



# **GOVERNMENT COLLEGE OF TECHNOLOGY**

(An Autonomous Institution Affiliated to Anna University)

Coimbatore - 641 013

**Curriculum & Syllabi (I - VII SEM)**

**B.E. (ELECTRONICS AND COMMUNICATION ENGINEERING)**

**(Part Time)**

# **2012**

**Regulations**

**OFFICE OF THE CONTROLLER OF EXAMINATIONS  
GOVERNMENT COLLEGE OF TECHNOLOGY  
THADAGAM ROAD, COIMBATORE - 641 013**

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# Regulations



## **Regulations for Part Time candidates admitted during the academic year 2012 - 2013 and onwards**

### **1. CONDITIONS FOR ADMISSION**

Candidates for admission to the first year of the Part Time - Seven Semester B.E. Degree course shall be required to have passed,

- i. the Diploma Examination in Engineering conducted by the State Board of Technical Education and Training, Tamil Nadu.

(or)

- ii. an Examination of any University or Authority, accepted by the Syndicate of the Anna University as equivalent thereto.

(or)

- iii. any other examination as notified by the Government of Tamil Nadu.

Any other conditions as notified by the Government of Tamil Nadu.

### **2. BRANCHES OF STUDY**

Branches will be offered at the time of admission to the course. The following are the branches offered in this college.

1. B.E. Civil Engineering
2. B.E. Mechanical Engineering
3. B.E. Electrical and Electronics Engineering
4. B.E. Electronics and Communication Engineering

### **3. STRUCTURE OF PROGRAMMES**

3.1 Every programme shall have a curriculum with well – defined syllabi comprising of both theory and practical courses such as :

- i. General core subjects comprising Mathematics, Basic Sciences, Engineering Sciences, Humanities and Engineering arts.
- ii. Core subjects of Engineering / Technology
- iii. Elective subjects for specialization in related fields
- iv. Workshop practice, computer practice, engineering graphics, laboratory work, industrial training, seminar presentation, project work, educational tours, camps etc.

3.2 The subjects of study shall be both theory and practical and shall be in accordance with the prescribed syllabus.

3.3 Each semester curriculum shall normally have a blend of lecture and practical subjects not exceeding 5.

3.4 A student who has passed all the subjects prescribed in the curriculum for the award of the

degree shall not be permitted to re-enroll to improve his/her **credits** in a subject or the aggregate **credits**.

3.5 The medium of instruction in examinations and project report shall be English.

#### 4. DURATION OF THE PROGRAMME

The duration of the programme for the Degree of B.E. Programme shall be SEVEN (7) semesters with semester pattern. The number of working days will be 90 days (which includes 15 days for end semester examinations) or 450 Hours or 540 periods of each 50 minutes duration for semester pattern. The number of working days is to be calculated excluding study holidays, Government holidays and end - semester examination days. The Head of the Department shall ensure that every teacher imparts instruction as per the number of periods specified in the syllabus and that the teacher teaches the full content of the specified syllabus for the course being taught.

#### 5. SYSTEM OF EXAMINATION

Performance in each subject of study shall be evaluated based on (i) continuous internal assessment through the semester and (ii) an end semester examination.

##### THEORY

End semester Examinations will be conducted in all the theory subjects of study at the end of each semester for all the subjects. The maximum marks of each subject shall be 100, out of which the continuous internal assessment will carry 25 marks, while the end semester Examination will carry 75 marks.

To arrive the internal mark the following guidelines are to be followed.

- |       |            |   |            |
|-------|------------|---|------------|
| (i)   | Test       | (3 Nos.) { each test is to be conducted for 50 Marks} | : 60 Marks |
| (ii)  | Assignment | (3 Nos.)  | : 30 Marks |
| (iii) | Attendance |   | : 10 Marks |

100 Marks

Total 100 Marks should be reduced to 25 Marks

##### \* Attendance (10 Marks)

Percentage of attendance	Marks
75	0
76 - 80	2
81 - 84	4
85 - 89	6
90 - 94	8
95 and above	10

##### PRACTICAL

The Practical classes for all the Practical / Lab component subjects will be assessed continuously and marks will be entered in the prescribed proforma. The progress of Practical classes will be monitored by a committee formed by the concerned Head of the Departments / Professor in-charge of the Programme to ensure that the concerned staff conducts the laboratory experiments as specified in the syllabus. The proforma should be submitted at the end of the each month for Principal's / Chairman, Board of Examinations' approval. The maximum marks for the Practical / Lab component subjects shall be 100, out of which the continuous internal assessment

will carry 25 marks, while the end semester practical examination will carry 75 marks. If any practical subject contains Part A and Part B components, the maximum marks for each Part of the lab will be 50 marks, out of which the continuous internal assessment will carry 12.5 marks, while the end semester practical examination will carry 37.5 marks. The award of the end semester practical examination marks shall be conducted by both the Internal and External examiners. To arrive the internal mark the following guidelines are to be followed.

- |                           |            |
|---------------------------|------------|
| (i) Continuous Assessment | : 50 Marks |
| (ii) Test (minimum one)   | : 40 Marks |
| (iii) Attendance          | : 10 Marks |

Total 100 Marks should be reduced to 25 Marks

Attendance (10 Marks)

Percentage of attendance	Marks
75	0
76 - 80	2
81 - 84	4
85 - 89	6
90 - 94	8
95 and above	10

#### PROJECT WORK AND VIVA - VOCE :

For the project work and viva-voce examination the maximum marks shall be 200 comprising of 50 marks for internal assessment and 150 for the end semester examination. The award of the end semester marks for 150 shall be evaluated by both the Internal and External examiners, out of which the project report shall carry a maximum of 50 marks (same mark must be awarded to every student of the project group) while the viva-voce examination shall carry 100 marks (awarded to each student of the project group based on the individual performance in the viva-voce examination).

For Internal Mark:

- |                                     |               |
|-------------------------------------|---------------|
| Work assessed by Guide / Supervisor | : 50 % weight |
| Work assessed by a Committee        | : 50 % weight |

#### 6. REQUIREMENTS OF EXAMINATIONS AND ATTENDANCE

A candidate who has fulfilled the following conditions shall be deemed to have satisfied the requirements for completion of a semester.

6.1 A candidate will be permitted to appear for the Examination for any semester, only if

- i. he / she secures not less than 75% of attendance in the number of working days during that semester, provided that it shall be open to Chairman of the Academic Council or any authority delegated with such powers (by the governing body) to grant exemption (based on the recommendation of the Head of the Department) to a candidate who has failed to secure 75% of the attendance for valid reasons and has secured not less than 66% of the attendance. Such exemptions can be allowed only TWO times during his/ her entire period of study.
- ii. Candidates representing University in State / National / International / Inter University Sports events, Co & Extra - Curricular activities, paper or project presentation with prior permission from the Head of Institution are given exemption upto 10% of the required attendance and such candidates shall be permitted to appear for the current semester examination.

- iii. his / her conduct has been certified to be satisfactory by the concerned Head of Department.
  - iv. **Condonation can be allowed only two times during his / her entire course of study.**
- 6.2 Candidates who do not complete the semester (as per clause 6.1), will not be permitted to write the end-semester examination and are not permitted to go to next semester. They are required to repeat the incomplete semester in the next academic year.

## **7. PROCEDURES FOR AWARDING MARKS FOR INTERNAL ASSESSMENT**

- i. Every teacher is required to maintain a 'ATTENDANCE AND ASSESSMENT RECORD' which consists of attendance marked in each lecture or practical or project work class, the test marks and the record of class work (topic covered), separately for each course. This should be submitted to the Head of the Departments periodically (atleast three times in a semester) for checking the syllabus coverage and the records of test marks and attendance. The Head of the Departments will put his signature and date after due verification at the end of the semester, the record should be verified by the Head of the Institution who will keep this document in safe custody (for five years).

### **ii. Theory subjects [25 marks]**

#### **(a). Unit Tests [60% weight] :**

Three tests each carrying fifty (50) marks shall be conducted by the Department / Institution. The total marks obtained in all the test put together out of 150, shall be reduced to 60 marks and rounded to nearest integer (this implies equal weight to all the three tests). However a retest at the discretion of the Head of the Department may be conducted for the deserving candidates.

#### **(b). Assignment [30% weight] :**

Three Assignments requiring work of average 5 to 6 hours of study and written work of average 5 to 6 hours, each carried out by a student in a separate assignment folder, duly indexed with headings, date of submission, marks, remarks and signature of faculty with date etc.

#### **(c). Attendance [ 10% weight] :**

A maximum 10 marks for attendance out of 100 marks shall be given to each student depending on his/her attendance percentage as per the distribution given below:

Attendance (10 Marks)	
Percentage of attendance	Marks
75	0
76 - 80	2
81 - 84	4
85 - 89	6
90 - 94	8
95 and above	10

The Internal marks are valid for two more attempts in addition to the current attempt for the candidates admitted from the academic year 2009 - 2010 and onwards. If a candidate scores 50% of marks only in the end semester examination, after three attempts (First attempt + two more attempts), he / she would be declared as a passed candidate in that examination.

iii. **Practical Courses [25 marks]**

Every practical exercise / experiment shall be evaluated based on conduct of exercise / experiment and records maintained. There shall be atleast one test. The criteria for arriving the internal assessment marks are :

Experiment / Record / Average Practical classes performance:	50% weight
Practical Test	: 40% weight
Attendance	: 10% weight
Total 100 marks should be reduced to 25 marks	

iv. **Theory Subjects with Laboratory Component**

(a). **Unit Tests [60% weight] :**

If there is a theory subject with Laboratory component, there shall be three tests; the first two tests (each 50 Marks) will be from theory portions and third test (maximum marks 50) will be for laboratory component. The total 150 marks should be reduced to 60 marks. However a retest at the discretion of the Head of the Department may be conducted for the deserving candidates.

(b). **Assignment [30% weight] :**

Three Assignments (at least 2 per term) requiring work of average 5 to 6 hours of study and written work of average 5 to 6 hours, each carried out by a student in a separate assignment folder, duly indexed with headings, date of submission, marks, remarks and signature of faculty with date etc. ✓

(c). **Attendance [10% weight] :**

A maximum 10 marks for attendance out of 100 marks shall be given to each student depending on his/her attendance percentage as per the distribution given below: ✓

Attendance (10) Marks	
Percentage of attendance	Marks
75	0
76 - 80	2
81 - 84	4
85 - 89	6
90 - 94	8
95 and above	10

The Internal marks are valid for two more attempts in addition to the current attempt for the candidates admitted from the academic year 2009 - 2010 and onwards. If a candidate scores 50% of marks only in the end semester examination, after three attempts (First attempt + two more attempts), he / she would be declared as a passed candidate in that examination.

v. **Project Work**

There shall be three assessments during the semester by a review committee. The students shall make presentation on the progress made before the committee. The Head of the Institution shall constitute the review committee for each branch of study. The criteria for arriving the internal assessment marks for the Project Work evaluated for 50 marks are :

Work assessed by the Project Guide	: 50%
Work Assessed by a committee	: 50%

The Internal marks are valid for two more attempts in addition to the current attempt for the candidates admitted from the academic year 2009 - 2010 and onwards. If a candidate scores 50% of marks only in the end semester examination, after three attempts (First attempt + two more attempts), he / she would be declared as a passed candidate in that examination.

#### 8. PROCEDURE FOR COMPLETING THE PROGRAMME

- i. A candidate who has for some reason discontinued the course can join the course of study of any semester only at the time of its normal commencement in the Institution for regular students upon satisfying all the following conditions
  - a) he / she should have completed the course of study of the previous semesters.
  - b) he / she should be eligible to register for the examinations and satisfy rule 8 (iii)
  - c) he / she should have registered for all the examinations of the previous semesters.
- ii. A candidate will be permitted to proceed from one semester to the next higher semester only if he / she has satisfied the regulation for eligibility to appear for the End-Semester examination in the concerned semester, subject to the condition that the candidate should register for all the arrear subjects of lower semesters along with the current (higher) semester subjects.
- iii. A candidate should have completed the B.E. Degree Programme within a period of **SEVEN** consecutive academic years (14 semesters) from the date of admission to the course, even if the candidate discontinues and rejoins subsequently, to be eligible for the award of the degree. The minimum and maximum period for completion of the U.G. Programmes are given below:

Programme	Min. No. of Semesters	Max. No. of Semesters
B.E. (Part Time)	7	14

#### 9. REQUIREMENTS FOR APPEARING FOR SEMESTER EXAMINATION

A candidate shall normally be permitted to appear for the semester examination of the current semester if he/she has satisfied the semester completion requirements (Subject to Clause 6.1) and has registered for examination in all subjects of that semester. Registration is mandatory for current semester examinations as well as arrears examinations failing which the candidate will not be permitted to move to the higher semester.

#### 10. PASSING MINIMUM AND CLASSIFICATION OF SUCCESSFULL CANDIDATES

- i. For each subject the examination will be conducted for 100 marks. A candidate who secures not less than 50% of the total marks in the End Semester examination and Internal Assessment put together in both theory and Practical courses, including Project work, subject to securing a minimum of 50% in the End - Semester examination,



wherever applicable, shall be declared to have passed the examination in that subject. When the mark secured for 100 is converted to 75, minimum 37 marks must be secured for pass. Any Programme, during any semester, conducts the lab in two parts, say A and B, it is mandatory that the student must appear for both the parts of the lab in the end semester practical examination. The candidate is declared as pass in both the parts A and B lab, only if he / she secures a minimum of **50% put together**, and the student must compulsorily appear for both the parts of the lab in the end semester practical examination. If the candidate is absent for any one part of the lab, the candidate is declared as fail in both the parts A and B of the lab [marked as Absent in External Examinations] and he / she should appear in both, part A and B in the Subsequent semesters.

- ii. A candidate who successfully completes the course requirements and has passed all the prescribed examinations in all the Seven Semesters within a maximum period of Seven years(14 semesters) reckoned from the commencement of the first semester to which the candidate was admitted is eligible to get the degree.
- iii. A candidate who qualifies for the Degree by passing the examination in all subjects of the entire Programme in first attempt within a period of Seven Semesters from the date of admission to the Programme and secures a **CGPA of not less than 8.00** for the entire Programme shall be declared to have passed the examination for the degree in **FIRST CLASS WITH DISTINCTION**. For this purpose the withdrawal from examination will not be construed as an appearance. Further, the authorized break of study will not be counted for the purpose of classification.
- iv. A candidate transferred from other Institution, who qualifies for the Degree by passing the examination in all subjects of the entire Programme in first attempt within a period of Seven Semesters from the date of admission to the Programme and secures a **CGPA of not less than 8.00** for the entire Programme shall be declared to have passed the examination for the degree in **FIRST CLASS WITH DISTINCTION**. For this purpose the withdrawal from examination will not be construed as an appearance. Further, the authorized break of study will not be counted for the purpose of classification.
- v. A candidate who qualifies for the award of the Degree having passed the examinations in all the subjects of the Programme in the semesters first to seven within a maximum period of Nine consecutive semesters after his/her commencement of study in the first semester and secures a **CGPA of not less than 6.50** for the entire Programme shall be declared to have passed the examination for the degree in **FIRST CLASS**. For this purpose, the authorized break of study will not be counted for the purpose of classification.
- vi. All other successful candidates shall be declared to have passed the examination for the Degree in **SECOND CLASS**.
- vii. A candidate who is absent in semester examination in a subject / project work after having registered for the same shall be considered to have appeared in that examination for the purpose of classification.

#### 11. ISSUE OF GRADE SHEETS

Individual grade sheet for each semester will be issued, containing the following information through the Head of the Department concerned, after the publication of the results.

- i) The **credits** obtained in each subject in internal assessment and end semester examination and total **credits** obtained for each course.
- ii) Whether the candidate has passed / failed in the courses concerned.

## **12. MALPRACTICE**

If a student indulges in malpractice in any of the end semester examinations, he / she shall be liable for punitive action as and when prescribed by the **Anna University, Chennai**.

## **13. REVALUATION**

- i. Copies of answer script for theory subjects can be obtained from the Office of the Controller of Examinations on payment of a prescribed fee specified for this purpose through proper application.
- ii. A candidate can apply for revaluation of his / her semester examination answer paper in a theory subject, on payment of a prescribed fee through proper application to the Office of the Controller of Examinations, as per the norms given by the Chairman, Academic Council. Revaluation is not permitted for Practical subjects and for Project work.
- iii. Retotalling is permissible for all arrear and current theory subjects.
- iv. Challenging the revaluation is permitted, for those students who have applied for photocopy of the answer script. The Copy of answer Script is to be valued by a competent authority and the valued script should be submitted to COE's office along with the prescribed fee for challenging revaluation.

## **14. ELIGIBILITY FOR THE AWARD OF DEGREE**

A candidate shall be declared to be eligible for the award of the B.E Degree provided the candidate has

- i) Successfully completed the course requirements and has passed all the prescribed examinations in all the **7 semesters within a maximum period of 7 years** from the commencement of first semester to which the candidate was admitted.
- ii) The award of degree must have been approved by the Syndicate of the University.
- iii) The Minimum credit to be earned to get -PTBE degree is 90 .

## **15. CLASS COMMITTEE**

15.1 A class committee consists of teachers of the concerned class, student representatives and a chairperson who is not teaching the class. It is like the 'Quality Circle' (more commonly used in industries) with the overall goal of improving the teaching-learning process. The functions of the class committee include

- Solving problems experienced by students in the class room and in the laboratories.
- Clarifying the regulations of the degree programme and the details of rules therein.
- Informing the student representatives the academic schedule including the dates of assessments and the syllabus coverage for each assessment.
- Informing the student representatives the details of Regulations regarding weightage used for each assessment. In the case of practical courses (laboratory/drawing/ project work/ seminar etc.) the breakup of marks for each experiment / exercise/ module of work, should be clearly discussed in the class committee meeting and informed to the students.
- Analyzing the performance of the students of the class after each test and finding the ways and means of solving problems, if any.
- Identifying the weak students, if any, and requesting the teachers concerned to provide some additional help or guidance or coaching to such weak students.

- 15.2 The class committee for a class under a particular branch is normally constituted by the Head of the Department. However, if the students of different branches are mixed in each class of the first semester (generally common to all branches), the class committee is to be constituted by the Head of the Institution.
- 15.3 The class committee shall be constituted on the first working day of any semester or earlier.
- 15.4 Atleast 4 student representatives (usually 2 boys and 2 girls) shall be included in the class committee.
- 15.5 The chairperson of the class committee may invite the Faculty Adviser(s) and the Head of the Department to the meeting of the class committee.
- 15.6 The Head of the Institution may participate in any class committee of the institution.
- 15.7 The chairperson is required to prepare the minutes of every meeting, submit the same to the Head of the Institution within two days of the meeting and arrange to circulate among the concerned students and teachers. If there are some points in the minutes requiring action by the management, the same shall be brought to the notice of the management by the Head of the Institution.
- 15.8 The first meeting of the class committee shall be held within one week from the date of commencement of the semester, in order to inform the students about the nature and weight of assessments within the framework of the Regulations. Two or three subsequent meetings may be held at suitable intervals. During these meetings the student members representing the entire class, shall meaningfully interact and express the opinions and suggestions of the class students to improve the effectiveness of the teaching-learning process.

#### **16. FACULTY ADVISER**

To help the students in planning their courses of study and for general advise on the academic programme, the Head of the Department of the student will attach a certain number of students to a teacher of the Department who shall function as Faculty Adviser for those students throughout their period of study. Such Faculty Adviser shall advise the students and monitor the courses taken by the students, check the attendance and progress of the students attached to him / her and counsel them periodically. If necessary, the faculty adviser may also discuss with or inform the parents about the progress of the students.

#### **17. COURSE COMMITTEE FOR COMMON SUBJECTS**

Each common theory subjects offered to more than one discipline or group, shall have a "Course Committee" comprising all the teachers teaching the common subject with one of them nominated as Course Coordinator. The nomination of the course Coordinator shall be made by the Head of the Department / Head of the institution depending upon whether all the teachers teaching the common subject belong to a single department or to several departments. The 'Course committee' shall meet as often as possible and ensure uniform evaluation of the tests and arrive at a common scheme of evaluation for the tests. Where it is feasible, the course committee may also prepare a common question paper for the test(s).

