

**ACHARYA NAGARJUNA UNIVERSITY**

NAGARJUNA NAGAR – 522 510

ANDHRAPRADESH, INDIA



**Course Structure of  
ELECTRONICS & COMMUNICATION ENGINEERING**

**4-Year B. Tech Degree Course  
(Semester System)**

**w.e.f. 2015-2016**

# Acharya Nagarjuna University

## Faculty of Engineering

### Academic Regulations 2015 (R15) for B. Tech (Regular)

(Applicable for the students admitted during the  
Academic Year 2015-2016 and onwards)

#### 1. Eligibility for Admission:

Admission to the above program shall be made subject to the eligibility, qualification and specialization prescribed by the University for each program from time to time.

- i. Admission shall be made either on the basis of merit/rank obtained by the qualifying candidates in EAMCET/ECET or otherwise specified, whichever is relevant.

The duration of B.Tech program is of four academic years divided into eight semesters comprising of two semesters in each academic year. A student is required to choose a branch of study at the time of admission. Students under lateral entry will be admitted straightaway into Third semester of B.Tech course in the respective branch. No change of branch shall be allowed after the admissions are closed.

#### 2. Award of B.Tech. Degree:

A student will be declared eligible for the award of the B.Tech. degree if he/she fulfils the following academic regulations:

- i. Regular entry students shall pursue a course of study for not less than four academic years and in not more than eight academic years.
- ii. Student's who fail to fulfill all the academic requirements for the award of the degree within eight academic years (for Regular Entry) / six academic years (for Lateral Entry) from the year of their admission, shall forfeit their seat in B.Tech course and their admission is cancelled.

*Completing the course of study shall mean not only satisfying the attendance requirements but also passing of all the subjects within the respective stipulated period*

#### 3. Branches of study:

The following Branches of study are offered at present for B. Tech. degree

S.No.	Branch
1.	Civil Engineering
2.	Electrical and Electronics Engineering.
3.	Mechanical Engineering.
4.	Electronics and Communication Engineering
5.	Computer Science and Engineering.
6.	Chemical Engineering
7.	Electronics & Instrument Engineering
8.	Information Technology
9.	BioTechnology

and any other branch as approved by the authorities of the University from time to time.

Each Branch will have a curriculum with a syllabi that shall consist of the following:

- i. General Core Courses
  1. Basic Sciences
  2. Engineering Sciences
  3. Humanities and social sciences
- ii. Program core courses in Engineering / Technology
- iii. Elective courses of Engineering / Technology / Management Entrepreneurship / Business Communication and allied fields.
- iv. Open Electives/CBCS
- v. Mandatory learning courses
- vi. Project work

#### 4. Credits:

- i. *Academic Year*: Two consecutive (one odd + one even) semesters constitute one academic year.
- ii. *Choice Based Credit System (CBCS)*: The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).
- iii. *Credit*: A unit by which the course work is measured.

#### 5. Distribution and Weightage of Marks (Internal & External):

- i. The performance of a student in each semester shall be evaluated subject-wise with a maximum of 100 marks for theory and 100 marks for practical subject. In addition internship & project work shall be evaluated for 100 and 200 marks respectively.
- ii. For theory subjects the distribution shall be 40 marks for Internal Evaluation and 60 marks for the External Evaluation.
- iii. There shall be four units in each of the theory subjects.
- iv. For theory subjects, there shall be two midterm examinations during the semester. Each midterm examination shall consist of assignment for 12 marks and sessional test for 18marks with duration of 120 minutes respectively.

First midterm examination shall be conducted for 50% coverage of syllabus and second midterm examination shall be conducted for remaining 50% of syllabus. Both the midterm exams are compulsory. Final midterm examination marks for a total of 30marks shall be arrived at, by considering the 80% weightage (24 marks) to that midterm examination in which the student scores more marks and the remaining 20% (6 marks) for other midterm exam.

\*Note 1: The assignment test paper shall contain 5 questions of equal weightage and student is asked to answer any 2 questions randomly and shall be condensed for 12 marks, any fraction rounded off to the next higher mark.

\*Note 2: The sessional examination shall contain 3 questions out of which first question is objective and compulsory and remaining two questions having internal choice and shall be considered for 18 marks, any fraction rounded off to the next higher mark.

\*Note 3: For the remaining 10 marks in internal evaluation, 5 marks allotted for attendance as indicated in CLAUSE(\_6\_) and the faculty members teaching the subject shall evaluate remaining 5 marks through quiz/online/objective examination at the end of semester.

V. For theory subjects, there will be 5 questions with following pattern in the End-Examination.

- a. All Questions have to be answered compulsorily.
- b. Question I shall contain 12 short Answer questions “a” to “l” each of 1 mark. (Total 12 marks) covering one question from each unit.
- c. Out of the remaining four questions, EITHER/OR type shall be followed with 12 marks for each.

- d. In each question as mentioned in (c), one, two or more bits can be set.
- vii. Further, whenever any theory subject with two parts is offered (combined subject), for ex: Electrical & Mechanical Technology, then there shall be only two parts Part A, Part B in the question paper.  
First question objective can be equally divided into two parts.  
Part – A: shall contain two questions, EITHER/OR type shall be followed with 12 marks for each.  
Part – B: shall also contain two questions, EITHER/OR type shall be followed with 12 marks for each.
- viii. Model Question paper for each theory course shall be prepared by the teacher within 15 days from the commencement of the semester and the same shall be forwarded to the Controller of Examinations through the Chairman, BOS concerned.
- ix. For practical subjects there shall be a continuous evaluation during the semester for 40 internal marks and 60 end examination marks. Day-to-day work in the laboratory shall be evaluated for 25 marks by the concerned laboratory teacher based on the report of experiments/jobs ( 10 marks for the record submitted and 15 marks for day to day work). The internal examination for 15 marks (10 marks for experiment and 5 marks for viva-voce) shall be conducted by the laboratory teacher and another examiner from the same department.
- \*Note: Day to day performance shall be recorded in student record(each experiment carries 15 marks, at least ten experiments should be done and average marks must be taken at the end of semester).
- x. There shall be an audit pass (Mandatory learning Course) course in Human Values & Professional Ethics, Life skills and Advanced Communication Skills lab with no credits. There shall be no external examination. However, attendance in the audit course shall be considered while calculating aggregate attendance and student shall be declared pass in the audit course when he/she secures 40% or more in the internal examinations.
- xi. There shall be an Discipline centric Elective Course through Massive Open Online Course (MOOC) in III year II semester (For EEE, ECE and CSE branches) and in IV year I semester (For Civil, Mechanical and Chemical branches), where in the student shall register the course offered by authorized institutions/Agencies, through online with the approval of Head of the Department. The Certificate issued by the institution/agency after successful completion of the course will be considered for the award of grade to that course.
- xii. For the subject having design and / or drawing, such as Engineering Drawing, Machine Drawing and Estimation, the distribution shall be 40 marks for internal evaluation and 60 marks for end examination. The Internal evaluation will be 20 marks for day-to-day work in the class that shall be evaluated by the concerned subject teacher based on the reports/submissions prepared in the class. Further, there shall be two midterm exams in a Semester for a duration of 2hrs each, evenly distributed over the syllabi for 20 marks and the average marks of both the mid examinations shall be considered as internal test marks. The sum of day to day evaluation and the internal test marks will be the final internal marks for the subject.
- xiii. There shall internship at the end of III year II Semester. For the internship, the student/institute shall select any organization and a minimum of 4 weeks work must be carried at the organization. A report on work done shall be evaluated by the external supervisor/mentor and department committee. The internship shall be evaluated for 100marks(60 marks shall be awarded by external supervisor and 40 marks by departmental committee). There shall be no external examination for internship.

A student shall acquire 2 credits assigned to the internship only when he/she secures 40 marks on aggregate out of 100 marks allocated.

- xiv. Out of a total of 200 marks for the project work, 80 marks shall be for Internal Evaluation and 120 marks for the End Semester Examination (Viva-voce). The viva-voce shall be conducted by a committee consisting of Head of the Department, Project Supervisor and an External Examiner nominated by the Principal from the panel of 3 members proposed by Head of the Department. The project work shall start in IV year I semester and shall continue in the semester break. The evaluation of project work shall be conducted at the end of the IV year II semester. The Internal Evaluation shall be made on the basis of weekly progress (a minimum of 12 weeks and 3 marks for each week progress) and at least two seminars (one at the beginning of IV B.Tech II semester (20 marks) and the other before submission of project work (24 marks) given by each student on the topic of his project).
- xv. The laboratory records and internal test papers shall be preserved for minimum of 2 years in the respective departments and shall be produced to the Committees of the college as and when the same are asked for.

#### **6. Attendance Requirements:**

- i. A student shall be eligible to appear for end examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.
- ii. **Shortage of Attendance below 65% in aggregate shall in NO case be condoned.**
- iii. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
- iv. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
- v. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester, as applicable. They may seek readmission for that semester when offered next.
- vi. A stipulated fee shall be payable towards condonation of shortage of attendance to the college.
- vii. A weightage in sessional marks upto a maximum of 5 marks out of 40 marks in each theory subject shall be given for those students who put in a minimum of 75% attendance in the respective subject in a graded manner as indicated below.

Attendance of 90% and above	5marks
Attendance of 85% and above and less than 90%	3marks
Attendance of 80% and above and less than 85%	2marks
Attendance of 75% and above and less than 80%	1mark

#### **7. Minimum Academic Requirements (For Regular Entry Students):**

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.6

- i. A student who could not secure a minimum of 50% aggregate from midterm examination marks is not eligible to appear for the semester end examination and shall have to repeat that semester.
- ii. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, design, drawing subject or project if he secures not less than 40% of marks in the semester end examination. In the internship & project he/she should secure not less than 40% and for practical examination not less than 50% of marks in the semester end examination.
- iii. A student shall be promoted from I to II year only if he/she fulfils the academic requirements of attendance and internal marks as stipulated in clause 6 and 7 irrespective of back log subjects in I/IV B.Tech.

- iv. A student shall be promoted from II to III year only if he/she fulfils the academic requirements of attendance and internal marks as stipulated in clause 6 and 7 and also must secure 70% of the credits of the subjects that have been studied up to I year II semester from irrespective of whether the candidate takes the end examination or not as per the normal course of study. At the time of commencement of class work, he must attain the required credits
- v. A student shall be promoted from third year to fourth year only if he fulfills the academic requirements of attendance and internal marks as stipulated in clause 6 and 7 and also must secure 70% of the credits of the subjects that have been studied upto II year II semester. At the time of commencement of class work, he must attain the required credits

And in case of getting detained for want of credits by sections ii and iii above, the student may make up the credits through supplementary exams of the above exams before the date of class work commencement of Third or Fourth year I semester respectively.

## 8. Minimum Academic Requirements (For Lateral Entry Students):

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.6

- i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 40% of marks in the end examination and a minimum of 50% of marks in the sum total of the internal evaluation and end examination taken together. In the Seminar & Comprehensive viva-voce he/she should secure 40%.
- ii. A student who could not secure a minimum of 50% aggregate from midterm examination marks is not eligible to appear for the semester end examination and shall have to repeat that semester.
- iii. A student shall be promoted from II to III year only if he/she fulfils the academic requirements of attendance and internal marks as stipulated in clause 6 and 7 irrespective of back log subjects in II/IV B.Tech
- iv. A student shall be promoted from III to IV year only if he/she fulfils the academic requirement of attendance and internal marks as stipulated in clause 6 and 7 and also must secure **70%** of the subjects that have been studied up to III year I semester from

## 9. Grading:

After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

**Table – Conversion into Grades and Grade Points assigned**

Range in which the marks in the subject fall	Grade	Grade points assigned
≥90	O (Outstanding)	10
80-89	A+ (Excellent)	9
70-79	A (Very Good)	8
60-69	B+ (Good)	7
50-59	B (Above Average)	6
45-49	C (Average)	5
40-44	D (Pass)	4
< 40	F (Fail)	0
Absent	Ab (Absent)	0

- i. A student obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered.
- ii. For non credit courses 'Satisfactory' or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

### **9.1. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):**

- i. The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$$SGPA = \frac{\sum (C_i \times G_i)}{\sum C_i}$$

Where,  $C_i$  is the number of credits of the  $i^{\text{th}}$  subject and  $G_i$  is the grade point scored by the student in the  $i^{\text{th}}$  course.

- ii. The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

$$CGPA = \frac{\sum (C_i \times S_i)}{\sum C_i}$$

Where 'S<sub>i</sub>' is the SGPA of the  $i^{\text{th}}$  semester and  $C_i$  is the total number of credits in that semester.

- iii. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- iv. While computing the GPA/CGPA the subjects in which the student is awarded Zero grade points will also be included.

*Grade Point:* It is a numerical weight allotted to each letter grade on a 10-point scale.

*Letter Grade:* It is an index of the performance of students in a said course. Grades are denoted by letters O, A+, A, B+, B, C, P and F.

*Grade Conversion to Percentage:*  $\% = CGPA \times 9.25$

### **10. Gap - Year:**

Gap Year – concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I year/II year/III year to pursue entrepreneurship full time. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. An evaluation committee shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for having the Gap Year.

### **11. Transitory Regulations:(old regulations changed)**

1. Candidates who admitted into the four year B.Tech degree course under R-15 regulations but who got detained in any year for want of attendance/minimum aggregate sessional marks may join the appropriate year /semester in the semester system applicable for that batch and be governed by the regulations of that batch from then onwards unless otherwise specified.
2. A student admitted under credit based regulations(CR) detained due to lack of sessional marks/attendance at the end of the first semester of II/IV B.Tech shall join II/IV first semester of R-15 batch . Such students will study all the courses prescribed for that R-15 in which the student joins. However the student has to clear all the first year backlog subjects by appearing the supplementary examination. Such candidates will be governed by the regulations applicable to lateral entry candidates of R-15 batch for the award of the degree.
3. A student admitted under CR, detained due to lack of sessional marks/attendance at the end of the second semester of II/IV B.Tech /at the end of subsequent semesters shall follow the credit based regulations only (CR).

### **12. With-holding of results:**

If the candidate has any dues not paid to the college or if any case of indiscipline or malpractice is pending against him, the result of the candidate shall be withheld and he will not be allowed / promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

**13. Award of Class:**

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree he shall be placed in one of the following four classes:

<b>Class Awarded</b>	<b>CGPA Secured</b>
First Class with Distinction	$\geq 8.0$
First Class	$\geq 6.5 < 8.0$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 4.0 < 5.5$

**14. Minimum Instruction Days:**

The minimum instruction period for a semester is 16 weeks. The minimum instruction days including exams for each semester shall be for 90days.

15. There shall be no branch transfers after the completion of admission process.

**16.General:**

- i. The academic regulations should be read as a whole for purpose of any interpretation.
- ii. Malpractice rules- nature and punishments is appended
- iii. Where the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
- iv. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the BOS is final.
- v. The University may from time to time, revise, amend or change the Regulations, Schemes of Examinations, and/or Syllabi.

**17. Conduct and discipline**

Students shall conduct themselves within and outside the premises of the institute in a manner befitting the students of our institution.

(b) As per the order of Honorable Supreme Court of India, ragging in any form is considered as a criminal offence and is banned. Any form of ragging will be severely dealt with.

(c) The following acts of omission and / or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging.

(i) Lack of courtesy and decorum, indecent behavior anywhere within or outside the campus.

(ii) Willful damage of college / individual property

(iii) Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.

(iv) Mutilation or unauthorized possession of library books.

(v) Noisy and unseemly behavior, disturbing studies of fellow students.

(vi) Hacking of computer systems (such as entering into other person's areas without prior permission, manipulation and / or damage of computer hardware and software or any other cyber-crime etc.)

(vii) Usage of camera / cell phone in the campus

(viii) Plagiarism of any nature

(ix) Any other acts of gross indiscipline as decided by the academic council from time to time.

(d) Commensurate with the gravity of offense, the punishment may be reprimand, fine,

expulsion from the institute / hostel, debar from examination, disallowing the use of certain facilities of the institute, rustication for a specified period or even outright expulsion from the institute or even handing over the case to appropriate law enforcement or the judiciary, as required by the circumstances.

(e) For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the chief warden, the head of the department and the principal respectively, shall have the authority to reprimand or impose fine.

(f) Cases of adoption of unfair means and / or any malpractice in an examination shall be reported to the principal for taking appropriate action.

(g) All cases of serious offence, possibly requiring punishment other than reprimand, shall be reported to the academic council.

(h) The institute level standing disciplinary action committee constituted by the academic council shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.

(i) The principal shall deal with any academic problem, which is not covered under these rules and regulations, in consultation with the programmes committee in an appropriate manner, and subsequently such actions shall be placed before the academic council for ratification. Any emergency modification of regulation, approved by the appropriate authority, shall be reported to the academic council for ratification.

(j) "Grievance and Redressal Committee" (General) constituted by the Principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters

### **18. Punishments for Malpractice Cases - Guidelines**

The examinations committee may take the following guidelines into consideration while dealing with the suspected cases of malpractice reported by the invigilators/squad members etc; during end examinations. The punishment may be more severe or less severe depending on the merits of the individual cases.

