



**HINDUSTAN  
UNIVERSITY**

HINDUSTAN INSTITUTE OF TECHNOLOGY & SCIENCE

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

Padur, Kancheepuram District - 603 103.

**DEPARTMENT OF  
COMPUTER SCIENCE AND ENGINEERING**

**Regulations Curriculum  
and Syllabus  
2013**

**M.Tech.  
(COMPUTER AND COMMUNICATIONS  
ENGINEERING)**



**ACADEMIC REGULATIONS**  
**(M.TECH./ M.B.A. / M.C.A.) (Full - Time / Part - Time)**  
**(Effective 2012-13)**

**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.

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

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

**20. Transfer of credits**

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

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

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

- i) registered and successfully credited all the core courses,
- ii) successfully acquired the credits in the different categories as specified in the curriculum corresponding to the discipline (branch) of his/her study within the stipulated time,
- iii) has no dues to all sections of the Institute including Hostels, and

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

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

**22. Power to modify**

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

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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**  
**M.Tech. (Computer and Communications Engineering)**  
**CURRICULUM 2013-2014**

**SEMESTER I**

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
<b>Theory</b>							
1.	PMA106	Advanced Applied Mathematics #	4	0	0	4	4
2.	PCE102	Advanced Computer Architecture***	4	0	0	4	4
3.	PCC101	Object Oriented System Design	4	0	0	4	4
4.	PCS101	Advanced Digital Signal Processing%	4	0	0	4	4
5.	PIT101	Advanced Data Communications\$\$\$	4	0	0	4	4
6.	PIT102	Internet Programming**	4	0	0	4	4
<b>Practical</b>							
7.	PCC103	Computer and Communication Lab - I	0	0	4	2	4
8.	PIT103	Internet Programming Lab\$	0	0	4	2	4
		<b>Total</b>				<b>28</b>	<b>32</b>

**SEMESTER II**

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
<b>Theory</b>							
1.	PIT204	Advanced Operating Systems\$	4	0	0	4	4
2.	PCC201	Advanced Network Administration	4	0	0	4	4
3.	PCS201	Mobile Communication Networks%	3	0	0	3	3
4.	PCS202	Multimedia Compression Techniques%	4	0	0	4	4
5.	E-Code	Elective-I	3	0	0	3	3
6.	E-Code	Elective-II	3	0	0	3	3

<b>Practical</b>							
7.	PCC202	Computer and Communication Lab - II	0	0	4	2	4
8.	PCC203	Network Administration Lab	0	0	4	2	4
		<b>Total</b>				<b>25</b>	<b>30</b>

### SEMESTER III

<b>Theory</b>							
1.	E-Code	Elective-III	3	0	0	3	3
2.	E-Code	Elective-IV	3	0	0	3	3
3.	E-Code	Elective-V	3	0	0	3	3
<b>Practical</b>							
4	PCC301	Project Phase-I	0	0	12	6	12
		<b>Total</b>				<b>15</b>	<b>21</b>

### SEMESTER IV

<b>Practical</b>							
1.	PCC304	Project Phase-II	0	0	24	12	24
		<b>Total</b>				<b>12</b>	<b>24</b>

**LIST OF ELECTIVES**

Sl.No	Course Code	Course Title	L	T	P	C	TCH
1	PCC701	XML and Web Services	3	0	0	3	3
2	PCE702	Cryptography and Network Security	3	0	0	3	3
3	PCE709	Adhoc and Sensor Networks	3	0	0	3	3
4	PCE710	Cloud Computing	3	0	0	3	3
5	PCE713	Service Oriented Architecture	3	0	0	3	3
6	PIT708	Agent Based Intelligent Systems	3	0	0	3	3
7	PCC702	Multimedia Management	3	0	0	3	3
8	PCC703	Human Interface System Design	3	0	0	3	3
9	PCC704	Internetworking Multimedia	3	0	0	3	3
10	PCS103	Optical Communication Networks	3	0	0	3	3
11	PCS204	Satellite Communication	3	0	0	3	3
12	PCS713	Error Control Coding	3	0	0	3	3
13	PCS714	Navigation Systems	3	0	0	3	3

# Common to M.Tech (ES/PCI/CS/AE/CCE and VLSI)

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

\*\*\* Common to M.Tech. CSE, M.Tech. CCE, M.Tech. IT, M.Tech. Embeddad

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

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

% Common to M.Tech. CSE, M.Tech. CS

**Total Credits : 80**

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**M.Tech. (Computer and Communications Engineering)**  
**CURRICULUM 2013-2014**

**PMA 106 ADVANCED APPLIED MATHEMATICS**

L	T	P	C
3	1	0	4

**Goal**

Develop the Mathematical skills to formulate certain practical problems, solve them and physically interpret the results

**Objectives**

The course should enable the students to

1. Understand the techniques to solve the system of equations using direct method and indirect methods. Learn to decompose the matrix in the LU form and to find the Eigen value of a matrix using power and Jacobi methods.
2. Learn to classify the initial and boundary value problems. Understand the D'Alemberts solution of the one dimensional wave equation. Learn significance of characteristic curves.
3. Learn series solutions of Bessel's and Legendre equations. Understand recurrence relation, generating functions and orthogonal properties.
4. Learn basics of probability, addition and multiplication, Baye's theorems. Understands the concept of random variable, moment generating function and their properties. Learn standard distributions in discrete and continuous cases.
5. Learn the different Markovian models with finite and infinite capacity and understand to classify them.

**Outcome**

The students should be able to

1. Write the algorithm for solving the simultaneous equations for direct and indirect methods. Identify the Eigen values using conventional method and compares with numerical solutions. Write the algorithm to find the Eigen values of a matrix.
2. Form the wave equations with initial conditions and solve them using D'Alemberts solutions. Solve the wave equations using Laplace transform for displacements in long string - long string under its weight and free and forced vibrations.
3. Solve the Bessel's equation and Legendre equations. Use Bessel's function to solve many practical problems that arise in electrical transmission problems and vibration of membranes as in loudspeakers.

4. Evaluate the probability using addition and multiplication theorem. Apply Baye's for practical problems to find the probability. 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.
5. Analyze and classify the models,  $M / M / 1$ ,  $M / M / C$ , finite and infinite capacity and solve practical problems related to the queuing models.

**UNIT I LINEAR ALGEBRAIC EQUATION AND EIGEN VALUE PROBLEMS 12**

System of Equations - Solution by Gauss Elimination and Gauss Jordan methods - LU decomposition method - Indirect methods - Gauss Jacobi and Gauss Seidel methods - Eigen values of a matrix using Jacobi and power methods.

**UNIT II WAVE EQUATION 12**

Solution of initial and boundary value problems - Characteristics - D'Alembert's solution - Significance of characteristic curves - Laplace transform solutions for displacement in a long string, in a long string under its weight - a bar with prescribed force on one end - Free vibrations of a string.

