hadoop - API - MapReduce Formats - Input Formats - MapReduce Features - Counters, Map Side Join - Reduce Side Join - MapReduce Algorithms -Input Formats

UNIT IV HBase

9

Introduction to HBase - HBase Concepts - The HBase Administration API - Accessing Data with the HBase - HBase Architecture - Schema Design in HBase

UNIT V OTHER TOOLS

9

Hive- Installing Hive - An Example - Running Hive – ZooKeeper – Sqoop.

TOTAL : 45

REFERENCE BOOKS

- Bill Schmarzo, “Big Data : Understanding How Data Powers Big Business”, Wiley, 2013
- Tom White, “Hadoop: The Definitive Guide”, O'Reilly Media, 3rd Edition, October 2012.
- The Apache HBase HandBook Online : <http://hbase.apache.org/book.html>