<b>S. No</b>	<b>Nature of Malpractices/Improper conduct</b>	<b>Punishment</b>
1.	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
2.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.

3.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
4.	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any other student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
5.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects including practical examinations and project work of that semester/year.
6.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects including practical examinations and project work of that semester/year.
7.	Smuggles in the Answer book or takes out or arranges to send out the question paper during the examination or answer book during or after the examination	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects including practical examinations and project work of that semester/year. The student is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
8.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
9.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects including practical examinations and project work of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
10.	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects including practical examinations and project work of that semester/year. The student is also debarred and forfeits the seat.
11.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 7 to 9.	For Student of the college: Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects including practical examinations and project work of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
12.	Impersonates any other student in connection with the examination	The student who has impersonated shall be expelled from examination hall. The student is debarred from writing the remaining exams, and rusticated from the college for one academic year during which period the student will not be permitted to write any exam. If the imposter is an outsider, he will be handed over to the police and a case is registered against him. The performance of the original student who has been impersonated, shall be cancelled in all the subjects of the examination including practicals and project work of that semester/year. The student is rusticated from the college for

		two consecutive years during which period the student will not be permitted to write any exam. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat
13.	If any malpractice is detected which is not covered in the above clauses 1 to 12 it shall be reported to the college academic council for further action to award suitable punishment.	
14.	Malpractice cases identified during sessional examinations will be reported to the examination committee nominated by Academic council to award suitable punishment.	

**Program Codes.**

ESC: Engineering Science Core  
 BSC: Basic Science Core  
 DEC: Departmental Elective Course  
 OPC: Open Elective Course  
 PCC: Program Core Course  
 PRC: Program Major Project

Acharya Nagarjuna University

Faculty of Engineering

**B.TECH COURSE STRUCTURE**

**For Circuit Branches:CSE/ECE/EEE/IT/EIE**

**(2015-16)**

**I YEAR I Semester**

Course Details		Scheme of Instruction			Scheme of Examination				
Code	Subject	L	T	P	Maxi Internal Marks	Maxi External Marks	Total Marks	Credits	Cat. code
BT/CSE/ECE/EEE-111	Mathematics –I	4	1	-	40	60	100	4	BSC
BT/CSE/ECE/EEE-112	Engineering Physics-1	3	-	-	40	60	100	3	BSC
BT/CSE/ECE/EEE-113	Engineering. Chemsitry-1	3	-	-	40	60	100	3	BSC
BT/CSE/ECE/EEE-114	Basic Mechanical Sciences	4	-	-	40	60	100	3	ESC
BT/CSE/ECE/EEE-115	Environmental science and Engineering	3	-	-	40	60	100	3	ESC
BT/CSE/ECE/EEE-116	Basic English for Engineers	4		-	40	60	100	4	HSC
BT/CSE/ECE/EEE-151	Physics Lab	-	-	3	40	60	100	2	BSC
BT/CSE/ECE/EEE-152	Engineering Graphics	-	-	6	40	60	100	2	ESC
BT/CSE/ECE/EEE-153	English Communication Lab	-	-	3	40	60	100	2	HSC
	<b>Total</b>	<b>21</b>	<b>1</b>	<b>12</b>	<b>360</b>	<b>540</b>	<b>900</b>	<b>26</b>	

## I YEAR II Semester

Course Details		Scheme of Instruction			Scheme of Examination				
Code	Subject	L	T	P	Maxi Internal Marks	Maxi External Marks	Total	Credits	Cat. code
BT/CSE/ECE /EEE-121	Mathematics –II	4	1	-	40	60	100	4	HSC
BT/CSE/ECE /EEE-122	Engineering Physics-II	3	-	-	40	60	100	3	BSC
BT/CSE/ECE /EEE-123	Engineering Chemistry-II	3	-	-	40	60	100	3	BSC
BT/CSE/ECE /EEE-124	Basic Electrical & Electronic Sciences	3	1		40	60	100	3	BSC
BT/CSE/ECE /EEE-125	Problem solving using C	3	1	-	40	60	100	3	ESC
BT/CSE/ECE /EEE-126	Advanced English for Engineers	4	-	-	40	60	100	4	ESC
BT/CSE/ECE /EEE-161	Chemistry Lab	-	-	3	40	60	100	2	BSC
BT/CSE/ECE /EEE-162	Computer Programming Lab	-	-	6	40	60	100	2	ESC
BT/CSE/ECE /EEE-163	Workshop(IT)	-	-	3	40	60	100	2	ESC
	<b>Total</b>	<b>20</b>	<b>3</b>	<b>12</b>	<b>360</b>	<b>540</b>	<b>900</b>	<b>26</b>	

**MATHEMATICS – I****Unit-I**

**Matrices:** Rank of a matrix, Consistency of linear system of equations, Linear transformations, vectors, Linear dependence, Eigen values and Eigen vectors, Properties of eigen values, Cayley- Hamilton theorem (without proof), Reduction to diagonal form, reduction of Quadratic form to canonical form, Complex matrices.

**Unit-II**

Rolle's Theorem( without proof), Lagrange's Mean value theorem ( without proof), Taylor's theorem (without proof), Expansions of functions: Maclaurin's series, Taylor's series, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers, Principle of least squares, method of least squares, fitting of other curves.

**Unit-III**

Double integrals, Change of order of integration , Double integrals in polar coordinates, Area enclosed by plane curves, Triple integrals, Change of variables, Beta function, Gamma function, Relation between beta and gamma functions, error function.

**Unit-IV**

Fourier Series: Introduction and Euler's formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, Change of interval, Even and Odd functions, Half range series, Typical wave forms and Parseval's formulae, Complex form of the Fourier series.

Text book

1]. Higher Engineering Mathematics by B.S. Grewal, 43<sup>rd</sup> edition, Khanna publishers, New Delhi.

Reference books:

[1]. Advanced Engineering Mathematics by kreyszig.

[2]. Engineering Mathematics by Babu Ram

[3] Engineering Mathematics – I BY N.P. Bali, Satyanarayana Bhavanari and Indrani Kelker Laxmipublications, New Delhi.

[4] Mathematical Foundations for Computer Sciences- by Satyanarayana Bhavanari, Pradeep Kumar T.V, Shaik Mohiddin shaw, BSP Publications.

**ENGINEERING PHYSICS - I****UNIT-I**

Ultrasonics

**12 Periods**

Production of Ultrasonics by Piezo electric oscillator method, Detection by Acoustic grating method, Applications - Pulse echo technique, ultrasonic imaging and some general applications.

Interference

Stokes principle (Phase change on reflection), Interference in thin films due to reflected light (Cosine law), Newton's rings experiment – Determination of radius of curvature, Michelson's interferometer: Principle, construction working and its application (Determination of wavelength of monochromatic source).

**UNIT-II****10 Periods**

Diffraction – Single slit (Qualitative and quantitative treatment).

Polarisation – Polarisation by reflection, Refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and half wave plate, circular and elliptical polarization and detection.

**UNIT-III****14 Periods**

**Lasers:** Laser characteristics, Spontaneous and Stimulated emissions, Basic requirements of a laser, Population inversion – Solid state laser (Ruby laser), Gas (He-Ne) laser, Semiconductor (GaAs) laser, Applications of lasers.

**Holography:** Principle, recording, reproduction and applications.

**Fiber optics:** Structure of optical fiber, Types of optical fibers, Numerical aperture, Fiber optics in communications and advantages.

**UNIT -IV****14 Periods**

Electricity and Magnetism

Gauss's law in electricity (statement & proof), Coulomb's law from Gauss law, Gauss law for magnetism, Faraday's law of electromagnetic induction, Lenz's law, Self Inductance, Mutual inductance, energy stored in a magnetic field, Displacement current, Maxwell's equations (qualitative treatment), electromagnetic wave equation and Velocity, A.C. circuit containing series LCR circuit (resonance condition).

**TEXT BOOKS:**

1. Engineering Physics - R .K. Gaur & S. L. Gupta , Danpati Rai Publications, Delhi, 2001.
2. Engineering Physics - Hitendra K. Malik & A.K.Singh, Tata MacGraw Hill, New Delhi,2009.

**REFERENCE BOOKS:**

1. Fundamentals of Physics - Resnick & Halliday, John Wiley sons ,9th Edition.
2. Applied Physics-S. Mani Naidu, Pearson Publishers, Chennai
3. Engineering Physics - M.Arumugam, Anuradha Publications, Chennai ,5thEdition , 2006.
4. Engineering Physics - B. K. Pandey & S. Chaturvedi, Cengage LearningIndia Pvt. Ltd., Delhi.
- 5.Engineering Physics, D.K. Bhattacharya and Poonam Tandon, oxford university Press, New Delhi

## ENGINEERING CHEMISTRY – I

## UNIT-I: WATER TECHNOLOGY

Various impurities of Water, WHO guidelines, Hardness units and determination by EDTA method (simple problems), water treatment for drinking purpose- sedimentation, coagulation, filtration (slow sand filter), various methods of chlorination, breakpoint chlorination.

Water treatment for industrial purpose: Boiler troubles, scales, sludges, caustic embrittlement, boiler corrosion, priming and foaming- causes and prevention, Internal conditioning -Phosphate, Calgon and carbonate treatment, External conditioning- Lime Soda process (simple problems), softening by ion exchange process, Desalination of brackish water by electro dialysis and reverse osmosis.

## UNIT-II: ELECTROCHEMICAL ENERGY SYSTEMS

Primary and Secondary batteries, Reserve batteries, Solid state and molten solvent batteries, Recent technological trends, Lithium ion batteries, Nanostructured electrode materials, Lithium and carbon based nanomaterials and nanocomposites, Solid-state Lithium ion batteries, Energy storage and backup. Fuel cells, Scientific prospects of fuel cells, Electrochemistry, In-situ and ex-situ electrochemical characterizations, Current-Voltage measurement, Current Interrupt measurements, Porosity, BET surface area analysis, Gas permeability, Hydrogen as future fuel, Alkaline-, acid- and molten carbonate-fuel cells, Solid oxide fuel cells.

## UNIT-III: CORROSION AND ITS PREVENTION

Introduction, electrochemical theory of corrosion, dry corrosion, corrosion due to differential aeration, Types of corrosion- galvanic corrosion (galvanic series), Pitting, Stress and microbiological corrosion, Factors affecting corrosion- oxidizers, pH, over voltage and temperature.

Protection methods: Cathodic protection, (Impressed current and sacrificial anode) anodic protection, corrosion inhibitors- types and mechanism of inhibition

## UNIT-IV: POLYMERS

Monomer functionality, degree of polymerization, Tacticity, classification of polymerization- addition, condensation and co-polymerization, mechanism of free radical polymerization.

Plastics- Thermoplastic and thermosetting resins, preparation, properties and uses of Bakelite, and PVC. Compounding of plastics.

Conducting polymers: Polyacetylene, mechanism of conduction, examples and applications.

Rubber- Processing of latex, Drawbacks of natural rubber- Vulcanization, Synthetic rubbers- Buna-S and Buna-N.

## Prescribed Text Books

1. Engineering Chemistry, P.C. Jain and M. Jain - Dhanapathi Rai & Sons, Delhi
2. A text book of Engineering Chemistry, S.S. Dara - S. Chand & Co. New Delhi
3. Engineering Chemistry, B.K. Sharma - Krishna Prakashan, Meerut
4. Shashi chawla, A text book of engineering chemistry, 3<sup>rd</sup> Edition, Dhanpat rai & co new delhi, 2007.

**Basic Mechanical Sciences****Unit – I****Transmission of Motion and Power**

Introduction, Methods of drive, Power transmission elements, shaft and axle, Belt-drive, Pulleys, Power transmitted by a belt, Chain drive, Friction drive, Gear drive

**Governors**

Introduction, Speed Control, Types of Governors, Watt Governor, Porter Governor, Hartnell Governor

**Unit – II**

**Basic Thermodynamics:** Work, Power, Energy, Heat, Temperature, Mechanical equivalent of heat, Internal energy, Enthalpy, Entropy, Efficiency, Statements of Zeroth law, First Law and Second Law of Thermodynamics

**Internal Combustion Engines**

Introduction, Classification, Engine details, Otto four-stroke cycle, Diesel-four-stroke cycle, Difference between Otto cycle and Diesel cycle, Two-stroke cycle, Difference between two-stroke and four-stroke cycles, Indicated Power (ip), Brake Power (bp), Efficiencies

**.Unit – III****Steam Boilers**

Introduction, Classification, Simple vertical boiler, Vertical multi tubular boiler, Cochran type, Lancashire boiler, Locomotive boiler, Babcock and Wilcox boiler, High pressure boilers, Boiler details, Boiler performance. Functioning of different mountings like Pressure guage, Water level indicator, Safety Valve etc. and Accessories like Feed Pump, Injector, Economizer, Steam trap etc.

**Refrigeration & Air Conditioning**

Introduction, Refrigerant, Types of refrigerators, Vapor compression refrigerating system, Window and split-air conditioners.

**Unit – IV****Pumps**

Introduction, Reciprocating pump types, operation, Air Chamber, Centrifugal pumps types, Priming, Rotary pumps.

**Air Compressors**

Introduction, Uses of Compressed air, Reciprocating compressors, Operation of a compressor, Work for compression, Power required, Reciprocating compressor efficiency, Multistage reciprocating compressors, Rotary compressors.

**TEXT BOOKS**

1. Elements of Mechanical Engineering , by Rajput ,Laxmi Publications, New Delhi
2. Elements of Mechanical Engineering by K.P. Roy , Media Promoters
3. Thermal Engineering – by Rajput, Laxmi Publications, New Delhi
4. Theory of Machines , by R.S. Khurmi & Gupta, S.Chand Publishers
5. Elements of Mechanical Engineering -- by K.P. Roy , Media Promoters

**ENVIRONMENTAL SCIENCE AND ENGINEERING****UNIT-I****Introduction:**

Definition, Scope and Importance.

**Natural Resources:**

Forest Resources – Use and over-exploitation, Deforestation, Mining, dams and their effects on forests and tribal people; Water Resources – Use and over-utilization of surface and ground water, floods and droughts, Water logging and salinity, Dams – benefits and problems, Conflicts over water; Energy resources – Energy needs, Renewable and non-renewable energy sources; Land resources – Land as a resource, land degradation, soil erosion & desertification, Effects of modern agriculture on land resources.

**Ecosystems:**

Definition, Structure and functions of an Ecosystems, Biogeochemical cycles-water, carbon, nitrogen and water cycles, Types-Forest, Greenland, Desert, Aquatic ecosystem.

**UNIT-II****Biodiversity and its Conservation:**

Definition, Value of biodiversity. Bio-geographical classification of India, India as a mega-diversity nation, Hot-spots of biodiversity, Threats to bio-diversity, Endemic and endangered species of India, Conservation of biodiversity.

**Environmental Pollution:**

Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear pollution, Solid waste management.

**UNIT-III****Social Issues and Environment:**

From unsustainable to sustainable development, Population growth and environment, Green revolution, Rain water harvesting, watershed management, cloud seeding, Resettlement and rehabilitation of people - problems and concerns, Environmental Impact Assessment.

**Climate Changes:**

Global warming & Green house effect, Acid rain, Ozone layer depletion.

**UNIT-IV****Environmental acts:**

Prevention and Control of Water pollution & Air Pollution act, Environmental protection act, Wildlife protection act, Forest Conservation act.

**International Conventions:**

Stockholm Conference 1972, Earth Summit 1992. Copenhagen Summit 2009.

**Case Studies:**

Chipko movement, Narmada Bachao Andolan, Silent Valley Project, Madhura Refinery and TajMahal, Chernobyl Nuclear Disaster, Ralegaon Siddhi, Florosis and Bhopal Tragedy.

**Field work:**

Visit to a local area to document environmental assets – river/ forest/ grassland / hill /mountain. Study of local environment-common plants, insects, birds. Study of simple ecosystems – pond, river, hill, slopes etc. Visits to industries, water treatment plants, effluent treatment plants.

**Text Books**

1. Environmental Studies, by Dr. Suresh K. Dhameja, Published by S.K. Kataria & Sons, Ludhiana.

**Reference Books**

1. Environmental studies by Anubha Kaushik and C.P.Kaushik., New Age International Publishers, New Delhi.
2. T Benny Joseph, Environmental Studies, the Tata McGraw-Hill Publishing Company Limited, New Delhi.
3. Environmental chemistry by A.K.De.