**UNIT III SPECIAL FUNCTIONS 12**

Series solutions - Bessel's equation - Bessel functions - Legendre's equation - Legendre polynomials - Rodrigue's formula - Recurrence relations - Generating functions and orthogonal property for Bessel functions of the first kind - Legendre polynomials.

**UNIT IV 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. Correlation and Regression.

**UNIT V 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.

**Total : 60**

**REFERENCE BOOKS**

1. Taha, H.A., "Operations Research - An Introduction", Prentice Hall, 6th Ed, New Delhi, 1997.
2. Dr.Singaravelu A., Dr.Siva Subramanian S., and Dr.Ramachandran C., "Probability and Queuing Theory", Meenakshi agency, 20th Ed., January 2013.
3. Veerarajan T., "Probability, Statistics and Random Processes", Tata McGraw-Hill, 2nd Ed., 2004.
4. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 34th Ed.
5. Sankara Rao K., "Introduction to Partial Differential Equations", PHI, 1995.
6. Veerarajan T., "Mathematics IV", Tata McGraw-Hill, 2000.

## PCE102 ADVANCED COMPUTER ARCHITECTURE

L	T	P	C
4	0	0	4

### Goal

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

### Objectives

The course should enable the student to learn

1. The parallel computer models.
2. Processor technology and memory organizations.
3. Pipeline design techniques.
4. Various parallel and scalable architectures.
5. The multithreaded and data flow computing architectures.

### Outcome

The student should be able to

1. Identify and understand the parallel computer models.
2. Understand the types of processors and memory hierarchy.
3. Understand various pipeline designs.
4. Explain parallel and scalable architectures.
5. Understand multithreading and data flow computers.

### UNIT I PARALLEL MODELS

12

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

### UNIT II PROCESSORS AND MEMORY HIERARCHY

12

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

### UNIT III PIPELINING AND SUPERSCALAR TECHNIQUES

12

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

### UNIT IV PARALLEL AND SCALABLE ARCHITECTURE

12

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



## UNIT V SCALABLE, MULTITHREADED & DATA FLOW ARCHITECTURE

12

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

**Total : 60**

### REFERENCE BOOKS

1. Kai Hwang, "Advanced Computer Architecture", Parallelism, Scalability, Programmability, McGraw Hill, 2008.
2. Hwang Briggs, "Computer Architecture and parallel processing", McGraw Hill, 2011.
3. William Stallings, "Computer Organization and Architecture- Designing for Performance", Prentice Hall of India, 2009.

## PCC 101 OBJECT ORIENTED SYSTEM DESIGN

L	T	P	C
4	0	0	4

### Goal

To introduce an integrated approach to software development incorporating quality management methodologies

### Objectives

The course should enable the student to learn

1. The concepts of modelling in object oriented context.
2. The Object Constraint Language.
3. Use cases, System Sequence Diagrams.
4. Interaction Diagrams, Class Diagrams.
5. Implementation related issues.

### Outcome

The student should be able to

1. Develop reliable software.
2. Use UML to design OO systems
3. Use reliability models in different environments.
4. Measure the reliability of the developed software
5. Apply advanced techniques including Architectural Analysis and Design Patterns.

## UNIT I INTRODUCTION

12

Introduction - Modelling as a design technique - UML diagrams - Class modeling -Object Constraint Language - State modeling - Interaction Modeling

**UNIT II OVERVIEW OF USECASES 12**

Inception - Evolutionary Requirements - Use Cases - Other Requirements - Domain Models - System Sequence Diagrams - Operation Contracts

**UNIT III MODELING AS DESIGN TECHNIQUE 12**

Requirements to Design - Logical Architecture and UML Package Diagrams - Object Design - Interaction Diagrams - Class Diagrams - Designing Objects with Responsibilities - Object Design Examples - Designing for Visibility

**UNIT IV MAPPING 12**

Mapping designs to code - Test Driven development and refactoring - UML Tools and UML as blueprint

**UNIT V PATTERNS 12**

More Patterns - Analysis update - Objects with responsibilities - Applying design patterns - Architectural Analysis - Logical Architecture Refinement - Package Design - Persistence framework with patterns.

**Total : 60**

**REFERENCE BOOKS**

1. Michael Blaha and James Rumbaugh, "Object-oriented modeling and design with UML", Prentice-Hall, 2005.
2. Craig Larman. "Applying UML and Patterns - An introduction to Object-Oriented Analysis and Design and Iterative Development", 3rd Ed, Pearson Education, 2005.
3. Booch, Grady, "Object Oriented Analysis and Design", 2nd ed. Pearson Education. 2000.
4. Ali Bahrami, "Object Oriented Systems Development", McGraw-Hill, 1999.
5. Fowler, Martin. UML Distilled. 3rd ed. Pearson Education. 2004.

**PCS101 ADVANCED DIGITAL SIGNAL PROCESSING**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Prerequisite**

Basic knowledge of random processes, Fourier Transform, auto-correlation matrices & sampling process.

**Goal**

To provide knowledge of digital signal processing methods and tools, including leading algorithms for various applications.

**Objectives**

The course will enable the students to:

- (i) Know the basics of discrete random processes
- (ii) Know the basics of various Spectrum estimation methods

- (iii) Know the basics of linear estimators & predictors
- (iv) Know the basics of various adaptive filters along with their applications
- (v) Know the fundamentals of multirate digital signal processing

**Outcome**

At the end of the course the students should be able to

- (i) Understand the various theorems & processing that are done on discrete random processes
- (ii) Understand the different parametric & non-parametric spectrum estimation methods
- (iii) Understand the linear predictors & Wiener filters
- (iv) Understand the adaptive filters & their various applications
- (v) Understand the importance of multirate digital signal processing

**UNIT I DISCRETE RANDOM SIGNAL PROCESSING 9**

Discrete Random Processes- Ensemble averages, stationary processes, Autocorrelation and Auto covariance matrices. Parseval's Theorem, Wiener-Khintchine Relation- Power Spectral Density- Periodogram Spectral Factorization, Filtering random processes. Low Pass Filtering of White Noise. Parameter estimation: Bias and consistency.

**UNIT II SPECTRUM ESTIMATION 9**

Estimation of spectra from finite duration signals, Non-Parametric Methods-Correlation Method , Periodogram Estimator, Performance Analysis of Estimators -Unbiased, Consistent Estimators- Modified periodogram, Bartlett and Welch methods, Blackman -Tukey method. Parametric Methods - AR, MA, ARMA model based spectral estimation. Parameter Estimation -Yule-Walker equations, solutions using Durbin's algorithm

**UNIT III LINEAR ESTIMATION AND PREDICTION 9**

Linear prediction- Forward and backward predictions, Solutions of the Normal equations- Levinson-Durbin algorithms. Least mean squared error criterion -Wiener filter for filtering and prediction , FIR Wiener filter and Wiener IIR filters ,Discrete Kalman filter

**UNIT IV ADAPTIVE FILTERS 9**

FIR adaptive filters -adaptive filter based on steepest descent method-Widrow-Hoff LMS adaptive algorithm, Normalized LMS. Adaptive channel equalization-Adaptive echo cancellation-Adaptive noise cancellation- Adaptive recursive filters (IIR). RLS adaptive filters-Exponentially weighted RLS-sliding window RLS.

**UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING 9**

Mathematical description of change of sampling rate - Interpolation and Decimation , Decimation by an integer factor - Interpolation by an integer factor, Sampling rate conversion by a rational factor, Filter implementation for sampling rate conversion- direct form FIR structures, Polyphase filter

structures, time-variant structures. Multistage implementation of multirate system. Application to sub band coding - Wavelet transform and filter bank implementation of wavelet expansion of signals.

**L=45, T=15, TOTAL=60**

**TEXT BOOK:**

1. Monson H.Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons, Inc., Singapore, 2002.

**REFERENCES:**

1. John G. Proakis, Dimitris G.Manolakis, Digital Signal Processing Pearson Education, 2002.
2. John G. Proakis et.al.'Algorithms for Statistical Signal Processing', Pearson Education, 2002.
3. Dimitris G.Manolakis et.al.' Statistical and adaptive signal Processing', McGraw Hill, Newyork, 2000.
4. Rafael C. Gonzalez, Richard E.Woods, 'Digital Image Processing', Pearson Education, Inc., Second Edition, 2004.( For Wavelet Transform Topic)

**PIT 101 ADVANCED DATA COMMUNICATIONS**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

**Goal**

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

**Objectives**

The course should enable the student to

1. Understand the concepts of TCP/IP, UDP and OSI architecture.
2. Have knowledge about the ATM Services and Connection
3. Know about the congestion control parameters
4. Establish the graph and finding the shortest path among different routing protocols.
5. Understand the key concepts of integrated service architecture and label switching

**Outcome**

The student should be able to:

1. Understood the fundamental concepts of data communications and networking
2. Have some idea about the ATM protocol architecture and services.
3. Know about how to control the congestion in layers.
4. Apply the different routing protocols to find the shortest path.
5. Design the ISA and several concepts on it.

**UNIT I NETWORK ARCHITECTURES 12**

The need for speed and quality of service, Advanced TCP/IP and ATM Networks, The need for a protocol architecture, The TCP/IP protocol architecture, The OSI model, Internetworking, TCP, UDP, IPv6.

**UNIT II ATM NETWORKS 12**

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

**UNIT III TRAFFIC MANAGEMENT 12**

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

**UNIT IV ROUTING PROTOCOLS 12**

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

**UNIT V ADVANCED NETWORKING CONCEPTS 12**

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

**Total : 60**

**REFERENCE BOOKS**

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

## PIT 102 INTERNET PROGRAMMING

L	T	P	C
4	0	0	4

### Goal

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

### Objectives

The course should enable the students to:

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

### Outcome

The student should be able to

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

### UNIT I INTRODUCTION

12

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

### UNIT II STYLING AND 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

### **PCC 103 COMPUTER AND COMMUNICATION LAB - I**

#### **Goal**

To provide practical knowledge in the design and implementation of computer and communication

#### **Objective**

This course should enable the students to understand computers and communication concepts.

#### **Outcome**

The students should be able to implement programs using simulation packages.

#### **LIST OF EXPERIMENTS**

- 1 Simulation of Modulation and Coding in a AWGN Communication Channel using simulation Packages.
- 2 Implementation of Adaptive Filters, periodogram and multistage multirate system in DSP Processor
- 3 Simulation of QMF using Simulation Packages.

4. Implementation of Linear and Cyclic Codes.
5. Implementation and study of Stop and Wait, Goback-N and Selective Repeat ARQ protocols
6. Study of DC characteristics of PIN PD and APD
7. Study of P-I characteristics of LED and LASER
8. Simulation of ATM switches
9. Simulation and implementation of ATM congestion control algorithms

### PIT 103 INTERNET PROGRAMMING LAB

L	T	P	C
0	0	3	2

#### Goal

To understand various Internet Technologies.

#### Objectives

The course should enable the students to:

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

#### Outcome

At the end of the course the student should be able to

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

### PIT 204 ADVANCED OPERATING SYSTEMS

L	T	P	C
4	0	0	4

#### Goal

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

#### Objectives

The course should enable the students to:

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

#### Outcome

The student should be able to

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

### UNIT I DISTRIBUTED OPERATING SYSTEM

12

Synchronization Mechanisms: Introduction - concept of a process - concurrent process - the critical section problem - Synchronization problems - language mechanisms for synchronization: Monitors. System Architecture types - issues in distributed operating systems - communication networks - communication primitives. Theoretical Foundations: inherent limitations of a distributed system - 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 checkpointing and recovery - checkpointing for distributed database systems - recovery in replicated distributed databases systems.

**UNIT IV MULTIPROCESSOR OPERATING SYSTEM 12**

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

**UNIT V DATABASE OPERATING SYSTEM 12**

Requirements of a database operating system Concurrency control : theoretical aspects - introduction, database systems - a concurrency control model of database systems- the problem of concurrency control - Serializability theory- distributed database systems, concurrency control algorithms - introduction, basic synchronization primitives, lock based algorithms-timestamp based algorithms, optimistic algorithms - concurrency control algorithms, data replication.

**Total : 60**

**REFERENCE BOOKS**

1. Mukesh Singhal, 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. PradeepK.Sinha, "Distributed operating system-Concepts and design", PHI, 2003.
5. Andrew S.Tanenbaum, "Distributed operating system", Pearson education, 2003.

## PCC 201 ADVANCED NETWORK ADMINISTRATION

L	T	P	C
4	0	0	4

### Goal

To study the advanced concepts, terminologies and technologies used in computer networks.

### Objectives

The course should enable the student to learn

1. Networking fundamentals.
2. Networking standards.
3. IEEE standards employed in computer networking.
4. Different protocols and network administration

### Outcome

The student should be able to

1. Understand the network models
2. Explain different transmission media and protocols.
3. Understand IP addressing and routing.

### UNIT I INTRODUCTION TO NETWORKING AND FUNDAMENTALS 12

Introduction - Data Communications, Networks, Internet, Protocols and Standard - Network Models - Layered tasks - Internet Model - OSI Model - VPN - DSL Technology - Cable Modem - Connecting devices - Backbone Networks - Virtual LANS - Circuit switching and Telephone Networks.

### UNIT II NETWORKING MEDIA 12

Data transmission - Analog and Digital Data transmission - Transmission Impairments - Transmission Media - LAN Technology.

### UNIT III ETHERNET FUNDAMENTALS 12

Local Area Networks: Ethernet - Traditional Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LANs - IEEE802.11 - Virtual Circuit Switching - Frame Relay - ATM - Cellular Telephony.

