



**HINDUSTAN  
UNIVERSITY**

HINDUSTAN INSTITUTE OF TECHNOLOGY & SCIENCE

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

Padur, Kancheepuram District - 603 103.

**DEPARTMENT OF  
INFORMATION TECHNOLOGY**

**REGULATIONS, CURRICULUM  
AND SYLLABUS  
2013**

**M.Tech.  
INFORMATION TECHNOLOGY**



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

**1. Vision, Mission and Objectives**

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

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

**1.2 Further, the institute always strives**

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

**1.3 Our aims and objectives are focused on**

- Providing world class education in engineering, technology, applied science and management.

- Keeping pace with the ever changing technological scenario to help our students to gain proper direction to emerge as competent professionals fully aware of their commitment to the society and nation.
- To inculcate a flair for research, development and entrepreneurship.

**2. Admission**

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

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

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

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

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

**3. Structure of the programme**

**3.1** The programme of instruction will have the following structure

- i) Core courses of Engineering / Technology / Management.
- ii) Elective courses for specialization in areas of student's choice

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

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

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

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

- One credit for each lecture hour per week per semester
- One credit for each tutorial hour per week per semester

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

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

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

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

**4. Faculty Advisor**

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

**5. Class Committee**

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

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

- (ii) All subject teachers of the class.
- (iii) Two students nominated by the department in consultation with the class.

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

The functions of the Class Committee will include:

- (i) Addressing problems experienced by students in the classroom and the laboratories.
- (ii) Analyzing the performance of the students of the class after each test and finding ways and means of addressing problems, if any.
- (iii) During the meetings, the student members shall express the opinions and suggestions of the class students to improve the teaching / learning process.

## 6. Grading

6.1 A grading system as below will be adhered to.

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

## 6.2 GPA & CGPA

GPA is the ratio of the sum of the product of the number of credits  $C_i$  of course "i" and the grade points  $P_i$  earned for that course taken over all courses "i" registered by the student to the sum of  $C_i$  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 Director (Academic).

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

**13.3** As an incentive to those students who are involved in extra curricular activities such as representing the University in Sports and Games, Cultural Festivals, and Technical Festivals, NCC/ NSS events, a relaxation of up to 10% attendance will be given subject to the

condition that these students take prior approval from the officer-in-charge. All such applications should be recommended by the concerned HOD and forwarded to Director (Academic) within seven instructional days after the programme/activity.

**14. Assessment Procedure**

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

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

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

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

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

- (i) Weekly assignment/Observation note book / lab records - weightage 60%.
- (ii) End semester examination of 3 hours duration including viva - weightage 40%

**15. Make up Examination/model examination**

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

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

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

**16. Project evaluation**

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

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

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

**17. Declaration of results**

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

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

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

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



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

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

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

## **18. Grade Card**

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

- (i) Program and branch for which the student has enrolled.
- (ii) Semester of registration.
- (iii) List of courses registered during the semester and the grade scored.
- (iv) Semester Grade Point Average (GPA)
- (v) Cumulative Grade Point Average (CGPA).

## **19. Class / Division**

**19.1** Classification is based on CGPA and is as follows:

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

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

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

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

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

<b>Program</b>	<b>No. of Semesters</b>
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 INFORMATION TECHNOLOGY  
M.Tech (INFORMATION TECHNOLOGY)**

**SEMESTER I**

Sl. No.	Course	Course Title	L	T	P	C	TCH
<b>Theory</b>							
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
<b>Practical</b>							
7	PCE104	Advanced Data Structures and Algorithms Lab	0	0	3	2	3
8	PIT103	Internet Programming Lab	0	0	3	2	3
		<b>Total</b>	<b>24</b>	<b>0</b>	<b>6</b>	<b>28</b>	<b>30</b>

**SEMESTER II**

S.No	Course	Course Title	L	T	P	C	TCH
<b>Theory</b>							
1	PIT201	Software Engineering	4	0	0	4	4
2	PIT202	Object Oriented System and 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
<b>Practical</b>							
7	PIT205	Software Engineering Lab	0	0	3	2	3
8	PIT206	Advanced Operating Systems Lab	0	0	3	2	3
		<b>Total</b>	<b>22</b>	<b>0</b>	<b>6</b>	<b>26</b>	<b>28</b>

**SEMESTER III**

S.No	Course	Course Title	L	T	P	C	TCH
<b>Theory</b>							
1	—	Elective-III	3	0	0	3	3
2	—	Elective-IV	3	0	0	3	3
3	—	Elective-V	3	0	0	3	3
<b>Practical</b>							
4	PIT301	Project Phase I	0	0	12	6	12
		<b>Total</b>	<b>9</b>	<b>0</b>	<b>12</b>	<b>15</b>	<b>21</b>

**SEMESTER IV**

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

### LIST OF ELECTIVES

S.No	Course	Course Title	L	T	P	C	TCH
1	PIT701	Compiler Design	3	0	0	3	3
2	PIT702	Theory of Computation	3	0	0	3	3
3	PIT703	Soft Computing Techniques	3	0	0	3	3
4	PIT704	Distributed Computing	3	0	0	3	3
5	PIT705	Multimedia Systems	3	0	0	3	3
6	PIT706	Bioinformatics	3	0	0	3	3
7	PIT707	Software Quality Assurance	3	0	0	3	3
8	PIT708	Agent Based Intelligent Systems	3	0	0	3	3
9	PIT709	Software Project Management	3	0	0	3	3
10	PIT710	High Speed Networks	3	0	0	3	3
11	PIT711	Wireless Communication Engineering	3	0	0	3	3
12	PIT712	Network Security	3	0	0	3	3
13	PIT713	Embedded Systems	3	0	0	3	3
14	PIT714	Digital Imaging	3	0	0	3	3
15	PIT715	Data Warehousing and Data Mining	3	0	0	3	3
16	PIT716	Cyber Crime & Security	3	0	0	3	3
17	PIT717	Information System Design	3	0	0	3	3
18	PCE709	Adhoc and Sensor Networks	3	0	0	3	3
19	PCE710	Cloud Computing	3	0	0	3	3

**TOTAL CREDITS : 81**

**SEMESTER I**  
**PIT101 ADVANCED DATA COMMUNICATIONS**

**4 Credits**

**GOAL**

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

**OBJECTIVES**

The course should enable the students to:

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

**OUTCOMES**

The student should be able to

- 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 - need for a protocol architecture - TCP/IP protocol architecture - 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.
4. William Stallings - Data and Computer Communications, 9th Ed., Pearson Education.
5. Andrew S. Tanenbaum - Computer Networks, 4th Ed., Pearson Education.

**PIT102 INTERNET PROGRAMMING**

**4 Credits**

**GOAL**

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

**OBJECTIVES**

The students should able to learn

- The basics of Internet architecture and basics of web designing
- Style sheets and client side scripting.
- Web databases and connectivity.
- Server Side Programming.
- PHP programming.