**18. PROVISION FOR WITHDRAWAL FROM EXAMINATION**

- i. A candidate may, for valid reasons, be granted permission to withdraw from appearing for the examination in any subject or subjects of only one semester examination during the entire duration of the degree programme. Also only one application for withdrawal is permitted for that semester examination in which withdrawal is sought.
- ii. Withdrawal application shall be valid only if the candidate is otherwise eligible to write the examination and if it is made prior to the commencement of the last examination in that semester and duly recommended by the Head of the Department and approved by the Head of the Institution.
- iii. Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction.
- iv. Withdrawal is possible only if the candidate satisfies the attendance requirements [as per Clause 6.1]

**19. TEMPORARY BREAK OF STUDY FROM A PROGRAMME**

- i. A candidate is not normally permitted to temporarily break the study. However if a candidate intends to temporarily discontinue the programme in the middle for valid reasons (such as accident or hospitalization due to prolonged ill health) and to rejoin the programme in a later semester he/she shall apply to the Head of the Institution in advance, in any case, not later than the last date for registering for the semester examinations of the semester in question, through the Head of the Department stating the reasons thereof.
- ii. The candidate permitted to rejoin the programme after the break shall be governed by the rules and regulations in force at the time of rejoining.
- iii. The duration specified for passing all the subjects for the purpose of classification vide Clause 10(iii), 10(iv) and 10(v) shall be increased by the period of such permitted break of study.
- iv. The total period for completion of the programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 8(iii) irrespective of the period of break of study in order that he/she may be eligible for the award of the degree (vide clause 14).
- v. If any student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted 'Break of Study' and Clause 19(iii) is not applicable for this case.

**20. RANK OF A STUDENT**

A candidate who qualifies for the Degree by passing the examination in all subjects of the entire Programme in first attempt within a period of Seven Semesters from the date of admission to the Programme can be given his position in the class as rank. The Rank is determined from I Semester to VII Semester end semester examination CGPA. Students transferred from other institutions to GCT are not eligible for rank.

**21. PROCEDURE FOR USING SCRIBER**

If a candidate is physically handicapped (in case of accidents / ill health) at the time of examination, then he / she may be permitted to use a scribe to write the examination. In such case 30 minutes extra time will be permitted. The Scribe shall be a non-engineering student / graduate.

**22. DISCIPLINE**

Every student is required to observe disciplined and decorous behaviour both inside and outside the college and not to indulge in any activity which will tend to bring down the prestige of the College. In the event an act of indiscipline being reported, the Principal shall constitute a disciplinary committee consisting of three Heads of Department of which one should be from the faculty of the student, to enquire into acts of indiscipline. The disciplinary action is subject to review by the University in case the student represents to the University. Any expulsion of the student from the college shall be with prior concurrence from Director of Technical Education / University.

**23. CREDIT SYSTEM**

The letter grade and the grade point are awarded based on percentage of marks secured by a candidate in individual course as detailed below:

Range of Total Marks	Letter Grade	Grade Points (GP)
90 to 100	S	10
80 to 89	A	9
70 to 79	B	8
60 to 69	C	7
55 to 59	D	6
50 to 54	E	5
0 to 49	U	0
Incomplete	I	0
Withdrawal	W	0

"U" denotes failure in the subject.

"I" denotes incomplete as per clause 6.1 and hence prevention from writing End Semester Examination.

"W" denotes withdrawal from the subject.

After results are declared, Grade sheets will be issued to each student which will contain the following details :

The list of subjects enrolled during the semester and the grades scored.  
The Grade Point Average (GPA) for the semester and  
The Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards.

GPA is the ratio of the sum of the products of the number of credits of subjects registered and the points corresponding to the grades scored in those subjects, taken for all the subjects, to the sum of the number of credits of all the subjects in the semester.

$$\text{GPA} = \frac{\text{Sum of } [C \times GP]}{\text{Sum of } C}$$

where C - credit of a particular subject  
GP - grade point obtained by the student in the respective subject.

CGPA will be calculated in a similar manner, considering all the subjects enrolled from first semester. "U", "I" and "W" grades will be excluded for calculating GPA and CGPA.

Each subject is normally assigned certain number of credits with 1 credit per lecture period per week, 1 credit per tutorial period per week, 1 credit for 2 periods of laboratory or practical or seminar or project work per week (2 credits for 3 or 4 periods of practical).

However, the performance of a student is evaluated only based on the credit system.

#### **24. REVISION OF REGULATION AND CURRICULUM**

The college may from time to time revise, amend or change the regulations, scheme of examinations and syllabus, if found necessary.

# Curriculum







**CURRICULUM**  
(Part Time Candidates admitted during 2012-2013 and onwards)

**FIRST SEMESTER**

S. No.	Subject Code	Course Title	Sessional marks	Final Exam marks	Total marks	L	T	P	C
1	12L1Z2	ENGINEERING MATHEMATICS I	25	75	100	3	1	0	4
2	12L106	PROGRAMMING IN C	25	75	100	3	1	0	4
3	12L206	SEMICONDUCTOR DEVICES	25	75	100	3	0	0	3
4	12L302	CIRCUIT THEORY	25	75	100	3	1	0	4
5	12L402	ENVIRONMENTAL SCIENCE AND ENGINEERING /	25	75	100	3	0	0	3
		<b>TOTAL</b>			<b>500</b>				<b>18</b>

**SECOND SEMESTER**

S. No.	Subject Code	Course Title	Sessional marks	Final Exam marks	Total marks	L	T	P	C
1	12L2Z2	ENGINEERING MATHEMATICS II	25	75	100	3	1	0	4
2	12L303	ELECTRONIC CIRCUIT DESIGN	25	75	100	3	1	0	4
3	12L403	ANALOG INTEGRATED CIRCUITS	25	75	100	3	0	0	3
4	12L405	DIGITAL LOGIC WITH HDL	25	75	100	3	1	0	4
		<b>PRACTICAL</b>							
5	12L407	INTEGRATED CIRCUITS LABORATORY	25	75	100	0	0	3	2
		<b>TOTAL</b>			<b>500</b>				<b>17</b>

### THIRD SEMESTER

S. No.	Subject Code	Course Title	Sessional marks	Final Exam marks	Total marks	L	T	P	C
		<b>THEORY</b>							
1	12L305	SIGNALS AND SYSTEMS	25	75	100	3	1	0	4
2	12L306	ELECTROMAGNETIC WAVES AND WAVE GUIDES	25	75	100	3	1	0	4
3	12L404	ANALOG COMMUNICATION	25	75	100	3	0	0	3
4	12L502	MICROPROCESSORS AND MICROCONTROLLERS	25	75	100	3	0	2	4
5	12L506	CONTROL SYSTEMS	25	75	100	3	1	0	4
		<b>TOTAL</b>			<b>500</b>				<b>19</b>

### FOURTH SEMESTER

S. No.	Subject Code	Course Title	Sessional marks	Final Exam marks	Total marks	L	T	P	C
		<b>THEORY</b>							
1	12L406	NETWORKS AND TRANSMISSION LINES	25	75	100	3	0	0	3
2	12L501	DIGITAL SIGNAL PROCESSING	25	75	100	3	1	0	4
3	12L503	DIGITAL COMMUNICATION	25	75	100	3	0	0	3
4	12L504	COMPUTER ARCHITECTURE AND ORGANIZATION	25	75	100	3	0	0	3
		<b>PRACTICAL</b>							
5	12L507	DIGITAL COMMUNICATION SYSTEMS LABORATORY	25	75	100	0	0	3	2
		<b>TOTAL</b>			<b>500</b>				<b>15</b>

### FIFTH SEMESTER

S. No.	Subject Code	Course Title	Sessional marks	Final Exam marks	Total marks	L	T	P	C
		<b>THEORY</b>							
1	12L505	CMOS VLSI SYSTEMS	25	75	100	3	0	0	3
2	12L603	ANTENNAS AND WAVE PROPAGATION	25	75	100	3	0	0	3
3	12L605	COMPUTER COMMUNICATION	25	75	100	3	0	0	3
4	12L701	MICROWAVE AND RF SYSTEMS	25	75	100	3	0	0	3
5	E1	ELECTIVE I	25	75	100	3	0	0	3
		<b>TOTAL</b>			<b>500</b>				<b>15</b>

### SIXTH SEMESTER

S. No.	Subject Code	Course Title	Sessional marks	Final Exam marks	Total marks	L	T	P	C
		<b>THEORY</b>							
1	12L601	MANAGEMENT THEORY AND PRACTICE	25	75	100	3	0	0	3
2	12L604	EMBEDDED SYSTEMS	25	75	100	3	0	0	3
3		ELECTIVE II	25	75	100	3	0	0	3
4		ELECTIVE III	25	75	100	3	0	0	3
		<b>PRACTICAL</b>							
5	12L508	VLSI LABORATORY	25	75	100	0	0	3	2
		<b>TOTAL</b>			<b>500</b>				<b>14</b>

### SEVENTH SEMESTER

S. No.	Subject Code	Course Title	Sessional marks	Final Exam marks	Total marks	L	T	P	C
		<b>THEORY</b>							
1	12L703	WIRELESS COMMUNICATION	25	75	100	3	0	0	3
2	12L704	FIBRE OPTIC COMMUNICATION	25	75	100	3	0	0	3
3		ELECTIVE IV	25	75	100	3	0	0	3
4		ELECTIVE V	25	75	100	3	0	0	3
		<b>PRACTICAL</b>							
5	12L801	PROJECT WORK & VIVA VOCE	50	150	200	0	0	12	6
		<b>TOTAL</b>			<b>600</b>				<b>18</b>

**LIST OF ELECTIVE SUBJECTS**  
**BRANCH- ELECTRONICS AND COMMUNICATION ENGINEERING**  
**(FIFTH SEMESTER)**

S. No.	Subject Code	Course Title	Sessional marks	Final Exam marks	Total marks	L	T	P	C
1	12L6E0	AUTOMOTIVE ELECTRONIC SYSTEMS	25	75	100	3	1	0	3
2	12L6E1	RELATIONAL DATABASE MANAGEMENT SYSTEMS	25	75	100	3	0	0	3
3	12L6E2	OPERATING SYSTEMS	25	75	100	3	0	0	3
4	12L6E3	MEASUREMENTS AND INSTRUMENTATION	25	75	100	3	1	0	3
5	12L6E4	TV AND VIDEO ENGINEERING	25	75	100	3	0	0	3
6	12L6E5	STATISTICAL THEORY OF COMMUNICATION	25	75	100	3	0	0	3

**LIST OF ELECTIVE SUBJECTS**  
**BRANCH- ELECTRONICS AND COMMUNICATION ENGINEERING**  
**(SIXTH SEMESTER)**

S. No.	Subject Code	Course Title	Sessional marks	Final Exam marks	Total marks	L	T	P	C
1	12L7E0	SPREAD SPECTRUM TECHNIQUES	25	75	100	3	0	0	3
2	12L7E1	ADVANCED DIGITAL SIGNAL PROCESSING	25	75	100	3	0	0	3
3	12L7E2	VLSI SIGNAL PROCESSING	25	75	100	3	0	0	3
4	12L7E3	SOFTWARE ENGINEERING	25	75	100	3	0	0	3
5	12L7E4	NEURAL NETWORKS	25	75	100	3	0	0	3
6	12L7E5	RADAR SYSTEMS	25	75	100	3	0	0	3
7	12L7E6	IMAGE PROCESSING	25	75	100	3	0	0	3
8	12L7E7	MULTIMEDIA COMPRESSION TECHNIQUES	25	75	100	3	0	0	3
9	12L7E8	MEMS	25	75	100	3	0	0	3
10	12L7E9	AVIONICS	25	75	100	3	0	0	3

**LIST OF ELECTIVE SUBJECTS**  
**BRANCH- ELECTRONICS AND COMMUNICATION ENGINEERING**  
**(SEVENTH SEMESTER)**

S. No.	Subject Code	Course Title	Sessional marks	Final Exam marks	Total marks	L	T	P	C
1	12L8E0	PROFESSIONAL ETHICS	25	75	100	3	0	0	3
2	12L8E1	DSP SYSTEM DESIGN	25	75	100	3	0	0	3
3	12L8E2	NANO ELECTRONICS	25	75	100	3	0	0	3
4	12L8E3	SOFT COMPUTING	25	75	100	3	0	0	3
5	12L8E4	TOTAL QUALITY MANAGEMENT	25	75	100	3	0	0	3
6	12L8E5	BIO MEDICAL INSTRUMENTATION	25	75	100	3	0	0	3
7	12L8E6	POWER ELECTRONICS	25	75	100	3	0	0	3
8	12L8E7	VLSI TESTING	25	75	100	3	0	0	3
9	12L8E8	SATTELITE COMMUNICATION,	25	75	100	3	0	0	3
10	12L8E9	NETWORK SECURITY	25	75	100	3	0	0	3

**Syllabi**







**12L1Z2 ENGINEERING MATHEMATICS I**

(Common to all branches)

**L T P C**

**3 1 0 4**

**(9)**

**MATRICES**

Characteristic equation - Eigen values and Eigen vectors of a real matrix - Properties of Eigen values - Cayley-Hamilton Theorem(statement only) and applications- Diagonalisation by similarity transformation - Reduction of quadratic form to canonical form.

**HYPERBOLIC FUNCTIONS AND SOLID GEOMETRY**

**(9)**

Hyperbolic functions and Inverse Hyperbolic functions -Identities-Real and imaginary parts- solving problems using hyperbolic functions.

Sphere - tangent plane- Orthogonal spheres - Cone- right circular cone - Cylinder - right circular cylinder.

**APPLICATIONS OF DIFFERENTIAL CALCULUS**

**(9)**

Curvature - cartesian and polar coordinates - Centre and radius of curvature - Circle of curvature -Evolutes - Envelopes - Evolutes as envelope of normal.

**FUNCTION OF SEVERAL VARIABLES**

**(9)**

Function of two variables - Taylor's theorem (statement only) and expansions - Maxima and minima - constrained maxima and minima by Lagrangian multiplier method - Jacobians - Differentiation under integral sign.

**INTEGRAL CALCULUS**

**(9)**

Gamma and Beta functions - Double integration - Cartesian and Polar Coordinates - change of order of integration - Area as double integral - Triple integration -Volume as a triple integral - Transformation to Cylindrical and Spherical coordinates.

**LECTURE:45 TUTORIAL:15 TOTAL:60 HOURS**

**Text books**

1. Veerarajan.T., "Engineering Mathematics" for Semesters I and II, Tata McGraw Hill Publishing Co., New Delhi, 2010.
2. Dr.Kandasamy.P., Dr.Thilagavathy.K and Dr.Gunavathy.K., "Engineering Mathematics" for First Year B.E/ B.Tech, S. Chand & Co., Ram Nagar, New Delhi, 2010.

**Reference books**

1. N.P.Bali., Dr. Manish Goyal., "A text book of Engineering Mathematics" vol. I, University science Press, New Delhi, 2010.
2. H.C.Taneja., "Advanced Engineering Mathematics" vol. I, I.K.International Pub.House Pvt.Ltd., New Delhi, 2007.
3. Baburam., "Engineering Mathematics" vol. I, Pearson, New Delhi, 2010.
4. B.V.Ramana., "Higher Engineering Mathematics" Tata McGraw Hill Publishing Co., New Delhi, 2007.
5. Grewal B.S., "Higher Engineering Mathematics" 40<sup>th</sup> Edition, Khanna Publishers, New Delhi., 2007

## 12L106 PROGRAMMING IN C

(Common to Civil, EEE, EIE, CSE, IT & IBT)

L T P C

3 1 0 4

### **BASICS OF COMPUTER, PROGRAMMING AND INFORMATION TECHNOLOGY**

(9)

Digital Computer fundamentals- Block diagram of a computer-Components of a Computer system-Applications of Computers-Hardware and Software definitions-Categories of Software-Bootting-Installing and Uninstalling Software-Software privacy-Software terminologies-Information Technology Basics-History of Internet-Internet Tools. Problem solving Techniques-Program-Program development cycle-Algorithm-Flow Chart-Pseudo Code-Program control structures-Types and generation of programming languages-Development of algorithms for simple problems.

### **BASIC ELEMENTS OF C**

(9)

Introduction to C-C Declaration- Operators and Expressions-Input and output Functions- Decision statements: If-If else- Nested If else-If else If ladder-break-continue-goto-switch-nested switch case-Switch case and nested ifs-Loop control: for, nested for, while, do-while- do while statement with while loop-Arrays: initialization, characteristics, types and operations.

### **POINTERS AND FUNCTIONS**

(9)

Strings and Standard functions: Declaration and initialization, formats, standard, conversion and memory functions, applications; Pointers-pointers and address- declaration-void, wild, constant pointers -arithmetic operations with pointers-pointers and arrays- pointers to pointers -pointers and strings; Functions-return statement-types-call by value and reference-returning more values, function as an argument, function with operators, decision statements, loop statements, arrays and pointers, recursion-Tower of Hanoi.

### **STORAGE CLASSES, STRUCTURE AND UNION**

(9)

Storage classes: auto-extern-static-register; Preprocessor directives; Structures: Declaration and initialization, structure within structure-Array of Structures-pointer to structure-structure and functions-typedef-bit fields- enumerated data types; union: calling BIOS and DOS services-union of structures.

### **FILES, GRAPHICS AND DYNAMIC MEMORY ALLOCATION**

(9)

Files: streams and file types-operations-File I/O-read and write-other - creating, processing and updating files-simple file handling programs-low level programming-command line arguments- Environment variables; Graphics: initialization-functions-library functions-text-patterns and styles-mouse programming-drawing non common figures; Dynamic memory allocation.

**LECTURE:45 TUTORIAL:15 TOTAL:60 HOURS**

**Text books**

1. ITL Education solutions Limited, **"Introduction to Information Technology"**, Pearson Education(India), 2005.  
(Unit I)(Chapter:1,7,9,10,15,16)
2. Ashok N. Kamthane, **"Programming in C"**, Pearson Education, 2<sup>nd</sup> Edition, 2012.

**Reference books**

1. Byron Gottfried, **"Programming with C"**, 2<sup>nd</sup> Edition, (Indian Adapted Edition), TMH publications, 2006.
2. Brain W. Kernighan and Dennis M. Ritchie, **"The C Programming Language"**, Pearson Education Inc. (2005).
3. E. Balagurusamy, **"Programming in ANSI C"**, 5<sup>th</sup> Edition, Tata McGraw-Hill Education, 2011.

**12L206 SEMICONDUCTOR DEVICES**

**L T P C**

**3 0 0 3**

**PN JUNCTION AND SEMICONDUCTOR DIODES**

**(9)**

Energy band structure of conductors, semiconductors and insulators-Classification of semiconductors- Conductivity of semiconductors-Drift and diffusion currents-Continuity Equation-Energy band structure of PN junction diode-Diode current equation-Transition or Space charge capacitance-Diffusion capacitance-Effect of temperature on PN junction diodes-Diode switching characteristics -PN diode and Zener diode applications.

**BIPOLAR JUNCTION TRANSISTORS**

**(9)**

Transistor current components-Eber moll's model of transistor-Transistor as an amplifier -CE, CB and CC configurations: Analysis of cut-off and saturation regions- Transistor switching times- Maximum voltage rating.

**FIELD EFFECT TRANSISTORS**

**(9)**

Operation and Characteristics of JFET,FET as a Voltage variable resistor, Metal oxide semiconductor field effect transistor(MOSFET)-Enhancement and Depletion mode MOSFET-Characteristics of n-MOS and p-MOS-CMOS characteristics-Inverted T FET-Operation and Characteristics.

**BIASING OF BJT AND FET**

**(9)**

DC operating point and Load line-Q point-Bias stability - Transistor biasing methods: Fixed bias-Collector to base bias-Self bias - Bias compensation methods, Thermistor and sensistor compensation techniques, thermal runaway, thermal stability - FET biasing methods: Self bias-Source bias-Voltage divider bias-Biasing enhancement and depletion MOSFET.