### UNIT IV TCP / IP PROTOCOL SUITE AND IP ADDRESSING 12

Internet Protocols - Principles of Internetworking - Connectionless Internetworking - Internet Protocol - IPV6 - IP Multicasting - Transport Protocols - Connection Oriented Transport Protocol Mechanisms - TCP - TCP Congestion Control - UDP - Network Security.

### UNIT V TCP APPLICATION LAYER AND ROUTING FUNDAMENTALS 12

DNS - SMTP and FTP - E-mail - File Transfer - Routing - Unicast Routing - Unicast Routing Protocols - Multicast Routing - Multicast Routing Protocols.

**Total : 60**

## REFERENCE BOOKS

1. Behrouz A. Forouzan, "Data Communication and Networking", Tata McGraw-Hill, 2004.
2. William Stallings, "Data and Computer Communication", 6th Ed, Pearson Education, 2002.
3. Andrew S. Tanenbaum, "Computer Networks", PH1, 4th Ed., 2003.

## PCS 201 MOBILE COMMUNICATION NETWORKS

L T P C  
4 0 0 4

### Goal

To introduce the evolution and concepts of mobile communication networks, various modulation techniques, propagation models, network architecture and protocol standards.

### Objectives

The course should enable the student to learn

1. The evolution and the fundamental of cellular radio concepts.
2. Different radio propagation models and air protocols.
3. Various Mobile network architecture.
4. Various issues in Wireless Networks.
5. Various security related issues in the wireless networks.

### Outcome

The student should be able to

1. Explain the evolution and concepts of cellular communication
2. Understand various radio propagation models.
3. Understand mobile network architecture and its operation.
4. Understand issues in wireless networks.
5. Understand various security mechanism of a wireless networks.

### UNIT I OPERATION OF MOBILE COMMUNICATION NETWORKS

12

Operation of first, second and third generation wireless networks: cellular systems, medium access techniques, Mobile networks, elementary Principles of cellular Telephony Channel Division Techniques (TDMA, FDMA, CDMA) Cellular Coverage Methods Network Planning and Resource Allocation, Network Dimensioning and Mobility Management Procedures.

### UNIT II PROPAGATION MODELS AND AIR PROTOCOLS

12

Radio propagation models, error control techniques, handoff, power control, Soft handover, Forward link - Reverse link - common air protocols (AMPS, IS-95, IS-136, GSM, GPRS, EDGE, WCDMA, cdma2000, etc)

**UNIT III MOBILE NETWORK ARCHITECTURE 12**

General Architecture definition, Mobile Terminals (MT, SIM) Radio Section (BTS, BSC) Core Network (MSC, G-MSC, VLR, HLR, AuC) User and Control Plane Protocol Stack, MAP & SS#7, the Key Role of Signaling Interfaces and Network Entities Relation The Physical Channel, The Logical Channels Terminal, Call and Network Management Procedures, Network Planning.

**UNIT IV WIRELESS LOCAL AREA NETWORKS 12**

Wireless Local Area Networks , General Characteristics of the Hyper LAN System, 802.11 Standard, Basic DCF access scheme, DCF Access Scheme with Handshaking, PCF Access Scheme, The 802.11a Standard, Mobile Ad Hoc Networks, Wireless Sensor Networks, Routing Energy Efficiency, Localization, Clustering.

**UNIT V SECURITY ISSUES IN WIRELESS NETWORKS 12**

Security in Wireless Networks, Secure routing, Key Pre-distribution and Management, Encryption and Authentication, Security in Group Communication, Trust Establishment and Management, Denial of Service Attacks, Energy-aware security mechanisms, Location verification, Security on Data fusion.

**Total : 60**

**REFERENCE BOOKS**

1. T.S. Rappaport, "Wireless Communications: Principles & Practice", Second Edition, Prentice Hall, 2002.
2. W. Stallings, "Wireless Communications and Networks", Prentice Hall, 2002.
3. V.K. Garg, "IS-95 CDMA and CDMA 2000", Prentice Hall PTR, 2000.
4. Leon-Garcia and I. Widjaja, "Communication Networks, Fundamental Concepts and Key Architectures", McGraw-Hill, 2000.
5. J.Schiller, "Mobile Communications", Addison Wesley, 2000.
6. Fred Halsall, "Multimedia Communications, Applications, Networks, Protocols and Standards", Addison Wesley, 2001.
7. Uyles Black , "Mobile and Wireless Networks" , Prentice Hall PTR, 1996.

## PCS 202 MULTIMEDIA COMPRESSION TECHNIQUES

L	T	P	C
4	0	0	4

### GOAL

To introduce the Fundamental Concepts in Multimedia and its compression techniques and standards for transmission and storage.

### Objectives

The course should enable the students to learn

1. The concepts in Video and Digital Audio.
2. Text compression techniques.
3. Audio compression techniques.
4. Image Compression techniques.
5. Video Compression techniques.

### Outcome

The students should be able to

1. Understand the concept Multimedia Compression and Error analysis.
2. Understand the various Coding Techniques.
3. Understand the concepts of A- Law,  $\mu$  - Law, G.722, MPEG audio.
4. Understand the concept of Predictive techniques and JPEG standards.
5. Explain MPEG standards and DVI technologies and applications.

### UNIT I INTRODUCTION

12

Special features of Multimedia - Graphics and Image Data Representations - Fundamental Concepts in Video and Digital Audio - Storage requirements for multimedia applications -Need for Compression - Taxonomy of compression techniques - Overview of source coding, source models, scalar and vector quantization theory - Evaluation techniques - Error analysis and methodologies

### UNIT II TEXT COMPRESSION

12

Compaction techniques - Huffmann coding - Adaptive Huffmann Coding - Arithmetic coding- Shannon-Fano coding - Dictionary techniques - LZW family algorithms

### UNIT III AUDIO COMPRESSION

12

Audio compression techniques - A- Law and  $\mu$  - Law companding. Frequency domain and filtering - Basic sub-band coding - Application to speech coding - G.722 - Application to audio coding - MPEG audio, progressive encoding for audio - Silence compression, speech compression techniques - Formant and CELP Vocoders

#### UNIT IV IMAGE COMPRESSION

12

Predictive techniques - DM, PCM, and DPCM: Optimal Predictors and Optimal Quantization - Contour based compression - Transform Coding - JPEG Standard - Sub-band coding algorithms: Design of Filter banks - Wavelet based compression: Implementation using filters - EZW, SPIHT coders - JPEG 2000 standards - JBIG, JBIG2 standards.

#### UNIT V VIDEO COMPRESSION

12

Video compression techniques and standards - MPEG Video Coding I: MPEG - 1 and 2 - MPEG Video Coding II: MPEG - 4 and 7 - Motion estimation and compensation techniques - H.261 Standard - DVI technology - PLV performance - DVI real time compression - Packet Video.