**OUTCOME**

The student should be able to

- 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**

1. Deitel, Deitel and Neito, "Internet and World Wide Web - How to program", Pearson Education Asia, 4th Edition, 2009.
2. Elliotte Rusty Herold, "Java Network Programming", O'Reilly Publications, 3rd Edition, 2004.
3. Jeffy Dwight, Michael Erwin and Robert Nikes "USING CGI", PHI Publications, 1997.



4. Jason Hunter, William Crawford "Java Servlet Programming" O'Reilly Publications, 2nd Edition, 2001.
5. Eric Ladd and Jim O'Donnell, et al, "USING HTML 4, XML, and JAVA1.2", Prentice Hall, 2003.
6. Bruce Lawson and Remy Sharp, "Introducing HTML5", New Riders, Second Edition, 2012.

## **PCE101 ADVANCED DATA STRUCTURES AND ALGORITHMS**

**4 Credits**

### **GOAL**

To study advanced representations in Data structures and algorithms, design techniques.

### **OBJECTIVES**

The course should enable the students to:

- Learn about the time complexity of algorithms.
- Understand the representations used in heap data structures
- Learn the different types of search structures.
- Study various algorithm design techniques
- Learn the advanced data structures.

### **OUTCOMES**

The student should be able to

- Calculate the time complexity of algorithms and express it using appropriate notations
- Compare and implement the different types of heap structures and search structures.
- Implement the applications of heap and search structures in computer science
- 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 - 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**

1. E. Horowitz, S.Sahni and Dinesh Mehta, Fundamentals of Data structures in C++, Uiversity Press, 2007.
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", Second Edition, Pearson Education, Asia.1994
4. Jean-Paul Tremblay, Paul .G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hill second edition , 1991.
5. Thomas .H. Cormen, Charles .E. Leiserson, Ronald .L. Rivest, "Introduction to Algorithms", PHI 1998.

**PCE102 ADVANCED COMPUTER ARCHITECTURE****4 Credits****GOAL**

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

**OBJECTIVES**

The course should enable the students to:

- Learn the parallel computer models.
- Understand the processor technology and memory organizations.
- Learn pipeline design techniques.
- Learn the various parallel and scalable architectures.
- Understand the multithreaded and data flow computing architectures.

## OUTCOMES

The student should be able to

- Identify and understand the parallel computer models.
- Have thorough knowledge about the types of processors and memory hierarchy.
- Design various pipeline architectures.
- Design parallel and scalable architectures.
- 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, 1993.
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

4 Credits

### GOAL

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

### OBJECTIVES

The course should enable the students to:

- 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.

### OUTCOME

The student should be able to

- 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 - 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", 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.

## 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

The course should enable the students to:

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

## OUTCOME

The students should be able to:

- Verify whether a given function is a probability mass or density function. Apply the discrete and continuous distributions for solving practical problems. Evaluate the moments of the distributions using moment generating function. Evaluate the probability using marginal and conditional distributions.
- 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.
- 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.
- Apply simulation techniques to generate random numbers and solves queuing problems.
- Use Kruskal and prim's algorithm to find the minimal spanning tree of a graph. Evaluate 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.

## PCE104 ADVANCED DATA STRUCTURES AND ALGORITHMS LAB

2 Credits

### GOAL

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

### OBJECTIVES

The course should enable the students to

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

### OUTCOME

The student should be able to:

- Use the appropriate data structures for applications in computer science.
- Understand the applications of heap and search structures in computer science.
- 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 Internet Technologies

#### **OBJECTIVES**

The course should enable the students to:

- 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

#### **OUTCOME**

The student should be able to

- 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 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**  
**PIT201 SOFTWARE ENGINEERING**

**4 Credits**

**GOAL**

To give a knowledge for maintaining ,developing and testing a software.

**OBJECTIVES**

The course should enable the student to :

- Learn about the process model, cost estimation and planning.
- Learn the various analysis models.
- Learn about design and its models.
- 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.

**OUTCOME**

The students should be able to:

- Develop the software based on life cycle model.
- Apply the testing strategies in software.
- Be aware of estimating software cost and maintenance.
- 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, 6th Edition, McGraw Hill, 2005.
2. I.Sommerville, Software Engineering, 5th Edition: Addison Wesley, 1996.
3. Pankaj Jalote- An Integrated Approach to Software Engineering, Springer Verlag, 1997.
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 AND DESIGN**

**4 Credits**

#### **GOAL**

To understand the concepts of object oriented analysis and design.

#### **OBJECTIVES**

The course should enable the student to :

- Understand the object oriented life cycle.
- Know how to identify objects, relationships, services and attributes through UML.
- Understand the use-case diagrams.
- Know the Object Oriented Design process.
- Know about software quality and usability.

#### **OUTCOME**

The students should be able to:

- Approach new complex software development with confidence
- Capture requirements through the utilization of Use Cases

- Utilize the UML diagrams that "best fit" in an organization
- Implement the software based on the design
- 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 Credits

### GOAL

To provide the concepts for various techniques in Mobile Communications and Mobile content services.

### OBJECTIVES

The course should enable the student to :

- Learn the Wireless voice and data communications technologies.
- Study the working knowledge on various telephone and satellite networks.
- Study the working principles of wireless LAN and its standards.
- Build knowledge on various Mobile Computing algorithms.
- Build skills in working with Wireless application and ad hoc routing protocols.

### OUTCOME

The students should be able to:

- Understand the frequency spectrum and its applications.
- Understand the wireless network concepts(GSM,GPRS)
- Understand the various types of broadcasting techniques.
- Implement Understand the various wireless protocol applications.
- Develop mobile content applications using various adhoc routing protocols.

### 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**

1. J.Schiller, Mobile Communication, Addison Wesley, 2000.
2. C. Siva Ram Murthy and B.S. Manoj "Ad Hoc Wireless Networks: Architectures and Protocols", Prentice Hall PTR,2004.
3. William Stallings, Wireless Communication and Networks, Pearson Education, 2003.
4. Singhal, WAP-Wireless Application Protocol, Pearson Education, 2003.
5. Lothar Merk, Martin. S. Nicklaus and Thomas Stober, Principles of Mobile Computing, Second Edition, Springer, 2003.
6. William C.Y.Lee, Mobile Communication Design Fundamentals, John Wiley, 1993.

**PIT204 ADVANCED OPERATING SYSTEM****4 Credits****GOAL**

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

**OBJECTIVES**

The course should enable the students to:

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

**OUTCOME**

The student should be able to

- Design distributed operating system.
- Detect, prevent and avoid the deadlocks in distributed environment.
- Explain the need for load distribution and the corresponding techniques.

- Design security mechanisms for distributed operating system.
- 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 - Lamport's logical clocks - vector clocks - causal 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, Niranjana G. 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 .

## PIT205 SOFTWARE ENGINEERING LAB

2 Credits

### GOAL

To give a practical knowledge about software development and testing

### OBJECTIVES

The course should enable the student to :

- Understand the practical difficulties for developing software.
- Understand the applications of software.
- Understand the various principles of software testing.