**DISPLAY DEVICES AND SPECIAL DIODES**

**(9)**

Photo emissivity and Photoconductivity-Construction and characteristics of LCD,LED, Photoconductive cell, Photo voltaic cell, Photo diode, Solar cell, Photo transistors - Plasma display, Numeric displays - Optocouplers and LASER diodes-Theory and Characteristics of Schottky diode, Tunnel diode and Varactor diode, SCR, TRIAC, LDR.

**TOTAL: 45 HOURS**

**Text books**

1. Jacob Millman, Christos Halkias & Satyabrata Jit, Millman's "Electronic Devices and Circuits", 2<sup>nd</sup> Edition, McGraw Hill, 2008.
2. Robert L.Boylestad, Louis Nashelsky, "Electronic Devices and Circuit theory", Pearson education, 9<sup>th</sup> Edition, 2006.

**Reference books**

1. S.Salivahanan, N.Sureshkumar and A.Vallavaraj, "Electronic Devices and Circuits", 2<sup>nd</sup> Edition, Tata McGraw Hill, 2008.
2. Allen Mottershead "Electronic Devices and Circuits", Prentice Hall of India, 2008.
3. Douglas.A.Pucknell, Kamran Eshraghian, "Basic VLSI Design, Principles and Application", PHI 2009.

## 12L302 CIRCUIT THEORY

L T P C

3 1 0 4

### DC AND AC CIRCUITS

(9)

DC circuits-Circuit elements - Current and voltage sources - Ohm's and Kirchhoff's laws - Resistive circuits - Series and parallel reduction method and analysis- Voltage and current division-Source transformation-Star delta transformation. AC circuits-Introduction to alternating quantities- Average and RMS values-Circuits elements, series and parallel combination of circuit elements - Use of complex notation- Phasor representation of variables - Steady state solution using phasor algebra - Analysis of series, parallel and series, parallel circuits - Active and reactive power.

### NETWORK ANALYSIS AND THEOREMS

(9)

Mesh and nodal analysis-Matrix method of solving network equations-Superposition theorem -Thevenin's and Norton's theorem- Maximum power transfer theorem - Millman's theorem - Compensation theorem - Reciprocity theorem - Tellegen's theorem.

### RESONANCE AND COUPLED CIRCUITS

(9)

Series and parallel resonance - Variation of impedance with frequency- Bandwidth of RLC circuit - Q factor - Impedance of RLC circuit near resonance - Selectivity - Effect of variation in circuit reactive elements on selectivity-Self inductance- Coefficient of coupling-Dot convention analysis of coupled circuits-Ideal transformer-Analysis of single tuned and double tuned circuits

### NETWORK TRANSIENTS

(9)

Transient concepts-Transient response of simple RL and RC series, RL and RC parallel circuits-Transient response of RLC series and parallel circuits - Solution of RL, RC and RLC series and parallel circuits for step input and sinusoidal input using Laplace transform method.

### GRAPH THEORY

(9)

Linear graph of a network - Trees-Tie-set and Cut-set schedules - Incidence matrix - Reduction-solution of resistive networks using tie-set and cut-set schedules-Principle of duality-Dual networks.

LECTURE:45 TUTORIAL:15 TOTAL:60 HOURS

#### Text books

1. William Hart Hayt, Jack Ellsworth Kemmerly, "Engineering Circuit Analysis", Tata McGraw- Hill, New Delhi, 7<sup>th</sup> Edition, 2007.
2. Boylestad R.L, "Introductory Circuit Analysis", Prentice Hall, 10<sup>th</sup> Edition, 2003.
3. Decarlo R.A, Pen-MinLin, "Linear Circuit Analysis", Oxford University press, 2001.

**Reference books**

1. Umesh Sinha, "*Network Analysis and Synthesis*", Satya Prakashan, New Delhi, Reprint edition, 1997.
2. Charles Alexander, Mathew Sadiku, "*Fundamentals of Electric Circuits*", Tata Mc Graw Hill, New Delhi, 2009.
3. Sudhahar.A, Shyammohan S.P, "*Circuits and Networks: Analysis and Synthesis*", Tata Mc Graw Hill, New Delhi, 3<sup>rd</sup> Edition, 2007.
4. D.R. Cunningham, J.A Stuller, "*Basic Circuit Analysis*", Jaico Publishing House, Mumbai, 2000.

**12L402 ENVIRONMENTAL SCIENCE AND ENGINEERING**

(Common to all branches)

L T P C  
3 0 0 3

**ENVIRONMENTAL RESOURCES**

(9)

Earth structure - Internal and external earth processes - Plate tectonics - erosion - Weathering - deforestation - Anomalous properties of water - Hydrological cycle - Effect of modern agriculture - fertilizers - pesticides - eutrophication - biomagnifications - Land degradation - Minerals - Rocks - Rock cycle - mining - types of mining - desertification - soil erosion - methods of conservation of soil erosion - renewable energy resources - wind - solar - geothermal - tidal - OTEC.

**ECO SYSTEM AND BIODIVERSITY**

(9)

Weather and climate - ocean current - upwelling - EL Niño - Ecology - ecosystem - biomes - physical and chemical components of ecosystem - biological components of ecosystem - forest ecosystem - desert ecosystem and pond ecosystem - Energy flow in ecosystem - nitrogen cycle - carbon dioxide cycle - phosphorous cycle - food pyramid - Ecological - succession - types - biodiversity - need for biodiversity - values of biodiversity - hot spots of biodiversity - endangered and endemic species - conservation of biodiversity insitu-exitu conservation.

**ENVIRONMENTAL POLLUTION**

(9)

Air pollution, classification of air pollutants gaseous particulars - sources effects and control of gaseous pollutants  $\text{SO}_2$  -  $\text{NO}_2$  -  $\text{H}_2\text{S}$  -  $\text{CO}$  -  $\text{CO}_2$  and particulates - control methods - cyclone separator - electrostatic precipitator - catalytic combustion - water pollution - classification of water pollutants - inorganic pollutants - sources - effects and control of heavy metals - organic pollutants - oxygen demanding wastes - aerobic and anaerobic decomposition - soil pollution - Noise pollution - sources - effects - decibel scale.

**ENVIRONMENTAL THREATS**

(9)

Acid rain - green house effect - global warming - disaster management flood - drought - earthquake - tsunami - threats to biodiversity - destruction of habitat - habit fragmentation - hunting - over exploitation - man - wildlife conflicts - The IUCN red list categories - status of threatened species.

**SOCIAL ISSUES AND ENVIRONMENT**

(9)

Sustainable development - sustainable technologies - need for energy and water conservation - rain water harvesting - water shed management - waste land reclamation - Air act - Wild life protection act - forest conservation act - population growth - exponential and logistic growth - variation in population among nations - population policy - women and child welfare programs - Role of information technology in human and health - HIV/AIDS - effects and preventive measures.

**TOTAL: 45 HOURS**



**Text books**

1. Sharma J.P., '*Environmental Studies*', 3<sup>rd</sup> Edition, University Science Press, New Delhi 2009. ✓
2. Anubha Kaushik and C.P.Kaushik, '*Environmental Science and Engineering*', 3<sup>rd</sup> Edition, New Age International Publishers, New Delhi 2008. ✓

**Reference books**

1. R.K.Trivedi, '*Hand book of Environmental Laws, Rules, Guidelines, Compliances and Standards*', Vol.I &II, Environ Media 2006. ✓
2. G.Tyler Miller, '*Environmental Science*', 10<sup>th</sup> Edition, Thomson BROOKS/COLE 2004. ✓
3. Gilbert M.Masters, '*Introduction to Environmental Engineering and Science*', 2<sup>nd</sup> Edition Pearson Education 2004. ✓

**12L2Z2 ENGINEERING MATHEMATICS II**

(Common to all branches)

**L T P C**  
**3 1 0 4**

**VECTOR CALCULUS** ✓

✓ (9)

Gradient, Divergence, Curl - Directional derivative - Irrotational and Solenoidal fields - Vector identities - Line, Surface and Volume Integrals - Green's Theorem in a Plane, Gauss Divergence and Stoke's Theorems (Statements only) - Verifications and Applications.

**ORDINARY DIFFERENTIAL EQUATIONS** ✓

✓ (9)

Linear equations of Second and Higher order with constant coefficients - Simultaneous first order Linear equations with constant coefficients - Linear equations of Second and Higher order with variable coefficients - Legendre type Method of variation of parameters - method of reduction of order. ✓

**COMPLEX DIFFERENTIATION**

(9)

Functions of a Complex variable - Analytic functions - Cauchy Riemann equations and sufficient conditions (excluding proof) - Harmonic and orthogonal properties of analytic functions - Construction of analytic functions - Conformal mappings :  $w = z + a$ ,  $az$ ,  $1/z$ ,  $z^2$ ,  $e^z$ ,  $\cos z$ ,  $\sin z$  and Bilinear Transformation.

**COMPLEX INTEGRATION** ✓

✓ (9)

Cauchy's integral theorem, Cauchy's integral formula - Taylor's and Laurent's theorems (Statements only) and expansions - Poles and Residues - Cauchy's Residue theorem - Contour integration - Circular and semicircular contours.

**LAPLACE TRANSFORMATIONS**

(9)

Laplace transforms - Properties and standard transforms - Transforms of unit step, unit impulse and error functions - Transforms of periodic functions - Inverse Laplace transforms - Initial and Final value theorems - Convolution theorem (statement only) and applications - Applications to Solution of Linear differential equations of second order with constant coefficients.

**LECTURE:45 TUTORIAL:15 TOTAL:60 HOURS**

**Text books**

1. Veerarajan.T., "Engineering Mathematics" for Semesters I and II, Tata McGraw Hill Publishing Co., New Delhi., 2010.
2. Dr.Kandasamy.P., Dr.Thilagavathy.K and Dr.Gunavathy.K., "Engineering Mathematics" for First Year B.E/ B.Tech, S. Chand & Co., Ram Nagar, New Delhi, 2010.

**Reference books**

1. N.P.Bali., Dr. Manish Goyal., "**A Text Book of Engineering Mathematics**" vol. II, University science Press, New Delhi, 2010.
2. H.C.Taneja., "**Advanced Engineering Mathematics**" vol.II, I.K.International Pub. House Pvt.Ltd., New Delhi, 2007.
3. Baburam., "**Engineering Mathematics**", Pearson, New Delhi, 2010.
4. B.V.Ramana., "**Higher Engineering Mathematics**" Tata McGraw Hill Publishing Co., New Delhi, 2007.
5. Grewal B.S., "**Higher Engineering Mathematics**", 40<sup>th</sup> Edition, Khanna Publishers, New Delhi., 2007.

12L303 ELECTRONIC CIRCUIT DESIGN

L T P C

3 1 0 4

**RECTIFIERS AND POWER SUPPLIES**

(9)

Classification of power supplies, Rectifiers - Half-wave, full-wave and bridge rectifiers - Rectifiers with filters - C, L, LC and CLC filter - Voltage regulators - Zener diode as a voltage regulator - Over voltage protection - Switched mode power supply - Power control using SCR - Uninterrupted Power supplies.

**LOW FREQUENCY AND HIGH FREQUENCY ANALYSIS OF AMPLIFIERS**

(9)

Frequency response of amplifiers - BJT AC Analysis - Hybrid and  $\pi$  equivalent models - Low frequency analysis of BJT and FET - High frequency analysis of BJT and FET - Miller's theorem - Midband analysis of amplifiers - Multistage frequency effects.

**FEEDBACK AMPLIFIERS AND OSCILLATORS**

(9)

Types of feedback amplifiers - Analysis of voltage and current feedback amplifiers - Oscillators - Barkhausen criterion - Design of Oscillators - Colpitts oscillator, Hartley oscillator, RC Phase Shift Oscillator, Wein Bridge oscillator and Crystal Oscillators.

**LARGE SIGNAL AND TUNED AMPLIFIERS**

(9)

Classification of large signal amplifiers - Class A, B, C, D and AB amplifiers operation - efficiency - Class A amplifier with load - Class B push-pull amplifier - Distortion in amplifiers - MOSFET power amplifier - Tuned Amplifiers - Single, Double Tuned and Stagger Tuned Amplifiers.

**MULTIVIBRATORS**

(9)

Design of Monostable, bistable and astable multivibrators - Schmitt trigger - Monostable and astable blocking oscillators using emitter based timing - UJT Saw tooth generator.

**LECTURE: 45 TUTORIAL: 15 TOTAL: 60 HOURS**

**Text books**

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", 9<sup>th</sup> Edition, Pearson Education / PHI, 2007.
2. Millman, J and Halkias, C, "Integrated Electronics", TMH, 2007.

**Reference books**

1. David A. Bell, "Electronic Devices & Circuits", 4<sup>th</sup> Edition, PHI, 2007
2. Floyd, "Electronic Devices", 6<sup>th</sup> Edition, Pearson Education, 2002.
3. I.J. Nagrath, "Electronic Devices and Circuits", PHI, 2007.
4. S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, "Electronic Devices and Circuits", 2<sup>nd</sup> Edition, TMH, 2007.
5. Jacob Millman & Taub, "Pulse, Digital and Switching Waveforms", 2<sup>nd</sup> Edition, 2007

## 12L403 ANALOG INTEGRATED CIRCUITS

L T P C

3 0 0 3

### IC FABRICATION AND CIRCUIT CONFIGURATION FOR LINEAR ICs

(9)

Advantages of ICs over discrete components - Fabrication of monolithic ICs - Current mirror and current sources - Current sources as active loads - BJT Differential amplifier with active loads - General operational amplifier stages and internal circuit diagram of IC 741 - DC and AC performance characteristics - slew rate - Open and closed loop configurations.

### APPLICATIONS OF OPERATIONAL AMPLIFIERS

(9)

Sign Changer - Scale Changer - Voltage Follower - V-to-I and I-to-V converters - adder - subtractor - Instrumentation amplifier - Integrator - Differentiator - Logarithmic amplifier - Antilogarithmic amplifier - Comparators - Schmitt trigger - Precision rectifier - peak detector - clipper and clamper - Low-pass - High-pass and Band-pass Butterworth filters.

### ANALOG MULTIPLIER AND PLL

(9)

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell - Variable transconductance technique - analog multiplier ICs and their applications - Operation of the basic PLL - Closed loop analysis - Voltage controlled oscillator - Monolithic PLL IC 565 - Application of PLL for AM detection - FM detection and Frequency synthesizing.

### DATA CONVERTERS

(9)

Analog and Digital Conversions, D/A converter - specifications - weighted resistor type, R-2R Ladder type, Inverted R-2R Ladder type - Switches for D/A converters, A/D Converters - specifications - Flash type - counter type - Successive Approximation type - charge balancing type and Dual Slope type.

### WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs

(9)

Sine-wave generators - Multivibrators and Triangular wave generator - Saw-tooth wave generator - Timer IC 555 - IC Voltage regulators - Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator - Switched capacitor filter IC MF10 - Frequency to Voltage and Voltage to Frequency converters - Audio Power amplifier and Video Amplifier

**TOTAL: 45 HOURS**

#### Text books

1. D.Roy Choudhry, Shail Jain, "*Linear Integrated Circuits*", New Age International Pvt. Ltd., 2000.
2. Sergio Franco, "*Design with Operational Amplifiers and Analog Integrated Circuits*", 3<sup>rd</sup> Edition, Tata McGraw-Hill, 2007.

**Reference books**

1. B.S.Sonde, "**System Design Using Integrated Circuits**", New Age Pub, 2<sup>nd</sup> Edition, 2001
2. Gray and Meyer, "**Analysis and Design of Analog Integrated Circuits**", Wiley International, 2005.
3. Ramakant A.Gayakwad, "**OP-AMP and Linear ICs**", Prentice Hall / Pearson Education, 4<sup>th</sup> Edition, 2001.
4. J.Michael Jacob, "**Applications and Design with Analog Integrated Circuits**", Prentice Hall of India, 1996.
5. William D.Stanley, "**Operational Amplifiers with Linear Integrated Circuits**", Pearson Education, 2004.

12L405 DIGITAL LOGIC WITH HDL

L T P C

3 1 0 4

(9)

NUMBERSYSTEMS

Number Systems - Number base conversions - Complements - Signed Binary Numbers - Binary codes - Boolean Algebra - Boolean functions - Canonical and Standard Forms - Minimization of Boolean expressions - Karnaugh map minimization - Don't care conditions - Tabulation Method - Implementation of logic functions using gates - NAND and NOR implementation.

(9)

COMBINATIONAL LOGIC CIRCUITS

Binary Adder - Binary Subtractor - BCD adder - Binary Multiplier - Magnitude comparator - Multiplexers/Demultiplexers - Decoders/Encoders - Code converters - Implementation of combinational logic using MUX - Introduction to Verilog - Verilog code for full adder, mux/demux and code converters.

(9)

SEQUENTIAL LOGIC CIRCUITS

Latches - Flip flops - Analysis of Clocked Sequential Circuits - State Reduction and Assignment - Design Procedure - Design of Asynchronous counters - Design of Synchronous counters - Modulo-n counter - Shift registers - Universal Shift Register - Ring counter - Johnson counter - Verilog code for Flip Flops, Registers and Counters.

(9)

ASYNCHRONOUS SEQUENTIAL CIRCUITS

Block Diagram - Modes of Operation - Analysis of Sequential Circuits - Circuits with Latches - Design Procedure - Reduction of State and Flow Tables - Races - Hazards.

(9)

MEMORY AND PROGRAMMING LOGIC

Classification of memories - RAM organization - Memory decoding - Memory expansion - Static RAM cell - Dynamic RAM cell - ROM organization - Types of ROM - Programmable Logic Array - Programmable Array Logic - Field Programmable Gate Arrays.

LECTURE:45 TUTORIAL:15 TOTAL:60 HOURS

Text books

1. M. Morris Mano, "Digital Design", 4<sup>th</sup> Edition, Pearson Education, 2011.

Reference books

1. Stephen Brown, Zvonko Vranesic, "Fundamentals of Digital Logic with Verilog Design", 2<sup>nd</sup> Edition, Tata McGraw Hill Education Pvt.Ltd., 2010.
2. A.Anand Kumar, "Fundamentals of Digital Circuits", 2<sup>nd</sup> Edition, PHI Learning Pvt.Ltd, New Delhi, 2011.
3. Charles H.Roth, Jr, "Fundamentals of Logic Design", 4<sup>th</sup> Edition, Jaico Publishing House, 2006.
4. Samir Palnitkar, "Verilog HDL", Pearson Education, 2009.
5. Donald D.Givone, "Digital Principles and Design", Tata Mc-Graw-Hill Publishing Company Ltd., New Delhi, 2003.

**12L407 INTEGRATED CIRCUITS LABORATORY**

**L T P C**  
**0 0 3 2**

**LIST OF EXPERIMENTS**

1. Implementation of Simple Boolean expression using Universal gates
2. Half Adder and Full adder
3. Multiplexer and Demultiplexer
4. Flip-flops
5. Synchronous and Asynchronous Counters
6. Data transfer using shift register
7. Applications of op-amp
8. Schmitt trigger using op-amp
9. Active filters using op-amp
10. Multivibrators using 555 timer

**TOTAL : 45 HOURS**

**Reference books**

1. D.Roy Choudhury and Shail Jain, "*Linear Integrated Circuits*" New Age international (P) Ltd. 1998.
2. M. Morris Mano, "*Digital Design*", 3<sup>rd</sup> Edition., Prentice Hall of India Pvt. Ltd., New Delhi, 2003



**12L305 SIGNALS AND SYSTEMS**

**L T P C**  
**3 1 0 4 /**

**CLASSIFICATION OF SIGNALS AND SYSTEMS**

**(9)**

Continuous Time (CT) signals - Discrete Time (DT) signals - Step, Ramp, Pulse, Impulse, Exponential, classification of CT and DT signals - periodic and aperiodic signals, random signals, Energy and Power signals - CT systems and DT systems, Classification of systems.