**Basic English for Engineers**

## UNIT-1:

1. Listening Skills: The boy who broke the bank (English and Soft Skills)
2. Sonnet - To Science (The Siren's Song)
3. Vocabulary Building: One-Word Substitutes, Words Often Confused
4. Reading Comprehension

## UNIT- II:

1. Written Communication Skills: Gateman's Gift (English and Soft Skills)
2. Work without Hope (The Siren's Song)
3. Grammar: Correction of Sentences
4. Writing: Letter Writing-- Formal and Informal Letters

## UNIT - III:

1. Assertive Skills: The Verger (English and Soft Skills)
2. Seven Ages of Man (The Siren's Song)
3. Writing: Note- Taking, Note-Making
4. Paragraph Writing: Technical Description-Process, Object

## UNIT - IV:

1. Teamwork Skills: Whitewashing the fence (English and Soft Skills)
2. Ozymandias (The Siren's Song)
3. Vocabulary Building: Idioms
4. Writing: Essay Writing

**TEXTBOOKS:**

1. S.P.Dhanavel, *English and Soft Skills*, New Delhi: Orient Black Swan Pvt. Ltd., 2013.
2. David Murdoch, *The Siren's Song: An Anthology of British and American Verse*, Madras, Orient Longman, 1993.
3. V.R.Narayanaswami, *Strengthen Writing 3rd Edition* New Delhi: Orient Blackswan Private Ltd., 2009.

**REFERENCE BOOKS:**

1. Dr. Shalini Verma, *Word Power Made Handy*, S.Chand & Co Ltd., 2009.
2. Sharon J.Gerson, Steven M.Gerson, *Technical Writing*, New Delhi: Pearson education, 2007.
3. Sanjay Kumar and Pushp Lata, *Communication Skills*, Noida: Oxford University Press, 2012.
4. M. Ashraf Rizvi, *Effective Technical Communication*, New Delhi: Tata Mc-Grew Hill, 2009.
5. Bikram K. Das, Kalyani Samantray, Rath Nayak, Susmita Pani & Saveeta Mohanty, *An Introduction to Professional English and Soft Skills*, New Delhi: Foundation Books, 2009.

Engineering Physics Lab

Any 15 experiments from the following list

**LIST OF EXPERIMENTS**

1. Compound pendulum –Determination of acceleration due to gravity (g)
2. Interference fringes - measurement of thickness of a foil / diameter of Wire using wedge method.
3. Sensitive galvanometer - Determination of figure of merit
4. Newton's rings – Measurement of radius of curvature of plano convex lens
5. Lissajous' figures –Calibration of an audio oscillator
6. Photo cell – I-V Characteristic curves and determination of stopping potential
7. Diffraction grating – Measurement of wavelengths
8. Torsional pendulum- Determination of rigidity modulus of the wire material.
9. Carey- Foster's bridge: Determination of specific resistance/Temperature coefficient of resistance.
10. Photo voltaic cell - Determination of fill-factor
11. Variation of magnetic field along the axis of a current carrying circular coil.
12. Series LCR resonance circuit - Determination of "Q" factor.
13. Thomson's method - determination of e/m of an electron.
14. Determination of a.c. Frequency – Sonometer.
15. Prism/Grating - Determination of dispersive power.
16. To determine the wavelength of Laser source.
17. Hall effect – Determination of Hall coefficient.
18. Determination of energy band gap.
19. Determination of Numerical Aperture of an optical fiber.
20. Determination of Amplitude and Frequency of an AC signal using a CRO.

**Engineering Graphics****Unit – I**

**General:** Use of Drawing instruments, Lettering .-Single stroke letters, Dimensioning- Representation of various type lines. Geometrical Constructions..Representative fraction, Scales.-Plain Scales, Diagonal Scales, Comparative Scales, Vernier Scales.

**Unit – II**

**Curves :** Curves used in Engineering practice - conic sections - general construction and special methods for ellipse, parabola and hyperbola. cycloid, epicycloids, hypocycloid involute of circle and Archimedian Spiral.

**Unit – III**

**Method of Projections:** Principles of projection - First angle and third angle projection of Points. Projection of Straight lines. Traces of lines. (Limited to first angle projection only)  
**Projections of Planes :** Projections of planes, projections on auxiliary planes.

**Unit – IV**

**Projections of Solids :** Projections of Cubes, Prisms, Pyramids, Cylinders and Cones with varying positions.

**Sections Of Solids:** Sections of Cubes, Prisms, Pyramids, cylinders and Cones, true shapes of sections. (Limited to the Section Planes perpendicular to one of the Principal Planes).

**Unit - V(Demonstration only).**

**Computer Aided Drafting (using any Standard Package):** Setting up a drawing, starting main menu (New, Open Save, Save As etc), Opening Screen error correction on screen units, co-ordinate system, limits, grid, snap, ortho.

Tool bars: Draw tool bar, object snap, tool bar, modify tool bar, dimension tool bar

**TEXT BOOK:**

- Engineering Drawing by N.D. Bhatt & V.M. Panchal. (Charotar Publishing House, Anand).

**REFERENCE BOOK:**

- Engineering Drawing by Prof.K.L.Narayana & Prof. R.K.Kannaiah. SciTech Publisher.

**English Communication Lab**

Module-1 Communication Skills

- a) Types of Communication
- b) Barriers to Communication
- c) Strategies for Effective Communication
- d) Verbal Communication Skills
- e) Non- verbal Communication Skills

Module-2: Advanced Vocabulary

- a) Word List (GRE & TOEFL related)
- b) Catchphrases
- c) Idioms

Module-3: Employability Skills

- a) Interview Skills
- b) Group Discussion
- c) Debate
- d) Resume Writing

Module-4: Telephonic Skills

- a) Formal & Informal interaction
- b) Receiving Messages & Complaints
- c) Tone modulation

Module-5: Descriptive Skills

- a) Process Description
- b) Picture Description
- c) Narration
- d) Email Etiquette

Module-6: Behavioural Skills

- a) Dress code & Conduct
- b) Personality Development
- c) Team Work
- d) Motivation
- e) Organization Skills

**Suggested Software:**

1. Globberena Software
2. K-Van Solutions Software
3. Centronix Software
4. Clarity English Software
5. Train 2 Success- CD Series (Zenith Global Consultancy)

**Suggested List of Tasks:**

<b>Module 1</b>	1. Tips for effective communication 2. Videos can be shown to make the students learn the importance of non-verbal communication
<b>Module 2</b>	3. Number of Worksheets will be given on Vocabulary enhancement 4. By conducting Quiz
<b>Module 3</b>	5. Mock Interviews can be conducted 6. Peer Discussions can be conducted
<b>Module 4</b>	7. Listening to Mock-Telephoning Skills 8. Role Plays can be conducted on telephonic conversations
<b>Module 5</b>	9. Pictorial descriptions 10. Narrating situations/stories
<b>Module 6</b>	11. Tips to improve personality development 12. Case studies on team work and organizational skills

**NOTE:** 10 Lab Activities are minimum in Record.

**Reference Books:** Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. *Communicate to Conquer: A Handbook of Group Discussions and Job Interviews* with CD, PHI Publications.
2. *The ACE of Soft Skills: Attitude, communication and Etiquette for Success*, by Pearson Publications.
3. Leena Sen, *Communication Skills 2<sup>nd</sup> Edition*, PHI, 2007.
4. Stephen P. Robbins and Timothy A. Judge, *Organizational Behavior 13<sup>th</sup> Edition*, PHI, 2009.
5. Meenakshi Raman and Prakash Singh, *Business Communication*, Oxford University Press, 2006.
6. Sanjay Kumar and Pushp Lata, *Communication Skills*, Oxford University Press, 2011.
7. Dr. Shalini Verma, *Word Power Made Handy*, S.Chand & Co Ltd., 2009.

**Mathematics-II****Unit-I**

Ordinary differential equations (first order): Introduction, variables separable equations, Linear equations, Bernoulli's equations, Exact equations, equations reducible to exact equations, Orthogonal trajectories, Newton's law of cooling, Rate of Decay of Radio-Active Materials.

**Unit-II**

Ordinary differential equations (higher order): Linear Differential equations: Definition, Theorem, Operator D, Rules for finding the complementary function, Inverse operator, Rules for finding the particular integral, Working procedure to solve the equation, Linear dependence of solutions, Method of variation of parameters, Equations reducible to linear equations, Cauchy's homogeneous linear equation, Legendre's linear equation, Simultaneous linear equations with constant coefficients.

**Unit-III**

Laplace Transforms : Introduction, Transforms of elementary functions, Properties of Laplace Transforms, existence conditions, Transforms of derivatives, Integrals, multiplication by  $t^n$ , division by  $t$ , Evaluation of integrals by Laplace Transforms, Inverse transforms, convolution theorem, Application to Differential equations with constant coefficients, transforms of unit step function, unit impulse function, periodic function.

**Unit-IV**

**Vector Calculus:** Scalar and vector point functions, Del applied to scalar point functions. Gradient, Del applied to vector point functions, Physical interpretation of divergence, Del applied twice to point functions, Del applied to products of point functions, Integration of vectors, Line integral, Surfaces, Green's theorem in the plane (without proof), Stoke's theorem (without proof), Volume integral, Gauss divergence Theorem (without proof),.

Text book

- 1]. Higher Engineering Mathematics by B.S. Grewal, 43<sup>rd</sup> edition, Khanna publishers, New Delhi.

**Reference books:**

- [1]. Advanced Engineering Mathematics by kreyszig.
- [2]. Engineering Mathematics by Babu Ram.
- [3] Engineering Mathematics – I BY N.P. Bali, Satyanarayana Bhavanari and Indrani Kelker Laxmipublications, New Delhi.
- [4] Mathematical Foundations for Computer Sciences- by Satyanarayana Bhavanari, Pradeep Kumar T.V, Shaik Mohiddin shaw, BSP Publications

**Engineering Physics-II****Unit-I****12 Periods****Principles of Quantum Mechanics**

Dual nature of light, Matter waves & properties, de Broglie's concept of matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle and applications (non-existence of electron in nucleus). One dimensional time independent Schrodinger's wave equation, Physical significance of the wave function, Particle in a box (one dimensional).

**Unit-II****12 Periods**

**ELECTRON THEORY OF METALS:** Classical free electron theory - Mean free path - Relaxation time and drift velocity - Quantum free electron theory - Fermi - Dirac (analytical) and its dependence on temperature - Fermi energy, Hall effect and its uses.

**BAND THEORY OF SOLIDS:** Bloch theorem (qualitative) - Kronig - Penney model - Origin of energy band formation in solids - Classification of materials into conductors, semi- conductors & insulators -Concept of effective mass of an electron.

**Unit-III****12 Periods****Dielectric and Magnetic Materials**

Electric dipole moment, polarization, dielectric constant, polarizability, types of polarizations, internal fields (qualitative), Clausius-Mossotti equation, Frequency dependence of polarization, Ferroelectrics and their applications.

Origin of magnetic moment of an atom, Bohr magneton, classification of dia, para and ferro magnetic materials on the basis of magnetic moment, Hysteresis curve, soft and hard magnetic materials, Ferrites and their applications.

**UNIT –IV****Advanced Materials of Physics****14 Periods**

**Optoelectronic devices:** Qualitative treatments of Photo diode, LED and LCD; Solar cell and its characteristics.

**Superconductivity:** First experiment, critical parameters ( $T_c$ ,  $H_c$ ,  $I_c$ ), Meissner effect, types of superconductors, BCS Theory (in brief) and Applications of superconductors.

**NanoTechnology :** Introduction to nano materials, nano scale, surface to volume ratio, fabrication of nanomaterials, sol-gel and chemical vapour deposition methods, Carbon nano tubes-preparation and properties (thermal, electrical and mechanical - in brief), some applications of nanomaterials.

**TEXT BOOKS**

1. Engineering Physics - R .K. Gaur & S. L. Gupta , Danpati Rai Publications, Delhi, 2001.
2. Engineering Physics – V. Rajendran, Tata MacGraw Hill, New Delhi, 2009.

**REFERENCE BOOKS**

1. Engineering Physics-P.K. Palanisamy, Scitech Publications PVT. Ltd, New Delhi
2. Engineering Physics – M.R. Srinivasan, New age International Publishers, New Delhi
3. Materials science – M.Vijaya and G.Rangarajan, TMH, New Delhi
4. Engineering Physics, D.K. Bhattacharya and Poonam Tandon, Oxford university Press, New Delhi

**ENGINEERING CHEMISTRY -II****UNIT-I: CHEMISTRY OF NANOMATERIALS**

Introduction to nano chemistry, preparation of nano materials - carbon nanotubes and fullerenes and their engineering applications.

**UNIT-II: INSTRUMENTAL METHODS OF ANALYSIS**

Basic principles, instrumentation and applications of UV-Visible, Infra-Red, Nuclear Magnetic Resonance (NMR), Gas Chromatography and High Performance Liquid Chromatography.

**UNIT-III: SOLID STATE CHEMISTRY**

Band theory of solids, types of semiconductors, preparation of semiconductors and semiconductor devices.

**UNIT-IV: SOLAR ENERGY HARNESSING**

Fundamentals, Conversion into electrical energy, Photovoltaic and Photogalvanic energy storage, Semiconductor photoelectrochemical cells, Photoelectrochemical reactions, Regenerative photoelectrochemical cells, Basic problems, Photocorrosion and protection of semiconductor electrodes, Protective coatings, Coatings of metals and electrically conductive polymers, Electrodes with chemically modified surfaces.

**Prescribed Text Books**

1. Engineering Chemistry, P.C. Jain and M. Jain – Dhanapath Rai & Sons, Delhi
2. Text book of Nano Science and Nano technology, B.S. Murthy and P. Shankar, University press.
3. Text book of engineering chemistry, Shashi chawla, Dhanapath rai & sons, Delhi.
4. Gurudeep raj & chatwal anand , “Instrumental methods of analysis “, 7<sup>th</sup> edition, CBS publications, 1986.
5. Quantitative analysis by day&underwood.
6. A Text book of Instrumental methods by Skoog and West.
7. H.W. Wilard and demerit, “Instrumental methods of analysis “, 7<sup>th</sup> edition, CBS publications, 1986.

**Basic Electrical and Electronic Sciences**

## UNIT – I

**Basic concept components and Electrical Circuits:** The unit of charge, voltage, current, power and energy. Circuit elements, circuit concept, Kirchhoff's voltage law and Kirchhoff's current law applied to simple series and parallel circuits.

**Alternating currents:** Definition of Peak value, RMS value, Average value, Peak factor and Form factor of Alternate current, Behaviour of Resistance, Inductance and Capacitance to Sinusoidal voltage.

Vector and J-notation as applied to the resolution of AC circuit, Vector diagrams, Single-phase series, and Parallel and Series-parallel circuits to sinusoidal excitation. Calculation of Active, Reactive and Complex power and Power factor.

## UNIT-II

**Polyphase circuits:** 3-phase supply, star-delta connections, Voltage, Current and Power relationships.

**Electromagnetic Induction:** Introduction – Electromagnetic Induction – Faraday's Laws of Electromagnetic Induction – Direction of Induced EMF and current – Induced EMF – Dynamically induced EMF – Statically induced EMF – Self Inductance – Mutual Inductance – Coefficient of coupling – Inductances in Series – Inductances in parallel – Energy stored in a magnetic field.

**Measuring Instruments:** Classification of instruments, construction and Principle of operation of permanent magnetic moving coil, moving iron dynamo meter type wattmeter Induction Type Energy Meter. Principle of operation of DVMs and CROs.

## UNIT - III

**Semiconductor Diodes:** Characteristics of Semiconductor junction Diode, Zener diode transistor, JFET, UJT, SCR and their applications. Half-wave, full-wave rectifiers and Bridge rectifier, with (L and LC) and without filters, Zener Voltage Regulator and their applications.

**Bipolar Junction Transistor:** Transistor operation, Common base configuration, Common emitter configuration, Transistor amplifying action, Common collector configuration, Operating point, Principal and characteristics of JFET.

## UNIT - IV

**AMPLIFIERS:** Need of biasing, Thermal runaway, Types of biasing-fixed bias, collectorbase bias, self bias, CE amplifier, frequency response.

**Feedback and Oscillator Circuits:** Feedback concepts, feedback connection types, Barkhausen criteria, Phase-Shift oscillator, Wien bridge oscillator, Hartley oscillator, Colpitts oscillator.

## LEARNING RESOURCES

## TEXT BOOKS:

1. A.Sudhakar and Shyam Mohan SP, Circuits and Networks: Analysis and Synthesis, 3<sup>rd</sup> Edition, TMH, 2006.
2. Robert Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", 6<sup>th</sup> Edition, PHI.

## REFERENCE BOOKS:

1. Mahmood Nahvi and Joseph Edminister, Electric Circuits, 4th Edition, Schaum's outline series, TMH, 2004.
2. Electrical Technology, B.L.Theraja & A.K.Theraja, Volume – I & II
3. S.Salivahanan, A.Vallavaraj, "Electronic Devices and Circuits", Tata McGraw Hill Publishers
4. N.N.Bhargava & D.C.Kulshreshtha, "Basic Electronics", Tata McGrawHill Publishers

**Problem Solving using C****UNIT-1 (16 Periods)**

Computer Basics: The Computer System, Generations of Computer, Classification of Computer, Block diagram of digital Computer, Inside the Computer-Processor, Memory, External Ports, PCI Card, Formatting Hard disk, Understanding BIOS, BIOS Commands, Algorithm, Flowchart, Programming Paradigms.