### OUTCOME

The students should be able to:

- Develop small application software easily.
- Apply the testing methods in software development.
- Be aware of software design and its 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 class 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 design and implement distributed operating systems.

#### **OBJECTIVES**

This course should enable the students to:

- Implement Semaphores.
- Implement Multithreading concepts.
- Develop Network Operating System
- Develop Real Time Operating System
- Develop Database Operating System.

#### **OUTCOME**

The students should be able to:

- 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

## LIST OF ELECTIVES

### PIT701 COMPILER DESIGN

3 Credits

#### GOAL

To provide exposure to the concepts of various Compilers and their design.

#### OBJECTIVES

The course should enable the student to :

- Understand the basic concepts of a compiler.
- Learn about the various phases in compiler construction.
- Learn about the various construction tools.
- Understand optimization of codes and runtime environment.

#### OUTCOME

The students should be able to:

- Implement a parser.
- Design a simple code generator.
- Develop a simple compiler.
- Generate lexical analyzer by using a tool.

#### UNIT I INTRODUCTION

9

Basic concepts - Grammar - Language - Parts of a compiler - Grouping of phases - Compiler construction tools.

#### UNIT II LEXICAL ANALYZER

9

Role of a lexical analyzer - Input buffering - Specification and recognition of tokens - Finite automata - Regular expression to finite automation - Optimization of DFA-based pattern matchers-Use of a tool for generating lexical analyzer.

#### UNIT III SYNTAX ANALYZER

9

Role of a parser - Context-free grammars - Top-down parsing - Bottom-up parsing - Use of a tool to generate parsers.

#### UNIT IV INTERMEDIATE CODE GENERATION

9

Intermediate languages - Declaration - Assignment statements - Boolean expressions - Flow control statements -Back patching.

## **UNIT V CODE GENERATION**

**9**

Introduction to optimization techniques - Issues in the design of a code generator - Run-time storage management - Design of a simple code generator.

**TOTAL : 45**

### **REFERENCE BOOKS**

1. A.V. Aho, Ravi Sethi, J.D. Ullman, Compilers - Principles, Techniques and Tools, Addison-Wesley, 1988.
2. Fischer Leblanc, Crafting Compiler, Benjamin Cummings, Menlo Park, 1988.
3. Kenneth C.Louden, Compiler Construction Principles and Practice, Vikas publishing House, 2003.
4. Allen I. Holub, Compiler Design in C, Prentice Hall of India, 2001.

## **PIT702 THEORY OF COMPUTATION**

**3 Credits**

### **GOAL**

To learn about the concepts of Finite automata, Context free languages and problems.

### **OBJECTIVES**

The course should enable the student to:

- Provide exposure to Finite automata and Regular Expressions .
- Study the concepts of Push down Automata and Turing Machine.

### **OUTCOME**

The students should be able to:

- Understand Automata and Turing Machine

## **UNIT I FINITE AUTOMATA AND REGULAR LANGUAGES**

**9**

Finite Automata and Regular languages - Regular expressions and Regular languages -non determinism and Kleenes theorem, Equivalence of DFA and NFA, Finite Automation with e-moves, equivalence of regular expression and NFA with e-moves - pumping lemma for regular sets.

## **UNIT II CONTEXT FREE LANGUAGES**

**9**

Context free languages, Derivation and languages, Relationship between derivation and derivation trees, Simplification of context free grammars - Normal forms for context free grammars, CNF, and GNF.

## **UNIT III PUSH DOWN AUTOMATA (PDA)**

**9**

Acceptance by PDA, Pushdown automata and Context free languages, Pumping lemma for CFL, deterministic Context free languages and Deterministic pushdown automata.

**UNIT IV TURING MACHINE****9**

Context sensitive languages and LBA, Turing machine (Definition and examples), Computable languages and functions, Church Turing hypothesis, Universal Turing machine, P and NP problems, NP-complete.

**UNIT V UNSOLVABLE PROBLEMS****9**

Unsolvability problems - Rice Theorem - Post's correspondence Problem, Recursive and recursively enumerable languages.

**TOTAL : 45****REFERENCE BOOKS**

1. Hopcroft and Ullman, Introduction to Automata, Languages and Computation, Narosa Publishers, 2nd Edition, 2000
2. A.M.Natarajan, A. Tamilarasi & P.Balasubramani, "Theory of Computation" New age International publishers, 2002
3. John.C.Martin, Introduction to languages and the Theory of Computation, 2nd Edition, McGraw Hill, 1997
4. K.L.P.Mishra, N.Chandrasekaran, Theory of Computation, EEE, Prentice Hall of India, 2nd Edition, 1998.
5. Peter Linz, "An Introduction to formal languages and Automata, Narosa Publishing House, 2001.
6. Harry R. Lewis, Christos H. Papadimitriou, "Elements of Theory of Computation, Prentice Hall, 2002.

**PIT703 SOFT COMPUTING TECHNIQUES****3 Credits****GOAL**

To provide exposure to Fuzzy logic, optimization and Neural Networks.

**OBJECTIVES**

The course should enable the student to :

- Introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience
- Become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems
- Provide the mathematical background for carrying out the optimization associated with neural network learning
- Familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations

## OUTCOME

The students should be able to:

- Know the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience
- Understand on neural networks and its applications
- Understand the genetic algorithms

### UNIT I ARTIFICIAL NEURAL NETWORKS 9

Basic concepts-single layer perceptron-Multi layer perceptron-Adaline-Madaline-Learning rules-Supervised learning-Back propagation networks-Training algorithm, Practical difficulties, Advanced algorithms-Adaptive network- Radial basis network-modular network-Applications

### UNIT II UNSUPERVISED NETWORKS 9

Introduction- unsupervised learning -Competitive learning networks-Kohonen self organising networks-Learning vector quantisation - Hebbian learning - Hopfield network-Content addressable nature, Binary Hopfield network, Continuous Hopfield network Travelling Salesperson problem - Adaptive resonance theory -Bidirectional Associative Memory-Principle component Analysis

### UNIT III FUZZY SYSTEMS 9

Fuzzy sets-Fuzzy rules: Extension principle, Fuzzy relation- fuzzy reasoning - fuzzy inference systems: Mamdani model, Sugeno model. Tsukamoto model -Fuzzy decision making- Multiobjective Decision Making,-Fuzzy classification-Fuzzy control methods -Application

### UNIT IV NEURO-FUZZY MODELLING 9

Adaptive Neuro Fuzzy based inference systems - classification and regression trees: decision tress, Cart algorithm - Data clustering algorithms: K means clustering, Fuzzy C means clustering, Mountain clustering, Subtractive clustering - rule base structure identification - Neuro fuzzy control: Feedback Control Systems, Expert Control, Inverse Learning, Specialized Learning, Back propagation through Real -Time Recurrent Learning.

### UNIT V GENETIC ALGORITHM 9

Fundamentals of genetic algorithm-Mathematical foundations-Genetic modeling-Survival of the fittest-crossover-Inversion and Deletion-mutation-reproduction-Generational cycle-rank method-rank space method- Other derivative free optimization-simulated annealing, Random search, Downhill simplex search-Application.