**ANALYSIS OF CONTINUOUS TIME SIGNALS**

**(9)**

Fourier series analysis - Spectrum of Continuous Time signals- Fourier and Laplace Transforms in signal Analysis.

**LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS**

**(9)**

Differential Equation - Block diagram representation-impulse response, Convolution integrals-Fourier and Laplace transforms in Analysis - State variable equations and matrix representation of systems.

**ANALYSIS OF DISCRETE TIME SIGNALS**

**(9)**

Baseband Sampling of CT signals - Aliasing - DTFT and properties - Z transform and properties.

**LINEAR TIME INVARIANT DISCRETE TIME SYSTEMS**

**(9)**

Difference Equations-Block diagram representation-Impulse response-Convolution sum- DTFT and Z Transform analysis of Recursive and Non-Recursive systems- State variable equations and matrix representation of systems.

**LECTURE:45 TUTORIAL:15 TOTAL:60 HOURS**

**Text books**

1. Allan V. Oppenheim, S. Willsky and S. H. Nawab, "**Signals and Systems**", Pearson, Indian Reprint, 2007.
2. Simon Haykins and Barry Van Veen, "**Signals and Systems**", John Wiley & sons, 2004.

**Reference books**

1. H P Hsu, Rakesh Ranjan, "**Signals and Systems**", Tata McGraw Hill, 7<sup>th</sup> Reprint, 2010
2. Edward W. Kamen, Bonnie S. Heck, "**Fundamentals of Signals and Systems Using the Web and MATLAB**", Pearson Prentice Hall, 2007.
3. John Alan Stuller, "**An Introduction to Signals and Systems**", Thomson, 2008
4. M. J. Roberts, "**Signals and Systems, Analysis using Transform methods & MATLAB**", Tata McGraw Hill (India), 2<sup>nd</sup> Edition, 2011.
5. Robert A. Gabel and Richard A. Roberts, "**Signals and Linear Systems**", John Wiley, 3<sup>rd</sup> Edition, 2009.

12L306 ELECTROMAGNETIC WAVES AND WAVEGUIDES

L T P C

3 1 0 4

**ELECTROSTATIC FIELDS**

(9)

Vector analysis- Orthogonal co-ordinate systems-Coulomb's Law-Electric field intensity-Field due to continuous Volume charge distribution-Field due to line charge-Field due to sheet of charge-Electric flux-Gauss law-Application of Gauss law-Divergence theorem-Electric scalar potential-Equipotential surface-Poisson's and Laplace equations-Capacitance of parallel plate-Capacitance of Coaxial cable-Parallel wire capacitance-Boundary conditions-Energy stored in electric field-Energy density.

**STEADY MAGNETIC FIELDS**

(9)

Biot-Savat's Law-Ampere's circuital law-Magnetic flux density-Scalar and Vector potential-Force on a moving charge and differential current element-Magnetic Boundary conditions-Magnetic circuit-Paraday's law of electromagnetic inductance-Inductance and Mutual inductance-Inductance of transmission line-Energy stored in magnetic field-Energy density.

**ELECTROMAGNETIC WAVES**

(9)

Displacement current-Maxwell's equation-Equation of continuity-Inconsistency of Ampere's law-Wave motion in free space-Uniform plane waves-Sinusoidal time variations-Conductors and Dielectrics-Propagation in good conductors and good dielectrics-Skin effect-Polarization-Reflection and Refraction of plane waves-Reflection by a conductor -Normal and Oblique incidence-Reflection by a Dielectric-Reflection at the surface of a conducting medium-Surface impedance-Poynting Theorem-Power loss in a plane conductor.

**GUIDED WAVES AND RECTANGULAR WAVEGUIDES**

(9)

General solutions for TE and TM waves-Waves between parallel planes of perfect conductors-Velocities of wave propagation-Attenuation in parallel plate waveguide-Wave impedance of TE and TM waves in a parallel plate waveguide-Types of waveguides-Mode theory of a Rectangular waveguide(TE and TM waves)-Characteristics of TE and TM waves-Impossibility of TEM waves in rectangular waveguides-Dominant mode -Wave impedances of TE and TM waves -Characteristic impedance of a waveguide-Attenuation factor -Excitation of various modes-Quality Factor.

**CIRCULAR WAVEGUIDES , CAVITY RESONATORS AND WAVEGUIDE COMPONENTS**

(9)

Bessel functions-TE and TM modes in circular Waveguides-Wave impedances-Dominant mode-Field configuration-Comparison of Circular and Rectangular waveguides-Excitation of modes-Microwave cavity resonators-Rectangular and Circular cavity resonators-Q factor of a cavity resonator for the  $TE_{101}$  mode-Cavity excitation and tuning-Applications-TEM wave in co-axial lines-Waveguide components.

LECTURE : 45 TUTORIAL : 15 TOTAL: 60 HOURS

**Text books**

1. William H.Hayt, "*Engineering Electromagnetics*", Tata McGraw-Hill, 2011.
2. Edward.C.Jordan & Keith.G.Balmai, "*Electromagnetic Waves and Radiating Systems*", Prentice Hall of India, 1995

**Reference books**

1. S.Baskaran, "*Transmission Lines and Waveguides*", Scitech Publications (India), 2011
2. David K.Cheng, "*Field and Wave Electromagnetics*", Pearson Edition, 1999.
3. Umesh Shinha, "*Electromagnetic Theory and its Applications*", Satya Prakashan, 1996.
4. Gangadhar.K.A, "*Field Theory*" Khanna Publishers, 2002.

12L404 ANALOG COMMUNICATION

L T P C

3 0 0 3

**AMPLITUDE MODULATION**

(9)

Spectral characteristics of periodic and non periodic signals - Generation and demodulation of AM, DSBSC, SSB and VSB signals - Comparison of amplitude modulation systems.

**ANGLE MODULATION AND PULSE MODULATION**

(9)

Phase and Frequency modulation - Single tone, narrow band and wideband FM - Transmission bandwidth - Generation and demodulation of FM signal, Phase Modulation - Pulse Amplitude Modulation - Pulse Time Modulation.

**NOISE THEORY**

(9)

Review of probability - Random variables and random process - Gaussian process - Noise - Shot noise - Thermal noise - White noise - Narrow band noise - Noise temperature - Noise figure.

**PERFORMANCE OF CW MODULATION SYSTEMS**

(9)

Super heterodyne radio receiver and its characteristics - SNR - Noise in DSBSC systems using coherent detection - Noise in AM system using envelope detection - Noise in FM system - FM threshold effect - Pre emphasis and De emphasis in FM - Comparison of performances.

**SATELLITE COMMUNICATION**

(9)

Satellite communication - Orbit dynamics - Kepler's law - Orbital parameters - Orbital perturbations - Station keeping - Geostationary - Frequency allocation - Units of visibility - Launching vehicles and propulsion.

**TOTAL: 45 HOURS**

**Text books**

1. Simon Haykin, "Communication Systems", John Wiley & sons, NY, 4<sup>th</sup> Edition, 2009.
2. Wayne Tomasi, "Electronic Communications Systems: Fundamentals Through Advanced Telecommunications Series", Edition 5, Pearson/Prentice Hall, 2004

**Reference books**

1. Dennis Roddy & John Coolen, "Electronic Communication", 4<sup>th</sup> Edition, Prentice Hall of India, 2008.
2. Herbert Taub & Donald L Schilling - "Principles of Communication Systems" 3<sup>rd</sup> Edition - Tata McGraw Hill, 2008.
3. B.P.Lathi, "Modern Digital and Analog Communication Systems", 3<sup>rd</sup> Edition, Oxford Press, 2007.
4. John G Proakis, Masoud Salehi, "Fundamentals of Communication Systems", Pearson Education, 2006.
5. George Kennedy, "Electronic Communication Systems", Tata McGraw Hill, 4<sup>th</sup> Edition, 1999.

**12L502 MICROPROCESSORS AND MICROCONTROLLERS**

**L T P C**

**3 0 2 4**

**8086 ARCHITECTURE**

**(9)**

8086 Micro processor Architecture - Pin Description- Minimum/Maximum mode system configuration - Memory and I/O interfacing - Bus cycles -Timing diagram - Interrupts.

**8086 PROGRAMMING AND INTERFACING**

**(9)**

8086 Instruction set, Addressing Modes- Procedures, Macros, Assembler Directives - Assembly language programming - Peripheral Interfacing using 8255 PPI - 8279 Keyboard/Display controller - 8251 USART.

**8051 MICROCONTROLLER**

**(9)**

8051 Microcontroller Architecture - Signals - Memory organization - SFRs- Interrupts - Timer/Counter- Port operation - Serial communication.

**8051 PROGRAMMING AND INTERFACING**

**(9)**

8051 Instruction Set -Programming 8051 Timers - Serial Port Programming - Interrupts Programming. LCD and Keyboard Interfacing- ADC, DAC and Sensor Interfacing, External Memory Interface - RTC Interfacing - Motor Control.

**PIC MICROCONTROLLER**

**(9)**

16C7X PIC Microcontroller Architecture - Signals - Memory organization - SFRs - Interrupts - Timer/Counter- I/O Expansion - I<sup>2</sup>C bus- EEPROM - A/D Converter - PWM module - MSSP module - USART - Instruction set - Addressing modes.

**List of Experiments:**

8086 Programming:

- Array Processing
- Code Conversions
- String Manipulation
- Peripheral Interfacing

**8051 Programming :**

- Bit manipulation
- Peripheral programming and Interfacing

**LECTURE : 45 PRACTICALS : 30 TOTAL: 75 HOURS**

**Text books**

1. Krishna Kant, **"Microprocessor and Microcontroller Architecture, Programming and System Design using 8085, 8086, 8051 and 8096"**, PHI, 2011.
2. Ajay Deshmukh, **"Microcontrollers : Theory and Applications"**, Tata McGraw Hill, 2010.

**Reference books**

1. Douglas V.Hall, **"Microprocessor and Interfacing, Programming and Hardware"**, Revised 2<sup>nd</sup> Edition, Tata McGraw Hill, Indian edition 2007.
2. Kenneth J.Ayala., **"The 8051 Microcontroller"**, 3<sup>rd</sup> Edition, Thompson Delmar Learning, 2007, New Delhi.
3. Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D. McKinlay, **"The 8051 Microcontroller and Embedded Systems"**, 2<sup>nd</sup> Edition, Pearson Education 2008.
4. A.K. Ray, K.M.Bhurchandi, **"Advanced Microprocessor and Peripherals"**, 2<sup>nd</sup> edition, Tata McGraw-Hill, 2007.

**12L506 CONTROL SYSTEMS**

**L T P C**

**3 1 0 4**

**CONTROL SYSTEM MODELING**

**(9)**

Basic Elements of Control System - Open loop and Closed loop systems - Differential equation - Transfer function - Modeling of Electric systems, Translational and rotational mechanical systems - Block diagram reduction Techniques - Signal flow graph.

**TIME RESPONSE ANALYSIS**

**(9)**

Time response analysis - First Order Systems - Impulse and Step Response analysis of second order systems - Steady state errors - P, PI, PD and PID Compensation.

**FREQUENCY RESPONSE ANALYSIS**

**(9)**

Frequency Response - Bode Plot, Polar Plot, Nyquist Plot - Frequency Domain specifications from the plots - Constant M and N Circles - Nichol's Chart - Use of Nichol's Chart in Control System Analysis-Series, Parallel, Series-parallel Compensators - Lead, Lag, and Lead Lag Compensators.

**STABILITY ANALYSIS**

**(9)**

Stability - Routh-Hurwitz Criterion, Root Locus Technique- Construction of Root Locus - Dominant Poles, Application of Root Locus Diagram - Nyquist Stability Criterion - Relative Stability.

**STATE VARIABLE ANALYSIS**

**(9)**

State space representation of Continuous Time systems - State equations - Transfer function from State Variable Representation - Solutions of the state equations - Concepts of Controllability and Observability - State space representation for Discrete time systems- Sampled Data control systems- Sampling Theorem- Sampler and Hold - Open loop and Closed loop sampled data systems.

Case study: Any two examples of control systems.

**LECTURE:45 TUTORIAL:15 TOTAL:60 HOURS**

**Text books**

1. J.Nagrath and M.Gopal, "**Control System Engineering**", New Age International Publishers, 5<sup>th</sup> Edition, 2007.

**Reference books**

1. Benjamin.C.Kuo, "**Automatic Control Systems**", Prentice Hall of India, 7<sup>th</sup> Edition, 1995.
2. M.Gopal, "**Control System – Principles and Design**", Tata McGraw Hill, 2<sup>nd</sup> Edition, 2002.
3. Schaum's Outline Series, "**Feedback and Control Systems**", Tata McGraw-Hill, 2007.
4. John J.D'azzo, Constantine H.Houpis, "**Linear Control System Analysis and Design**", Tata McGraw-Hill, Inc., 1995.
5. Richard C. Dorf, Robert H. Bishop, "**Modern Control Systems**", Addison – Wesley, 1999.

## 12L406 NETWORKS AND TRANSMISSION LINES

L T P C  
3 0 0 3

### SYMMETRICAL AND ASYMMETRICAL TWO PORT NETWORKS

(9)

Two port networks- Characterization in terms of impedance, Admittance, Hybrid and Transmission parameters - Inter relationships among parameter sets - Interconnection of two port networks - Series, parallel and cascade. Lattice Networks- Symmetrical two port networks: T and  $\pi$  Equivalent of a two port network - Image impedance - Characteristic impedance and propagation constant of a symmetrical two port network.

### PASSIVE NETWORKS

(9)

Constant K filters-m derived filters-Composite filters-Design procedures-Series and shunt equalizer- Symmetrical and asymmetrical attenuators - T and  $\pi$  sections.

### PASSIVE NETWORK SYNTHESIS

(9)

Synthesis: Positive real functions - Driving point functions - Brune's positive real functions - Properties of positive real functions. Testing driving point functions - Application of maximum modulus theorem - Properties of Hurwitz polynomials - Even and odd functions - Strum's theorem - Driving point synthesis - RC elementary synthesis operations - LC network synthesis - Properties of RC network functions - Foster and Cauer forms of RC and RL networks.

### TRANSMISSION LINE THEORY

(9)

Line parameters and transmission constants-Transmission line equation-Physical significance of the equation-Infinite line-Input and transfer impedance-Waveform distortion- Distortionless line- Loading-Reflection phenomena-Reflection loss and insertion loss-Skin and proximity effect-T and  $\pi$  equivalent of transmission lines.

### LINE AT RADIO FREQUENCIES

(9)

Parameters of open wire line and co-axial line at high frequencies-Standing waves-Standing wave ratio-Input impedance of open and short circuited lines-Relation between VSWR and reflection co-efficient-Quarter wave transformer-Single and double stub matching-Smith chart and its applications.

**TOTAL: 45 HOURS**

#### Text books

1. John.D.Ryder "*Networks Lines and Fields*", Prentice hall of India Pvt.Ltd, 2<sup>nd</sup> Edition, 1997.
2. Sudhakar.A, Shyamamohan S.P, "*Circuits and Networks : Analysis and Synthesis*", Tata Mc Graw Hill, New Delhi, 3<sup>rd</sup> Edition, 2007.



**Reference books**

1. Umesh Sinha "*Network Analysis And Synthesis*", Sathya Prakashan Publishers, 1997.
2. Van Valkenburg "*Introduction to Modern Synthesis*", Wiley Eastern Publication, 2007.
3. B. P. Lathi, "*Linear Systems and Signals*", Oxford University Press, 2<sup>nd</sup> Edition, 2009.
4. D.Roy Choudhary, "*Network and Systems*", New Academic Science, 2<sup>nd</sup> Edition, 2009.

## 12L501 DIGITAL SIGNAL PROCESSING

L T P C  
3 1 0 4

### DISCRETE-TIME SIGNALS AND SYSTEMS

(9)

Review of discrete time signals and systems - DFT and its properties - FFT algorithms and its application to convolution - Overlap-add and overlap-save methods.

### DESIGN OF INFINITE IMPULSE RESPONSE FILTERS

(9)

Analog filters - Butterworth and Chebyshev Type I. Analog Transformation of prototype LPF to BPF /BSF/ HPF. Transformation of analog filters into equivalent digital filters using Impulse invariant method and Bilinear transform method- Realization structures for IIR filters - Direct, cascade, parallel forms.

### DESIGN OF FINITE IMPULSE RESPONSE FILTERS

(9)

Linear phase response of FIR-FIR design using window method- Rectangular, Hamming, Hanning and Blackmann Windows- Frequency sampling method - Realization structures for FIR filters - Transversal and Linear phase structures- Comparison of FIR and IIR filters.

### QUANTIZATION EFFECTS AND DSP ARCHITECTURE

(9)

Representation of numbers-ADC Quantization noise-Coefficient Quantization error-Product Quantization error-truncation and rounding errors - Limit cycle due to product round off error-Round off noise power-limit cycle oscillation due to overflow in digital filters- Principle of scaling- Introduction to PDSP - Special features-TMS320C54x DSP processor architecture and addressing schemes.

### MULTIRATE SIGNAL PROCESSING

(9)

Introduction to Multirate signal processing-Decimation Interpolation (by an integer and rational factor)-Poly phase Decomposition of FIR filter-Multistage implementation of sampling rate conversion- Applications.

LECTURE:45 TUTORIAL:15 TOTAL:60 HOURS

#### Text books

1. A.V.Oppenheim, R.W. Schaffer and J.R. Buck, "Discrete-Time Signal Processing", Prentice Hall, 3<sup>rd</sup> Edition, 2010.
2. John G Proakis and Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson Education, 4<sup>th</sup> Edition, 2009.

#### Reference books

1. Emmanuel C. Ifeache, Barry W. Jervis, "Digital Signal Processing: A Practical Approach" 2<sup>nd</sup> Edition, Pearson Education, 2004.
2. Lonnie C. Ludeman, "Fundamentals of Digital Signal Processing" John Wiley & Sons, 1986.

3. S.K. Mitra, "**Digital Signal Processing, A Computer Based approach**", McGraw-Hill, 4<sup>th</sup> Edition, 2010.
4. P.Ramesh Babu, "**Digital Signal Processing**", Scitech Publications, 4<sup>th</sup> Edition, 2011.
5. V.Udayashankara, "**Real Time Digital Signal Processing**", PHI learning, 2010.

**12L503 DIGITAL COMMUNICATION**

**L T P C**

**3 0 0 3**

**PULSE MODULATION**

**(9)**

Sampling process -PAM- Other forms of pulse modulation-Bandwidth -Noise tradeoff-Quantization-PCM-Noise considerations in PCM Systems-TDM- Digital multiplexers-Limitation and modification of PCM-Delta modulation-Linear prediction-differential pulse code modulation-Adaptive Delta Modulation - Source coders based on probability -Shannon Fano coding, Shannon binary coding, Huffman coding.

**ERROR CONTROL CODING**

**(9)**

Discrete memoryless channels - Linear block codes - Cyclic codes - Convolutional codes -Maximum likelihood decoding of convolutional codes-Viterbi Algorithm-Trellis coded Modulation-Turbo codes -Applications.

**BASEBAND PULSE TRANSMISSION**

**(9)**

Line coding - Intersymbol Interference- Nyquist's criterion for Distortion less Base band Binary Transmission- Correlative level coding-Baseband M-ary PAM transmission-Adaptive Equalization -Eye patterns.

**DIGITAL MODULATION TECHNIQUES**

**(9)**

Generation of ASK,PSK,FSK - Signal space diagram - Matched filter-detection - Bit error probability and Power spectra of BPSK, QPSK, FSK -Differential phase shift keying - Comparison of Digital modulation systems - Carrier and symbol synchronization.

**SPREAD SPECTRUM MODULATION**

**(9)**

Pseudo- noise sequences-A notion of spread spectrum -Direct sequence spread spectrum with coherent binary phase shift keying - Signal space dimensionality and processing gain -Probability of error - Frequency -Hop spread spectrum -Code Division Multiplexing.

**TOTAL:45 HOURS**

**Text books**

1. Simon Haykins, "*Communication Systems*" John Wiley, 2009.
2. Amitabha Battacharya, "*Digital Communications*", Tata McGraw Hill, 2006.