C-Basics: C-character set, Data types, Constants, Expressions, Structure of C program, Operators and their precedence & associativity, Simple programs in C using all the operators, Type casting, type coercion.

**UNIT-II (16 Periods)**

Control Structures, Basic input and output statements, Preprocessor directives. Functions: Concept of a function, passing the parameters, automatic variables, scope and extent of variables, storage classes, recursion, iteration vs recursion, types of recursion, Simple recursive and non recursive programs, Towers of Hanoi problem.

**UNIT-III (16 Periods)**

Arrays: Single and multidimensional Arrays, Character array as a string, string functions, Programs using arrays and string manipulation.  
Pointers: Pointers declarations, Pointer expressions, Pointer parameters to functions. Pointers, Pointers and array, Pointer arithmetic.

**UNIT-IV (16 Periods)**

Structures: Declaring and using structures, operations on structures, structures and arrays, user defined data types, pointers to structures. Command line arguments.  
Files: Introduction, file structure, file handling functions, file types, file error handling, Programs using file functions.

**Text Books:**

1. Programming with C-Gottfried-Schaums Outline Series-TMH
2. C Programming – Anitha Goel/Ajay Mittal/E.Sreenivasa Reddy-Pearson India

**References :**

1. Problem Solving with C- Somasekharan-PHI.
2. C Programming- Behrouz A forouzan – CENGAGE Learning
2. Test your c skills-Yaswanth kanithker
3. Let us C- Yaswanth kanithker

**Advanced English for Engineers****UNIT-1:**

1. Learning Skills: Three Questions (English and Soft Skills)
2. The Human Seasons (The Siren's Song)
3. Vocabulary Building: Root Words (100)
4. Writing: Data Interpretation (IELTS Model)

**UNIT- II:**

1. Problem - Solving Skills: (English and Soft Skills)
2. On His having arrived at the Age of Twenty Three (The Siren's Song)
3. Grammar: Text Completion (GRE Model)
4. Writing: Technical Reports (Factual Reports, Feasibility Reports, Survey Reports)

**UNIT - III:**

1. Interview Skills: The lighthouse keeper of Aspinwall (English and Soft Skills)
2. Youth and Age (The Siren's Song)
3. Grammar: Sentence Equivalence (GRE Model)
4. Analytical Writing: Analyzing an Issue, Analyzing an Argument (GRE Model)

**UNIT - IV:**

1. Adaptability Skills: Senior Payroll (English and Soft Skills)
2. The Marriage of True Minds (The Siren's Song)
3. Vocabulary Building: Foreign Expressions (100)
4. Writing: Office Correspondences (Memos, Circulars, Notice, Agenda of a meeting)

**TEXTBOOKS:**

1. S.P.Dhanavel, *English and Soft Skills*, New Delhi: Orient Black Swan Pvt. Ltd., 2013.
2. David Murdoch, *The Siren's Song: An Anthology of British and American Verse*, New Delhi: Orient Longman, 2012.

**REFERENCE BOOKS:**

1. B. Theodore, *Easy Way to Learn Difficult Words: The Unique English Etymology Dictionary*, Theos Publications, 2011.
2. Gill, Japinder. *Vocabulary Advantage*, Pearson Publication, 2012.
3. Philip G., *Pearsons Essential Words for GRE*, New Delhi : New Age International Publishers, 2012.
4. V.R.Narayanaswami, *Strengthen Writing 3rd Edition* New Delhi: Orient Blackswan Private Ltd., 2009.
5. Sharma C. *Business Correspondence & Report Writing*, Tata Mc Graw –Hill, 2002.
6. Kirkman, John . *Good Style: Writing for Science & Technology*, Routledge Study Guides,
7. Alec Fisher, *Critical Thinking An Introduction*, New Delhi: CUP, First South Asian Edition, 2011.

**ENGINEERING CHEMISTRY LABORATORY**

**LIST OF EXPERIMENTS:**

1. Determination of purity of washing soda
2. Determination of alkalinity of water
3. Determination of iron from Mohr's salt by permanganometry
4. Determination of iron from hematite by dichrometry
5. Determination of copper from brass by iodometry
6. Determination of available chlorine in bleaching powder.
7. Determination of hardness of water by EDTA method
8. Determination of tin and lead from solder by complex metric titrations
9. Determination of chloride by precipitation titration method
10. Determination of calcium by semi gravimetric method
11. Preparation of phenol-formaldehyde resin
12. Chemistry of blue printing

**DEMONSTRATON:**

13. Acid-Base titration by pH meter, conductivity meter and potentiometer
14. Determination of viscosity of viscosity of lubricating oil.

**Computer Programming Lab****CYCLE-I Basics of Hardware and Software Exercises:**

1. Explore Mother Board components and Layouts, identifying external ports and interfacing, identifying PCI cards and interfacing.
2. Practice partitioning and formatting Hard disks.
3. Install and Uninstall system and application software.
4. Understand BIOS configuration.
5. Connect 2 or more computers in a LAN network.
6. Assembling a Computer and troubleshooting a Computer.
7. Study and practice of operating system commands
  - a. Study and practice of directory Related Utilities.
  - b. Study and practice of file and Text Processing Utilities.
  - c. Study and practice of disk, Compress and Backup Utilities.
  - d. Study and practice of Networking Utilities

**CYCLE-II Programming Exercises:****1.Exercises on data types and operators?**

- a) Practice exercises 3.1 to 3.16 and 4.1 to 4.17 and 14.1 to 14.20 Test your C Skills - yaswanth kanitkar text book.
- b) Write a program which determines the largest and the smallest number that can be stored in different data types of like short, int., long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?
- c) Write a program to find greatest of three numbers using conditional operator?
- d) Write a program to swap two numbers with and without temp variable?
- e) Practice a program using multiple unary increment and decrement operators in arithmetic expressions?

**2. Exercises on control structures?**

- a) Practice exercise 2.1 to 2.15 Test your C Skills - yaswanth kanitkar text book.
- b) Write a program to find greatest of three numbers? Use nested if, if else if and switch statements?
- c) Write a program to read marks of a student and print the sum and average? Display the grade based on the sum of marks?
- e) write a program to count the digits of a number? Use for loop
- f) Write a program to check whether a number is perfect or not? Use do-while
- g) Write a program to check whether a number is strong or not? Use while
- h) Write a program to check whether a number is amstrong or not? Use for
- i) Write a program to check whether a number is palindrome or not? Use for
- j) Write a program to find the Fibonacci series upto the given number? Use while
- k) Write a program to print the pascals triangle? Used do-while
- l) Write a program to print the result of the series  $1+x^2/2+x^3/3+\dots+x^n/n$

**3. Exercises on functions?**

- a) Practice exercise 5.1 to 5.14 Test your C skills -yaswanth kanitkar text book.
- b) Write program to swap two variables using functions?  
Write a program to perform menu driven arithmetic operations using functions?
- c) Write a program to find the factorial of a number using recursive and non- recursive functions?
- d) Write a program to find the Fibonacci series using recursive functions?
- e) Write a program to find the solution for towers of Hanoi using recursive function?
- f) Write a program to pass parameters to a functions using call by value and call by reference?

#### 4. Exercises on Arrays?

- a) Practice exercise 9.1 to 9.17 Test your C skills - yaswanth kanitkar text book.
- b) Write a program to read n numbers and sort them?
- c) Write a program to find the minimum and maximum numbers of the array?
- d) Write a program to read two matrices and find their sum, difference and product of them?
- e) Find the transpose of a matrix?
- f) Write a program to print upper and lower triangle of a given matrix?

#### 5. Exercises on strings?

- a) Practice exercise 10.1 to 10.15 yaswanth kanitkar text book.
- b) Write a program to demonstrate the use of string manipulation functions?
- c) Write a program to compare two strings?
- d) Write a program to sort the names in Alphabetical order?

#### 6. Exercises on pointers?

- a) Practice exercise 7.1 to 8.26 yaswanth kanitkar text book.
- b) Write a program to read dynamic array and sort the elements?
- c) Write a program to read dynamic array and find the minimum and maximum of the elements?
- d) Write a program to perform pointer arithmetic?
- e) Write a program on pointers for strings?
- f) Write a program to use array of pointers?

#### 7. Exercises on structures?

- a) Practice exercise 11.1 to 11.30 yaswanth kanitkar text book.
- b) Write a program to create student structure and read marks of three subjects and find the sum and total of the student?
- c) Write a program on arrays of structures for 60 students record using the above student structure?
- d) Write a program for complex structure? Perform addition, subtraction and multiplication of two complex numbers?
- e) Write a program for addition and multiplication of two polynomials?

#### 8. Write a program on Files?

- a) Practice exercise 12.1 to 12.20 yaswanth kanitkar text book.
- b) write a program to append content of a file?
- c) Write a program to display the content of a file?
- d) Write a program to copy content of one file to other file?
- e) Write a program to count the no of characters in a file?
- f) Write a program to compare the contents of two files?

#### References:

1. Test your C Skills by – Yaswanth Kanithkar-BPB Publishers
2. C programming; Test your skills-A.N.Kamthane-Pearson India

**Workshop(IT)**  
**LIST OF EXPERIMENTS**

**PC Hardware****Task 1 :**

Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

**Task 2 :**

Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

**Task 3 :**

Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

**Task 4 :**

Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

**Task 5: Hardware Troubleshooting:**

Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

**Task 6 : Software Troubleshooting :**

Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

**Internet & World Wide Web****Task 1**

**Orientation & Connectivity Boot Camp :** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN

**Task 2 : Web Browsers, Surfing the Web :**

Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plugins like Macromedia Flash and JRE for applets should be configured

**Task 3****Search Engines & Netiquette :**

Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

**Task 4:****Cyber Hygiene:**

Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install antivirus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

**Task 5:**

Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

**Productivity tools LaTeX and Word**

**Word Orientation:** The mentor needs to give an overview of LaTeX and Microsoft (MS)

office 2007/ equivalent (FOSS) tool word: Importance of LaTeX and MS office 2007/ equivalent (FOSS) tool Word as word Processors, Details of the three tasks and features that would be covered in each, using LaTeX and word Accessing, overview of toolbars , saving files, Using help and resources, rulers, format painter.

Task 1 :

Using LaTeX and Word to create project certificate. Features to be covered:

Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Task 2:

Creating project abstract Features to be covered: Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 3 :

Creating a Newsletter : Features to be covered: Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

### **EXCEL-**

Excel Orientation:

The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool

Excel as a Spreadsheet tool, give the details of the two tasks and features that would be covered in each. Using Excel –Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler

Features to be covered:-Gridlines, Format Cells, Summation, auto fill, Formatting Tex

Task 2 : Calculating GPA -.Features to be covered:-

Cell Referencing, Formulae in excel –average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP, Sorting, Conditional formatting LaTeX and MS/equivalent (FOSS) tool

### **Power Point**

Task1:

Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :-

PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting

Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and Power point. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

Task 2:

Second week helps students in making their presentations interactive. Topic covered during this week includes: Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Chart.

Task 3:

Concentrating on the in and out of Microsoft power point and presentations in LaTeX. Helps them learn best

practices in designing and preparing power point presentation. Topic covered during this week includes: -

Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc),

Inserting –Back ground, textures, Design Templates, Hidden slides.

### **REFERENCE BOOKS:**

1. Introduction to Information Technology, IITL Education Solutions limited, Pearson Education.

2. LaTeX Companion Leslie Lamport, PHI/Pearson.

3. Introduction to Computers, Peter Norton, 6/e Mc Graw Hill Publishers.

4. Upgrading and Repairing, PC's 18, Scott Muller QUE, Pearson Education

5. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech

6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. CISCO Press, Pearson Education.

7. PC Hardware and A+ Handbook Kate J. Chase PHI (Microsoft

**ACHARYA NAGARJUNA UNIVERSITY**

**SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f. 2015-2016**

**ELECTRONICS & COMMUNICATION ENGINEERING BRANCH**

**II/IV B.TECH - I & II SEMESTERS**

Sl. No.	Course Details		Scheme of Instruction			Scheme of Examination		Credits	
	Code No.	Subject Name	Periods per week			Maximum Marks			Total Marks
			L	T	P	Internal	External		
1.	EC/EE 211	Mathematics-III	4	1	-	40	60	100	4
2.	EC/EE 212	Network Theory	4	1	-	40	60	100	4
3.	EC/EE 213	Electronics Devices & Circuits	4	1	-	40	60	100	4
4.	EC/EE 214	Digital Electronics	4	1	-	40	60	100	4
5.	EC 215	DS USING C++	4	1	-	40	60	100	4
6.	EC 216	Professional Ethics and Human Values	4	-	-	40	60	100	0
7.	EC 251	Electronic Devices and Circuits Lab	-	--	3	40	60	100	2
8.	EC 252	Digital Electronics Lab	-	-	3	40	60	100	2
9.	EC 253	Data Structures Lab	--	-	3	40	60	100	2
	Total		24	4	9	360	540	900	26

**II/IV B.TECH - II SEMESTER**

Sl. No.	Course Details		Scheme of Instruction			Scheme of Examination			Credits
	Code No.	Subject Name	Periods per week			Maximum Marks		Total Marks	
			L	T	P	Internal	External		
1.	EC/EE 221	Mathematics-IV	4	1	-	40	60	100	4
2.	EC/EE 222	Electronics Circuit Analysis	4	1	-	40	60	100	4
3.	EC 223	Electromagnetic Field Theory	4	1	-	40	60	100	4
4.	EC 224	Network Analysis and Synthesis	4	1	-	40	60	100	4
5.	EC 225	Electronic Measurements and Instrumentation	4	1	-	40	60	100	4
6.	EC 226	Signals and Systems	4	1	-	40	60	100	4
7.	EC 261	Advanced communication skills lab (Audit)	-	-	3	40	60	100	0
8.	EC 262	Electronic Circuit Analysis Lab	-	-	3	40	60	100	2
9.	EC 263	Signals and Systems Lab	-	-	3	40	60	100	2
	Total		24	6	9	360	540	900	28

## MATHEMATICS – III

CS/IT/EC/EE/EI/ME 211

L T P M C

4 1 0 100 4

### UNIT – I

Partial Differential Equations:

Introduction - Formation of Partial Differential Equations - Solutions of a Partial Differential Equation- Equations solvable by direct Integration - Linear Equations of the first Order- Non-Linear Equations of the first Order- Charpits Method - Homogeneous Linear Equations with Constant Coefficients- Rules for finding The Complementary Function - Rules for finding the Particular Integral- Non – Homogeneous Linear equations.

### UNIT – II

Integral Transforms:

Introduction- Definition – Fourier integrals – Fourier integral theorem (without proof)-Fourier sine and cosine integrals – complex form of Fourier integral - Fourier Transforms - Properties of Fourier Transforms - Finite Fourier sine and cosine transforms - Convolution theorem (without proof), Parseval's Identity for Fourier Transforms(without proof)

Numerical Solutions of Equations:

Introduction - Solution of Algebraic and Transcendental Equations - Bisection method-

Newton- Raphson Method - Solutions of linear Simultaneous Linear Equations: iterative

Methods - Gauss-Seidel Method.

### UNIT-III

Finite Differences and Interpolation:

Finite Differences – Differences of a polynomial – factorial notation – relations between operators – Newton's Interpolation formulae – central difference interpolation formulae - Gauss interpolation formulae – stirlings formula - interpolation with unequal intervals – Lagranges interpolation – inverse interpolation.

## **UNIT-IV**

Numerical Differentiation and Integration:

Numerical Differentiation – Formulae for derivatives.

Numerical Integration: Trapezoidal rule - Simpson's one-third rule - Simpson's three-eighth.

Numerical Solution of Ordinary Differential Equations: Introduction – Picard's Method- Euler's Method - Runge- Kutta Method of fourth order.

Numerical Solution of Partial Differential Equations: Introduction - Classification of second order equations

### **TEXT BOOK:**

1. B.S. Grewal, Higher Engineering Mathematics, 43<sup>rd</sup> Edition, Khanna Publishers,

### **REFERENCE BOOKS:**

1. N.P. Bali, A textbook of Engineering Mathematics, Laxmi publications
2. Erwin Kreyszig, Advanced Engineering Mathematics, 8th Edition, New Age International
3. Engineering Mathematics – I BY N.P. Bali, Satyanarayana Bhavanari and Indrani Kelker Laxmi publications, New Delhi.

	<b>L</b>	<b>T</b>	<b>P</b>	<b>M</b>	<b>C</b>	
<b>EC/EE 212 NETWORK THEORY</b>	<b>4</b>	<b>1</b>	<b>0</b>	<b>100</b>	<b>4</b>	<b>U N I T - I</b>

Rev  
iew

of R,L,C and M(Mutual Inductance) and their V-I characteristics-dot rule-Energy Sources, Ideal, Practical and dependent sources and their V-I characteristics, Source transformation, Voltage and Current division; V-I characteristics of Passive elements and their series / parallel combination; Star Delta transformation

**Graph Theory:** Introduction to Graph Theory, Tree, Branch, Link, Cutset and loop matrices, relationship among various matrices and parameters, Mesh and Nodal Analysis for DC circuits. Formulation of mesh & nodal equations involving are R,L,C and M.