**TOTAL : 45**

## REFERENCE BOOKS

1. Jang J.S.R.,Sun C.T and Mizutani E - "Neuro Fuzzy and Soft computing", Pearson education (Singapore) 2004
2. David E.Goldberg : "Genetic Algorithms in Search, Optimization, and Machine Learning", Pearson Education, Asia, 1996

3. Laurene Fauseett:"Fundamentals of Neural Networks", Prentice Hall India, New Delhi, 1994.
4. Timothy J.Ross:"Fuzzy Logic Engineering Applications", McGrawHill, NewYork, 1997.
5. S.Rajasekaran and G.A.Vijayalakshmi Pai "Neural networks,Fuzzy logics,and Genetic algorithms", Prentice Hall of India,2003
6. George J.Klir and Bo Yuan,"Fuzzy Sets and Fuzzy Logic",Prentice Hall Inc., New Jersey,1995

### **PIT704 DISTRIBUTED COMPUTING**

**3 Credits**

#### **GOAL**

To learn the concepts of Distributed Objects and Computing, Operating System Issues and Distributed Transaction Management.

#### **OBJECTIVES**

The course should enable the student to:

- Study the concepts and models of distributed systems.
- Study the various processes and distributed objects.
- Learn about the various issues of operating system.
- Study the concepts of distributed transaction management.

#### **OUTCOME**

The students should be able to:

- Analyze the issues in distributed system.
- Compare the various networks.
- Understand distributed transaction processing.

#### **UNIT I INTRODUCTION**

**9**

Characterization of Distributed Systems - Examples - Resource Sharing and the Web - Challenges - System Models - Architectural and Fundamental Models - Networking and Internetworking - Types of Networks - Network Principles - Internet Protocols - Case Studies.

#### **UNIT II PROCESSES AND DISTRIBUTED OBJECTS**

**9**

Interprocess Communication - The API for the Internet Protocols - External Data Representation and Marshalling - Client-Server Communication - Group Communication - Case Study - Distributed Objects and Remote Invocation - Communication Between Distributed Objects - Remote Procedure Call - Events and Notifications - Java RMI - Case Study.

#### **UNIT III OPERATING SYSTEM ISSUES - I**

**9**

The OS Layer - Protection - Processes and Threads - Communication and Invocation - OS Architecture

- Security - Overview - Cryptographic Algorithms - Digital Signatures - Cryptography Pragmatics - Case Studies - Distributed File Systems - File Service Architecture - Sun Network File System - The Andrew File System

**UNIT IV OPERATING SYSTEM ISSUES - II** **9**

Name Services -Domain Name System - Directory and Discovery Services - Global Name Service - X.500 Directory Service - Clocks, Events and Process States - Synchronizing Physical Clocks - Logical Time And Logical Clocks - Global States - Distributed Debugging - Distributed Mutual Exclusion - Elections - Multicast Communication Related Problems.

**UNIT V DISTRIBUTED TRANSACTION PROCESSING** **9**

Transactions - Nested Transactions - Locks - Optimistic Concurrency Control - Timestamp Ordering - Comparison - Flat and Nested Distributed Transactions - Atomic Commit Protocols - Concurrency Control in Distributed Transactions - Distributed Deadlocks - Transaction Recovery - Overview of Replication And Distributed Multimedia Systems.

**TOTAL : 45**

**REFERENCE BOOKS**

1. George Coulouris, Jean Dollimore and Tim Kindberg, Distributed Systems Concepts and Design, Pearson Education, 3rd Edition, 2002.
2. Sape Mullender, Distributed Systems, Addison Wesley, 2nd Edition, 1993.
3. Albert Fleishman, Distribute Systems- Software Design and Implementation, Springer-Verlag, 1994
4. M.L.Liu, Distributed Computing Principles and Applications, Pearson Education, 2004.
5. Andrew S Tanenbaum , Maartenvan Steen,Distibuted Systems -Principles and Pardigms,Pearson Education, 2002
6. Mugesh Singhal,Niranjan G Shivaratri,Advanced Concepts in Operating Systems,Tata McGraw Hill Edition, 2001.

**PIT705 MULTIMEDIA SYSTEMS**

**3 Credits**

**GOAL**

To learn about Multimedia Systems, storage and Communication.

**OBJECTIVES**

The course should enable the student to :

- Study the concepts of multimedia systems.
- Learn about communication and synchronization concepts of multimedia systems.

## OUTCOME

The students should be able to:

- Understand the concepts of multimedia systems.
- Learn the communication and synchronization concepts of multimedia systems.

### **UNIT I INTRODUCTION AND QOS 9**

Introduction-QOS Requirements and Constraints-Concepts-Resources- Establishment Phase-Run-Time Phase-Management Architectures.

### **UNIT II OPERATING SYSTEMS 9**

Real-Time Processing-Scheduling-Interprocess Communication-Memory and Management-Server Architecture-Disk Management.

### **UNIT III FILE SYSTEMS AND NETWORKS 9**

Traditional and Multimedia File Systems-Caching Policy-Batching-Piggy backing-Ethernet-Gigabit Ethernet-Token Ring-100VG AnyLAN-Fiber Distributed Data Interface (FDDI)- ATM Networks-MAN-WAN.

### **UNIT IV COMMUNICATION 9**

Transport Subsystem-Protocol Support for QOS-Transport of Multimedia-Computer Supported Cooperative Work-Architecture-Session Management-MBone Applications.

### **UNIT V SYNCHRONIZATION 9**

Synchronization in Multimedia Systems-Presentation-Synchronization Types-Multimedia Synchronization Methods-Case Studies-MHEG-MODE-ACME.

**TOTAL : 45**

## REFERENCE BOOKS

1. Ralf Steinmetz and Klara Nahrstedt, "Multimedia Systems", Springer, I Edition 2004.
2. Ralf Steinmetz and Klara Nahrstedt, Media Coding and Content Processing, Prentice hall, 2002.
3. Vaughan T, Multimedia, Tata McGraw Hill, 1999.
4. Mark J.B., Sandra K.M., Multimedia Applications Development using DVI technology, McGraw Hill, 1992.
5. K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovacovic, D. A. Milovacovic, Multimedia Communication Systems: Techniques, Standards, and Networks, Prentice Hall, 1st Edition, 2002
6. Ze-Nian Li and Mark S. Drew, Fundamentals of Multimedia, Pearson, 2004.



## PIT706 BIOINFORMATICS

3 Credits

### GOAL

The course is to expose the bioinformatics processing, bio computational techniques and bio informatics tools.

### OBJECTIVES

The course should enable the student to:

- Study the basic aspects of the biological patterns
- Study Biological pattern matching
- Use the archives and information retrieval strategies
- Learn the approaches to sequence alignments
- Study the issues in proteins and drug discovery.

### OUTCOME

The students should be able to:

- Understand the genome architectures
- Know how to IT integrate with biotechnology.
- Gain working knowledge on bioinformatics tools.