**Reference books**

1. Sam K.Shanmugam, "*Digital & Analog Communication Systems*", John Wiley, 2008.
2. John G.Proakis, Masoud Salehi, "*Digital Communications*", McGraw Hill, 4<sup>th</sup> Edition, 2008.
3. Taub & Schilling, "*Principles of Communication Systems*", Tata McGraw-Hill, 3<sup>rd</sup> Edition, 2008.
4. B.P.Lathi, "*Modern Digital and Analog Communication Systems*", 3<sup>rd</sup> Edition, Oxford Press, 2007

**12LS04 COMPUTER ARCHITECTURE AND ORGANIZATION**

**L T P C**

**3 0 0 3**

**BASICS OF COMPUTER SYSTEM DESIGN**

**(9)**

Machine computation - Evolution: First, Second, Third and Fourth generation of computer systems - Recent developments - Different layers of Computer systems - Complexity of computing - Computer system Design Layers - RTL structure of computer system.

**CENTRAL PROCESSING UNIT**

**(9)**

Data path and Control path support - Microoperations and Control signals on Data path: Memory, Bus and Inter register transfer - Arithmetic and Logic microoperations - Machine language instructions - Execution of instructions - ALU - Bit sliced ALU.

**CONTROLLER DESIGN**

**(9)**

Controller functions - Control transfer: Instruction control and Program control transfers - Hardwired Control : Sequence counter method - Delay element method - State table method - Microprogrammed Control : Encoding of control signals - Next address generation - Microprogram sequencer - Microinstruction execution -Control memory optimization.

**MEMORY SUBSYSTEM**

**(9)**

CPU - Memory interaction - Performance measures - Memory array organization : 2D, 3D and 2.5D memory organization - Memory Hierarchy - Cache memory - address mapping techniques - Associate memory : Principle of CAM - Associative memory block diagram and Applications -Virtual memory : organization - Address translation schemes.

**ADVANCED COMPUTER ARCHITECTURES**

**(9)**

RISC architecture - Instruction pipelining - R2000/R3000 functional block diagram and Instruction pipeline - Parallel architectures : models of computation - classification - dataflow architecture - reduction machine - Control driven machines - Multiprocessing architecture - MIMD model - Key issues of Multiprocessing.

**TOTAL: 45 HOURS**

**Text book**

1. P.Pal Chaudhuri, "Computer Organization and Design", Prentice Hall of India, New Delhi, 3<sup>rd</sup> Edition, 2010.

**Reference books**

1. Hayes J.P., "Computer Architecture and Organization", McGraw Hill, New Delhi, 3<sup>rd</sup> Edition, 2002.
2. Harry F. Jordan and Gita Alaghband, "Fundamentals of Parallel Processing", Prentice Hall of India, New Delhi, 2002.
3. Kai Hwang and F.A. Briggs, "Computer Architecture and Parallel Processing", McGraw Hill, 1999.

12L507 DIGITAL COMMUNICATION SYSTEMS LABORATORY

L T P C  
0 0 3 2

**LIST OF EXPERIMENTS**

**DIGITAL SIGNAL PROCESSING (IMPLEMENTATION USING MATLAB/ TMS320C5X)**

1. Fast Fourier Transform algorithms, Linear convolution/ circular convolution.
2. IIR filter Design- Impulse invariant and Bilinear transformation methods.
3. FIR Filter Design - Window-based method.
4. Multi rate filters, Decimation by poly phase decomposition.
5. Study of various addressing modes of DSP using simple programming examples.

**DIGITAL COMMUNICATION (IMPLEMENTATION USING SIMULINK/ HARDWARE)**

6. Signal sampling and reconstruction.
7. Pulse Code Modulation/ Delta Modulation.
8. Convolutional coder.
9. Generation and study of eye patterns.
10. ASK, FSK, PSK schemes.
11. Code Division Multiplexing.

**TOTAL: 45 HOURS**

**Reference books**

1. John G Proakis and Manolakis, "**Digital Signal Processing Principles, Algorithms and Applications**", Pearson Education, 4<sup>th</sup> Edition, 2009.
2. S.K. Mitra, "**Digital Signal Processing, A Computer Based approach**", McGraw-Hill, 4<sup>th</sup> Edition, 2010.
3. The Manuals of the Digital Signal Processors manufactured by Texas Instruments (Available online on the web pages of Texas Instruments)
4. Amitabha Battacharya, "**Digital Communications**", Tata McGraw Hill, 2006.
5. Taub & Schilling, "**Principles of Communication Systems**", Tata McGraw-Hill, 3<sup>rd</sup> Edition, 2008.

## 12LS05 CMOS VLSI SYSTEMS

L T P C

3 0 0 3

(9)

### OVERVIEW OF VLSI

Complexity and Design - MOSFETs as switches - Basic Logic Gates in CMOS - Complex Logic Gates in CMOS - Transmission Gate circuits - CMOS Layers - Designing FET Arrays.

### MOS PHYSICS

(9)

nFET Current-Voltage Equations - The FET RC Model - pFET Characteristics - DC characteristics of CMOS Inverter - Inverter Switching Characteristics - Power Dissipation - Transmission Gates and Pass Transistors.

### CMOS CIRCUITS

(9)

Pseudo-NMOS - Tri-State Circuits - Clocked CMOS - Dynamic CMOS - Logic circuits - Interconnect Delay Modeling - Crosstalk - Floor planning and Routing - Input and Output circuits - Power distribution and consumption - Low Power Design Considerations.

### CLOCKING AND TESTING

(9)

CMOS clocking styles - Pipelined systems - System Design Considerations - Reliability and Testing of VLSI circuits - General Concepts - CMOS testing - Test Generation Methods.

### VLSI SYSTEMS SPECIFICATIONS AND COMPONENTS

(9)

Systems Specifications - Structural Gate Level Modeling - Switch Level Modeling - Design Hierarchy - Behavioral and RTL Modeling - Multiplexer - Binary Decoders - priority Encoders - Latches - Flip Flops and Registers - Arithmetic Circuits in CMOS VLSI: Adders and Multipliers.

**TOTAL: 45 HOURS**

#### Text books

1. John P. Uyemura, "Introduction to VLSI Circuits and Systems", John Wiley & Sons, 2003.
2. Keng, Lable Bick, "CMOS Digital Integrated Circuits", Tata McGraw Hill, 1999.

#### Reference books

1. Neel H.E. Weste Eshraghian, "Principles of CMOS VLSI Design", Addison Wesley, 1999
2. Sjoehom S. & Lindh L., "VHDL for Designers", Prentice Hall, 1997.
3. Smith, "Application Specific Integrated Circuits", Addison Wesley, 1997.
4. Mukherjee, "Introduction NMOS and CMOS VLSI System Design", PHI 1986.
5. Douglas A. Pucknell & K. Eshraghian, "Basic VLSI Design", PHI 3rd edition 1994.

12L603 ANTENNAS AND WAVE PROPAGATION

L T P C

3 0 0 3

ANTENNA FUNDAMENTALS AND PARAMETERS

(9)

Introduction - Types of antennas - Radiation mechanism current distribution - Radiation pattern - Power density - Radiation intensity - Directivity - gain - antenna efficiency beamwidth - Bandwidth - Polarization radiation efficiency - Effective aperture - Friss equation and radar range equation - antenna temperature - Far field radiation - Duality theorem.

LINEAR WIRE AND LOOP ANTENNAS

(9)

Linear wire antenna - Infinitesimal dipole - small dipole - finite length dipole - Half wavelength dipole, Loop antenna - Circular loop antenna of constant current - ferrite loop.

PLANAR AND LINEAR ARRAYS

(9)

Two-element array - N element linear array - Uniform spacing and amplitude - Broadside, end-fire, phased array - N element linear array directivity and characteristics - N element linear array - Uniform spacing and non-uniform amplitude - Planar array - Circular array.

TRAVELING WAVE AND BROADBAND ANTENNAS

(9)

Folded dipole, V antenna, Rhombic antenna, Helical antenna, Yagi-uda array of linear elements - Spiral antenna - Log periodic antenna, Patch antenna. Concept of Horn antenna - Parabolic reflector, Antenna measurement - Radiation pattern, far and near field measurement - Anechoic chamber.

WAVE PROPAGATION

(9)

Fundamental equation for free space propagation - Modes of propagation - structure of atmosphere and characteristics - sky wave propagation - effects of Earth's magnetic field - Application of Bartree magnetic ionic formula - Hartree formula - effective dielectric constant and conductivity of the ionosphere and collision frequency - Lowest Usable frequency - Skip distance - Optimum working frequency - Ionospheric Abnormalities - Multi hop propagations - Space wave propagation - Duct propagation.

TOTAL: 45 HOURS

Text books

1. Constantine A. Balanis "Antenna Theory: Analysis and Design", John Wiley Publishers, 2003.
2. K.D. Prasad "Antennas and Wave Propagation", Satya prakashan, 1996.

Reference books

1. John D. Kraus "Antennas", Tata Mc Graw Hill, 2002.
2. H. Griffiths, J. Encianan, A. Papiernik & Serge Drabowitch "Modern Antennas", Chapman & Hall, 2005.



**12L605 COMPUTER COMMUNICATION**

**L T P C**

**3 0 0 3**

**DATA COMMUNICATION**

**(9)**

OSI reference model, Open system standard, Transmission of Digital Data -Electrical Interface, MODEMS, Line Configuration, Encoding and Decoding, Multiplexing, Error Detection and Correction .

**DATA LINK CONTROL AND PROTOCOLS**

**(9)**

Flow control and error control, stop and wait, Sliding windows, Automatic Repeat (ARQ), Asynchronous Protocols, - X MODEM, Y MODEM, Synchronous protocols -Character Oriented and Bit oriented protocols (HDLC).

**LOCAL AREA NETWORKS AND METROPOLITAN NETWORKS**

**(9)**

IEEE 802 standards, LLC, MAC layer protocols - CSMA/CD Ethernet, Token Bus, Token Ring, FDDI, Distributed Queue Dual Bus, Switched Multimega Bit Data Service.

**WIDE AREA NETWORKS**

**(9)**

Circuit Switch packet Switch, Message Switching, X .25 Protocols- Architecture and Layers of Protocol, Frame Delay, ISDN and ATM Protocol, Internetworking Device- Repeater, Bridge, Routes and Gateways, Routing Algorithms.

**UPPER OSI LAYERS AND INTRODUCTION TO CLOUD COMPUTING**

**(9)**

Session layer protocols, Presentation layer - Data Security, Encryption/Decryption, Authentication, Data Composition, Application layer protocols -MHS, File transfer, Virtual terminal, CMIP.

Cloud Computing -History of Cloud Computing - Cloud Architecture - Cloud Storage - Advantages and disadvantages of Cloud Computing - Companies in the Cloud Today -Cloud Services- Developing Cloud Services

**TOTAL : 45 HOURS**

**Text books**

1. Behrouz A. Forouzan, "*Data Communications and Networks*", 4th Edition, Tata McGraw Hill Publication, 2006.
2. Michael Miller, "*Cloud Computing: Web-Based Applications that Change the Way You Work and Collaborate Online*," Que Publishing, August 2008.

**Reference books**

1. William Stallings, "*Data and Computer Communications*", 6th Edition, Pearson Education Asia, 2002.
2. Andrew. S. Tanenbaum, "*Computer Networks*", 4th edition, Pearson Education, 2002.
3. Larry L. Peterson and Bruce S. Davie, "*Computer Networks: A Systems Approach*", 3rd Edition, Morgan Kaufmann Publishers, 2003.

12L701 MICRO WAVE AND RF SYSTEMS

L T P C  
3 0 0 3

**Z, Y & S PARAMETERS AND PLANAR TRANSMISSION LINES**

(9)

Impedance and Admittance matrices-reciprocal networks-Lossless networks-Scattering matrices-Generalized scattering matrix - Transmission matrix - Relation between impedance, admittance, scattering and transmission matrices. Planar transmission lines - Microstrip- Formula for effective dielectric constant characteristic impedance and attenuation.

**IMPEDANCE MATCHING**

(9)

Matching with lumped elements-Single stub and Double Stub matching - Analytic and Smith Chart solutions, Quarter wave Transformer-Tapered lines-Exponential taper-Triangular taper. Passive Microwaves Circuits : Dividers and couplers- Three port networks- T Junction - Lossless divider -Resistive divider - Branch line coupler-hybrid coupler-maximally flat low pass filter - Stepped impedance filter.

**ACTIVE MICROWAVE CIRCUITS**

(9)

Ferrite devices-Phase shifters-Isolator-circulator-Low noise amplifier-Mixers-Single ended mixers- Single Balanced mixers-Single pole switch-PIN diode switches-One port negative resistance oscillator. High power sources Klystron -Magnetron-TWT-Low power source-GUNN, IMPATT, TRAPATT

**WIRELESS RF SYSTEMS**

(9)

Introduction to wireless systems -Design and performance issue -Wireless Antennas - Propagation and Fading -Power Amplifier -Diode Mixer -SAW Filters - Frequency Synthesizer - PLL Analysis - Oscillator Phase Noise - Receiver Architecture - Dynamic Range - Digital Cellular Receiver.

**RF CIRCUITS**

(9)

Linearity and Distortion in RF Circuits - Intercept Points - Review of Technology - Bipolar transistors - current dependence - High frequency effects - Bipolar transistor design considerations - CMOS transistors - NMOS - CMOS small signal models - Square Law Equations . Block Diagram of RFID - Readers - Tags - middleware RFID Applications - Merits and Demerits.

**TOTAL:45 HOURS**

**Text books**

1. David M.Pozar, "*Microwave Engineering*", John Wiley & Sons, 2001
2. Annapurna Das & Sisir K.Das, "*Microwave Engineering*", Tata McGraw Hill, 2000.
3. John Rogers & Calvin Plett, "*Radio Frequency Integrated Circuits*", Artech House, 2003.

**Reference books**

1. R.E.Collin, "*Foundations of Microwave Engineering*", McGraw Hill, 2007.
2. [www.trenster.com](http://www.trenster.com), [www.activewaveinc.com](http://www.activewaveinc.com), [www.chipcon.com](http://www.chipcon.com),
3. [www.microcircuits.com](http://www.microcircuits.com)

**12L601 MANAGEMENT THEORY AND PRACTICE**

**L T P C**

**3 1 0 3**

**BASICS OF MANAGEMENT THOUGHT**

**(9)**

Evolution of Management - definition-Levels-Principles-Differences with administration-Roles of Managers-Social Responsibility of Business-External environment of business-Management Ethics

**PLANNING**

**(9)**

Nature-Purpose-Types-Steps-Management by Objectives-Strategic planning process-Decision-making- Types of decisions- Approaches to decision - Making under uncertainty.

**ORGANIZING**

**(9)**

Formal, Informal organization- Span of Management- Departmentation -Line, Staff authority, Decentralization and Delegation of authority- Effective organization and organization culture.

**STAFFING AND LEADING**

**(9)**

Systems Approach to staffing- Performance appraisal process and career strategy formulation, Leadership theories, Theories of motivation, Communication - Process, Barriers, Guidelines for effective communication - Electronic media in communication.

**CONTROLLING**

**(9)**

Process, Feedback loop of Management control, Requirements for effective control - Control techniques- Operations research for controlling, Overall and Preventive control.

**TOTAL : 45 HOURS**

**Text books**

1. Harold Koontz, Weihrich, "*Essentials of Management*", Tata McGraw Hill, New Delhi, 2010
2. Tripathy, P.C And Reddy, P.N., "*Principles of Management*", Tata McGraw Hill, 2010

**Reference books**

1. Joseph Massie, "*Essentials of Management*", Prentice Hall of India, New Delhi, 2007.
2. Prasad, L.M., "*Principles and Practice of Management*", Sultan Chand and Sons, New Delhi, 2010

12L604 EMBEDDED SYSTEMS

L T P C

3 0 0 3

INTRODUCTION TO EMBEDDED COMPUTING

(9)

Complex systems and microprocessors - Embedded system design process - Formalism for system design - Instruction sets Preliminaries - ARM Processor - CPU Programming input and output - Supervisor mode, exception and traps - Coprocessor - Memory system mechanism - CPU performance - CPU power consumption.

COMPUTING PLATFORM AND DESIGN ANALYSIS

(9)

CPU buses - Memory devices - I/O devices - Component interfacing - Design with microprocessors - Development and Debugging - Program design - Model of programs - Assembly and Linking - Basic compilation techniques - Analysis and optimization of execution time - power - energy - program size - Program validation and testing.

PROCESS AND OPERATING SYSTEMS

(9)

Multiple tasks and multi processes - Processes - Context Switching - Operating Systems Scheduling policies - Multiprocessor - Inter Process Communication mechanisms - Evaluating operating system performance - Power optimization strategies for processes.

HARDWARE/SOFTWARE INTEGRATION

(9)

Compiler - Cross compiler - Emulator, Simulators - Host and target machines - Linkers/locators for embedded software - Getting embedded software into the target system and testing on host machine.

EMBEDDED SYSTEM APPLICATIONS

(9)

Applications of Embedded systems - Recent trends in Embedded systems - Case study of Embedded systems like Digital camera-Smart card-Flight simulation and control.

TOTAL: 45 HOURS

Text books

1. Wayne Wolf, "Computers as Components - Principles of Embedded Computer System Design", Morgan Kaufmann Publisher, 2006.
2. Rajkamal, "Embedded Systems Architecture, Programming and Design", TATA McGraw-Hill, First Reprint, 2003.

Reference books

1. Steve Heath, "Embedded Systems Design", 2nd Edition, Elsevier Publications, 2006.
2. David E-Simon, "An Embedded Software Primer", Pearson Education, 2007.
3. Frank Vahid and Tony Gwasrgie, "Embedded System Design", John Wiley and Sons, 2002.

**12L508 VLSI LABORATORY**

**L T P C**  
**3 0 3 2**

**LIST OF EXPERIMENTS**

**DESIGN AND SIMULATION USING HDL**

1. Combinational Logic circuits
2. Synchronous Sequential Logic circuits
3. Asynchronous Sequential Logic circuits
4. Architecture level :
  - a. Memory devices
  - b. ALU
  - c. RISC CPU (3 bit opcode, 5 bit address)
5. Implementation of Traffic light controller
6. Study of Synthesis tools
7. Layout Design of Logic gates & Combinational circuits
8. Study of development tool for FPGAs for schematic entry and Verilog

**TOOLS :**

Xilinx Tools, Cadence Tools, Model SIM, Mentor Graphics Tools, T-SPICE

**TOTAL: 45 HOURS**

**Reference books**

1. Cyril, "**Fundamentals of HDL Design**", Pearson Education, 2009.
2. Samir Palnitkar, "**Verilog HDL**", Pearson Education, 2003.

12L703 WIRELESS COMMUNICATION

L T P C  
3 1 0 3

**WIRELESS CHANNELS**

(9)

Large scale path loss - Path loss models -Link Budget design - small scale fading- Fading due to Multipath time delay spread - flat fading - frequency selective fading - Fading due to Doppler spread - fast fading - slow fading - Parameters of mobile multipath channels - Time dispersion parameters-coherence bandwidth - Doppler spread and Coherence time.

**CELLULAR ARCHITECTURE**

(9)

Evolution of Mobile Communication- trends in Cellular radio and personal communications- Cellular concept-Frequency reuse - channel assignment- hand off interference and system capacity- trunking and grade of service.

**DIGITAL SIGNALING FOR FADING CHANNELS**

(9)

Structure of a wireless communication link, Modulation and demodulation - Quadrature Phase Shift Keying,  $\pi/4$ -Differential Quadrature Phase Shift Keying- Offset-Quadrature Phase Shift Keying-Binary Frequency Shift Keying-Minimum Shift Keying-Gaussian Minimum Shift Keying-Power spectrum and Error performance in fading channels-OFDM principle - Transceiver implementation-Cyclic prefix-PAPR-Inter-carrier interference.

**MULTIPATH MITIGATION TECHNIQUES**

(9)

Diversity -Micro- and Macrodiversity-Diversity combining techniques-Error probability in fading channels with diversity reception, Rake receiver, MIMO systems -Spatial Multiplexing, System Model, Channel state information, Capacity in fading and non-fading channels.