**Total : 60**

#### REFERENCE BOOKS

1. Khalid Sayood, "Introduction to Data Compression", Morgan Kauffman Harcourt India, 2nd Ed., 2000.
2. David Salomon, "Data Compression - The Complete Reference", Springer Verlag , 2nd Ed., 2001.
3. Yun Q.Shi, Huifang Sun, "Image and Video Compression for Multimedia Engineering - Fundamentals", Algorithms & Standards, CRC press, 2003.
4. Peter Symes, "Digital Video Compression", McGraw Hill Pub., 2004.
5. Mark Nelson, "Data compression", BPB Publishers, New Delhi, 1998.
6. Mark S.Drew, Ze-Nian Li : "Fundamentals of Multimedia", PHI, 1st Edition, 2003.
7. Watkinson,J, "Compression in Video and Audio", Focal press,London. 1995.
8. Jan Vozer, "Video Compression for Multimedia", AP Profes, NewYork, 1995

#### PCC 202 COMPUTER AND COMMUNICATION LAB - II

L	T	P	C
0	0	4	2

#### Goal

To provide a practical knowledge in communication design.

#### Objective

This course should enable the students to implement communication methodologies.

#### Outcome

The students should be able to design topology in communication methodology using tools.

#### LIST OF EXPERIMENTS

1. Study of Network Simulator Packages - such as opnet, ns2, etc.
2. Study of Matlab package

3. Simulation of GPRS MS-BS Interface using ns-Network Simulator
4. Network Operating System - Installation and troubleshooting
5. Distributed Operating System - Installation and troubleshooting
6. Image Compression - Implementation of various techniques
7. Video Compression - Implementation of various techniques

### PCC 203 NETWORK ADMINISTRATION LAB

L	T	P	C
0	0	4	2

#### Goal

To provide a wide knowledge in Network Administration.

#### Objective

This course should enable the students to understand network administration concepts.

#### Outcome

The students should be able to design topology in communication and configuring network devices.

#### LIST OF EXPERIMENTS

##### Basic of Hardware

1. Motherboard configuration
2. Different types of hard disk
3. Different types of RAM
4. VGA & network card
5. SMPS & UPS
6. Monitor in different type

##### Network Level - I

1. LAN
2. WAN
3. MAN
4. Switch
5. Hub
6. Router
7. Layers configuration
8. Network hardwares



## Network Level - II

### Router configuration

1. All router protocol configuration
2. RIP
3. IGRP
4. EIGRP

### Linux Administrator

1. Basic command of Linux
2. HTML configuration in Linux
3. Linux server - Apache, samba
4. Administration maintaining

## PCC 701 XML AND WEB SERVICES

L	T	P	C
3	0	0	3

### Goal

To provide exposure to the concepts of Web Technologies and its applications.

### Objectives

The course should enable the student to learn the

1. Basics of XML
2. Basics of SOAP
3. Architecture of web services and XML security

### Outcome

The student should be able to

1. Understand the basic elements of XML
2. Understand SOAP
3. Demonstrate web services and XML security.

### UNIT I INTRODUCTION

9

Role of XML - XML and the Web - XML Language Basics - SOAP - Web Services - Revolutions of XML - Service Oriented Architecture (SOA).

### UNIT II XML TECHNOLOGY

9

XML - Name Spaces - Structuring With Schemas and DTD - Presentation Techniques - Transformation - XML Infrastructure.

<b>UNIT III SOAP</b>	<b>9</b>
Overview Of SOAP - HTTP - XML-RPC - SOAP: Protocol - Message Structure - Intermediaries - Actors - Design Patterns And Faults - SOAP With Attachments.	
<b>UNIT IV WEB SERVICES</b>	<b>9</b>
Overview - Architecture - Key Technologies - UDDI - WSDL - ebXML - SOAP And Web Services in E-Commerce - Overview of .NET And J2EE.	
<b>UNIT V XML SECURITY</b>	<b>9</b>
Security Overview - Canonicalization - XML Security Framework - XML Encryption - XML Digital Signature - XKMS Structure - Guidelines For Signing XML Documents - XML In Practice.	
<b>Total : 45</b>	

**REFERENCE BOOKS**

1. Frank. P. Coyle, XML, Web Services And The Data Revolution, Pearson Education, 2002.
2. Ramesh Nagappan , Robert Skoczylas and Rima Patel Sriganesh, " Developing Java Web Services", Wiley Publishing Inc., 2004.
3. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services", Pearson Edu., 2004.
4. McGovern, et al., "Java Web Services Architecture", Morgan Kaufmann Publishers,2005.

**PCE 702 CRYPTOGRAPHY AND NETWORK SECURITY**

L T P C  
3 0 0 3

**Goal**

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

**Objectives**

The course should enable the student to learn

1. The number theory.
2. Various symmetric and public key ciphers and their security analysis.
3. Authentication requirements and the hash algorithms for generating authenticators.
4. Existing important security protocols.
5. The concepts of system level security.

**Outcome**

The student should be able to

1. Understand the concept of number theory.

2. Develop a security model to prevent, detect and recover from attacks.
3. Encrypt and decrypt messages using existing ciphers.
4. Generate the digital signature and perform security analysis.
5. Understand and demonstrate the technologies used to protect cipher space against security threats.

**UNIT I INTRODUCTION 12**

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

**UNIT II PUBLIC KEY CRYPTOGRAPHY 12**

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

**UNIT III AUTHENTICATION AND HASH FUNCTION 12**

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

**UNIT IV NETWORK SECURITY 12**

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

**UNIT V SYSTEM LEVEL SECURITY 12**

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

**TOTAL: 60**

**REFERENCE BOOKS**

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

## PCE 709 ADHOC AND SENSOR NETWORKS

L T P C  
3 0 0 3

### Goal

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

### Objectives

The course should enable the student to learn

1. The major issues associated with ad-hoc/sensor networks.
2. Current ad-hoc/sensor technologies by researching key areas such as algorithms, protocols, hardware, and applications.
3. The constraints of the wireless physical layer.
4. MAC and routing protocols.
5. Security threats to adhoc networks.

### Outcome

The student should be able to

1. Describe the unique issues in ad-hoc/sensor networks.
2. Describe current technology trends for the implementation and deployment of wireless ad-hoc/sensor networks.
3. Explain the challenges in designing MAC, routing and transport protocols for wireless ad-hoc/sensor networks.
4. Build and configure a test bed for a sensor network.

### UNIT I ADHOC MAC 9

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

### UNIT II ADHOC NETWORK ROUTING & TCP 9

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

### UNIT III WSN -MAC 9

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

### UNIT IV WSN ROUTING, LOCALIZATION & QOS 9

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

## UNIT V MESH NETWORKS

9

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

Total : 45

### REFERENCE BOOKS

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

### PCE 710 CLOUD COMPUTING

L	T	P	C
3	0	0	3

#### Goal

To provide an introduction to cloud computing and its techniques.