### UNIT I INTRODUCTION

9

The Central Dogma - Killer Application - Parallel Universes - Watson's Definition - Top Down Vs Bottom Up Approach - Information Flow - Conversance - Communications.

### UNIT II DATABASE AND NETWORKS

9

Definition - Data Management - Data Life Cycle - Database Technology - Interfaces - Implementation - Networks: Communication Models - Transmission Technology - Protocols - Bandwidth - Topology - Contents - Security - Ownership - Implementation.

### UNIT III SEARCH ENGINES AND DATA VISUALIZATION

9

Search Process - Technologies - Searching And Information Theory - Computational Methods - Knowledge Management - Sequence Visualizations - Structure Visualizations - User Interfaces - Animation Vs Simulation

### UNIT IV STATISTICS, DATA MINING AND PATTERN MATCHING

9

Statistical Concepts - Micro Arrays - Imperfect Data - Basics - Quantifying - Randomness - Data Analysis - Tools Selection - Alignment - Clustering - Classification - Data Mining Methods - Technology - Infrastructure Pattern Recognition - Discovery - Machine Learning - Text Mining - Pattern Matching Fundamentals - Dot Matrix Analysis - Substitution Matrix - Dynamic Programming - Word Method - Bayesian Method - Multiple Sequence Alignment Tools.

## **UNIT V MODELING SIMULATION AND COLLABORATION**

**9**

Drug Discovery Fundamentals - Protein Structure - System Biology Tools : BLAST, PubMed, Chimera, Rasmol - Collaboration And Communication - Standards - Issues - Case Study.

**TOTAL : 45**

### **REFERENCE BOOKS**

1. Bryan Bergeron, "Bio Informatics Computing", Prentice Hall, 2003.
2. T.K. Affward, D.J. Parry Smith, "Introduction to Bio Informatics", Pearson Education, 2001.
3. Pierre Baldi, Soren Brunak, "Bio Informatics - The Machine Learning Approach", 2nd Edition, First East West Press, 2003
4. Zhumur Ghose, Bibekanand Malick "Bio Informatics Principal and Applications" Oxford University Press 2008.

## **PIT707 SOFTWARE QUALITY ASSURANCE**

**3 Credits**

### **GOAL**

To provide exposure to the concepts of Software Quality and Control.

### **OBJECTIVES**

The course should enable the student to:

- Study the various processes and distributed objects.
- Study the relevant software quality processes in order to manage and plan the SQA activity.
- Examination the concepts relating to software quality assurance, methods for quality assurance, and measurement as applied to SQA and V&V.

### **OUTCOME**

The students should be able to:

- Know the various processes and distributed objects.
- Understand the concepts of software quality assurance, methods for quality assurance, and measurement as applied to SQA and V&V.

## **UNIT I CONCEPTS**

**9**

Concepts of Quality Control, Quality Assurance, Quality Management - Total Quality Management; Cost of Quality; QC tools - 7 QC Tools and Modern Tools; Other related topics - Business Process Re-engineering -Zero Defect, Six Sigma, Quality Function Deployment, Benchmarking, Statistical process control.

## **UNIT II SOFTWARE ENGINEERING CONCEPTS**

**9**

Software Engineering Principles, Software Project Management, Software Process, Project and

Product Metrics, Risk Management, Software Quality Assurance; Statistical Quality Assurance - Software Reliability, Muse Model; Software Configuration Management; Software Testing; CASE (Computer Aided Software Engineering).

**UNIT III QUALITY ASSURANCE MODELS 9**

Models for Quality Assurance-ISO-9000 - Series, CMM, SPICE, Malcolm Baldrige Award.

**UNIT IV SOFTWARE QUALITY ASSURANCE RELATED TOPICS 9**

Software Process - Definition and implementation; internal Auditing and Assessments; Software testing -Concepts, Tools, Reviews, Inspections & Walkthrough; P-CMM.

**UNIT V FUTURE TRENDS 9**

PSP and TSP, CMMI, OO Methodology, Clean-room software engineering, Defect injection and prevention.

**TOTAL: 45**

**REFERENCE BOOKS**

1. Watts Humphery, "Managing Software Process ", Addison - Wesley, 1998.
2. Philip B Crosby, " Quality is Free: The Art of Making Quality Certain ", Mass Market, 1992.
3. Roger Pressman, "Software Engineering ", Sixth Edition, McGraw Hill, 2005.

**PIT708 AGENT BASED INTELLIGENT SYSTEMS**

**3 Credits**

**GOAL**

To impart the knowledge about agent based intelligent systems.

**OBJECTIVES**

The course should enable the student to:

- Learn concepts of agent technology.
- Understand the fundamentals of Knowledge based agents.
- Learn the steps to define the behaviour of agents.
- Learn the methods to deal with uncertainty.
- Understand the features of communicative agents.

**OUTCOME**

The student should be able to:

- Have the knowledge about how intelligent agents solve complex problems.
- Do planning for agents.
- Describe the reasons for uncertainty

- Apply the knowledge how to deal with uncertainty.
- Have the understanding of the concepts of learning agents and their applications.

**UNIT I INTRODUCTION 9**

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

**UNIT II KNOWLEDGE BASED AGENTS 9**

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

**UNIT III PLANNING AGENTS 9**

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

**UNIT IV AGENTS AND UNCERTAINTY 9**

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

**UNIT V HIGHER LEVEL AGENTS 9**

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

**TOTAL : 45**

**REFERENCE BOOKS**

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

## PIT709 SOFTWARE PROJECT MANAGEMENT

3 Credits

### GOAL

To learn the concepts of Software Project Management, Process Frame Work and Optimizing the process.

### OBJECTIVES

The course should enable the students to:

- Introduce and develop concepts those are seen as central to the effective management of software projects.
- Develop an appreciation of key, generic project management concepts and techniques as well as those techniques and approaches those are specific to the management of software projects.
- Know the core techniques, you will be expected to apply them across a limited range of software project management scenarios.

### OUTCOME

The students will be able to :

- Manage, estimate, cost, plan, schedule, specify, design, implement, test, and measure an object-oriented application
- Present deliverables
- Review deliverables of other teams for each of the above tasks, students will use a language, tool, or technique that is being widely used in industry.

### UNIT I INTRODUCTION 9

Conventional Software Management - Evolution of Software Economics - Improving Software Economics - Conventional versus Modern Software Project Management

### UNIT II SOFTWARE MANAGEMENT PROCESS FRAMEWORK 9

Lifecycle Phases - Artifacts of the Process - Model Based Software Architectures - Workflows of the Process - Checkpoints of the Process

### UNIT III SOFTWARE MANAGEMENT DISCIPLINES 9

Iterative Process Planning - Organisation and Responsibilities - Process Automation - Process Control and Process Instrumentation - Tailoring the Process

### UNIT IV MANAGED AND OPTIMIZED PROCESS 9

Data Gathering and Analysis: Principles of Data Gathering, Data Gathering Process, Software Measures, Data Analysis - Managing Software Quality - Defect Prevention

## **UNIT V CASE STUDIES**

**9**

COCOMO Cost Estimation Model - Change Metrics - CCPDS-R

**TOTAL: 45**

### **REFERENCE BOOKS**

1. Walker Royce "Software Project Management - A Unified Framework ", Pearson Education, 2004
2. Humphrey, Watts: "Managing the software process ", Addison Wesley, 1989.
3. Ramesh Gopaldaswamy, "Managing Global Projects", Tata McGraw Hill, 2001.
4. Bob Hughes, Mikecoterrell, "Software Project Management", 3rd Edition, Tata McGraw Hill, 2004.