**WIRELESS STANDARDS**

(9)

Principles of Spread Spectrum Techniques, FDMA, TDMA and CDMA - Capacity Calculations -GSM and GPRS, CDMA in IS-95 / CDMA 2000, Wi-Fi, WiMax.

**TOTAL: 45 HOURS**

**Text books**

1. Andreas.F. Molisch, "*Wireless Communications*", John Wiley, 2nd Edition- India, 2006.
2. Rappaport,T.S., "*Wireless Communications*", Pearson Education, 2nd Edition 2009.

**Reference books**

1. David Tse and Pramod Viswanath, "*Fundamentals of Wireless Communication*", Cambridge University Press, 2005.
2. Gordon L. Stuber, "*Principles of Mobile Communication*", Springer International Ltd.,3rd Edition , 2011.
3. Simon Haykins & Michael Moher, "*Modern Wireless Communications*", Pearson Education, 3rd Edition,2007.
4. Vijay. K. Garg, "*Wireless Communication and Networking*", Morgan Kaufmann Publishers, 2007, <http://books.elsevier.com/9780123735805>;
5. Van Nee, R. and Ramji Prasad, "*OFDM for Wireless Multimedia Communications*", Artech House, 2000.

**12L704 FIBER OPTIC COMMUNICATION**

L T P C  
3 0 0 3 ✓

**INTRODUCTION TO OPTICAL FIBERS**

(9)

Review of Electrical communication systems - Need for optical communication. Electrical and Optical communication - Advantages and applications - EM spectrum - System model description - Selection of system components -Choice of operating wave length - System performance .Mode theory of Circular Wave guides - Overview of Modes - Key Modal concepts -Linearly Polarized Modes -Single Mode Fibers -Graded Index fiber structure.

**FIBER OPTICAL SOURCES & PHOTO DETECTORS**

(9)

Characteristics and requirements - Spontaneous and stimulated emission - Source classifications: Ruby, He-Ne lasers, Homo & Hetero structures, Laser Diodes and LED's characteristics, Comparison and applications - Physical principles of Photodiodes, Photo detector Noise, Detector response time - Avalanche multiplication Noise - Comparisons of photo detectors.

**MODULATION TECHNIQUES**

(9)

Classifications, Direct/Internal modulation: Analog and Digital modulation formats-External modulators: Electro-optic and Acousto - Optic modulators.

**TRANSMISSION MEDIA & OPTICAL RECEIVERS**

(9)

Fiber-optics Vs Coaxial cables - Optical fiber modes and configurations - Fiber transmission properties-Choice of wave length for fiber-optic transmission - Cable configurations - Splices, connectors and couplers -Requirements - Methods of detection process - Comparison - Basic principles of photo detection -Photo diode - Avalanche photo multiplier - Receiver configurations - Pre amplifiers for detectors.

**SYSTEM CONFIGURATIONS AND FIBER OPTIC APPLICATIONS**

(9)

Laser radar system - Fiber optic link for computers - Multichannel audio/video communication systems-Repeater/Regenerator for fiber-optic systems - Power Budget and Rise-time Budget- Basic networks - SONET/SDH -WDM concepts and components - Optical CDMA - Generation of optical fiber link - Introduction to Ultra High Capacity Networks - optical networking technology in enterprise.

**TOTAL: 45 HOURS**

**Text books**

1. Keiser G, "Optical Fiber Communications", McGraw Hill, New Delhi, 3<sup>rd</sup> Edition, 2001.
2. Hohn M. Senior, "Optical Fiber Communications Principles and Practice", PHI, New Delhi, 3<sup>rd</sup> Edition, 2008.
3. Gower, J "Optical Communication Systems", PHI, New Delhi, 2<sup>nd</sup> edition, Fifth reprint, 1995.

**Reference books**

1. Franz J.H. Jain V.K, "Optical Communication, Components And Systems", Narosa publications, New Delhi, 2000.
2. K. Mynbaev and Lowell L Scheiner, "Fiber Optic Communication Technology", Pearson Education Asia, New Delhi, 2009

12L6E0 AUTOMOTIVE ELECTRONIC SYSTEMS

L T P C  
3 0 0 3

**ELECTRONICS IN AUTOMOTIVE SYSTEMS**

(9)

Overview of Automotive Mechanical systems - Need for Automotive Electronics System - Performance (Speed, Power and Torque)-Control (Emission, Fuel Economy, Drivability and Safety) & Legislation (Environmental legislation for pollution and safety norms) - Overview of vehicle electronic systems: Basic electrical components and their operation in an automobile: Power train subsystem(Starting systems, Charging systems - Ignition systems - Electronic fuel control), Chassis subsystem(ABS,TCS and ESP) - Comfort and safety subsystems (Night vision, airbags, Seatbelt Tensioners, Cruise Control-Lane-departure-warning, Parking)

**EMBEDDED HARDWARE AND SOFTWARE**

(9)

Hardware module - Introduction to an embedded board -components - Software Module: IDE - Getting started: Creating new project, creating new files, adding files to project, compile, build, debug and simulation of a project.

**EMBEDDED SYSTEM PROGRAMMING AND DEBUGGING**

(9)

Embedded System Programming - Up-loaders- ISP - ROM Emulators, In-Circuit Emulators - Debug Interfaces: BDM and JTAG

**EMBEDDED SYSTEM IN AUTOMOTIVE APPLICATIONS**

(9)

Engine management systems - Gasoline/ Diesel systems - various sensors used in system - Electronic transmission control - Vehicle safety system - Electronic control of braking and traction - Body electronics - Infotainment systems - Navigation systems - System level tests - Software calibration using engine and vehicle dynamometers - Environmental tests for Electronic Control Unit - Application Control Unit - Application of Control elements and control methodology in Automotive System.

**EMBEDDED SYSTEM COMMUNICATION PROTOCOLS**

(9)

Introduction to control networking - Communication protocols in embedded systems - SPI, I<sup>2</sup>C, USB - Vehicle communication protocols - Introduction to CAN, LIN, FLEXRAY, MOST, KWP2000.

**TOTAL:45 HOURS**

**Text books**

1. Denton.T, "Automobile Electrical and Electronic Systems", Edward Arnold Publishers, 4<sup>th</sup> Edition 2012.
2. Nicholas Navit, "Automotive Embedded System Handbook", CRC press, 2009 .

**Reference books**

1. Robert Bosch GmbH, "Automotive Handbook", John Wiley & Sons, 6<sup>th</sup> Edition, 2004.
2. Knowles.D, "Automotive Electronic and Computer Controlled Ignition Systems", Prentice Hall, 1998.
3. William B. Ribbens, "Understanding Automotive Electronics", Newnes Publishing, 6<sup>th</sup> Edition 2003.
4. Joerg Schaeuffele, Thomas Zurawka - "Automotive Software Engineering - Principles, Processes, Methods and Tools", SAE Publications, 2005



**12L6E1 RELATIONAL DATABASE MANAGEMENT SYSTEMS**

**L T P C**  
**3 0 0 3**

**INTRODUCTION AND CONCEPTUAL MODELING**

**(9)**

Introduction to File and Database systems- Database system structure -Data Models -Introduction to Network and Hierarchical Models -ER model -Relational Model -Relational Algebra and Calculus.

**RELATIONAL MODEL**

**(9)**

SQL -Data definition- Queries in SQL- Updates- Views -Integrity and Security -Relational Database design -Functional dependences and Normalization for Relational Databases (up to BCNF).

**DATA STORAGE AND QUERY PROCESSING**

**(9)**

Record storage and Primary file organization- Secondary storage Devices- Operations on Files- Heap File- Sorted Files- Hashing Techniques - Index Structure for files - Different types of Indexes- B-Tree - B+Tree -Query Processing.

**TRANSACTION MANAGEMENT**

**(9)**

Transaction Processing - Introduction- Need for Concurrency control- Desirable properties of Transaction- Schedule and Recoverability- Serializability and Schedules - Concurrency Control -Types of Locks- Two Phases locking- Deadlock- Time stamp based concurrency control - Recovery Techniques -Concepts- Immediate Update- Deferred Update - Shadow Paging.

**CURRENT TRENDS**

**(9)**

Object Oriented Databases - Need for Complex Data types- OO data Model- Nested relations- Complex Types- Inheritance Reference Types - Distributed databases- Homogenous and Heterogenous- Distributed data Storage - XML - Structure of XML- Data- XML Document- Schema- Querying and Transformation. - Data Mining and Data Warehousing.

**TOTAL: 45 HOURS**

**Text book**

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan- **"Database System Concepts"**, 6<sup>th</sup> Edition, McGraw-Hill, 2010.

**Reference books**

1. Ramez Elmasri and Shamkant B. Navathe, **"Fundamental Database Systems"**, 6<sup>th</sup> Edition, Pearson Education, 2010.
2. Raghu Ramakrishnan, **"Database Management System"**, 3<sup>rd</sup> Edition, Tata McGraw-Hill Publishing Company, 2003.
3. Hector Garcia-Molina, Jeffrey D. Ullman and Jennifer Widom- **"Database System Implementation"**- 2<sup>nd</sup> Edition; Pearson Education- 2009.
4. Peter Rob and Carlos Coronel- **"Database System, Design, Implementation and Management"**, Thompson Learning Course Technology- 5<sup>th</sup> Edition, 2003.

12L6E2 OPERATING SYSTEMS

L T P C  
3 0 0 3

**OPERATING SYSTEM CONCEPTS**

(9)

Introduction - Multitasking - Multiprogramming - Multi user - Multithreading - Types of Operating Systems - Batch operating system - Time sharing systems - Distributed OS - Network OS - Real Time OS - Operating system services - Architectures - System programs and calls.

**PROCESS MANAGEMENT AND PROCESS SYNCHRONIZATION**

(9)

Process concept - Process scheduling - Scheduling criteria - Scheduling algorithms - First Come First Serve - Shortest Job First - Priority Scheduling - Round Robin - Multilevel Queue Scheduling. Process synchronization and Deadlock - Critical Section Problems - Semaphores - Methods for handling Deadlocks - Deadlock prevention, avoidance and detection - Deadlock recovery.

**MEMORY MANAGEMENT**

(9)

Logical and Physical address Space - Swapping - Contiguous memory allocation - Non-contiguous memory allocation - Virtual memory management - Paging and Segmentation techniques - Segmentation with paging - Demand Paging - Page replacement Algorithms.

**FILE SYSTEM AND I/O SYSTEMS**

(9)

Different types of files - Access methods - Directory structures - Allocation methods - Disk scheduling and management and its associated algorithms - Distributed file system. I/O Hardware - application I/O Interface - Kernel - Transforming I/O requests - Performance Issues.

**OVERVIEW OF UNIX SYSTEM AND WINDOWS**

(9)

UNIX system call for processes and file system management - Windows architecture overview - Windows file system - Case studies: Linux System - Windows XP - Mach system.

**TOTAL : 45 HOURS**

**Text books**

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Concepts", John Wiley & Sons, 7<sup>th</sup> Edition, 2005.
2. Dhamdhere D.M., "Operating Systems – A Concept-Based Approach ", 3<sup>rd</sup> Edition, Tata McGraw Hill, New Delhi, 2012.

**Reference books**

1. William Stallings, "Operating Systems", Prentice Hall, New Delhi, 6<sup>th</sup> Edition, 2005.
2. Harvey M. Deitel, Paul J. Deitel, David R. Choffnes, "Operating Systems", Prentice Hall, New Delhi, 3<sup>rd</sup> Edition, 2004.
3. Jean Bacon, Tim Harris, "Operating Systems", Addison Wesley, New Delhi, 1<sup>st</sup> Edition, 2003.

**12L6E3 MEASUREMENTS AND INSTRUMENTATION**

**L T P C**

**3 0 0 3** ✓

**BASICS OF MEASUREMENT**

**(9)**

Measurement System -Instrumentation -Characteristics of measurement systems -Static and Dynamic - Errors in Measurements -Calibration and Standards.

**TRANSDUCERS**

**(9)**

Classification of Transducers-Variable Resistive transducers-Strain gauges-Thermistor-RTD- Variable Inductive transducers-LVDT, RVDT - Variable Capacitive Transducers - Capacitor microphone- Photo electric transducers Piezoelectric transducers-Thermocouple-IC sensors-Fibre optic sensors-Smart/intelligent sensors.

**SIGNAL CONDITIONING AND SIGNAL ANALYZERS**

**(9)**

DC and AC bridges - Wheatstone-Kelvin-Maxwell-Hay and Schering.Pre- amplifier - Isolation amplifier -Filters -Data acquisition systems. Spectrum Analyzers -Wave analyzers-Frequency selective wave analysers,Heterodyne wave analyser-Total harmonic distortion-Harmonic distortion analysers-Logic analyzers.

**DIGITAL INSTRUMENTS**

**(9)**

Digital instruments-Classification of Digital instruments-Digital methods of measuring frequency-period-phase difference-pulse width-time interval-AC and DC Voltage and current-Digital Voltmeters- automation in Voltmeter -Accuracy and Resolution in DVM-Guarding techniques -Frequency counter-DMM-DPM and Digital Q- meter.

**DATA DISPLAY AND RECORDING SYSTEMS**

**(9)**

Dual trace CRO -Digital storage and Analog storage oscilloscope. Analog and Digital Recorders and printers. Virtual Instrumentation - Block diagram and architecture -Applications in various fields. Measurement systems applied to Micro and Nanotechnology.

**TOTAL: 45 HOURS**

**Text books**

1. Albert D.Helfrick and William D. Cooper, "*Modern Electronic Instrumentation and Measurement Techniques*", Prentice Hall of India, 2007.
2. A.K Sawhney, "*Course In Electrical And Electronic Measurement And Instrumentation*", Dhanpat Rai Publisher, 2000.

**Reference books**

1. John P. Bentley, "*Principles of Measurement Systems*", 4<sup>th</sup> edition, pearson Education Limited, 2005.
2. Ernest .o .Doebelin and Dhanesh. N. manik, "*Measurement systems*", 5<sup>th</sup> edition, McGraw-Hill, 2007.
3. Bouwens,A.J, "*Digital Instrumentation*", Tata Mc-Graw Hill, 1986.
4. David A.Bell, "*Electronic Instrumentation and Measurements*", 2<sup>nd</sup> edition, PHI, 2007.
5. Kalsi.H.S,"*Electronics Instrumentation*".Tata Mc Graw Hill,4<sup>th</sup> edition,2004.

12L6E4 TV AND VIDEO ENGINEERING

L T P C

3 0 0 3

FUNDAMENTALS OF TELEVISION

(9)

Aspect ratio-image continuity - Number of scanning lines - Interlaced scanning - Picture resolution - Camera tubes - Image orthicon - Vidicon- Plumbicon- Silicon diode array vidicon- Solid state image scanners - Monochrome picture tubes - Composite video signal - Video signal dimension - Horizontal sync. Composition- vertical sync. Details-functions of Vertical pulse train - Scanning sequence details. Picture signal transmission - Positive and negative modulation - VSB transmission - Sound signal transmission - Standard channel bandwidth.

MONOCHROME TELEVISION TRANSMITTER AND RECEIVER

(9)

TV transmitter-TV signal propagation- interference- TV Transmission antennas- Monochrome TV receiver - RF tuner- UHF, VHF tuner- digital tuning techniques - aft- IF subsystems - AGC noise cancellation - Video amplifier circuits- Sync operation - Typical sync processing circuits - Deflection oscillators- Frame deflection circuits- Requirements- Line deflection circuits - EHT generation - Receiver antennas.

ESSENTIALS OF COLOUR TELEVISION

(9)

Compatibility- colour perception- three colour television cameras- values of luminance and colour difference signals- Colour television display tubes - Delta- Gun precision-in-line and Trinitron colour picture tubes - Purity and convergence- Purity and static and dynamic convergence adjustments- Pincushion - Correction techniques- Automatic degaussing circuits- Gray scale tracking - Colour signal transmission - Bandwidth - Modulation of colour difference signals - Weighting factors - Formation of chrominance signal.

COLOUR TELEVISION SYSTEMS

(9)

NTSC colour TV systems- SECAM system- PAL colour TV systems- cancellation of phase errors- PAL-D colour system- PAL coder- PAL- Decoder receiver- Chromo signal amplifier- Separation of U and V signals- Colour burst separation- Burst phase discriminator- Acc amplifier- Reference oscillator- Ident and colour killer circuits - U and V demodulators- Colour signal matrixing. Sound in TV

ADVANCED TELEVISION SYSTEMS

(9)

Satellite TV technology- Geo stationary satellites - Satellite electronics - Domestic broadcast system- Cable TV - Cable signal sources- Cable signal processing, Distribution and scrambling - Video recording- VCR electronics- Video home formats- Video disc recording and playback- DVD players- Tele text signal coding and broadcast receiver- Digital television- Transmission and reception- Projection- Flat panel display TV receivers- LCD and plasma screen receivers- 3DTV- EDTV

TOTAL: 45 HOURS

Text books

1. R.R.Gulati, "Monochrome Television Practice, Principles, Technology and servicing" 3<sup>rd</sup> Edition 2006, New Age International (P) Publishers.
2. R.R.Gulati, "Monochrome & Colour Television", New Age International (P) Publishers, 2003.

Reference book

1. A.M Dhake, "Television and video Engineering", 2<sup>nd</sup> Edition., TMH, 2003

## 12L7E0 SPREAD SPECTRUM TECHNIQUES

L T P C  
3 0 0 3

### INTRODUCTION TO SPREAD SPECTRUM

(9)

Introduction-Application and advantages Of Spread Spectrum (SS)-Classification of SS Pseudo Noise Sequences-Direct Sequence SS-Frequency Hopping-Chirp-Hybrid Spectrum Methods.

### SPREAD SPECTRUM TECHNIQUES

(9)

Frequency hop SS signals; performance of FHSS-Fast hopping and Slow hopping-DS and FH, CDMA system based on FHSS signals - Types of SS signals - Time hopping SS systems.

### SPREAD SPECTRUM ANALYSIS

(9)

Synchronization of SS System-Acquisition, Tracking, Jamming Considerations-Broad Band-Partial-Multiple Tone-Pulse-Repeat Band Jamming Blade Systems.

### CRYPTOGRAPHY

(9)

Fundamental concepts of cryptosystems - Authentication - digital signature - key schedule - Encipherment, Decipherment, stream cipher system, public key - Cryptosystem - Public key distribution system - RSA Cryptosystem and authentication scheme- Protocols - Internetworking security mechanisms - Private and public key encryption.

### APPLICATIONS

(9)

Commercial application of SS-CDMA-multi path channels- FCC part 15 rules-direct sequence CDMA-IS-95 CDMA digital cellular systems - SS applications in cellular - PCS and mobile communication.

**TOTAL:45 HOURS**

#### Text books

1. Bernard sklar, "*Digital Communication-Fundamentals and Application*", Pearson Edition, 2001.
2. M.K.Simon, J.K.Scholtz and B.K.Levitt, "*Spread Spectrum Communications Vol-1, Vol-2, Vol-3*", computer science press Inc, 2002.

#### Reference books

1. John G. Proakis, "*Digital Communications*", McGraw Hill Inc, 2001.
2. Feher.K., "*Wireless Digital Communications*", Pearson education, 1995.
3. John.G.Proakis, "*Digital Communications*", Tata McGraw Hill Publishing Company Ltd, 4<sup>th</sup> Edition, 2006.

**12L7E1 ADVANCED DIGITAL SIGNAL PROCESSING**

**L T P C**  
**3 0 0 3**

**DISCRETE RANDOM SIGNAL PROCESSING**

**(9)**

Discrete Random Processes - Ensemble Averages - Stationary processes - Bias and Estimation - Autocovariance - Autocorrelation - Parseval's theorem - Wiener- Khintchine relation - White noise - Power Spectral Density - Spectral factorization - Filtering Random Processes - Special types of Random Processes - ARMA, AR, MA - Yule-Walker equations.