## UNIT – II

**Review of sinusoidal analysis:** Phase relation in pure resistor, Inductor and capacitor; Impedance diagram, phasor diagram, series and parallel circuits, compound Circuits.

Computation of active, reactive and complex powers; power factor.

First order R-L, R-C circuits, Initial conditions in RLC elements- initial conditions for complicated network-time constant-second order circuits (RLC series and parallel circuits)

## UNIT – III

### Laplace Transforms:

Laplace Transforms of typical signals, periodic functions, Inverse transforms, Initial and final value theorems, Application of Laplace transforms in circuit analysis.

**Transformed Network Analysis:** Response of RL, RC, RLC circuits for impulse and pulse excitations using Laplace Transform method.

Definition of operational/ transformed impedances and admittances of L, C and transformer with initial conditions; development of transformed networks incorporating initial conditions as sources and solution of transformed networks.

## UNIT – IV

**Network Theorems:** Superposition theorem, Thevenin's and Norton's theorems, Reciprocity, Compensation, Maximum power transfer theorems, Tellegan's and Millman's theorems, Application of theorems to DC circuits. Sinusoidal steady state Mesh and Node Analysis. Application of network theorems to AC circuits.

**Resonance:** Series resonance, Impedance and phase angle, voltages and currents, bandwidth and Q factor and its effect on bandwidth, magnification, parallel resonance, resonant frequency, variation of impedance with

frequency , Q factor, magnification, reactance curves in parallel resonance. Frequency response of RL, RC circuits.

### **TEXT BOOKS:**

1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, Engineering Circuit Analysis, 6<sup>th</sup> Edition, TMH, 2002.
2. M.E. Vanvalkenburg, Network Analysis, 3<sup>rd</sup> Edition, PHI, 2003.
3. A Sudhakar and Shyam Mohan SP, Circuits and Networks: Analysis and Synthesis, 4<sup>th</sup> Edition, TMH, 2010

### **REFERENCE BOOKS:**

1. Franklin F. Kuo, Network Analysis and Synthesis, 2<sup>nd</sup> Edition, John Wiley & Sons, 2003.
2. Mahmood Nahvi and Joseph Edminister, Electric Circuits, 4<sup>th</sup> Edition, Schaum's outline series, TMH, 2004.

**UNIT I**

**THE PN JUNCTION DIODE:** Basic Structure of the PN Junction, Biasing of PN Junction Diode, V-I characteristics of PN junction diode, Diode Current Equation, Effect of temperature on PN junction diodes, Static and Dynamic Resistances, Break Down of PN Junction Diode, Diffusion Capacitance, Transition Capacitance of The Diode, Diode Switching times, Piecewise Linear Diode Model.

**UNIT II**

**BIPOLAR JUNCTION TRANSISTOR (BJT):** Transistor Construction, Operation, Specification Sheet, Transistor Testing, Transistor Casing and Terminal Identification, Transistor Biasing, Operation of NPN and PNP transistor, Transistor as an Amplifier, Transistor configurations and their characteristics, Ebers Moll Model.

**UNIT III**

**TRANSISTOR BIASING AND STABILIZATION:** Need for Biasing, Operating Point, Load lines and Quiescent Point, Fixed Bias Circuit, Self Bias Circuit, Voltage Divider Bias Circuit, Collector to Base Bias Circuit Emitter Stabilized Bias Circuit, Bias Compensation using Diodes and Transistors Stabilization Factors, Stabilization against variations in  $V_{BE}$  and  $\beta$ , Bias Compensation using Diodes and Transistors, Thermal Runaway, Thermal Stability, .

**UNIT IV**

**JFET BIASING:** Biasing Circuits for FET: Fixed Bias Circuit, Voltage Divider Bias Circuit, Self Bias Circuit, Graphical Solution for Self Bias.

**MOSFET:** Depletion MOSFET, Enhancement MOSFET, Comparison of BJT, JFET and MOSFET, Comparison of DMOSFET and EMOSFET, Biasing of MOSFET.

**TEXT BOOKS:**

1. Jacob Millman, Christos C. Halkias, and Satyabrata Jit "Electronic devices and Circuits", 2nd Edition TMH, 1998.
2. Donald A. Neamen, "Semiconductor Physics and Devices", 3<sup>rd</sup> edition, TMH,2003
3. Robert L.Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory, Tenth Edition, PEARSON Publications.

**REFERENCE BOOKS:**

4. S.Salivahanan, N.Suresh Kumar and A.Vallavaraju, "Electronic Devices and Circuits" 2<sup>nd</sup> Edition, 2008, TMH.
5. U.A.Bakshi and A.P.Godse "Electronic Devices and Circuits" 1<sup>st</sup> Edition, 2014, Technical Publications.

**UNIT-I**

**NUMBER SYSTEMS AND CODES:** Decimal, Binary, Hexadecimal Number Systems and their Conversions Arithmetic Additions Subtraction using the method of Complements, Multiplication and Division Codes: BCD, Excess-3, Gray and Alphanumeric Codes

**BOOLEAN ALGEBRA:** Boolean Expressions and Theorems, Logic Gates, Universal Gates, Canonical and Standard forms, Boolean functions, Simplification of Boolean functions using K maps, Minimal Functions and their properties, Tabulation Method NAND and NOR Implementations Two Level and Multi Level

**UNIT-II**

**COMBINATIONAL LOGIC CIRCUITS:** EX-OR EX-NOR Circuits, General procedure for combinational logic circuits, design and application of binary Adders and Subtractors, Comparators, Encoders, Decoders Multiplexers and Demultiplexers, Design of BCD to 7 Segment Decoder, Parity Generator and Checker, BCD Adder/Subtractor, Carry Look Ahead Adders

**UNIT-III**

**SEQUENTIAL LOGIC CIRCUITS:** Latches, characteristic table, characteristic Equation, Excitation Table, State table and State Diagrams for SR, JK, Master Slave JK, D and T flip-flops, Conversion from one type of Flip-Flop to another, shift registers, Analysis and Synthesis of Sequential Circuits, Sequence Generator, Sequence detector, Parity Generator

**COUNTERS USING FLIP-FLOPS:** Design of Ripple Counters, Synchronous Counter Up/Down Counters using Flip-Flops.

**UNIT-IV**

**SYNCHRONOUS SEQUENTIAL CIRCUITS:** Basic Design Steps, State Assignment Problem, Mealy State Model, Serial Adder Example, State Minimization, Design of a Counter using the Sequential Circuit Approach, FSM as an Arbiter Circuit, Analysis of Synchronous Sequential Circuits, ASM Charts, Formal Model for Sequential Circuits

**IC LOGIC FAMILIES:** RTL, DTL, TTL, ECL and IIL families and their comparison

**TEXT BOOKS:**

1. M Morris Mano and Micael D. Ciletti, Digital Design, Pearson Education, 2008
2. Digital Principles and Design, Donald D. Givone, TMH, 2008

**REFERENCE BOOKS**

1. Thomas L. Floyd, Digital Fundamentals 7th Edition, Pearson
2. Charles H. Roth jr., Fundamentals of logic Design, Jaico publications, 1992
3. Taub and Schilling, Digital Integrated Electronics.

## UNIT - I

**Principles Of Object Oriented Programming:** Concepts, benefits of OOPS, Object oriented Languages, Applications of OOPs.

**Tokens, Expressions And Control Structures:** Introduction, Tokens, Keywords, Basic Data Types, User defined data types, Derived data types, Declaration of variables, Operators in C++, Types, Scope resolution operator, Member dereferencing operator, Memory management operator, Type cast operator.

## UNIT - II

**Functions:** Function prototyping, Call by reference, Return by reference, Inline function, Function Overloading, Friend and Virtual functions.

**Classes And Objects:** Specifying a class, Defining member functions, Memory allocation for objects, Friendly functions, Pointer to members.

**Constructors And Destructors** – Introduction, Type conversions, Operator overloading and inheritance and virtual functions.

## UNIT - III

**Linked Lists:** List operations and their implementation using arrays, Linked list operations and their implementations, Single linked, Double linked and Circular linked lists.

**Stacks:** Logical operations on stack, Stack implementations with arrays and linked lists, Stack applications.

**Queues:** Queue operations, Queue implementation with arrays and linked lists, Queue applications.

## UNIT - IV

**Sorting Methods:** Insertion sort, Shell sort, Merge sort, Quick sort, Heap sort, Radix sort and their implementations.

**Searching Methods:** Binary Search, Hashing methods and applications.

**Trees:** Logical operations on Trees, Binary Tree Traversals, Binary Search Tree ADT,

**TEXT BOOKS:**

1. E Balaguruswamy, object oriented programming using c++Programming ANSI C, PHI, 1993.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, The Benjamin & Cummings, Addison Wesley, 1997
3. Trembley and Sorenson, An Introduction to Data Structures with Applications, Tata McGraw Hill, 1997.

**REFERENCES :**

1. Digital and Digital c+ programming
2. S Tanenbaum, Data Structures Using C, PHI, 1992

**UNIT – I**

**Human Values:** Morals, Values and Ethics, Integrity, Work Ethic, Service Learning, Civic Virtue, Respect for Others, Living Peacefully, caring, Sharing, honesty, Courage, Valuing Time, Co-operation, Commitment, Empathy, Self Confidence, Character, Spirituality.

**UNIT – II**

**Engineering Ethics:** Senses of ‘Engineering Ethics’, Variety of model issues, Types of inquiry, Moral dilemmas, Moral Autonomy, Kohlberg’s theory, Gilligan’s theory, Consensus and Controversy, Professions and Professionalism, Professional Ideals and Virtues, Theories about right action, Self-interest, customs and Religion, Uses of Ethical Theories.

**UNIT – III**

**Engineering as Social Experimentation:** Engineering as Experimentation, Engineers as responsible Experimenters, Codes of Ethics, A Balanced Outlook on Law.

**Safety, Responsibility and Rights:** Safety and Risk-Assessment of safety and risk , risk benefit analysis and reducing risk. Collegiality and Loyalty , Respect for Authority , Collective Bargaining -Confidentiality, Conflicts of Interest, Occupational Crime , Professional

Rights, employee Rights, Intellectual Property Rights (IIPR) ,Discrimination.

**UNIT – IV**

**Global Issues:** Multinational Corporations, Environmental Ethics, Computer Ethics, Weapons Development, Engineers as Managers, consulting Engineering, 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, etc.

**TEXT BOOKS:**

1. Mike Martin and Roland Schinzinger, Ethics in Engineering, McGraw Hill, New York 1996.
2. Govindarajan. M, Natarajan. S, Senthilkumar. V.S, Engineering Ethics, PHI, 2004.

**REFERENCE BOOKS:**

1. Charles D Fleddermann, Engineering Ethics, Prentice Hall, New Jersey, 2004
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, Engineering Ethics Concepts and Cases, Thomson Learning, United States, 2000.
3. John R Boatright, Ethics and the Conduct of Business, PHI, New Delhi, 2003.  
Edmund G Seebauer and Robert L Barry, Fundamentals of ethics for Scientists and Engineers, Oxford University Press, 2001.

1. Study of C.R.O
2. Characteristics of Silicon and Germanium diodes
3. Characteristics of Zener diode and regulator
4. Characteristics of Common Base configuration
5. Characteristics of Common Emitter configuration
6. Characteristics of Emitter follower circuit
7. Drain and Transfer Characteristics of JFET
8. Drain and Transfer Characteristics of Depletion MOSFET
9. Drain and Transfer Characteristics of Enhancement MOSFET
10. Design and verification of Self bias circuit
11. Characteristics of LDR and Thermistor
12. Characteristics of source follower circuit
13. Characteristics of Photo transistor
14. Design and verification of collector to base bias circuit
15. Design and verification of Current Source Bias Circuit

1. Realization of Gates using Discrete Components.
2. Realization of Gates using Universal Building Block (NAND only).
3. Design of Combinational Logic Circuits like Half-adder, Full-adder, Half-Subtractor and Full- Subtractor
4. Verification of 4-bit Magnitude Comparator.
5. Design of Decoders like BCD-Decimal decoder.
6. Applications of IC Parallel Adder (1's & 2's complement addition).
7. Design of Code Converters (Binary to Gray).
8. Design of Multiplexers/De-Multiplexers.
9. Verification of Truth-Table of Flip-Flops using Gates.
10. Design of Shift registers (To Verify Serial to parallel, parallel to Serial, Serial to Serial and parallel to parallel Converters) using Flip-Flops.
11. Design of ring & Johnson counters using flip-flops.
12. Conversion of flip-flops (JK-T, JK-D).
13. Design of binary/decade counter
14. Design of Asynchronous counter, mod counter, up counter, down counter & up/down counter.
15. Design of synchronous counter, mod counter, up counter, down counter & up/down counter

1. Over Loading Functions
2. Objects and Classes
3. Arrays
4. Overloading Operators
5. Inheritance
6. Virtual Functions
7. Linear list-Three programs.
8. Linear and Binary search.
9. Stacks - Two programs.
10. Queues - One program.
11. Linked Lists - Two programs.
12. Heap - One program
13. Sorting - One program on (a) Quick sort (b) Heap sort  
Sorting - One program on (a) Radix sort (b) Merge sort.
14. Binary Tree-One program.
15. Tree Traversal-One program.

NOTE: A minimum of 10(Ten) programs, with One program from each Head, have to be performed and recorded by the candidate to attain eligibility for University Practical Examination.

**EE/EC 221**

**L T P M C**

**4 0 0 100 4**

**MATHEMATICS – IV**

**UNIT – I**

Complex Analysis:

Introduction – Limits – Continuity – Derivative of a function - Analytic functions - Cauchy-Riemann equations in Cartesian and polar forms - , Harmonic functions – harmonic conjugate - Orthogonal systems – Geometrical representation of  $w = f(z)$ - conformal mapping - Some standard transformations  $w = z + c$ ,  $w = cz$ ,  $w = 1/z$  Bilinear transformations

**UNIT – II**

COMPLEX INTEGRATION:

Cauchy's integral theorem (without proof), Cauchy's integral formula (without proof)- series of complex terms: Taylor's series – Laurents series – Zeros of analytic function – singularities of analytic function.

**UNIT – III:**

RESIDUES and POLES:

Introduction – Definition of Residue - Calculation of Residues – Cauchy's Residue theorem (with out proof) - , Evaluation of real definite integrals: Integration around a unit circle, Integration around a semicircle.

**UNIT – IV**

Random Variables – continuous probability distributions, expectation, Variance, Normal distribution, normal approximation to binomial distribution – correlation – coefficient of correlation(direct Method), Lines of regression

**TEXT BOOK:**

1. B S Grewal, Higher Engineering Mathematics, 43th Edition, Khanna Publishers, Delhi.

**REFERENCE BOOKS:**

1. J.W. Brown and R.V.Churchil , Complex variables and applications – 8e- Mc Graw hills higher education.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 8th Edition, New Age International (P) Ltd.
3. N.P. Bali, A textbook of Engineering Mathematics, Laxmi publications .
4. Engineering Mathematics – I BY N.P. Bali, Satyanarayana Bhavanari and Indrani Kelker Laxmi publications, New Delhi.

**UNIT I**

**SINGLE STAGE AMPLIFIERS:** Small Signal Low Frequency Amplifier Circuits: CE, CB, CC Amplifier Circuits, Small Signal Analysis of Junction Transistor: Analysis of CE, CB, CC using Hybrid Model, Analysis of CE Amplifier with Collector to Base Bias, Millers Theorem, Analysis of CE Amplifier with Emitter Resistance: Exact and Approximate Analysis.

**MULTI STAGE AMPLIFIERS:** Need for cascading, Methods of Inter stage Coupling, Gain, Selection of Configuration in cascading Amplifiers, RC Coupled CE-CE Amplifier, CE-CB Cascode Amplifier, CE-CC Amplifier, Effect of cascading on Bandwidth and Gain.

**UNIT II**

**FET AMPLIFIERS:** JFET Low Frequency small signal Model, Analysis of Common Source, Common Drain, Common Gate Amplifiers using small signal model.

**FREQUENCY RESPONSE:** Amplifier Frequency Response, System Transfer Functions, Transistor Amplifiers with Circuit Capacitors, Bipolar Transistor Frequency Response, The FET Frequency Response, High Frequency Response of Transistor Circuits

**UNIT III**

**POWER AMPLIFIERS:** Power Amplifiers, Power Transistors, Classification of Amplifiers: Class-A, Class B, Class C, Class AB Power Amplifiers.

**UNIT IV**

**FEEDBACK AMPLIFIERS:** Introduction to Feedback, Basic Feedback Concepts, Ideal Feedback Topologies, Voltage Amplifiers, Current Amplifiers, Transconductance Amplifiers, Transresistance Amplifiers

**OSCILLATORS:** Barkausen Criterion, The Phase Shift Oscillator, Resonant Circuit Oscillator and Crystal Oscillator.

**TEXT BOOKS:**

1. Donald A. Neamen, "Electronic Circuits Analysis and Design", 3<sup>rd</sup> Edition, TMH, 2007.
2. Jacob Millman and Christos C. Halkias, "Integrated Electronics", TMH, 1972

**REFERENCE BOOKS:**

1. Rashid – "Electronic Circuit Analysis". Cengage Learning, 2013.
2. Uday A Bakshi- "Electronic Circuit Analysis" 1<sup>st</sup> Edition, 2008, Technical Publications.