## **PIT710 HIGH SPEED NETWORKS**

**3 Credits**

### **GOAL**

To learn the concepts, congestion control, management and services for high speed networks.

### **OBJECTIVES**

The course should enable the students to:

- Understand the advanced concepts of data communications.
- Study different protocols and network components.
- Understand network management protocols.

### **OUTCOME**

Students will be able to

- Use the advanced concepts of data communications.
- Analysis different protocols and network components.
- Design network management protocols.

## **UNIT I HIGH SPEED NETWORKS**

**9**

Frame Relay Networks - Asynchronous transfer mode - ATM Protocol Architecture, ATM logical Connection, ATM Cell - ATM Service Categories - AAL. High Speed LAN's: Fast Ethernet, Gigabit Ethernet, Fibre Channel - Wireless LAN's.

## **UNIT II CONGESTION AND TRAFFIC MANAGEMENT**

**9**

Queuing Analysis- Queuing Models - Single Server Queues - Effects of Congestion - Congestion Control - Traffic Management - Congestion Control in Packet Switching Networks - Frame Relay Congestion Control.

**UNIT III TCP AND ATM CONGESTION CONTROL****9**

TCP Flow control - TCP Congestion Control - Retransmission - Timer Management - Exponential RTO backoff - KARN's Algorithm - Window management - Performance of TCP over ATM. Traffic and Congestion control in ATM - Requirements - Attributes - Traffic Management Frame work, Traffic Control - ABR traffic Management - ABR rate control, RM cell formats, ABR Capacity allocations - GFR traffic management.

**UNIT IV INTEGRATED AND DIFFERENTIATED SERVICES****9**

Integrated Services Architecture - Approach, Components, Services- Queuing Discipline, FQ, PS, BRfq, GPS, WFQ - Random Early Detection, Differentiated Services.

**UNIT V PROTOCOLS FOR QOS SUPPORT****9**

RSVP - Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms - Multiprotocol Label Switching - Operations, Label Stacking, Protocol details - RTP - Protocol Architecture, Data Transfer Protocol, RTCP.

**TOTAL: 45****REFERENCE BOOKS**

1. William Stallings, "High Speed Networks and Internet", Second Edition, Pearson Education, 2002.
2. Warland, Pravin Varaiya, "High Performance Communication Networks", Second Edition, Jean Harcourt Asia Pvt. Ltd., 2001.
3. Irvan Pepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN Architecture", Cisco Press, Volume 1 and 2, 2003.

**PIT711 WIRELESS COMMUNICATION ENGINEERING****3 Credits****GOAL**

To provide knowledge, skills and values in wireless communication.

**OBJECTIVES**

The course should enable the students to:

- Understand advanced sub-fields in the field of wireless communication.
- Understand how different sub-systems are used and how they integrate with each other.
- Study synchronization and propagation techniques.

**OUTCOME**

Students will be able to

- Provide knowledge about wireless communication.
- Know the synchronization, propagation techniques, modulation and Equalizer.

**UNIT I DESIGN FUNDAMENTALS****9**

Cellular Concept-systems Design Fundamentals: Frequency Reuse - Channel Assignment & Handoff Strategies - Interference and System Capacity - Trunking and Grade of Service - improving coverage & Capacity in Cellular Systems - Radio wave propagation - Free Space Propagation Model - Basic Propagation Mechanisms - reflection - Ground Reflection Model - Diffraction - Scattering - Practical link budget design - outdoor and indoor propagation models - signal penetration into buildings - ray tracing and site specific modeling.

**UNIT II PROPAGATION****9**

Mobile Radio Propagation -Long term fading - Small scale fading and multipath - Small scale multipath propagation- impulse response model of a multipath channel-parameters of mobile multipath channels- Types of small scale fading- statistical model for multipath channels-multipath shape factors for small scale fading wireless channels.

**UNIT III SYNCHRONIZATION TECHNIQUES****9**

Synchronization Techniques-Carrier and Symbol synchronization, carrier, phase estimation- PLL, Decision directed loops, Symbol timing, estimation, Maximum likelihood and non decision directed timing estimation, Joint estimation.

**UNIT IV MODULATION****9**

Modulation Techniques for Mobile Radio-, Angle modulation-Digital Modulation- Line coding-Pulse shaping techniques- Geometric representation of modulation signals-Linear modulation Techniques- Constant envelope modulation-Combined linear and constant modulation Techniques-Spread spectrum modulation-Modulation performance in fading and multipath channels.

**UNIT V EQUALIZER - FDMA - TDMA****9**

Equalization, Diversity, Multiple access Techniques: Fundamental of equalization- Training in generic adaptive equalizer-Equalizers in communication receivers-Linear equalizer- Non-Linear equalization- Algorithm for adaptive equalization- Fractional Equalizer-Diversity Techniques-RAKE Receivers- Interleaving, FDMA-TDMA-Spread Spectrum Multiple access, Space division Multiple Access-Packet Radio

**TOTAL : 45****REFERENCE BOOKS**

1. T.S.Rappaport "Wireless Communication" Pearson Education, 2002
2. E.A.Lee and D.G.Messerschmitt "Digital Communication" 2nd Ed., Allied Pub, 1994.
3. John .G.Proakis "Digital Communications" 4th Ed. Mc Graw Hill Int. Ed., 2000.



## PIT712 NETWORK SECURITY

3 Credits

### GOAL

To learn the concepts, skills and values in Network Security.

### OBJECTIVES

The course should enable the students to:

- Learn how to establish policies to protect network and computer systems from abuse and inappropriate use.
- Study the methods that will aid in the identification and prevention of abuse of a network and computer systems.
- Provide an effective study method for responding to questions and complaints regarding abuses - real or unconfirmed of a network and computer system.

### OUTCOME

The students should be able to:

- Identify the various attacks.
- Apply the appropriate encryption and decryption algorithms.
- Ensure authentication in a network.
- Identify the type of threats the system has incurred.

<b>UNIT I INTRODUCTION</b>	<b>9</b>
Attacks - Services - Mechanisms - Conventional Encryption - Classical And Modern Techniques - Encryption Algorithms - Confidentiality.	
<b>UNIT II PUBLIC KEY ENCRYPTION</b>	<b>9</b>
RSA - Elliptic Curve Cryptography - Number Theory Concepts	
<b>UNIT III MESSAGE AUTHENTICATION</b>	<b>9</b>
Hash Functions - Digest Functions - Digital Signatures - Authentication Protocols.	
<b>UNIT IV NETWORK SECURITY PRACTICE</b>	<b>9</b>
Authentication, Applications - Electronic Mail Security - IP Security - Web Security.	
<b>UNIT V SYSTEM SECURITY</b>	<b>9</b>
Intruders - Viruses - Worms - Firewalls Design Principles - Trusted Systems.	