**SPECTRAL ESTIMATION**

**(9)**

Estimation of spectra from finite duration signals - Nonparametric methods - Periodogram - Modified periodogram - Bartlett - Welch and Blackman-Tukey methods - Parametric methods - ARMA - AR and MA model based spectral estimation - Solution using Levinson-Durbin algorithm.

**LINEAR ESTIMATION AND PREDICTION**

**(9)**

Linear prediction - Forward and Backward prediction - Solution of Prony's normal equations - Least mean - squared error criterion - Wiener filter for filtering and prediction - FIR and IIR Wiener filters - Discrete Kalman filter.

**ADAPTIVE FILTERS**

**(9)**

FIR adaptive filters - Adaptive filter based on steepest descent method - Widrow - Hopf LMS algorithm - Normalized LMS algorithm - Adaptive channel equalization - Adaptive echo cancellation - Adaptive noise cancellation - RLS adaptive algorithm.

**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 Polyphase filter structures - Time invariant structures - Multistage implementation of multirate system, Application to subband coding - Wavelet transform.

**TOTAL:45 HOURS**

**Text book**

1. Monson H. Hayes, "Statistical Digital Signal Processing and Modeling", John Wiley and Sons, Inc, Singapore, 2008.

**Reference books**

1. John J. Proakis, Dimitris G. Manolakis, "Digital Signal Processing", Pearson Education, 4<sup>th</sup> Edition, 2009.
2. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Pearson Education Inc., 3<sup>rd</sup> Edition, 2008.

**12L7E2 VLSI SIGNAL PROCESSING**

**L T P C**

**3 0 0 3**

**ITERATION BOUND**

**(9)**

Introduction to DSP Systems -Typical DSP algorithms.Iteration Bound - Data flow graph representations - loop bound and iteration bound - Longest Path Matrix algorithm - Pipelining and parallel processing - Pipelining in FIR digital filters - parallel processing - pipelining and parallel processing for low power- Retiming - Definitions and properties-Solving systems of Inequalities Techniques.

**UNFOLDING**

**(9)**

Unfolding - Algorithm - Properties and Applications of Unfolding - Unfolding for retiming-1D & 2D systolic architecture design -selection of scheduling vectors-Algorithmic strength reduction in filters - 2-parallel FIR filter- 2-parallel fast FIR filters - DCT algorithm architecture transformation - parallel architectures for rank-order filters - Odd- Even, Merge Sort architectures - Parallel rank-order filters.

**FAST CONVOLUTION**

**(9)**

Fast convolution - Cook-Toom algorithm - modified Cook-Toom algorithm- Pipelined and parallel recursive and adaptive filters - inefficient/efficient single channel interleaving- Look- Ahead pipelining in first- order IIR filters - Look-Ahead pipelining with power-of-two decomposition - Clustered Look-Ahead pipelining - parallel processing of IIR filters - combined pipelining and parallel processing of IIR filters - pipelined adaptive digital filters - Relaxed look-ahead - pipelined LMS adaptive filter.

**BITLEVEL ARITHMETIC ARCHITECTURES**

**(9)**

Bit-Level Arithmetic Architectures Scaling and roundoff noise- scaling operation, roundoff noise, state variable description of digital filters - scaling and roundoff noise computation - roundoff noise in pipelined first-order filters - Bit-Level Arithmetic Architectures-parallel multipliers with sign extension - parallel carry-ripple array multipliers, parallel carry-save multiplier, 4x4 bit Baugh- Wooley carry-save multiplication tabular form and implementation - bit-serial FIR filter - CSD representation - CSD multiplication using Horner's rule for precision improvement.

**NUMERICAL STRENGTH REDUCTION**

**(9)**

Numerical Strength Reduction – sub expression elimination, multiple constant multiplications, iterative matching. Linear transformations, Synchronous, Wave and asynchronous pipelining- synchronous pipelining and clocking styles, clock skew in edge-triggered single-phase clocking, two-phase clocking, wave pipelining, asynchronous pipelining bundled data versus dual rail protocol.

**TOTAL:45 HOURS**

***Text books***

1. ***Keshab K.Parhi, "VLSI Digital Signal Processing Systems, Design and Implementation", Wiley, Inter Science, 2007.***

***Reference books***

1. ***Mohammed Isamail and Terri Fiez, "Analog VLSI Signal and Information Processing", Mc Graw-Hill, 1994.***
2. ***S.Y. Kung, H.J. White House, T. Kailath, "VLSI and Modern Signal Processing", Prentice Hall, 1985.***
3. ***Jose E. France, Yannis Tsividis, "Design of Analog - Digital VLSI Circuits for Telecommunication and Signal Processing", Prentice Hall, 1994.***



**12L7E3 SOFTWARE ENGINEERING**

**L T P C**

**3 0 0 -3**

**SOFTWARE PROCESS**

**(9)**

Introduction - S/W Engineering Paradigm - Life cycle models (water fall, incremental, spiral, WINWIN spiral, evolutionary, prototyping, object oriented) - System engineering - Computer based system - Cerification - Calidation - Life cycle process - Development process - System engineering hierarchy.

**SOFTWARE REQUIREMENTS**

**(9)**

Functional and non-functional - User - System - Requirement engineering process - Feasibility studies - Requirements - Elicitation - validation and management - Software prototyping - Prototyping in the software process - Rapid prototyping techniques - User interface prototyping -S/W document. Analysis and modeling - Data, functional and behavioral models - Structured analysis and data dictionary.

**DESIGN CONCEPTS AND PRINCIPLES**

**(9)**

Design process and concepts - Modular design - Design heuristic - Design model and document. Architectural design - Software architecture - Data design - Architectural design - Transform and transaction mapping - User interface design - User interface design principles. Real time systems - Real time software design - System design - Real time executives - Data acquisition system - Monitoring and control system. SCM - Need for SCM - Version control - Introduction to SCM process - Software configuration items.

**TESTING**

**(9)**

Taxonomy of software testing - Levels - Test activities - Types of s/w test - Black box testing - Testing boundary conditions - Structural testing - Test coverage criteria based on data flow mechanisms - Regression testing - Testing in the large. S/W testing strategies - Strategic approach and issues - Unit testing - Integration testing - Validation testing - System testing and debugging.

**SOFTWARE PROJECT MANAGEMENT**

**(9)**

Measures and measurements - S/W complexity and science measure - Size measure - Data and logic structure measure - Information flow measure. Software cost estimation - Function point models - COCOMO model- Delphi method.- Defining a Task Network - Scheduling - Earned Value Analysis - Error Tracking - Software changes - Program evolution dynamics - Software maintenance - Architectural evolution. Taxonomy of CASE tools.

**TOTAL:45 HOURS**

**Text book**

1. Roger S.Pressman, "*Software Engineering- A Practitioner's Approach*", McGraw-Hill International Edition, 6<sup>th</sup> Edition, 2006.

**Reference books**

1. Ian Sommerville, "*Software Engineering*", Pearson education Asia, 8<sup>th</sup> Edition, 2007.
2. Pankaj Jalote- *An Integrated Approach to Software Engineering*, Springer Verlag, 1997.
3. James F Peters and Witold Pedrycz, "*Software Engineering – An Engineering Approach*", John Wiley and Sons, New Delhi, 2000.
4. Ali Behforooz and Frederick J Hudson, "*Software Engineering Fundamentals*", Oxford University Press, New Delhi, 1996.

## 12L7E4 NEURAL NETWORKS

L T P C

3 0 0 3

### INTRODUCTION

(9)

Artificial neural networks -History-Structure and function of single neuron-Weights, activation functions and bias-Fundamental neuron models and learning-Neural net architectures-Learning algorithms, supervised and unsupervised-Use of neural networks - Perceptron - Linear separability.

### FEED FORWARD AND FEEDBACK NETWORKS

(9)

Back propagation network-Architecture -Delta rule-Weight updation for output and hidden layer -Local and global minima-practical considerations - Merits, demerits and applications-Pattern association-Associative memories-BAM-Energy theorem-Architecture and processing-Hopfield memory-Discrete and continuous -Optimization using hopfield networks.

### SIMULATED ANNEALING AND COMPETITIVE NETWORKS

(9)

Annealing- Boltzman machine architecture, learning and processing-Practical considerations-Neural networks based on competition-Counter propagation network-Forward mapping CPN and complete CPN-Building blocks-Architecture, Training and data processing-Practical considerations and applications.

### SOM AND ADAPTIVE RESONANCE THEORY

(9)

Topologically organized network-Feature map classifier-Applications-Learning vector quantization-Adaptive resonance theory-Fundamentals-Basic architecture and operation-Pattern matching-ART1 network - Architecture and processing summary.

### HANDWRITTEN CHARACTER AND SPEECH RECOGNITION

(9)

Neocognetron - Architecture - Data processing and performance-Spatio-temporal pattern classification-STN - Architecture-Speech recognition-SCAF-Training - Time dilation effect.

**TOTAL : 45 HOURS**

#### Text book

1. James A. Freeman, David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Education (Singapore) Private Limited, Delhi, 2003.

#### Reference books

1. Satish Kumar, "Neural Networks: A Classroom Approach", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2004.
2. Simon Haykin, "Neural Networks: A Comprehensive Foundation", 2nd Edition, Addison Wesley Longman (Singapore) Private Limited, Delhi, 2001.
3. Laurence Fausett, "Fundamentals of neural networks, Architectures, Algorithms and Applications", Pearson education Private Limited, Delhi, 2004.
4. Sivanandam.S.N, Sumathi.S, Deepa.S.N, "Introduction to Neural networks using MATLAB 6.0", Tata Mc-Graw-Hill Publishing Company Limited, New Delhi, 2006

## 12L7E5 RADAR SYSTEMS

L T P C

3 0 0 3

### INTRODUCTION TO RADAR

(9)

Fundamentals of Radar - Elements - Functions - System considerations - Radar Targets - Basic Principle. Radar equation. Radar cross section. Cross section of small targets. Target scattering matrices. Area and volume targets.

### RADAR SIGNALS

(9)

Real, Complex, Analytic Radar signals - Duration, Frequency, Bandwidth of radar signals. Ambiguity function and its properties. Uncertainty principle. Pulse compression - Linear FM pulse - Pulse compression by Costas FM and binary phase coding.

### RADAR TRANSMITTER AND RECEIVER

(9)

Radar Transmitters- Introduction - Linear Beam Power Tubes - Solid State RF Power Sources - Magnetron - Crossed Field Amplifiers - Other RF Power Sources - Other aspects of Radar Transmitter. Radar Receivers - The Radar Receiver - Receiver noise Figure - Superheterodyne Receiver - Duplexers and Receiver Protectors- Radar Displays.

### RADAR DETECTION

(9)

Radar detection, Optimum Bayesian decision rules - Detection criteria for different target models.

### MEASUREMENT AND TRACKING

(9)

Range and Doppler measurements and tracking - Range and Doppler frequency resolutions - Optimum receivers - Optimum filters for Doppler measurements - Coherent and non coherent implementations. Angle measurement and tracking, Angle measurement and tracking by conical scan and monopulse - Optimum monopulse systems.

**TOTAL: 45 HOURS**

#### *Text books*

1. Peyton Z. Peebles, "Radar Principles", John Wiley, 2004.
2. Merrill I. Skolnik, "Introduction to Radar Systems", Tata McGraw-Hill 3rd Edition 2003

#### *Reference books*

1. J.C Toomay, "Principles of Radar", 2nd Edition - PHI, 2004

**12L7E6 IMAGE PROCESSING**

**L T P C**

**3 0 0 3**

**DIGITAL IMAGE FUNDAMENTALS**

**(9)**

Elements of digital image processing systems - Vidicon and Digital Camera working principles - Elements of visual perception - brightness contrast hue saturation Mach Band effect - Image sampling - Quantization - Dither - Two -dimensional mathematical preliminaries.

**IMAGE TRANSFORMS**

**(9)**

1D DFT, 2D transforms - DFT, DCT, Discrete Sine, Walsh, Hadamard, Slant, Haar, KLT, SVD, Wavelet transform.

**IMAGE ENHANCEMENT AND RESTORATION**

**(9)**

Histogram modification - Noise distributions - Spatial averaging - Directional Smoothing - Median, Geometric mean, Harmonic mean, Contraharmonic and Yp mean filters. Design of 2D FIR filters. Image restoration - Degradation model, Unconstrained and Constrained restoration - Inverse filtering - Removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations - Spatial transformations, Gray - Level interpolation.

**IMAGE SEGMENTATION AND RECOGNITION**

**(9)**

Image segmentation - Edge detection, Edge linking and boundary detection, Region growing, Region splitting and Merging - Image Recognition - Patterns and pattern classes, Matching by minimum distance classifier, Matching by correlation - Neural networks-Backpropagation network and training, Neural network to recognize shapes.

**IMAGE COMPRESSION**

**(9)**

Need for data compression - Huffman - Run Length Encoding - Shift codes - Arithmetic coding - Vector Quantization - Block Truncation Coding - Transform coding - JPEG standard - JPEG 2000 - EZW - SPIHT - MPEG

**TOTAL: 45 HOURS**

**Text books**

1. Rafael C. Gonzalez, Richard E. Woods, "**Digital Image Processing**", Pearson Education, Inc., 2<sup>nd</sup> Edition, 2004
2. Anil K. Jain, "**Fundamentals of Digital Image Processing**", Prentice Hall of India, 2002.

**Reference books**

1. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, "**Digital Image Processing using MATLAB**", Pearson Education, Inc., 2004.
2. Milan Sonka et al, "**Image Processing, Analysis and Machine Vision**", Brookes/Cole, Vikas Publishing House, 2<sup>nd</sup> Edition, 1999;
3. Jayaraman S, Esakkirajan S and Veerakumar J, "**Digital Image Processing**", Tata McGrawHill Education pvt ltd, 2010.

### 12L7E7 MULTIMEDIA COMPRESSION TECHNIQUES

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#### MULTIMEDIA COMPONENTS

(9)

Introduction - Multimedia skills - Multimedia components and their characteristics - Text, Sound, images, Graphics, Animation, Video, Hardware.

#### TEXT COMPRESSION

(9)

Compression principles-source encoders and destination encoders - Lossless and Lossy compression - Entropy encoding - Source encoding - Text compression - Static Huffman coding dynamic coding - Arithmetic coding - LZW Compression - Entropy and Quality measures.

#### IMAGE COMPRESSION

(9)

Approaches to image compression - Predictive Techniques - PCM, DPCM, DM - Progressive based compression - Vector quantization - Binary Tree Predictive - Quad trees - DCT coding - Wavelet methods - Filter banks - EZW, SPIHT - Compression standards..

#### AUDIO COMPRESSION

(9)

Audio compression - Companding laws - frequency domain filtering - Basic subband coding - application to speech coding - G.722 - Application to Audio coding - MPEG Audio - Progressive encoding for Audio - Silence compression - Speech compression techniques - CELP Vocoders - LPC.

#### VIDEO COMPRESSION

(9)

Video compression techniques - Standards - MPEG 1, 2, 4, 7 Video coding - Motion estimation and compensation techniques - H.261-H.263.

**TOTAL: 45 HOURS**

#### Text books

1. Fred Halshall, *"Multimedia Communication - Applications, Networks, Protocols And Standards"*, Pearson education, 2007.
2. Khalid Sayood, *"Introduction to Data Compression"*, 3<sup>rd</sup> Edition, Morgan Kaufmann Series in Multimedia Information and Systems, 2006.

#### Reference books

1. K.R. Rao, Z.S. Bojkovic, D.A. Milovanovic, *"Multimedia Communication Systems: Techniques, Standards, and Networks"*, Pearson Education 2007
2. R. Steinmetz, K. Nahrstedt, *"Multimedia Computing, Communications and Applications"*, Pearson Education, First ed, 1995.
3. Ranjan Parekh, *"Principles of Multimedia"*, TMH, 2006.
4. Tay Vaughan, *"Multimedia: making it work"*, 7/e, TMH, 2007.

12L7E8 MEMS

L T P C

3 0 0 3

**INTRODUCTION TO MEMS**

(9)

MEMS and Microsystems - Miniaturization - Typical products - Micro sensors - Micro actuation - MEMS with micro actuators - Micro accelerometers and Micro fluidics - MEMS materials - Micro fabrication.

**MECHANICS FOR MEMS DESIGN**

(9)

Elasticity - Stress - strain and material properties - Bending of thin plates - Spring configurations - torsional deflection - Mechanical vibration - Resonance - Thermo mechanics - actuators, force and response time, Fracture and thin film mechanics.

**ELECTRO STATIC DESIGN AND SYSTEM ISSUES**

(9)

Electrostatics: basic theory - electro static instability. Surface tension, gap and finger pull up - Electro static actuators, Comb generators - gap closers - rotary motors - inch worms - Electromagnetic actuators - bistable actuators - Electronic Interfaces - Feed back systems - Noise - Circuit and system issues.

**MEMS APPLICATION**

(9)

Case studies-Capacitive accelerometer - Piezo electric pressure sensor - Microfluidics application - Modeling of MEMS systems - CAD for MEMS.

**INTRODUCTION TO OPTICAL AND RF MEMS**

(9)

Optical MEMS - System design basics-Gaussian optics - matrix operations - resolution. Case studies - MEMS scanners and retinal scanning display - Digital Micro mirror devices. RF Memes -design basics, case study-Capacitive RF MEMS switch, performance issues.

**TOTAL: 45 HOURS**

**Text books**

1. Stephen Santeria, " *Microsystems Design*", Kluwer publishers, 2000.
2. N.P.Mahalik, " *MEMS*", Tata McGraw hill, 2007

**Reference books**

1. Vijay.K.Varadan, K.J.Vinoy,K.A.Jose, " *RF MEMS and applications*", John Wiley & Sons, 2003.
2. Nadim Maluf, " *An Introduction to Micro Electro Mechanical System Design*", Artech House, 2000.
3. Mohamed Gad-el-Hak, editor, " *The MEMS Handbook*", CRC press Boca Raton, 2000.
4. Tai Ran Hsu, " *MEMS & Micro systems Design and Manufacture*" Tata McGraw Hill, New Delhi, 2002.
5. Liu, " *MEMS*", Pearson education, 2007.

12L7E9 AVIONICS

L T P C  
3 0 0 3

**INTRODUCTION**

(9)

Introduction to aircraft - Axes system - Parts, importance and role of Avionics - systems which interface directly with pilot - Aircraft state sensor systems - Navigation systems - External world sensor systems - Task automation systems. Avionics architecture evolution. Avionics Data buses - MIL STD 1553, ARINC 429, ARINC 629.

**RADIO NAVIGATION**

(9)

Types of Radio Navigation - ADF, DME, VOR, LORAN, DECCA, OMEGA. ILS, MLS

**INERTIAL AND SATELLITE NAVIGATION SYSTEMS**

(9)

Inertial sensors - Gyroscopes, Accelerometers, Inertial navigation systems - Block diagram, Platform and strap down INS. Satellite Navigation - GPS

**AIR DATA SYSTEMS AND AUTOPILOT**

(9)

Air data quantities - Altitude, Airspeed, Mach no., Vertical speed, Total Air temperature, Stall warning, Altitude warning. Autopilot - Basic principles - Longitudinal and lateral autopilot.

**AIRCRAFT DISPLAYS**

(9)

Display technologies - LED, LCD, CRT, Flat Panel Display. Primary Flight parameter displays - Head Up Display, Helmet Mounted Display, Night vision goggles, Head Down Display, MFD, MFK, Virtual cockpit.

**TOTAL: 45 HOURS**

**Text books**

1. Albert Helfrick. D, "**Principles of Avionics**", Avionics communications Inc., 2004
2. Collinson, R.P.G, "**Introduction to Avionics**", Chapman and Hall, 1996.