#### Objectives

The course should enable the student to learn

1. Cloud migration
2. IAS and enterprise cloud
3. Virtual machines and management
4. CAS and secured cloud and integration of cloud
5. To use cloud services

#### Outcome

The student should be able to

1. Understand migration
2. Understand issues for enterprise application
3. Understand virtual machines and management
4. Understand CAS and integration of cloud

## 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.

## **PCE 713 SERVICE ORIENTED ARCHITECTURE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **Goal**

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

### **Objectives**

The course should enable the student to learn

1. The fundamentals of SOA and Web Services.
2. Basics of Web services policy and framework.
3. SOA life cycle model.

4. Service oriented design principles.
5. Web service security.

**Outcome**

The student should be able to

1. Make them understand and explain SOA values.
2. Explain the model of SOA management.
3. Prepare students with comprehensive knowledge and broad perspective of this important trend in software engineering.
4. Develop and deploy web services using different design tools.

**UNIT I SOA AND WEB SERVICES FUNDAMENTALS 9**

Fundamentals of SOA - Characteristics - Common misperception - Benefits - Pitfalls of adopting SOA - Transition from XML to web service to SOA - Reshaping of XML and web service through SOA - Standards for SOA - Comparison of SOA vs Past architecture - Web services frame work - Service description - Messaging with SOA.

**UNIT II SECOND GENERATION WEB SERVICES 9**

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

**UNIT III SERVICE ORIENTATION 9**

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

**UNIT IV TECHNOLOGIES AND DESIGN FOR SOA 9**

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

**UNIT V SERVICE DESIGN AND SECURITY 9**

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

**Total : 45**

## REFERENCE BOOKS

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

## PIT 708 AGENT BASED INTELLIGENT SYSTEMS

L	T	P	C
3	0	0	3

### Goal

To impart detailed knowledge on the techniques of knowledge based agents.

### Objectives

The course should enable the students to learn

1. Concepts of agent technology.
2. Fundamentals of Knowledge based agents.
3. Steps to define the behaviour of agents.
4. The methods to deal with uncertainty.

### Outcome

The student should be able to

1. Explain how intelligent agents solve complex problems.
2. Describe the reasons for uncertainty
3. Explain how to deal with uncertainty.
4. Understand out 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.

**PCC 702 MULTIMEDIA MANAGEMENT**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Goal**

To study the concepts of multimedia systems and management.

**Objectives**

The course should be enable the students to learn

1. The nature of interactive multimedia.
2. How to create and communicate using multimedia.
3. Multimedia benefits.

4. The design principles of multimedia applications
5. The multimedia production process.

**Outcome**

The students should be able to

1. Understand the Multimedia server architecture and components.
2. Analyze the various scheduling techniques.
3. Identify and overcome the issues involved in Multimedia storage system.
4. Understand the Cache management techniques.
5. Evaluate the load balancing and various caching policies.

**UNIT I MULTIMEDIA SERVER APPLICATIONS AND ENVIRONMENTS 9**

Introduction - Multimedia Server Environment - Multimedia Server Architecture and Components.

**UNIT II SCHEDULING 9**

Client session scheduling - Client request scheduling - Scheduling in system components.

**UNIT III THE STORAGE SUBSYSTEM 9**

Storage Management Overview - Single Disk Issue - Multiple Disk Organization - Storage Hierarchy.

**UNIT IV CACHE MANAGEMENT 9**

Caching overview - Memory cache - Disk cache.

**UNIT V RELEATED ISSUES 9**

Performance evaluation - Affinity Routing - Load Balancing - Caching among disks - Distributed disk caching - Disk caching policies.

**Total : 45**

**REFERENCE BOOKS**

1. Dinker Sitaram, Asit Dan, "Multimedia Servers - Applications, Environments and Design", Morgan Kaufmann Publishers, 2000.
2. S. Ghandeharizadeh, S Kim, C Shahabi and R. Zimnorman, "Multimedia Information Storage Management", Kluwer Academic Press, 1996.
3. C. K. Wong, "Algorithmic Studies in Mass Storage Systems, Computer Science Press, 1983.

## PCC 703 HUMAN INTERFACE SYSTEM DESIGN

L	T	P	C
3	0	0	3

### Goal

To understand the concepts of Human Computer Interface Design.

### Objectives

The course should be enable the students to learn

1. The theoretical foundations of human computer interaction;
2. The appreciation for human factors in software systems
3. To create the good interface
4. Practice in designing user-centered interfaces.

### Outcome

The students should be able to

1. The student should be able to apply human factors for the development of interactive software
2. Design an efficient user interface
3. Do a case study on usability of websites

### UNIT I HUMAN FACTORS 9

Human Factors of Interactive Software - Interaction Devices.

### UNIT II MODELS 9

Theories - Principles and Design Guidelines for User Interface Design - Object - Action Interface Model -Principles for Design - Data display and entry guidelines.

### UNIT III DESIGN PROCESS 9

User Interface Design Process - Usability Testing - Usability Requirements and Specification procedures and techniques.

### UNIT IV INFORMATION RELATED 9

Information Search - Visualization and the WWW.

### UNIT V USABILITY 9

Usability of Web Sites and Case Study of e-commerce sites.

**Total : 45**

### REFERENCE BOOKS

1. Ben Schneiderman, "Designing the User Interface", Addison Wesley, 2000.
2. Jacob Nielsen, "Usability Engineering ", Academic Press, 1993.
3. Alan Dix et al, "Human - Computer Interaction", Prentice Hall, 1993.
4. Alan Cooper, "The Essentials of User Interface Design", IDG Books, 1995.

## PCC 704 INTERNETWORKING MULTIMEDIA

L	T	P	C
3	0	0	3

### Goal

To learn the Internetworking techniques and standards for the Multimedia communication across the networks

### Objectives

The course should enable the students to learn

1. Multimedia Networking concepts.
2. Broadband Network Technology
3. Reliable Transport Protocol and Applications
4. Multimedia Communication Standards.
5. Multimedia Communication across Networks.

### Outcome

The student should be able to

1. Understand the concept Basic Multimedia Networking and various Compression Techniques.
2. Understand the Broadband services and Storage and media services
3. Understand the Reliability of transport protocols and its applications.
4. Understand the various standards like MPEG 7, MPEG 21, H322
5. Understand various multimedia communication systems across the Networks

### UNIT I MULTIMEDIA NETWORKING

9

Digital sound, video and graphics, basic multimedia networking, multimedia characteristics, evolution of Internet services model, network requirements for audio/ video transform, multimedia coding and compression for text, image, audio and video.