**TOTAL : 45**

## REFERENCE BOOKS

1. Stallings, Cryptography & Network Security - Principles & Practice, Prentice Hall, 3rd Edition 2002.
2. Bruce, Schneier, Applied Cryptography, 2nd Edition, Toha Wiley & Sons, 1996.
3. Man Young Rhee, "Internet Security", Wiley, 2003.
4. Pfleeger & Pfleeger, "Security in Computing", Pearson Education, 3rd Edition, 2003.

## PIT713 EMBEDDED SYSTEMS

3 Credits

### GOAL

To give knowledge and understanding of embedded systems design.

### OBJECTIVES

The course should enable the student to:

- Study the embedded systems, its hardware and software.
- Learn about the devices and buses used for embedded networking.
- Explain programming concepts and embedded programming in C and C++.

### OUTCOME

The student should be able to:

- Design the communication system and the types of busses for communication.
- Develop the program for embedded system.
- Design the various real time operating systems.

### UNIT I INTRODUCTION TO EMBEDDED SYSTEMS

9

Definition and Classification - Overview of Processors and hardware units in an embedded system - Software embedded into the system - Exemplary Embedded Systems - Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits

### UNIT II DEVICES AND BUSES FOR DEVICES NETWORK

9

I/O Devices - Device I/O Types and Examples - Synchronous - Iso-synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-Communication Devices - UART and HDLC - Parallel Port Devices - Sophisticated interfacing features in Devices/Ports- Timer and Counting Devices - '12C', 'USB', 'CAN' and advanced I/O Serial high speed buses- ISA, PCI, PCI-X, cPCI and advanced buses.

### UNIT III EMBEDDED PROGRAMMING

9

Programming in assembly language (ALP) vs. High Level Language - C Program Elements, Macros and functions -Use of Pointers - NULL Pointers - Use of Function Calls - Multiple function calls in a

Cyclic Order in the Main Function Pointers - Function Queues and Interrupt Service Routines Queues Pointers - Concepts of EMBEDDED PROGRAMMING in C++ - Objected Oriented Programming - Embedded Programming in C++, 'C' Program compilers - Cross compiler - Optimization of memory codes.

**UNIT IV REAL TIME OPERATING SYSTEMS - PART - 1** **9**

OS Services - Interrupt Routines Handling, Task scheduling models - Handling of task scheduling and latency and deadlines as performance metrics - Inter Process Communication And Synchronisation - Shared data problem - Use of Semaphore(s) - Priority Inversion Problem and Deadlock Situations - Inter Process Communications using Signals - Semaphore Flag or mutex as Resource key - Message Queues - Mailboxes - Pipes - Virtual (Logical) Sockets - RPCs.

**UNIT V REAL TIME OPERATING SYSTEMS - PART - 2** **9**

Study of RTOS, VxWorks - Basic Features - Task Management Library at the System - Library Header File - VxWorks System Functions and System Tasks - Inter Process (Task) Communication Functions - Case Study of Coding for Sending Application Layer Byte Streams on a TCP/IP Network Using RTOS Vxworks.

**TOTAL:45**

**REFERENCE BOOKS**

1. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw Hill, First reprint 2003
2. David E.Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.

**PIT714 DIGITAL IMAGING**

**3 Credits**

**GOAL**

To provide a detail view on various image processing techniques.

**OBJECTIVES**

The course should enable the student to:

- Study the image processing techniques and mathematical transforms necessary for image processing.
- Study the image enhancement techniques
- Study image restoration procedures.
- Study the image compression procedures.
- Study the image segmentation and representation techniques.

## OUTCOME

The student should be able to:

- Compare the various image transforms.
- Enhance, segment, compress and restore an image by using appropriate techniques.
- Interpret and recognize an image by applying pattern matching.

### **UNIT I DIGITAL IMAGE FUNDAMENTALS 9**

Image formation, Image transforms - fourier transforms, Walsh, Hadamard, Discrete cosine, Hotelling transforms.

### **UNIT II IMAGE ENHANCEMENT & RESTORATION 9**

Histogram modification techniques - Image smoothening - Image Sharpening - Image Restoration - Degradation Model - Noise models - Spatial filtering - Frequency domain filtering.

### **UNIT III IMAGE COMPRESSION & SEGMENTATION 9**

Compression Models - Elements of information theory - Error free Compression -Image segmentation -Detection of discontinuities - Edge linking and boundary detection - Thresholding - Region based segmentation - Morphology.

### **UNIT IV REPRESENTATION AND DESCRIPTION 9**

Representation schemes- Boundary descriptors- Regional descriptors - Relational Descriptors

### **UNIT V OBJECT RECOGNITION AND INTERPRETATION 9**

Patterns and pattern classes - Decision-Theoretic methods - Structural methods.

**TOTAL : 45**

## REFERENCE BOOKS

1. Gonzalez.R.C & Woods. R.E., Digital Image Processing, 2nd Edition, Pearson Education, 2002.
2. Anil Jain.K, Fundamentals of Digital image Processing, Prentice Hall of India, 1989.
3. Sid Ahmed, Image Processing, McGraw Hill, New York, 1995.

## PIT716 DATA WAREHOUSING AND DATA MINING

3 Credits

### GOAL

Understand the fundamentals of data mining functionalities and its application in various business and social domains.

### OBJECTIVES

The course should enable the students to learn:

- Data warehousing components and data models for big data.
- The fundamentals of data mining and its functionalities
- Issues regarding classification and prediction.
- Concepts of cluster and cluster analysis.
- Application of data mining in different domains.

### OUTCOMES

The students should be able to:

- Develop data warehousing and big data models.
- Apply principles of data mining techniques in problem solving.
- 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, 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.

**PIT716 CYBER CRIME & SECURITY****3 Credits****GOAL**

This course intends to impart knowledge about security dimensions of cyber threat and cyber crime. The course would also cover how nation states are threaten by cyber attack. Course follows detection and prevention mechanism along with cyber laws and regulations.

**OBJECTIVES**

The course should enable the students to :

- Know about the cyber laws
- Know about impact of cyber crime on national security
- Explore the awareness of the cyber security
- Discuss the various cyber crime activities.

## OUTCOME

The students should be able to:

- Follow the cyber laws and solve issues if any.
- Ascertain the impacts on citizen security
- Import security in the network activities.
- Undertake cyber defensive measures.