**UNIT - I****Electrostatics —I:**

The experimental law of coulomb, Electric field intensity, Field due to a continuous volume charge distribution, Field of a line charge, sheet of charge. Electric Flux Density, Gauss's law, Applications of Gauss law, Divergence, Maxwell's First equation (Electrostatics), Energy expended in moving a point charge in an electric field, The line integral, Definition of potential and potential difference. The potential field of a point charge, system of charges, potential gradient, the dipole and Energy density in electrostatic field.

**UNIT - II****Electrostatics — II:**

The nature of dielectric materials, boundary conditions for perfect dielectric materials. Capacitance. Several capacitance examples. Capacitance of a two wire line. Derivations of Poisson's and Laplace's equations, Examples of the solution of Laplace's equation. Current and current density, continuity of current, conductor properties and boundary conditions

**UNIT - III**

**The Steady Magnetic Field:** Biot-Savart Law, Ampere's Circuital Law Magnetic Flux and Magnetic Flux Density, The scalar and vector magnetic potentials

**Magnetic Forces and Materials:** Force on a moving charge, force on a differential current element, force between differential current elements, force and torque on a closed circuit, the nature of magnetic materials, magnetization and permeability, magnetic boundary conditions. Potential energy in magnetic fields.

**UNIT- IV**

**Time Varying Fields and Maxwell's Equations:** Faraday's law, Displacement current, Maxwell's equations in point form, integral form.

**The Uniform Plane Wave:** Wave propagation in free space, dielectrics, Poynting theorem and wave power. Propagation in good conductors: skin effect, Wave polarization.

**TEXT BOOKS:**

1. W H Hayt, J A Buck Engineering Electromagnetics 8th Edition TMH, 2006.
2. Mathew NO Sadiku, Elements of Electromagnetics, Oxford University Press, 2003.
3. G S N Raju, Electromagnetic Field Theory and transmission lines, 1<sup>st</sup> Edition, Pearson Education India, 2005.

**REFERENCE BOOKS:**

1. Joseph A Edminister, Theory and Problems of Electromagnetics, 2<sup>nd</sup> Edition, Schaum's Outline Series, Me- Graw Hill International, 1993
2. EC Jordan and KG Balmain, Electromagnetic Wave; and Radiating Systems, PHI 2003.

## UNIT -1

**NETWORK FUNTIONS:** Poles and Zeros, Network functions for the one port and two port, Poles and zeros of network functions, Restrictions on pole and zero locations for driving point functions and transfer functions, Time domain behavior from the pole zero plot.

**TWO PORT NETWORK PARAMETERS:** Two port network, Open circuit impedance, Short circuit admittance (Y), Transmission, Inverse transmission, Hybrid and inverse hybrid parameters, Relation between parameter sets, Interconnection of two port networks, Lattice networks, Image parameters.

## UNIT-II

**ATTENUATORS:** Symmetrical and Asymmetrical attenuators, T-type attenuator, P-type attenuator, Lattice attenuator, Bridged T attenuator, L- type attenuator.

**FILTERS:** Characteristic impedance of symmetrical networks, Properties of symmetrical networks, Filter fundamentals, Pass and stop bands, Characteristic impedance, Constant K low pass filter, Constant K high pass filter, m - derived T section, m - derived Section, Variation of characteristic impedance over the pass band, Termination with m-derived half section, Band pass filters, Filter circuit design, Filter performance.

## UNIT-III

**FILTER DESIGN:** The filter design problem, The approximation problem in network theory, The maximally flat low pass filter approximation, other low-pass filter approximations, Transient response of low pass filters, Magnitude and phase normalization, Frequency transformation.

## UNIT - IV

**NETWORK SYNTHESIS:** Positive real functions, Positive real function properties, Testing driving point functions, Driving point function synthesis with two LC,RL,RC (Both caur and foster forms) elements, Two port network synthesis by ladder development, series and parallel realizations.

**TEXT BOOKS:**

- 1.M.E.Vanvalkenburg, Network Analysis, 3<sup>rd</sup> Edition PHI, 2003.
2. A Sudhakar and Shyam Mohan SP, Circuits and Networks: Analysis and Synthesis, 3<sup>rd</sup> Edition, TMH, 2006.
3. John D Ryder, Networks, Lines and Fields, 2<sup>nd</sup> Edition, PHI, 2003.
4. Franklin F. Kuo, Network Analysis and Synthesis, 2<sup>nd</sup> Edition, Wiley India Ltd.,2005.

**REFERENCE BOOKS:**

1. M.E Vanvalkenburg, Introduction to Modem Network Systhesis, 2<sup>nd</sup> Edition, Wiley India Ltd, 1986.
2. Vasudev K Atre, Network Theory and Filter Design, 2<sup>nd</sup> Edition, Wiley Estern,2002.

**UNIT -1**

**MEASUREMENT AND ERROR:** Definitions, Accuracy and precision, Types of errors, Statistical analysis, Probability of errors, Limiting errors.

**DIRECT CURRENT INDICATING INSTRUMENTS:** DC ammeters, DC voltmeters, Series type ohmmeter, Shunt type ohmmeter, Multimeter, Calibration of DC Instruments.

**DC & AC BRIDGES:** Wheatstone, Kelvin, Guarded Wheatstone, Maxwell, Hay, Schering and Wein bridges, Wagner ground connection.

**UNIT - II**

**ELECTRONIC INSTRUMENTS FOR MEASURING BASIC PARAMETERS:**

AC voltmeters using rectifiers, True RMS responding voltmeter, Electronic multimeter, Digital voltmeters: Ramp, Stair case ramp, Integrating, Successive approximation, Quantizing error; Frequency counter, Universal counter.

**CATHODE RAY OSCILLOSCOPE:** Introduction, Cathode ray oscilloscope, Storage and sampling oscilloscopes, Digital storage oscilloscope, Spectrum analyzer.

**UNIT-III**

**TRANSDUCERS:** Introduction, Classification of transducers, Analog transducers, Resistive transducers, Potentiometers, Strain gauges, Types of strain gauges, Resistance strain gauges, Semiconductor strain gauges, Resistance thermometers, Thermistors, Application of Thermistors, Thermo couple construction, Measurement of thermocouple output, Compensating circuits, Advantages and disadvantages of thermocouples, Variable inductance type transducer, Variation of self inductance, Variation of mutual inductance, Linear variable differential transformer, Rotary variable differential transformer, Capacitive transducers, Piezo-electric transducers, Digital transducers, Shaft Encoder.

**UNIT-IV**

**DATA ACQUISITION SYSTEMS:** Digital Data Acquisition System, Various ways of multiplexing, Computer controlled instrumentation.

**BIO-MEDICAL MEASUREMENTS: Bioelectric signals (ECG,EMG,ERG,EOG) and electrodes.**  
Elementary Principles of Electrocardiograph, Electromyograph, Electroencephalograph.

**TEXT BOOKS:**

1. WD Cooper & A D Helfrick, Electronic Instrumentation and Measurement Techniques, PHI, 1998
2. A K Sawhney, Electrical and Electronics Measurement and Instrumentation Dhanpat Rai, 2000
3. R S Khandpur, Hand Book of Biomedical Engineering, TMH, 2002

**REFERENCE BOOKS:**

1. C S Rangan, G R Sarma and V S V Mani, Instrumentation Devices and Systems, TMH, 1997
2. H S Kalsi, Electronic Instrumentation, TMH, 1995
3. John G. Webster, Medical Instrumentation: Application and Design 3<sup>rd</sup> Edition, Wiley India

**SIGNAL ANALYSIS:** Introduction to signals and systems, classification of signals and systems ( both discrete and continuous), approximation of a function by a set of mutually orthogonal functions, evaluation of mean square error, orthogonality in complex functions, trigonometric and exponential Fourier series.

## UNIT - II

### FOURIER TRANSFORM

Representation of a periodic function by Fourier series/Fourier transform, Properties of Fourier transforms, Fourier transform of Simple functions. Sampling theorem - statement and proof, Aliasing

**SIGNAL TRANSMISSION THROUGH LINEAR NETWORKS:** Linear time- invariant system, Time response, Convolution and it's graphical interpretation, Causality and stability, Paley-Wiener criterion, Frequency response, Filter characteristics of linear systems, Conditions for distortionless transmission, Relation between bandwidth and rise time.

## UNIT - III

**SPECTRAL DENSITY AND CORRELATION:** Energy and power spectral density, Properties, Auto-correlation and Cross-correlation functions, Properties of correlation function, Parseval's theorem.

**NOISE:** Sources of Noise, Thermal Noise, Noise power spectral density, Noise calculation, Noise calculations in Passive circuits, Equivalent noise bandwidth, Noise-Figure of an amplifier, Power density and available power density, Effective input noise temperature, Effective noise temperature, Noise Figure in terms of available gain, Cascaded stages, Measurement of Noise Figure.

## UNIT-IV

**PROBABILITY& RANDOM VARIABLES:** Random variables, discrete and continuous, probability distribution function, probability density function, Gaussian Random variable, Conditional distribution and density functions, Mean, Variance and Standard deviation of a random variable, characteristic function.

**RANDOM PROCESSES:** Random process concept, stationarity and independence, correlation functions, Gaussian random process and Poisson random process, power density spectrum and its properties, relationship between power spectrum and autocorrelation function.

### TEXT BOOKS:

1. B P Lathi, Signals, Systems and Communications, BSP, 2003
2. P.Z Peebles, Jr, Probability, random variables and random signal principles, TMH.
4. A.Anand Kumar, Signals and Systems, PHI Learning, 2012
3. Simon Haykin, Signals and Systems, John Wiley, 2004

### REFERENCE BOOKS:

1. A V Oppenheim, A S Wilsky and IT Young, Signals and Systems, PHI/ Pearson,2003
2. David K Cheng, Analysis of Linear Systems, Narosa Publishers, 1990.

**EC 261 ENGLISH COMMUNICATION SKILLS & SOFT SKILLS LAB (AUDIT)**

**L T P M C**  
**0 0 3 100 0**

**Syllabus:**

Module-1: Phonetics

- a) Introduction to vowels and consonants
- b) Introduction to Accent, Intonation and Rhythm

Module-2: Presentation Skills

- d) Debate
- e) Paper Presentation:
  - i) Identification of source material
  - ii) Arrangement of Collected Data
- f) Extempore

Module-3: Employability Skills

- a) Resume Preparation
  - i) Identification of information
  - ii) Arrangement of collected data
- b) Group Discussions
- c) Interview Skills
  - i) Dress code
  - ii) Behavioral Skills

Module-4: Telephonic Skills

- a) Formal & Informal interaction
- b) Receiving Messages & Complaints

Module-5: Soft Skills

- e) Voluntary & Involuntary Body Language
- f) Self-Esteem
- g) Creative Thinking
- h) Team Management

Module-6: Interpersonal and Intrapersonal Skills

- a) Motivation
- b) Stress Management
- c) Negotiation Skill
- d) Effective Listening

**NOTE:** 12 Lab Activities are minimum in Record (125 pages single side book) with contents: Name of the Activity, Source, Skill Improved.

**Minimum Requirements:**

The Communication and Soft Skills Lab shall need two labs. One is Communication Skills Lab with LAN facilitated 60 multimedia systems and English language software suggested by the concern faculty. The other, Conversational Skills Lab with 6 to 10 round tables, 60 movable chairs and audio-visual Devices with LCD Projector.

**Suggested Software:**

- Cambridge Advanced Learners' English Dictionary with CD.
- Clarity Pronunciation Power
- The Rosetta Stone English Library
- Dorling Kindersley series of Grammar, Punctuation, Composition etc.
- English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge
- Language in Use, Foundation Books Pvt. Ltd with CD.
- Mastering English in Vocabulary, Grammar, Spellings, Composition
- Telephoning in English
- A Practical Course in Spoken English with CD by J.K. Gangal, PHI Publications.
- Communicate to Conquer: A Handbook of Group Discussions and Job Interviews with CD, PHI Publications.

**Reference Books:**

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems) :

1. Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP.
2. English Pronouncing Dictionary Daniel Jones Current Edition with CD.
3. Spoken English- R. K. Bansal and J. B. Harrison, Orient Longman 2006 Edn.
4. Speaking English Effectively by Krishna Mohan & NP Singh (Macmillan)
5. A Practical Course in English Pronunciation, (with two Audio cassettes) by J. Sethi, Kamlesh Sadanand & D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi.
6. A text book of English Phonetics for Indian Students by T.Balasubramanian (Macmillan)
7. English Skills for Technical Students, WBSCTE with British Council, OL
8. Soft Skills: Know Yourself & Know the World, Dr.K.Alex, S.Chand Publications
9. The ACE of Soft Skills: Attitude, communication and Etiquette for Success, by Pearson Publications.

Converston Developing Soft Skills, 4<sup>th</sup> Edition, Pearson Publication.

**Experiments Based on Electronic Circuits**

1. Study of Full Wave Rectifier with and without Filters.
2. Frequency Response of Common Emitter Amplifier.
3. Frequency Response of Common Source Amplifier.
4. Measurement of Parameters of Emitter Follower and Source Follower;  $R_I$ ,  $A_V$ ,  $A_I$  &  $R_O$ .
5. Two Stage RC-Coupled Amplifier.
6. Study of Cascode Amplifier.
7. Current series feedback topology

**Experiments Based on Networks**

8. Constant K Low-Pass and High-Pass Filter.
9. Constant K Band-Pass and Band-Elimination Filters.
10. M-Derived Low-Pass and High-Pass Filters.
11. T and  $\pi$  Attenuators
12. Measurement of Impedance, Admittance and Transmission Parameters
13. Measurement of Image and Iterative Impedance of Symmetrical and Asymmetrical Networks
14. Design of Constant Resistance and Bridged T-Equalizers

1. Write a program to generate the discrete sequences (i) unit step (ii) unit impulse (iii) ramp (iv) periodic sinusoidal sequences. Plot all the sequences.
2. Find the Fourier transform of a square pulse .Plot its amplitude and phase spectrum.
3. Write a program to convolve two discrete time sequences. Plot all the sequences. Verify the result by analytical calculation.
4. Write a program to find the trigonometric Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings.
5. Write a program to find the trigonometric and exponential fourier series coefficients of a periodic rectangular signal. Plot the discrete spectrum of the signal.
6. Generate a discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.
7. The signal  $x(t)$  is defined as below. The signal is sampled at a sampling rate of 1000 samples per second. Find the power content and power spectral density for this signal.
 
$$X(t) = \cos(2\pi * 47t) + \cos(2\pi * 219t), 0 < t < 10$$

$$X(t) = 0, \text{ otherwise}$$
8. Write a program to find the magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.
9. Write a program to find the response of a low pass filter and high pass filter, when a speech signal is passed through these filters.
10. Write a program to find the autocorrelation and cross correlation of sequences.
11. Generate a uniformly distributed length 1000 random sequence in the range (0,1). Plot the histogram and the probability function for the sequence. Compute the mean and variance of the random signal.
12. Generate a Gaussian distributed length 1000 random sequence . Compute the mean and variance of the random signal by a suitable method.
13. Write a program to generate a random sinusoidal signal and plot four possible realizations of the random signal.
14. Generate a discrete time sequence of  $N=1000$  i.i.d uniformly distributed random numbers in the interval (-0.5,-0.5) and compute the autocorrelation of the sequence.
15. Obtain and plot the power spectrum of the output process when a white random process is passed through a filter with specific impulse response .

**Text Book:** Contemporary Communication Systems using MATLAB by John G.Proakis, M.Salehi, Cengage Learning Publisher.

## UNIT-1

Introduction: Basic concept of simple control system, open loop-closed loop control systems. Effect of feedback on overall gain-stability, sensitivity and external noise. Types of feedback control systems-Linear time invariant, time variant systems and non-linear control systems.

Mathematical models and Transfer functions of Physical systems:

Differential equations-impulse response and transfer functions-translational and rotational mechanical systems. Transfer functions and open-loop and closed-loop systems. Block diagram representation of control systems-black diagram algebra-signal flow graph-Mason's gain formula.

Components of Control Systems: DC servo motor-AC servo motor-synchro transmitter & receiver

## UNIT-II

Time domain analysis: Standard test signals-step, ramp, parabolic and impulse response function-characteristic polynomial and characteristic equations of feedback systems-transient response of first order and second order systems to standard test signals. Time domain specifications-steady state response-steady state error and error constants. Effect of adding poles and zeros on over shoot, rise time, band width-dominant poles of transfer functions.

Stability Analysis in the complex plane: Absolute, relative, conditional, bounded input – bounded output, zero input stability, conditions for stability, Routh – Hurwitz criterion.

## UNIT – III

Frequency domain analysis: Introduction – correlation between time and frequency responses – polar plots – Bode plots – Nyquist stability criterion – Nyquist plots. Assessment of relative stability using Nyquist criterion – closed loop frequency response.