**Reference books**

1. Middleton, D.H, "**Avionics Systems**", Longman Scientific and Technical, Longman Group UK Ltd, England, 1989.
2. Spitzer, C.R. "**Digital Avionics Systems**", Prentice Hall, Englewood Cliffs, N.J., USA 1993.
3. Spitzer, C.R, "**The Avionics Handbook**", CRC Press, 2000.
4. Pallet, E.H.J, "**Aircraft Instruments and Integrated Systems**", Longman Scientific



12L8E0 PROFESSIONAL ETHICS

L T P C

3 0 0 3

(9)

**ENGINEERING ETHICS**

Senses of 'Engineering Ethics' - Variety of moral issues - Types of inquiry - moral dilemmas - Moral autonomy - Kohlberg's theory - Gilligan's theory - Consensus and Controversy - Models of Professional Roles - Theories about right action - Self-Interest - Customs and religion - Uses of ethical theories.

**ENGINEERING AND SOCIAL EXPERIMENTATION**

(9)

Engineering as experimentation - engineers as responsible experimenters - Codes of ethics - A balanced outlook on law - The challenger case study

**SAFETY**

(9)

Safety and risk - Assessment of safety and risk - Risk benefit analysis and reducing risk - The three mile island and chernobyl case studies.

**RESPONSIBILITIES AND RIGHTS**

(9)

Collegiality and loyalty - Respect for authority - Collective bargaining - Confidentiality - Conflicts of interest - Occupational crime - Professional rights - Employee rights - Intellectual Property Rights (IPR) - discrimination.

**GLOBAL ISSUES**

(9)

Multinational corporations - Environmental ethics - Computer ethics - Weapons development - Engineers as managers - Consulting Engineers - Engineers as expert witnesses and advisors - Moral leadership - Sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE), India

**TOTAL : 45 HOURS**

**Text books**

1. Mike Martin and Roland Schinzinger, "*Ethics in Engineering*", McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "*Engineering Ethics*", Prentice Hall of India, New Delhi, 2004.

**Reference books**

1. Charles D. Fleddermann, "*Engineering Ethics*", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint)
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "*Engineering Ethics – Concepts and Cases*", Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, "*Ethics and the Conduct of Business*", Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, "*Fundamentals of Ethics for Scientists and Engineers*", Oxford University Press, Oxford, 2001.

12L8E1 DSP SYSTEM DESIGN

L T P C  
3 0 0 3

**ADSP21XX ARCHITECTURE AND PROGRAMMING**

(9)

Introduction to ADSP- 2100 family of processors - Assembly language overview - Development systems - Single precision fixed point division, Multiprecision fixed point addition, subtraction, multiplication and division - Fixed point to floating point conversion and vice versa - Floating point addition, subtraction, multiplication and division - Sine, arctangent, square root and logarithm approximation - Uniform random number generation.

**FFT AND FILTER IMPLEMENTATION USING ADSP 21XX**

(9)

Implementation of FFT: Radix-2 fast Fourier transforms - Block floating point scaling - Optimized radix-2 DIT FFT - Leakage - Implementation of digital filters: single and double precision FIR Filters, IIR Filters - Multirate filters.

**TMS320C6X ARCHITECTURE**

(9)

CPU Operation - Pipelined CPU - VelocityTI - C64x DSP - Software tools: EVM - DSK Target C6x board Assembly file - Memory management - Compiler utility - Code initialization - Code composer studio - Interrupt data processing.

**CODE OPTIMIZATION**

(9)

Word-wide optimization - Mixing C and assembly - Software pipelining - C64x improvements - Real time filtering - Circular buffering - Adaptive filtering.

**FRAME PROCESSING, REAL TIME ANALYSIS AND SCHEDULING**

(9)

Frame processing: DMA DSP Host Communication - DFT and FFT Implementation - Real time FFT - Real time analysis - Real time scheduling - Real time data exchange - DSP / BIOS - Data synchronization and communication.

**Text books**

**TOTAL: 45 HOURS**

1. "Digital Signal Processing Applications using the ADSP-2100 Family", Volume 1 Analog devices, DSP Division Prentice Hall, 1992.
2. Nasser Kehtarnavaz and Mansour Keramat, "DSP System Design Using The TMS320C600", Prentice hall, 2001.

**Reference books**

1. Sophocles J. Orfanidis, "Introduction to signal processing", Prentice Hall, 1998.
2. Sen M. Kuo, Bob H. Lee, "Real-time digital signal processing- Implementations, Applications And Experiments With The TMS320C55x", John Wiley and Sons, 2001.
3. John G Proakis and Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson Education, 4<sup>th</sup> Edition, 2009.

## 12L8E2 NANO ELECTRONICS

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### INTRODUCTION TO NANOTECHNOLOGY

(9)

Background to nanotechnology: Types of nanotechnology and nanomachines - Periodic table - atomic structure - Molecules and phases - Energy - Molecular and atomic size - Surface and dimensional space - Top down and bottom up; Molecular Nanotechnology: Electron microscope - Scanning electron microscope - Atomic force microscope - Scanning tunnelling Microscope - Nanomanipulator - Nanotweezers - Atom manipulation - Nanodots - Self assembly - Dip pen nanolithography. Nanomaterials: preparation - Plasma arcing - Chemical vapor deposition - Sol-gels - Electrodeposition - Ball milling - Applications of nanomaterials;

### FUNDAMENTALS OF NANOELECTRONICS

(9)

Fundamentals of logic devices:- Requirements - Dynamic properties - Threshold gates; physical limits to computations; concepts of logic devices:- classifications - Two terminal devices - Field effect devices - Coulomb blockade devices - Spintronics - Quantum cellular automata - Quantum computing - DNA computer; performance of information processing systems;- basic binary operations, measure of performance processing capability of biological neurons - Performance estimation for the human brain. Ultimate computation:- Power dissipation limit - Dissipation in reversible computation - The ultimate computer.

### SILICON MOSFETs & QUANTUM TRANSPORT DEVICES

(9)

Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices- scaling rules - silicon-dioxide based gate dielectrics - metal gates - junctions & contacts - advanced MOSFET concepts. Quantum transport devices based on resonant tunneling:- Electron tunneling - resonant tunneling diodes - resonant tunneling devices; Single electron devices for logic applications:- Single electron devices - applications of single electron devices to logic circuits.

### CARBON NANOTUBES

(9)

Carbon Nanotube: Fullerenes - Types of nanotubes - Formation of nanotubes - Assemblies - Purification of carbon nanotubes - Electronic properties - Synthesis of carbon nanotubes - Carbon nanotube interconnects - Carbon nanotube FETs - Nanotube for memory applications - Prospects of an all carbon nanotube nanoelectronics.

### MOLECULAR ELECTRONICS

(9)

Electrodes & contacts - Functions - Molecular electronic devices - First test systems - simulation and circuit design - Fabrication; Future applications: MEMS - Robots - Random access memory - Mass storage devices.

**TOTAL: 45 HOURS**

#### Text books

1. Michael Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons and Burkhard Raguse, "Nanotechnology: Basic Science and Emerging Technologies", Chapman & Hall / CRC, 2002

#### Reference books

1. T.Pradeep, "NANO: The Essentials – Understanding Nanoscience and Nanotechnology", TMH, 2007
2. Rainer Waser (Ed.), "Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices", Wiley-VCH, 2003

12L8E3 SOFT COMPUTING

L T P C  
3 0 0 3

**FUZZY SET THEORY**

(9)

Introduction to Neuro Fuzzy and Soft Computing-Fuzzy Sets -Basic Definition and Terminology-Set-theoretic Operations-Member Function Formulation and Parameterization-Fuzzy Rules and Fuzzy Reasoning-Extension Principle and Fuzzy Relations-Fuzzy If-Then Rules -Fuzzy Reasoning -Fuzzy Inference Systems-Mamdani Fuzzy Models-Sugeno Fuzzy Models-Tsukamoto Fuzzy Models-Input Space Partitioning and Fuzzy Modeling.

**OPTIMIZATION**

(9)

Derivative-based Optimization -Descent Methods - Method of Steepest Descent-Classical Newton's Method -Step Size Determination-Derivative free Optimization- Simulated Annealing -Random Search Down hill Simplex Search-Genetic Algorithms.

**ARTIFICIAL INTELLIGENCE**

(9)

Introduction - Knowledge Representation -Reasoning, Issues and Acquisition: Propositional and Predicate Calculus Rule Based knowledge Representation, Symbolic Reasoning - Under Uncertainty - Basic knowledge Representation Issues- Knowledge acquisition-Heuristic Search: Techniques for Heuristic search, Heuristic Classification - State Space Search: Strategies Implementation of Graph Search - Search based on Recursion Patent-directed Search Production System and Learning.

**NEURO FUZZY MODELING**

(9)

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

**APPLICATIONS OF COMPUTATIONAL INTELLIGENCE**

(9)

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

**TOTAL: 45 HOURS**

**Text books**

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.
2. N.P.Padhy, "Artificial Intelligence and Intelligent Systems", Oxford University Press, 2006.

**Reference books**

1. Elaine Rich & Kevin Knight, *"Artificial Intelligence"*, 2<sup>nd</sup> Edition, Tata Mcgraw Hill Publishing Comp., 2006, New Delhi.
2. Timothy J. Ross, *"Fuzzy Logic with Engineering Applications"*, McGraw-Hill, 1997.
3. Davis E. Goldberg, *"Genetic Algorithms: Search, Optimization and Machine Learning"*, Addison Wesley, N.Y., 1989.
4. S. Rajasekaran and G.A.V.Pai, *"Neural Networks, Fuzzy Logic and Genetic Algorithms"*, PHI, 2003.

12L8E4 TOTAL QUALITY MANAGEMENT

L T P C  
3 0 0 3

**INTRODUCTION**

(9)

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM.

**PRINCIPLES OF TQM**

(9)

Leadership - Strategic quality planning, Quality statements - Customer focus - Customer orientation, Customer satisfaction, complaints, and retention - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Appraisal of Performance

**TQM TOOLS & TECHNIQUES**

(9)

The seven traditional tools of quality - New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT - Bench marking - process - FMEA - Stages, Types.

**TQM TOOLS & TECHNIQUES II**

(9)

Quality circles – 5s, Kaizen, Quality Function Deployment (QFD) - Taguchi Quality loss function - TPM - Concepts, improvement needs - Cost of Quality - Performance measures.

**QUALITY SYSTEMS**

(9)

Need for ISO 9000- ISO 9000-2000 Quality System - Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 - Concepts, Requirements and Benefits - Case studies of TQM implementation in manufacturing and service sectors including IT.

**TOTAL: 45 HOURS**

**Text books**

1. Dale H. Besterfield, et al., "Total Quality Management", Pearson Education Asia, 3<sup>rd</sup> Edition, Indian Reprint 2009.
2. Suganthi, L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
3. Janakiraman, B and Gopal, R.K., "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.

**Reference books**

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6<sup>th</sup> Edition, South-Western (Thomson Learning), 2005.
2. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3<sup>rd</sup> Edition, 2003.

**12L8E5 BIO MEDICAL INSTRUMENTATION**

**L T P C**

**3 0 0 3**

**PHYSIOLOGY AND TRANSDUCERS**

**(9)**

Cell and its structure - Resting and Action Potential - Nervous system: Functional organization of the nervous system - Structure of nervous system, neurons - synapse - transmitters and neural communication - Cardiovascular system - respiratory system, Basic components of a biomedical system. Transducers - selection criteria - Piezo electric, ultrasonic transducers, Temperature measurements - Fibre optic temperature sensors.

**ELECTRO - PHYSIOLOGICAL MEASUREMENTS**

**(9)**

Electrodes - Limb electrodes-floating electrodes - pregelled disposable electrodes - micro - needle and surface electrodes - Amplifiers: Preamplifiers - differential amplifiers - chopper amplifiers - Isolation amplifier. Physiological measurements- ECG - EEG - EMG - ERG - Lead systems and recording methods-Typical waveforms. Electrical safety in medical environment: shock hazards-leakage current.

**NON-ELECTRICAL PARAMETER MEASUREMENTS**

**(9)**

Measurement of blood pressure - Cardiac output - Heart rate- Heart sounds, Pulmonary function measurements - spirometer - Photo Plethysmography, Body Plethysmography-Blood Gas analysers : pH of blood -measurement of blood pCO<sub>2</sub>, pO<sub>2</sub>, finger-tip oxymeter - ESR, GSR measurements.

**MEDICAL IMAGING AND BIOTELEMETRY**

**(9)**

Radio graphic and fluoroscopic techniques -Computer tomography-Magnetic Resonance Imaging -Ultrasonography-A mode, B mode, M mode- Endoscopy-Thermography-Different types of biotelemetry systems and patient monitoring- Wireless telemetry, single channel, multi channel, multi patient and implantable telemetry systems.

**ASSISTING AND THERAPEUTIC EQUIPMENTS**

**(9)**

Pacemakers-External and internal pacemakers-Defibrillators-DC defibrillator, implantable defibrillators-Ventilators -Nerve and muscle stimulators -TENS-Surgical diathermy machine,safety aspects in Electro surgical units- Heart Lung machine-Audiometers-Dialysers-Lithotripsy.

**TOTAL : 45 HOURS**

**Text books**

1. R.S.Khandpur, "*Hand book of Bio-Medical instrumentation*", Tata McGraw Hill Publishing Co Ltd., 2004.
2. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, "*Bio-Medical Instrumentation and Measurements*", 2nd Edition, Pearson Education, 2002.

**Reference books**

1. M.Arumugam, "*Bio-Medical Instrumentation*", Anuradha Agencies, 2003.
2. L.A. Geddes and L.E.Baker, "*Principles of Applied Bio-Medical Instrumentation*", John Wiley & Sons, 1975.
3. J.Webster, "*Medical Instrumentation*", John Wiley & Sons, 1995.

**12L8E6 POWER ELECTRONICS**

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**POWER SEMICONDUCTOR DEVICES**

**(9)**

Power transistors - Fast recovery diodes- Thyristors, Power TRIAC, MOSFET, IGBT, GTO- characteristics, Rating, Protection circuits, Driver Circuits.

**CONTROLLED RECTIFIERS AND AC VOLTAGE CONTROLLERS**

**(9)**

Single Phase and Three Phase Controlled rectifiers- Design of Trigger circuits - Dual Converters- AC Voltage controllers

**POWER SUPPLIES**

**(9)**

DC - DC Converters - Gating requirements, Switching mode regulators - Boost, Buck, Buck-Boost and Cuk regulators, DC and AC Power supplies - Switched mode, Resonant and Bidirectional Power supplies.

**INVERTERS**

**(9)**

Voltage and current source inverters, Resonant - Series inverter - PWM inverter.

**APPLICATIONS**

**(9)**

DC motor drives- Induction and Synchronous motor drives - Switched reluctance and brushless motor drives - Solid state relays - Microelectronic relays

**TOTAL : 45 HOURS**

**Text book**

1. Muhammad H.Rashid, "*Power Electronics - Circuits, Devices and Applications*", 3<sup>rd</sup> Edition, Prentice Hall of India, 2004.

**Reference books**

1. M.D.Singh, K.B. Khanchandani, "*Power Electronics*", Tata McGraw-Hill, 1998.
2. Ned Mohan, Tore M.Undeland, William P.Robbins, "*Power Electronics, Converters, Applications and Design*", John Wiley & Sons, 1994.
3. B.K.Bose, "*Modern Power Electronics*", Jaico Publishing House, 1999.
4. Sen, "*Power Electronics*", Tata McGraw-Hill, 1987.



**12L8E7 VLSI TESTING**

**L T P C**  
**3 0 0 3**

**FAULT SIMULATION**

**(9)**

Introduction to Testing - Faults in digital circuits - Modelling of faults - Logical Fault Models - Fault detection - Fault location - Fault dominance - Logic Simulation - Types of simulation - Delay models - Gate level Event-driven simulation.

**TEST GENERATION**

**(9)**

Test generation for combinational logic circuits - Testable combinational logic circuit design - Test generation for sequential circuits - design of testable sequential circuits.

**TESTABLE DESIGN**

**(9)**

Design for Testability - Ad-hoc design - Generic scan based design - Classical scan based design - System level DFT approaches.

**BUILT IN SELF TEST**

**(9)**

Built-In Self Test - Test pattern generation for BIST - Circular BIST - BIST Architectures - Testable Memory Design - Test algorithms - Test generation for Embedded RAMs

**FAULT DIAGNOSIS**

**(9)**

Logic Level Diagnosis - Diagnosis by UUT reduction - Fault Diagnosis for Combinational Circuits - Self-checking design - System Level Diagnosis.

**TOTAL: 45 HOURS**

**Text books**

1. Abramovici M, Breuer M.A and Friedman A.D, "Digital Systems and Testable Design" Jaico Publishing House, 2002.
2. Bushnell M.L and Agrawal V.D, "Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits", Kluwer Academic Publishers, 2002.

**Reference books**

1. Lala P.K, "Digital Circuit Testing and Testability", Academic Press, 2002.
2. Crouch.A.L, "Design for Test for Digital IC's and Embedded Core Systems", Prentice Hall International, 2002.

## 12L8E8 SATELLITE COMMUNICATION

L T P C  
3 0 0 3  
(9)

### SATELLITE ORBITS AND TRAJECTORIES

Orbital Mechanics - Orbit Equations - Kepler's Laws - Orbital Period - Orbits and their types - Look angle calculation; Satellite Launch.

### SATELLITE SUBSYSTEM

Satellite Subsystems - AOCS, TTC and M - Power - Transponders, Antennas; earth control-Effects of earth-Perturbation, Sun transit, Moon transit, Satellite power design, MTBF. Basic Equations - System Noise and G/T ratio- Uplink, Downlink and Design for a specified C/N ratio with GEO and LEO examples; Atmospheric and Rain effects on link performance.

### LINK DESIGN, MODULATION AND ERROR CONTROL

Single link design-Double link design aspects - PAM - Baseband processing - Digital Modulation for satellite links- BPSK, QPSK and QAM - TDM standards for satellite systems - Error control requirements for satellite link - ARQ, Concatenated Codes, Interleaving, Turbo codes.

### MULTIPLE ACCESS FOR SATELLITE COMMUNICATIONS

FDM-FM-FDMA - TDMA-structure and system design; Onboard Processing systems; DAMA and PAMA; CDMA- System design and capacity.

### APPLICATIONS

Remote sensing, Navigation, Scientific and military application, VSAT - Network architecture, Access Control protocols and techniques, VSAT Earth stations; Satellite Mobile Telephony - Global star, DBS/DTH Television, GPS, Weather satellites.

**TOTAL: 45 HOURS**

#### Text books

1. T.Pratt, C. Bostian and J.Allnut,; "Satellite Communications", John Wiley and Sons, 2<sup>nd</sup> Edition, 2006.
2. D.Rody, "Satellite Communications", McGraw-Hill, 2006.
3. M. Richharia, "Satellite Communication Systems", John Wiley & Sons, 2<sup>nd</sup> Edition, 2011.

#### Reference books

1. W.L.Pritchard, H G Snyderhoud and R A Nelson, "Satellite Communication System Engineering", 2<sup>nd</sup> Edition, Prentice Hall, 1993.
2. Tri. T. Ha, "Digital Satellite Communications", Tata McGraw Hill, Indian reprint, 2009.
3. B.N.Agarwal, "Design of Geosynchronous Space Craft", Prentice Hall, 2007.

**12L8E9 NETWORK SECURITY**

L T P C  
3 0 0 3

**INTRODUCTION**

(9)

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

**PUBLIC KEY CRYPTOGRAPHY**

(9)

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

**AUTHENTICATION AND HASH FUNCTION**

(9)

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

**NETWORK SECURITY**

(9)

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

**SYSTEM LEVEL SECURITY**

(9)

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

**TOTAL: 45 HOURS**

**Text book**

1. Behrouz A Forouzan, "Cryptography and Network Security", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2007.

**Reference books**

1. Atul Kahate, "Cryptography and Network Security", 2<sup>nd</sup> Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2009
2. William Stallings, "Cryptography and Network Security", 4<sup>th</sup> edition, Prentice Hall, New Delhi, 2006
3. Bruce Schneier, "Applied Cryptography", 2<sup>nd</sup> edition, John Wiley & Sons, New York, 1996.
4. Chris Brenton, "Mastering Network Security", BPB Publication, New Delhi, 2002.
5. Steven L Shaffer, Alan R Simon, "Network Security", AP Professional, New York, 2001.