### **UNIT I INTRODUCTION TO CYBER TECHNOLOGIES 9**

Information Systems - Networks/ LAN/ WAN - Military Sensors

### **UNIT II TYPES OF CYBER CRIME 9**

Hacking - Password Cracking - Insecure Network Connection - Theft at Tele Communication Services

### **UNIT III IMPACT OF CYBER CRIME ON NATIONAL SECURITY 9**

Impact on Armed Forces & Law enforcement Agencies' Information Systems - Impact on National Economy / Market - Impact on Citizen Security

### **UNIT IV DETECTION AND PREVENTION METHODOLOGIES 9**

Risk Identification - Levels of Protection - Cyber Defensive Measures

### **UNITY V CYBER LAWS 9**

Overview of General Laws and Procedures in India - Introduction to Indian Cyber Law - Cyber Crime and Digital Evidence- Indian Perspective.

**TOTAL : 45**

## REFERENCE BOOKS

1. Cyber Security - the Essential body of knowledge by Dan Shoemaker and Wm Arthur Conklin, published by Cengage Learning.
2. Cyber Security and Homeland Security - edited by Lin V Choi.
3. Cyber Security - Public Sector threats and responses edited by Kim Andreasson, published by CRC Press.

## PIT717 INFORMATION SYSTEM DESIGN

3 Credits

### GOAL

To provide exposure to the concepts of design, development and management of information systems.

### OBJECTIVES

The course should enable the students to :

- Know how to manage the digital firm.
- Understand the design, development and maintenance of information systems.
- Understand the issues in knowledge management and information systems.
- Know the ethical and security issues in information systems.

### OUTCOME

The students should be able to:

- Design, develop and maintain information systems.
- Handle the issues in knowledge management and information systems.
- Analyze the information system architecture
- Make case studies on information system issues for decision making.

### UNIT I INFORMATION SYSTEM AND ORGANIZATION 9

Matching the Information System Plan to the Organizational Strategic Plan - Identifying Key Organizational Objective and Processes and Developing an Information System Development User role in Systems Development Process - Maintainability and Recoverability in System Design.

### UNIT II REPRESENTATION AND ANALYSIS OF SYSTEM STRUCTURE 9

Models for Representing Systems: Mathematical, Graphical and Hierarchical (Organization Chart, Tree Diagram) - Information Flow - Process Flow - Methods and Heuristics - Decomposition and Aggregation - Information Architecture - Application of System Representation to Case Studies.

### UNIT III SYSTEMS, INFORMATION AND DECISION THEORY 9

Information Theory - Information Content and Redundancy - Classification and Compression - Summarizing and Filtering - Inferences and Uncertainty - Identifying Information needed to Support Decision Making - Human Factors - Problem characteristics and Information System Capabilities in Decision Making.

### UNIT IV INFORMATION SYSTEM APPLICATION 9

Transaction Processing Applications - Basic Accounting Application - Applications for Budgeting and Planning - Other use of Information Technology: Automation - Word Processing - Electronic Mail - Evaluation Remote Conferencing and Graphics - System and Selection - Cost Benefit - Centralized versus Decentralized Allocation Mechanism.



## UNIT V DEVELOPMENT AND MAINTENANCE OF INFORMATION SYSTEMS

9

Systems analysis and design - System development life cycle - Limitation - End User Development - Managing End Users - off-the Shelf Software Packages - Outsourcing - Comparison of Different Methodologies.

**TOTAL: 45**

### REFERENCE BOOKS

1. K. C. Laudon, J. P. Laudon, M. E. Brabston, "Management Information Systems: Managing the Digital Firm", Pearson Education 2002.
2. K. C. Laudon, J. P. Laudon, "Management Information Systems, Organization and Technology in the Networked Enterprise," Sixth Edition, Prentice Hall, 2000.
3. E.F. Turban, R.K., R.E. Potter. "Introduction to Information Technology", Wiley, 2004.
4. M. E. Brabston, "Management Information Systems: Managing the Digital Firm", Pearson Education, 2002.
5. Jeffrey A. Hoffer, Joey F. George, Joseph S. Valachich, "Modern Systems Analysis and Design", Third Edition, Prentice Hall, 2002.

## PCE709 ADHOC AND SENSOR NETWORKS

**3 Credits**

### GOAL

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

### OBJECTIVES

The course should enable the students to:

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

### OUTCOME

The students should be able to:

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

<b>UNIT I ADHOC MAC</b>	<b>9</b>
Introduction - Issues in Ad-Hoc Wireless Networks. MAC Protocols - Issues, Classifications of MAC protocols, Multi channel MAC and Power control MAC protocol.	
<b>UNIT II ADHOC NETWORK ROUTING AND TCP</b>	<b>9</b>
Issues - Classifications of routing protocols - Hierarchical and Power aware. Multicast routing - Classifications, Tree based, Mesh based. Ad Hoc Transport Layer Issues. TCP over Ad Hoc - Feedback based, TCP with explicit link, TCP-BuS, Ad Hoc TCP, and Split TCP.	
<b>UNIT III WSN -MAC</b>	<b>9</b>
Introduction - Sensor Network Architecture, Data dissemination, Gathering. MAC Protocols - self-organizing, Hybrid TDMA/FDMA and CSMA based MAC.	
<b>UNIT IV WSN ROUTING, LOCALIZATION AND QOS</b>	<b>9</b>
Issues in WSN routing - OLSR, AODV. Localization - Indoor and Sensor Network Localization. QoS in WSN.	
<b>UNIT V MESH NETWORKS</b>	<b>9</b>
Necessity for Mesh Networks - MAC enhancements - IEEE 802.11s Architecture - Opportunistic routing - Self configuration and Auto configuration - Capacity Models - Fairness - Heterogeneous Mesh Networks - Vehicular Mesh Networks.	

**TOTAL : 45**

#### **REFERENCE BOOKS**

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

## PCE710 CLOUD COMPUTING

3 Credits

### GOAL

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

### OBJECTIVES

The course should enable the students to:

- Learn fundamental concepts of cloud.
- Understand different types of services in cloud.
- Understand cloud computing environment .
- Learn scheduling in cloud
- Learn cloud collaboration methods.

### OUTCOME

The students should be able to:

- Have an understanding on the concepts of cloud architecture.
- Design and develop a cloud
- Design cloud services.
- Have an understanding on different uses of Cloud computing.
- Have an understanding on advancement in cloud services.

### UNIT I UNDERSTANDING CLOUD COMPUTING

9

Cloud Computing - History of Cloud Computing - Cloud Architecture - Cloud Storage - Why Cloud Computing Matters - Advantages of Cloud Computing - Disadvantages of Cloud Computing - Companies in the Cloud Today - Cloud Services.

### UNIT II DEVELOPING CLOUD SERVICES

9

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

### UNIT III CLOUD COMPUTING FOR EVERYONE

9

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

### UNIT IV USING CLOUD SERVICES

9

Collaborating on Calendars, Schedules and Task Management - Exploring Online Scheduling Applications - Exploring Online Planning and Task Management - Collaborating on Event Management

- Collaborating on Contact Management - Collaborating on Project Management - Collaborating on Word Processing - Collaborating on Databases - Storing and Sharing Files.

**UNIT V OTHER WAYS TO COLLABORATE ONLINE**

**9**

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

**TOTAL : 45**

**REFERENCE BOOKS**

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