## UNIT – IV

Root locus Technique: Introduction – construction of root loci – Introduction to Compensation Techniques.

State space analysis: Concepts of state, state variables and state models – digitalization – solution of state equations – state models for LTI systems. Concepts of controllability and Observability.

## TEXT BOOKS:

1. B.C. Kuo, Automatic control systems, 7th edition, PHI.
2. I.J.Nagrath & M Gopal, Control Systems Engineering, 3rd edition, New Age International.
3. K. Ogata, Modern Control Engineering, 3rd edition, PHI.

## REFERENCE BOOKS:

1. Schaum Series, Feedback and Control Systems, TMH
2. M.Gopal, Control Systems Principles and Design, TMH
3. John Van de Vegta, Feedback Control Systems, 3rd edition, Prentice Hall,1993.

**UNIT-I****OPERATIONAL AMPLIFIERS:**

Operational amplifier and block diagram representation, op-amp with negative feedback. Block diagram representation of feedback configurations, voltage series feedback amplifier, voltage shunt feedback amplifier, differential amplifier with one op-amp, input offset voltage, input bias current, input offset current, total output offset voltage, frequency response of op-amp, stability, slew rate.

**OP-AMP APPLICATIONS:**

The summing amplifier, Differential and instrumentation amplifiers, Voltage to current and current to voltage conversion, The Op-amp with complex impedances, Differentiators and integrators, Non Linear Op Amp circuits, Precision rectifiers.

**UNIT – II****OSCILLATORS:**

Oscillator principles, Oscillator types, Frequency stability, Phase shift oscillator, Wein bridge oscillator, Quadrature oscillator, Square-wave generator, Triangular wave generator, Saw tooth wave generator, Voltage controlled oscillator.

**COMPARATORS:**

Introduction to comparator, Basic comparator, Zero-crossing detector, Schmitt Trigger, Comparator characteristics, Limitations of Op-Amps as comparators, Voltage limiters.

**UNIT – III****CLIPPERS, CLAMPERS & CONVERTERS:**

Positive and negative clippers, Positive and negative clampers, Absolute value output circuit, Peak detector, Sample and hold circuit. D/A conversion fundamentals, Weighted resistor summing D/A Converter, R-2R Ladder D/A converter, A/D conversion: Ramp converters, Successive Approximation A/D converters, Dual slope converters, Parallel A/D converters. Tracking A/D converters.

**UNIT – IV****APPLICATIONS OF SPECIAL ICs:**

The 555 timer, 555 as Monostable and Astable Multivibrator and applications. Phase Locked Loops, Operating principles, Monolithic PLLs, 565 PLL applications, A 723 Voltage Regulator and its design.

**ACTIVE FILTERS:**

Active LP and HP filters, Band pass filters: Wideband, Narrow Band pass filters, Band stop filters, State variable filters, All pass filters

**TEXT BOOKS:**

- 1) Rama Kant A. Gayakwad, Op-Amps and Linear Integrated Circuits, 4 th Edition, PHI/ Pearson Education, 2003.
- 2) D.Roy and Choudhury, Shail B.Jain, Linear Integrated Circuits, 2nd Edition, New Age International, 2003.
- 3) Denton J Dailey, Operational Amplifiers and Linear Integrated Circuit Theory and Applications,

**REFERENCE BOOK:**

1. J.Michael Jacob, Applications and Design with Analog Integrated Circuits, 2nd Edition, PHI, 2003.

**UNIT-I**

**LINEAR WAVE SHAPING:**

Responses of RC-high pass circuit and low pass circuits to sinusoidal, step, pulse, square, ramp and exponential inputs, Criteria for good differentiation and integration, Uncompensated and compensated attenuators, Ringing circuit.

**UNIT – II**

**NON-LINEAR WAVE SHAPING:**

Clipping circuits with diodes, Multi-diode circuits, Transient and steady state response of a diode clamping circuit, Clamping circuit theorem, Practical clamping circuits, Transistor as switch, Design of Transistor switch, Transistor Switching Times

**UNIT – III**

**MULTIVIBRATORS (using BJTs):**

Bistable Multivibrator: Fixed bias and self-bias transistor binary, Commutating capacitors, Non-saturated binary, Direct coupled binary, Unsymmetrical and Symmetrical triggering of binary, Schmitt Trigger circuit, Collector Coupled Monostable and Astable Multivibrators-operation & design

**UNIT –IV**

**SWEEP CIRCUITS:**

Voltage sweep circuits, Deviation from linearity expressed as errors, Exponential and Constant current charging voltage sweep circuits, Principles of Miller and Bootstrap Sweep circuits, Simple current sweep circuit, Need for a trapezoidal waveform for linearity correction, its generation and application.

**TEXT BOOKS:**

1. J Millman and H Taub, Pulse, Digital and Switching Circuits, TMH, 2003
2. David A Bell, Solid State Pulse Circuits, 4th Edition, PHI, 2003
3. Mothiki S. Prakash Rao, Pulse Digital & Switching Waveforms, 2nd Edition, TMH.

## **EC 314            COMPUTER ORGANIZATION AND OPERATING SYSTEMS**

### **UNIT-I**

Register Transfer and Micro-operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-operations, Logic micro-operations, Shift micro-Operations, Arithmetic Logic shift Unit.

Basic Computer organization and Design: Instruction codes, Computer Registers, computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instruction, Input-output and Interrupt, Design of basic Computer, design of Accumulator logic.

Micro Programmed control: Control memory, Address sequencing, Micro-program example, Design of control unit.

### **UNIT-II**

Central Processing Unit: General Register organization, stack organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced instruction set(RISC).

Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Floating-point Arithmetic Operations.

Memory Organization: Memory Devices, Semiconductor Memories, Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory.

### **UNIT-III**

Overview of Operating Systems:

Introduction, Computer system structures, Operating system structures.

Processing Management: Process: Process Concepts, Process scheduling, Operation on Process, Co-operating Process, Threads, Inter process communication.

CPU Scheduling: Scheduling criteria, Scheduling algorithm, Multiprocessor scheduling, Real time scheduling, Algorithm evaluation.

### **UNIT-IV**

Storage Management: Memory Management: - Logical Vs Physical address space, Swapping Contiguous allocation, paging segmentation, Segmentation with paging.

Virtual Management: Performance of Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing, Demand segmentation.

CASE STUDIES: Features of Linux OS

### **TEXT BOOK:**

1. M..Morris Mano, Computer System Architecture, 3rd Edition, PHI, 2003.
2. Silberschatz and Galvin, Operating System Concepts, Fourth Edition, John Wiley & Sons, 2002. (For Units III & IV)

### **REFERENCE BOOKS**

1. William Stallings, Operating Systems, Fourth Edition, Pearson Education/PHI, 2003
2. Timothy Budd, An Introduction to Object Oriented Programming, Second Edition, Pearson Education, 2002

## UNIT-I

AMPLITUDE MODULATION: Time domain description, Frequency domain description, Single tone modulation, Generation of AM wave, Square law modulator, Switching Modulator, Detection of AM waves, Square law detector, Envelope detector, DSB-SC Modulation, Time-domain and frequency domain descriptions of DSB-SC, Generation of DSB-SC: Balanced modulator, Coherent detection of DSBSC modulated waves, Costas loop, Quadrature-Carrier multiplexing.

SSB AND VSB MODULATIONS: Band-pass transmission, Complex low-pass representation of Narrow-band signals, Concepts of pre-envelope, Complex envelope and Natural envelope, Equivalent low-pass transmission model, Single side band modulation: Frequency domain description, Generation of SSB-SC wave, Frequency-discrimination method, Phase discrimination method, Demodulation of SSB-SC waves, Vestigial side-band modulation, Frequency domain description, Generation of VSB modulated wave, Envelope detection of VSB wave plus carrier, Comparison of AM techniques, Frequency Division Multiplexing (FDM).

## UNIT – II

ANGLE MODULATION: Introduction to Angle modulation, Relation between frequency Modulation and phase modulation, Single tone frequency modulation, Spectrum analysis of sinusoidal FM wave, Narrow Band FM and Wide Band FM, Transmission bandwidth of FM waves, Carson's Rule, Generation of FM waves, Indirect FM (Armstrong Method), Direct FM, Demodulation of FM waves, Balanced frequency discriminator – Zero-crossing detector, Linearized model of PLL, FM demodulation employing first order PLL, Practical Considerations, FM limiters, Applications.

## UNIT – III

DISCRETE MODULATION: Generation and Demodulation of PAM, PWM and PPM; TDM, Comparison of Discrete Modulation Techniques.

NOISE IN ANALOG MODULATION: AM Receiver model, Signal to noise ratios for coherent reception. DSB-SC receiver, SSC-SC receiver, Noise in AM receivers using envelope detection. AM threshold effect, FM receiver model, Noise in FM reception, Capture effect in FM, Threshold effect, FM threshold reduction, Pre-emphasis and De-emphasis in FM.

## UNIT-IV

## RADIO TRANSMITTERS:

Frequency allocation for radio communication systems, Block diagrams and functions of radio transmitters for AM and FM systems.

## RADIO RECEIVERS:

TRF and super heterodyne receivers, RF, Mixer and IF stages, Choice of IF stages, Choice of IF, Image frequency, Alignment and tracking of radio receivers, AGC, Tone and volume controls, Receiver characteristics and their measurements, FM receivers, communication receivers, Fading and diversity reception.

## TEXT BOOKS:

1. Simon Haykin, Introduction to Analog and Digital Communication Systems, John Wiley and Sons, 3rd Edition, 2001
2. Leon W Couch II, Digital and Analog Communication Systems, Pearson Education, 2004
3. George Kennedy, Electronic Communication Systems, Mc Graw Hill, 4th Edition, 1999

# EC 316 TRANSMISSION LINES AND WAVEGUIDES

## UNIT-I

### Transmission Lines:

Concept of symmetrical networks: T &  $\pi$  networks. Types of transmission lines, two wire lines, primary and secondary constants, Transmission line equations, Infinite line and characteristics impedance, Distortion less transmission line.

## UNIT-II

### Open And Short Circuited Lines:

Propagation constants, wavelength, velocity of propagation and group velocity, open and short circuited lines and their significance. Reflection, reflection coefficient, standing wave ratio, reflection loss and insertion loss.

## UNIT-III

### Ultra High Frequency lines:

Impedance at any point on the transmission line, input impedance, RF and UHF lines, transmission lines as circuit elements, properties of  $\lambda/2$ ,  $\lambda/4$  and  $\lambda/8$  lines, smith chart, properties and applications of smith chart.

## UNIT-IV

### Waveguides:

The concept of a waveguide, transverse electric waves, transverse magnetic waves, transverse electromagnetic waves. TE propagation in parallel plate waveguide, TM propagation in parallel plate waveguides, rectangular waveguides, circular waveguides

### Text Books:

1. Elements of Electromagnetics, Matthew N.O. Sadiku, 4th edition, 2008, Oxford University Press
2. Engineering Electromagnetics, William H. Hayt Jr. and John A. Buck, 7th edition, 2006, TMH
3. Networks Lines and Fields, John D. Ryder, 2nd edition, 1999, PHI

### Reference Books

1. Electromagnetic Waves and Radiating Systems, E.C. Jordan and K.G. Balmain, 2nd edition, 2000, PHI
  2. Transmission Lines and Networks, Umesh Sinha, Satya Prakashan, 2001, (Tech. India Publications), New Delhi
-

1. Linear Wave-Shaping.
2. Non-linear Wave-Shaping.
3. Design and Verification of Astable Multivibrator.
4. Design and Verification of Monostable Multivibrator.
5. Design and Verification of Schmitt Trigger (using discrete components and using IC741).
6. Measurement of Op-amp Parameters.
7. Applications of Op-amp (Adder, Subtractor, Integrator, Differentiator).
8. Instrumentation Amplifier using Op-Amp.
9. Waveform Generation using Op-amp (Square, Triangular).
10. Design of Active Filters (LPF&HPF-First Order).
11. Application of 555 Timer (Astable, Monostable, Schmitt Trigger).
12. PLL using 556.
13. Design of IC Regulator using 723.
14. Design of VCO using 566.
15. D-A Converter (R-2R Ladder).

NOTE: A minimum of 10(Ten) experiments have to be performed and recorded by the candidate to attain eligibility for University Practical Examination

1. Obtain the V-I characteristics of silicon and Germanium diodes.
2. Design a Zener diode voltage regulator.
3. Design and verify the operating point for a self-bias circuit.
4. Study the characteristics of a half wave and full wave rectifier.
5. Study the characteristics of a bridge rectifier.
6. Obtain the frequency response of a CE amplifier.
7. Obtain the frequency response of a two stage RC couple CE amplifier.
8. Design and simulate class A power Amplifier.
9. Simulate a differentiator and integrator using OPAMP.
10. Simulate a low pass and high pass filter using OPAMP.
11. Simulate a RC phase shift and Wein bridge oscillator using OPAMP.
12. Design and simulate a constant resistance and bridged T equalizer.
13. Simulate an Amplitude Modulator and Demodulator.
14. Simulate an Amplitude Modulator and Demodulator.
15. Simulate a Frequency Modulator and Demodulator.

NOTE: A minimum of 10(Ten) experiments have to be performed and recorded by the candidate to attain eligibility for University Practical Examination

1. Amplitude Modulation and Demodulation
2. DSB SC Modulation and Demodulation
3. SSB SC Modulation and Demodulation
4. Frequency Modulation and Demodulation
5. Pre Emphasis - De Emphasis Circuits
6. Verification of Sampling Theorem
7. PAM and Reconstruction
8. PWM and PPM: Generation and Reconstruction
9. Effect of Noise on the Communication Channel
10. Design of Mixer
11. Class-A Power Amplifier
12. RC Phase Shift Oscillator
13. Hartley and Colpitts Oscillators

NOTE: A minimum of 10(Ten) experiments have to be performed and recorded by the candidate to attain eligibility for University Practical Examination

**UNIT – I****PULSE CODE MODULATION:**

Quantization Process, Quantization Noise, Pulse Code Modulation Line Codes Noise Considerations in PCM Systems Virtues, Limitations, and Modifications of PCM Delta Modulation, Differential Pulse Code Modulation, Adaptive differential Pulse Code Modulation.

**BASE BAND PULSE TRANSMISSION:**

Matched filter, Properties, Error Rate due to Noise Intersymbol interference, Nyquist's criterion for Distortionless Baseband Binary Transmission, Correlative level coding, Optimum Linear receiver Eye Pattern.

**UNIT – II****DIGITAL PASSBAND TRANSMISSION:**

Geometric representation of signals, Conversion of the continuous AWGN channel into A vector channel Likelihood Functions Maximum Likelihood decoding Correlation Receiver probability of error Passband Transmission model coherent BPSK, QPSK, M-PSK Coherent BFSK, MSK, GMSK Non Coherent BFSK DPSK Comparison of Digital Modulation Schemes.

**UNIT – III****SPREAD SPECTRUM MODULATION:**

PN sequence A Notion of spread spectrum direct Sequence spectrum spread spectrum with Coherent BPSK Signal Space Dimensionality and Processing gain Probability of error frequency Hop spread spectrum.

**FUNDAMENTAL LIMITS IN INFORMATION THEORY:**

Uncertainty, Information, Entropy, Source Coding Theorem, Data Compaction, Discrete memoryless channels, Mutual information, Channel capacity, Channel coding theorem, Information capacity theorem, Data Compression.

**UNIT – IV****ERROR CONTROL CODING:**

Discrete Memoryless channels Linear Block codes, Cyclic Codes, Convolution Codes, Maximum Likelihood and Sequential Decoding of Convolution Codes.

**TEXT BOOKS:**

1. Simon Haykin, Communication Systems, 4th edition John Wiley & Sons, 2001
2. Modern Digital and Analog Communication Systems, 3rd edition, OUP, 1998
3. Leon W Couch II, Digital and Analog Communication Systems, 6th Edition, Pearson, 2004

**REFERENCE BOOKS:**

4. John G Proakis, Digital Communications, 4th Edition, McGraw Hill, 2001
5. Bernard Sklar, Digital Communication, 2nd Edition, Pearson Education, 2001
6. Taub and Schilling, Principles of Communication Systems, 2nd Edition, TMH, 1986

## UNIT – I

Microprocessor: Introduction to microcomputers and microprocessors, introduction and architecture of 8086 family, addressing modes, instruction description and assembler directives of 8086 microprocessors.

## UNIT – II

8086 programming and system connections: Program development steps, writing programs for use with an assembler, assembly language program development tools, writing and using procedures and assembler macros.

An example of minimum mode system, addressing memory and ports in microcomputer system. 8086 interrupts and interrupt responses.

## UNIT – III

Digital interfacing: Programmable parallel ports, handshake IO, interface Microprocessor to keyboards.

Analog interfacing: DAC principle of operation, specifications and different types of DACs and interfacing.