### UNIT II BROADBAND NETWORK TECHNOLOGY

9

Broadband services, ATM and IP, IPV6, High speed switching, resource reservation, Buffer management, traffic shaping, caching, scheduling and policing, throughput, delay and jitter performance - Storage and media services, voice and video over IP, MPEG-2 over ATM/IP, indexing synchronization of requests, recording and remote control.

### UNIT III RELIABLE TRANSPORT PROTOCOL AND APPLICATIONS

9

Multicast over shared media network, multicast routing and addressing, scaling multicast and NBMA networks, Reliable transport protocols, TCP adaptation algorithm, RTP, RTCP - MIME, Peer-to- Peer computing, shared application, video conferencing, centralized and distributed conference control, distributed virtual reality, light weight session philosophy.

#### UNIT IV MULTIMEDIA COMMUNICATION STANDARDS

9

Objective of MPEG- 7 standard, Functionalities and systems of MPEG-7, MPEG-21 Multimedia Framework Architecture - Content representation, Content Management and usage, Intellectual property management, Audio visual system- H322: Guaranteed QOS LAN systems; MPEG\_4 video Transport across internet.

#### UNIT V MULTIMEDIA COMMUNICATION ACROSS NETWORKS

9

Packet Audio/video in the network environment, video transport across Generic networks- Layered video coding, error Resilient video coding techniques, Scalable Rate control, Streaming video across Internet, Multimedia transport across ATM networks and IP network, Multimedia across wireless networks.

**Total : 45**

#### REFERNECE BOOKS

1. Jon Crowcroft, Mark Handley, Ian Wakeman, Internetworking Multimedia, Harcourt Pub., 1998.
2. B.O. Szuprowicz, Multimedia Networking, McGraw Hill, Newyork. 1995
3. Tay Vaughan, Multimedia - Making it to work, 4ed, Tata McGraw Hill , NewDelhi, 2000.
4. K.R.Rao, Zoran S. Bojkovic and Dragorad A. Milovanovic, Multimedia Communication systems, Prentice Hall, 2003

#### PCS 103 OPTICAL COMMUNICATION NETWORKS

L	T	P	C
4	0	0	4

#### Goal

The goal of the programme is to study the Optical network components for Optical Network communication, study various Network architecture and topologies for optical networks and to study the issues in the network design and operation for wavelength routing in optical networks.

#### Objectives

The course should enable the students to learn

1. Evolution of optical networks, first and second generation and various developments over the years, and various optical networking components.
2. Features of TDM signals, Layers, Framing, Transport overhead, Alarms, Multiplexing, Network elements, Topologies, Protection architectures and Network Management.
3. Various broadcast and select networks. How the medium is to effectively share through various protocols.
4. The bottlenecks in network design and wavelength assignment.
5. Various high capacity optical networks and TDM techniques in optical domain.

## Outcome

The student should be able to

1. Explain first- and second-generation optical network, operation of couplers, isolators, circulators, multiplexers and filters and optical amplifiers. Understand various optical switching mechanisms and wavelength converters.
2. Solve various networking problems and understand the concept of network management.
3. Understand single-hop, multi-hop and shufflenet networks and media access protocols.
4. Explain techniques for effective wavelength assignment with existing efforts as examples.
5. Understand high capacity optical networks and techniques to realize the same.

### **UNIT I OPTICAL NETWORKING COMPONENTS 12**

First- and second-generation optical networks, Components: couplers, isolators, circulators, multiplexers, filters, amplifiers, switches and wavelength converters.

### **UNIT II SONET AND SDH NETWORKS 12**

Integration of TDM signals, Layers, Framing, Transport overhead, Alarms, Multiplexing, Network elements, Topologies, Protection architectures, Ring architectures, Network Management.

### **UNIT III BROADCAST -AND- SELECT NETWORKS 12**

Topologies, Single-hop, Multihop, and Shufflenet multihop networks, Media-Access control protocols, Test beds.

### **UNIT IV WAVELENGTH-ROUTING NETWORKS 12**

Node designs, Issues in Network design and operation, Optical layer cost Tradeoffs, Routing and Wavelength assignment, Wavelength routing test beds.

### **UNIT V HIGH CAPACITY NETWORKS 12**

SDM, TDM, and WDM approaches, Application areas, Optical TDM Networks: Multiplexing and demultiplexing, Synchronization, Broadcast networks, Switch-based networks, OTDM testbeds.

**Total : 60**

## REFERENCE BOOKS

1. Rajiv Ramaswami and Kumar Sivarajan, Optical Networks: A practical perspective, MorganKaufmann, 1st edition, 2001.
2. Vivek Alwayn, Optical Network Design and Implementation, Pearson Education, 2004.
3. Hussein T.Mouftab and Pin-Han Ho, Optical Networks: Architecture and Survivability, KluwerAcademic Publishers, 2002.
4. Biswanath Mukherjee, Optical Communication Networks, McGraw Hill, 1997.

## PCS 204 SATELLITE COMMUNICATION

L T P C  
4 0 0 4

### Goal

The student will get to know the satellite systems advantages and disadvantages and the various services offered by Satellite Systems

### Objectives

The course should enable the students to learn

1. Keplers laws of Planetary motion and its application to Earth satellite systems, orbital elements and controlling of them.
2. 3 types of orbits and launching satellite into there orbits and maintaining them there throughout their life.
3. The details of communication link throughout the satellite both uplink and downlink
4. How a satellite can be accessed by many who come within its range of visibility
5. Several services offered by a satellite and the national, regional and international systems currently operating.

### Outcome

The student should be able to

1. Explain Keplers laws for planetary motion and its application to Earth Satellite System
2. Understand the three types of orbits to which the satellite can be launched and maintaining them in the specified orbits to the accuracy requires by Indiana tuned authorities.
3. Demonstrate design of satellite communication links for a given range and for given specifications either digital or Analogue.
4. Understand the various multiple access technique available for the users of the satellite and the comparative merits and demerits
5. Familiar with the several services possible in satellite system and to know the capabilities of national, regional & international systems

### UNIT I ORBITAL MECHANICS

12

Kepler's laws of motion, Orbits, Orbit Equations, Orbit Description, Locating the Satellite in the Orbit and with Respect to Earth, Orbital Elements-Look Angle Determination and Visibility - Orbital Perturbations, Orbit Determination, Launch Vehicles, Orbital Effects in Communication System - Performance Attitude control; Satellite launch vehicles, spectrum allocations for satellite systems.

### UNIT II SPACECRAFT SUB SYSTEMS AND EARTH STATION

12

Spacecraft Subsystems, Altitude and Orbit Control, Telemetry and Tracking, Power Systems, Communication Subsystems, Transponders, Antennas, Equipment Reliability, Earth Stations, example of payloads of operating and planned systems.

### UNIT III SPACE LINKS

12

The Space Link, Satellite Link Design - Satellite uplink -down link power Budget, Basic Transmission Theory, System Noise Temp, G/T Ratio, Noise Figure, Downlink Design, Design of Satellite Links for Specified C/N - Microwave Propagation on Satellite-Earth Paths - Interference between satellite circuits, Energy Dispersal, propagation characteristics of fixed and mobile satellite links.

### UNIT IV MULTIPLE ACCESS TECHNIQUES AND NETWORK ASPECTS

12

Single access vs. multiple access (MA). Classical MA techniques: FDMA, TDMA. Single channel per carrier (SCPC) access - Code division multiple access (CDMA). Demand assignment techniques. Examples of MA techniques for existing and planned systems (e.g. the satellite component of UMTS) - Mobile satellite network design, ATM via satellite - TCP/IP via satellite - Call control, handover and call set up procedures - Hybrid satellite-terrestrial networks.

### UNIT V SERVICES AND APPLICATIONS

12

Fixed and mobile services - Multimedia satellite services - Advanced applications based on satellite platforms - INTELSAT series - INSAT, VSAT, Remote Sensing - Mobile satellite service: GSM - GPS, INMARSAT, Navigation System, Direct to Home service (DTH), Special services, E-mail, Video conferencing and Internet connectivity.

**Total : 60**

### REFERENCES BOOKS

1. Dennis Roddy, "Satellite Communications", Third Edition, Mc Graw Hill International Editions, 2001.
2. Bruce R.Elbert, "The Satellite Communication Applications Hand Book, Artech House Boston,1997.
3. Wilbur L.Pritchard, Hendri G.Suyderhood, Robert A.Nelson,"Satellite Communication Systems Engineering", II Edition, Prentice Hall, New Jersey, 1993
4. Tri T.Ha, "Digital satellite communication", 2nd Edition, McGraw Hill, New york.1990

### PCS 713 ERROR CONTROL CODING

L	T	P	C
4	0	0	4

#### Goal

The goal of the programme is to study the cyclic redundancy codes in detail, and to get a clear concept of different error correcting codes and convolutional codes.

#### Objectives

The course should enable the students to learn

1. The vector algebra required for coding theory.
2. Various properties of BCH codes and its techniques in detail.



3. Error correcting codes, both burst and random errors.
4. Convolutional codes, its importance, design and decoding.
5. Turbo codes and space-time coding techniques.

**Outcome**

The students should be able to

1. Solve problems in vector algebra which will help them in error control coding design.
2. Design BCH codes, decoding of BCH codes, Reed-Solomon codes etc.
3. Develop error correcting codes, and its decoding for both burst and random errors.
4. Explain Viterbi algorithm, convolutional codes, and its decoding algorithms.
5. Solve problems related to turbo codes and decoding of turbo codes. Learn space-time codes.

**UNIT I VECTOR ALGEBRA 9**

Basics of Vector Algebra - Galois Field arithmetic in detail.

**UNIT II BCH CODES 9**

BCH codes, Decoding of BCH codes, implementation of Galois field arithmetic, Implementation of error correction, Non-binary BCH and Read Solomon codes, Weight distribution and error detection of binary BCH codes.

**UNIT III ERROR CORRECTING CODES 9**

Burst error correcting coders, decoding of single burst error correcting cyclic codes, interleaved codes, phased burst correcting codes, Burst and random error correcting codes.

**UNIT IV CONVOLUTIONAL CODES 9**

Convolutional codes, Maximum likelihood decoding of convolutional codes, sequential decoding of convolutional codes - stack and fano algorithm, Application of Viterbi decoding, Sequential decoding, majority logic decoding, Burst error correction and convolutional codes in ARQ systems.

**UNIT V TURBO CODES 9**

Turbo codes - Coding - Performance - BCJR algorithm - Low density parity check codes - Space time codes.

**Total : 45**

**REFERENCE BOOKS**

1. Shu Lin & D.J. Costello, "Error Control Coding", Second Edition, PHI, 2004.
2. Simon Haykin, "Digital communication", John Wiley and Sons, 1988.
3. Bernard Sklar, "Digital Communication, fundamental and applications", pearson education, 2001.

## PCS 714 NAVIGATION SYSTEMS

L T P C  
3 0 0 3

### Goal

To introduce the basic concepts of Navigation systems used in aircraft.

### Objectives

The course should enable the students to learn

1. The basic concept of navigation systems and various types of sensors
2. The principles in INS and its function, effects and errors
3. Different types of radio navigation-
4. Ground controlled approach system - surveillance systems, and landing aids.
5. The satellite navigation and hybrid navigation.

### Outcomes

The students should be able to

1. Explain the basic concept of navigation systems and various types of sensors.
2. Understand the principle concepts of INS and its function, effects and errors.
3. Explain the different types of radio navigation
4. Understand the Ground controlled approach system - surveillance systems, and landing aids.
5. Understand the satellite navigation and hybrid navigation

### UNIT I VARIOUS TYPES OF NAVIGATION SENSORS 6

Introduction to navigation systems, Gyroscopes-Mechanical-electromechanical-Ring Laser gyro- Fiber optic gyro, Accelerometers

### UNIT II INERTIAL NAVIGATION SYSTEMS 9

INS components: transfer function and errors-The earth in inertial space, the coriolis effect-Mechanisation. Platform and Strap down, INS system block diagram, Different co-ordinate systems, Schuler loop, compensation errors, Gimbal lock, Alignment.

### UNIT III RADIO NAVIGATION 12

Different types of radio navigation-ADF, VOR/DME- Doppler -LORAN, DECCA and Omega - TACAN

### UNIT IV APPROACH AND LANDING AIDS 6

ILS, MLS, GLS - Ground controlled approach system - surveillance systems-radio altimeter

## UNIT V SATELLITE NAVIGATION & HYBRID NAVIGATION

12

Introduction to GPS -system description -basic principles -position and velocity determination signal structure-DGPS, Introduction to Kalman filtering-Estimation and mixed mode navigation-Integration of GPS and INS-utilization of navigation systems in aircraft

**Total : 45**

### REFERENCE BOOKS

1. Nagaraja, N.S. "Elements of Electronic Navigation", Tata McGraw-Hill, 2nd Ed., 1975.
2. Myron Kyton, Walfred Fried, 'Avionics Navigation Systems', John Wiley & Sons, 2nd Ed., 1997.
3. George M Siouris, 'Aerospace Avionics System; A Modern Synthesis', Academic Press, 1993.
4. Albert Helfrick, 'Practical Aircraft Electronic Systems', Prentice Hall, Career and Technology, 1995.
5. Albert D. Helfrick, 'Modern Aviation Electronics', 2nd Ed. Prentice Hall, Career and Tech., 1994.
6. Sen, A.K. & Bhattacharya, A.B. "Radar System and Radar Aids to Navigation", Khanna Pub.
7. Slater, J.M. Donnel, C.F.O and others, "Inertial Navigation Analysis and Design", McGraw-Hill Book Company, New York, 1964.