Programmable devices: Introduction to Programmable peripheral devices 8254,8259, 8251, DMA data transfer, RS232 communication standard and maximum mode of 8086 operation

## UNIT – IV

Introduction:-

Introduction to microcontrollers, comparing microprocessors and microcontrollers, Architecture:- Architecture of 8051, pin configuration of 8051 microcontroller, hardware input pins, output pins ports and external memory, counters and timers, serial data input and output and interrupts.

Programming & interfacing 8051:-

Addressing modes of 8051 microcontroller, Instruction set of 8051 microcontroller, simple programs using 8051 microcontroller.

## TEXT BOOKS:

1. Duglus V. Hall, Microprocessor and Interfacing, Revised 2nd Edition, TMH,2006.
2. Kenneth J. Ayala, The 8051 Microcontroller Architecture Programming and Applications, 2nd Edition, Penram International Publishers (I), 1996.

## REFERENCE BOOKS:

3. John Uffenbeck, The 80X86 Family, Design, Programming and Interfacing, 3rd Edition, Pearson Education, 2002.
4. Barry Bray, the intel microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium processors, architecture, programming, and interfacing, 6th Edition, PHI edition.
5. Mohammed Ari Mazidi and Janci Gillispie, The 8051 Microcontroller and Embedded Systems, Pearson Education Asia, New Delhi, 2003.

## UNIT – I

DISCRETE SIGNALS AND SYSTEMS: Introduction to digital signal processing, Advantages and applications, Discrete time signals, LTI system: Stability and causality, Frequency domain representation of discrete time signals and systems.

Z-TRANSFORMS: Z-transforms, Region of convergence, Z-transform theorems and properties, Parseval's relation, Relation between Z-transform and Fourier transform of a sequence, Inverse Z transform using Cauchy's integration theorem, Partial fraction method, Long division method, Solution of differential equations using one sided Z-transform, Frequency response of a stable system.

## UNIT – II

DFT AND FFT: Discrete Fourier Series, Properties of DFS, Discrete Fourier Transform, Properties of DFT, Linear convolution using DFT, Computations for evaluating DFT, Decimation in time FFT algorithms, Decimation in frequency FFT algorithm, Computation of inverse DFT.

## UNIT – III

IIR FILTER DESIGN TECHNIQUES: Introduction, Properties of IIR filters, Design of Digital Butterworth and Chebyshev filters using bilinear transformation, Impulse invariance transformation methods. Design of digital filters using frequency transformation method.

## UNIT – IV

FIR FILTER DESIGN TECHNIQUES: Introduction to characteristics of linear phase FIR filters, Frequency response, Designing FIR filters using windowing methods: Rectangular window, Hanning window, Hamming window, Generalised Hamming window, Bartlett window, Comparison of IIR and FIR filters.

REALISATION OF DIGITAL FILTERS: Direct, Canonic, Cascade, Parallel and Ladder realizations.

## TEXT BOOKS:

- 1) Lonnie C Ludeman, Fundamentals of Digital Signal Processing, John Wiley & Sons, 2003.
- 2) S K Mitra, Digital Signal Processing: A Computer Based Approach, 2nd Edition, TMH, 2003
- 3) Alan V Oppenheim and Ronald W Schaffer, Digital Signal Processing, Pearson Education/PHI, 2004.
- 4) P.Ramesh Babu, Digital Signal Processing, 2nd Edition, Scitech Publications, 2004.

## REFERENCE BOOKS:

- 1) Johnny R. Johnson, Introduction to Digital Signal Processing, PHI, 2001.
- 2) Andreas Antoniou, Digital Signal Processing, TMH, 2006.
- 3) John G. Proakis, Dimitris G Manolakis, digital Signal Processing: Principles, Algorithms and Applications, Pearson Education / PHI, 2003

**UNIT – I****RADIATION:**

Radiation Mechanism, Potential functions-heuristic approach, Maxwell's equation approach, Potential functions for sinusoidal oscillations, Alternating current element, Power radiated by current element, Application to short antennas, Assumed current distribution, Radiation from quarter wave Monopole / half wave dipole, Traveling wave antennas and the effect of the point of feed on standing wave antennas.

**UNIT – II****ANTENNA FUNDAMENTALS:**

Isotropic, Directional, Omni-directional patterns, Principle patterns, Field regions, Radiation density, Radiation intensity, Directive gain, Power gain, Half power Beam width, Antenna polarisation, Power loss factor, Radiation efficiency, Effective aperture of antenna, Relation between maximum effective aperture and directivity, Friss transmission equation.

**ARRAY ANTENNAS**

Two element array, Uniform linear array, Side lobe level and beam width of broadside array, Beam width of end fire array, Principle of multiplication of patterns, Effect of earth on vertical patterns, Binomial array, Basic principle of Dolph-Tschebyscheff array.

**UNIT – III****CHARACTERISTICS OF TYPICAL ANTENNAS:**

V and Rhombic antennas, Folded Dipole, Loop antenna, Yagi Uda array, Helical antenna, Log periodic antenna, Pyramidal and conical Horn antenna, Corner reflector antenna, Parabolic reflector antennas - Paraboloid and parabolic cylinder, Cassegrain system of reflectors, Basic principles of slot antennas and micro strip antennas.

**UNIT – IV****RADIO WAVE PROPAGATION:**

Ground wave Propagation, Earth constants, Space-wave Propagation, Effect of curvature of an Ideal Earth, Variations of Field strength with height in space-wave Propagation, Atmospheric effects in space-wave Propagation, Radio-Horizon, Duct Propagation, Extended-range Propagation resulting from Tropospheric Scattering, Ionospheric Propagation, Gyro frequency, Refraction and reflection of Sky Waves by the Ionosphere, Critical Frequency, Skip Distance, Maximum Usable Frequency.

**TEXT BOOK**

- 1) Edward C Jordan and Keith G Balmain, Electromagnetic Waves and Radiating Systems, 2nd Edition, PHI, 2003
- 2) Constantine A Balanis, Antenna Theory : Analysis and Design, Harper and Row Publishers, 2002
- 3) G.S.N.Raju, Antennas and Wave Propagation, 1st Edition, Pearson Publication, Singapore
- F.E. Terman, Electronic and Radio Engineering, Mc Graw Hill, 1985.

**REFERENCE BOOK:**

- 1) J.D.Kraus and Ronald J Marhefka, Antennas For all Applications, TMH, 2003

**UNIT – I**

**INTRODUCTION:**

Uses of Computer networks, Network Hardware, Network Software, Reference Models (OSI and TCP/IP only).

**PHYSICAL LAYER:**

Introduction to Guided Transmission Media, Wireless Transmission

**UNIT – II**

**DATA LINK LAYER:**

Data Link Layer design issues, Error detection and correction, Elementary Data link Protocols, Sliding window protocols

**MEDIUM ACCESS CONTROL SUBLAYER:**

The channel Allocation problem, Multiple Access Protocols, Ethernet, Wireless LANs, Broadband wireless, Bluetooth, Data Link Layer Switching.

**UNIT – III**

**NETWORK LAYER:**

Network layer Design Issues, Routing Algorithms – (The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Routing for Mobile Hosts.)

Congestion Control Algorithms, Quality of Service - (Requirements, Techniques for Achieving Good Quality of Service), Internetworking, The Network layer in the internet- (The IP Protocol, IP Address, Internet Control Protocols, OSPF, BGP).

**UNIT – IV**

**TRANSPORT LAYER:**

Elements of Transport Protocols, TCP, UDP, RTP.

**TEXT BOOKS:**

1. A.S Tanenbaum, Computer Networks, 4th Edition, PHI, 2003
2. Behrouz A. Foruzan, Data communication and Networking, 4 th Edition, TMH, 2004.

**Experiments Based on ALP (8086)**

1. Programs on Data Transfer Instructions.
2. Programs on Arithmetic and Logical Instructions.
3. Programs on Branch Instructions.
4. Programs on Subroutines.
5. Sorting of an Array.
6. Programs on Interrupts (Software and Hardware).
7. 8086 Programs using DOS and BIOS Interrupts.

**Experiments Based on Interfacing & Microcontroller (8051)**

8. DAC Interface-Waveform generations.
9. Stepper Motor Control.
10. Keyboard Interface / LCD Interface.
11. Data Transfer between two PCs using RS.232 C Serial Port
12. Programs on Data Transfer Instructions using 8051 Microcontroller.
13. Programs on Arithmetic and Logical Instructions using 8051 Microcontroller.
14. Applications with Microcontroller 8051.

1. Generation and Detection of Time Division Multiplexing
2. Generation and Detection of Pulse Code Modulation
3. Generation and Detection of D M
4. Generation and Detection of DPCM
5. Generation and Detection of DPSK
6. Generation and Detection of Spread spectrum
7. Generation and Detection of QPSK
8. Generation and Detection of ASK
9. Generation and Detection of FSK
10. Generation and Detection of PSK
11. Error detection and correction using hamming code

Experiments Based On Tool Boxes

1. Simulation of AM.
2. Simulation of FM.
3. Simulation of LPF and HPF.
4. Fourier Transforms.
5. Simulation of M-ary PSK.
6. Simulation of DPCM.
7. Evaluation of DFT and IDFT of 16 Sample Sequence using DIT Algorithm.
8. Evaluation of DFT and IDFT of 16 Sample Sequence using DIF Algorithm.
9. Design of IIR Butterworth Filter using Impulse Invariant Method.
10. Design of FIR Filter using Windowing Technique.
11. Convolution of Two Signals.
12. Correlation of Two Signals.
13. DFT Analysis of a Noise Corrupted Signal.

NOTE: A minimum of 10(Ten) experiments have to be performed and recorded by the candidate to attain eligibility for University Practical Examination

**ACHARYA NAGARJUNA UNIVERSITY**  
**SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f. 2015-2016**  
**ELECTRONICS & COMMUNICATION ENGINEERING BRANCH**  
**IV/IV B.TECH - I SEMESTER**

Sl. No.	Course Details		Scheme of Instruction			Scheme of Examination			Credits
	Code No.	Subject Name	Periods per week			Maximum Marks		Total Marks	
			L	T	P	Internal	External		
1.	EC 411	Industrial Management	4	-	-	40	60	100	3
2.	EC 412	Digital Image Processing	4	-	-	40	60	100	4
3.	EC 413	Microwave Engineering	4	1	-	40	60	100	4
4.	EC 414	VLSI Design	4	1	-	40	60	100	4
5.	EC 415	Elective-I DSP Processors Neural Networks Speech Signal Processing Satellite Communications	4	1	-	40	60	100	4
6.	EC 416	Open Elective Applied Electronics Basic Communication	4		-	40	60	100	3
7.	EC 451	VHDL Lab	-	--	3	40	60	100	2
8.	EC 452	Microwave Lab	-	-	3	40	60	100	2
9.	EC 453	Project Work(Part A) & Internship	-	-	4	50		50	2
10.	EC 454	Internship						0	
	Total		24	3	10	370	480	850	28

**ACHARYA NAGARJUNA UNIVERSITY**  
**SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f. 2015-2016**  
**ELECTRONICS & COMMUNICATION ENGINEERING BRANCH**  
**IV/IV B.TECH - II SEMESTER**

Sl. No.	Course Details		Scheme of Instruction			Scheme of Examination			Credits
	Code No.	Subject Name	Periods/week			Maximum Marks		Total Marks	
			L	T	P	Internal	External		
1.	EC 421	Mobile and Cellular Communication	4	1	-	40	60	100	4
2.	EC 422	Optical Communication	4	1	-	40	60	100	4
3.	EC 423	Elective-III ➤ Telecommunication & Switching Networks ➤ Orthogonal Frequency Division Multiplexing ➤ Spread Spectrum Communication ➤ RF circuit Design ➤ Embedded Systems	4	1	-	40	60	100	4
4.	EC 424	Elective –IV ➤ Radar and Navigational Aids ➤ Wireless Communications ➤ Coding Theory and Techniques ➤ HDL programming	4	1	-	40	60	100	4
7.	EC 461	Optical Communication Lab	-	-	3	40	60	100	2
8.	EC 462	Project Work (Part B)	-	-	12	80	120	200	10
	Total		16	4	15	280	420	700	28

**UNIT – I****GENERAL MANAGEMENT:**

Principles of scientific management, Brief treatment of managerial functions.

**FORMS OF BUSINESS ORGANISATION:**

Salient features of sole proprietorship. Partnership, Joint Stock Company, private limited and public limited companies.

**UNIT – II****FINANCIAL MANAGEMENT:**

Concept of interest, compound interest, equivalent cash flow diagram

**ECONOMIC EVALUATION OF ALTERNATIVES:**

Basic methods, the annual equivalent method, present worth method, future worth method.

**DEPRECIATION:**

Purpose, types of depreciation, common methods of depreciation. The straight line method, declining balance method, the sum of the years digits method.

**UNIT – III****PERSONNEL MANAGEMENT:**

Functions of Personnel Management – Human Resources Planning, Brief treatment of Recruitment, Selection, Placement, Performance Appraisal, Career Development, Training and Development, Compensation. Staff role of Personnel Department, Organization for the Personnel Function. Goals and Plans of the Organization. Motivation and Leadership, Theories of Motivation and styles of Leadership.

**UNIT – IV****MATERIAL MANAGEMENT:**

Purchasing, Objective, Source Selection, Procurement Methods, Inventory Management –EOQ, EPQ, ABC Analysis.

MARKETING MANAGEMENT: Functions of Marketing, Product life cycle, Channels of distribution, Advertising & Sales promotion, Market Research.

**TEXT BOOKS:**

1. KK Ahuja, Industrial Management, Vol. I & II, Dhanpat Rai, 1978.
2. E.Paul Degarmo, John R Chanda, William G Sullivan, Engineering Economy, Mac Millan Publishing Co, 1979

**REFERENCE BOOKS:**

1. Philip Kotler, Marketing Management, 11th Edition, Pearson Education, 2004.
2. P. Gopalakrishnan, Hand Book of Materials Management, PHI, 1999  
Heinz Weirich and Harold Koontz, Management, 10th Edition, TMH, 2004

**UNIT – I****INTRODUCTION:**

Origin of Digital Image Processing, Fields that uses Digital Image Processing, Fundamental steps in Digital Image Processing, Components of an Image Processing System.

**DIGITAL IMAGE FUNDAMENTALS:**

Elements of Visual perception, Image sampling and Quantization, Basic relationships between Pixels, Linear and Non-linear operations.

**UNIT – II****IMAGE ENHANCEMENT IN SPATIAL DOMAIN:**

Some basic Grey level transformations, histogram processing, enhancement using Arithmetic/Logic operations, Smoothing Spatial Filters, Sharpening Spatial Filters.

**IMAGE ENHANCEMENT IN FREQUENCY DOMAIN:**

Introduction to Fourier Transform and the Frequency Domain, Smoothing Frequency Domain Filters, Sharpening Frequency Domain Filters.

**UNIT – III****IMAGE RESTORATION:**

Noise models, Restoration in the presence of Noise, only Spatial Filtering, Periodic Noise reduction by Frequency Domain Filtering, Linear, Position- Invariant Degradations, Inverse Filtering, Wiener Filtering.

**IMAGE COMPRESSION:**

Fundamentals – Image Compression models – Error Free Compression, Lossy Compression.

**UNIT – IV****IMAGE SEGMENTATION:**

Detection of discontinuities, Thresholding, Edge based Segmentation and Region based Segmentation.

**IMAGE REPRESENTATION AND DESCRIPTION:**

Representation schemes, Boundary Descriptors, Regional Descriptors.

**TEXT BOOK:**

1. R C Gonzalez and Richard E Woods, Digital Image Processing, Pearson Education, Second Edition, 2002

**REFERENCE BOOKS:**

1. A K Jain, Digital Image Processing, PHI, 1989
2. B Chanda and D Dutta Majumder, Digital Image Processing and Analysis, PHI,
3. MilanSonka, Vaclav Hlavac and Roger Boyle, Image Processing Analysis and Machine Vision, Thomson learning, Second Edition, 2001.

**UNIT – I****Microwave Waveguides and Components:**

**Rectangular Waveguides:** Solutions of Wave Equations in Rectangular Coordinates, TE Modes in Rectangular Waveguides, TM Modes in Rectangular Waveguides, Power Transmission in Rectangular Waveguides, Power Losses in Rectangular Waveguides.

**Circular Waveguides :** Solutions of Wave Equations in Cylindrical Coordinates, TE Modes in Circular Waveguides, TM Modes in Circular Waveguides, TEM Modes in Circular Waveguides, Power Transmission in Circular Waveguides or Coaxial Lines, Power Losses in Circular Waveguides or Coaxial Lines.

**Microwave Cavities :** Rectangular-Cavity Resonator, Circular-Cavity Resonator, Q Factor of a Cavity Resonator. Microwave Hybrid Circuits: Waveguide Tees, Magic Tees (Hybrid Tees), Directional Couplers: Two-Hole Directional Coupler, S Matrix of a Directional Coupler, Circulators and Isolators: Microwave Circulators, Microwave Isolators.

**UNIT –III**

**MICROWAVE LINEAR-BEAM TUBES (O TYPE):** Limitations of Conventional Vacuum Tubes, Two Cavity Klystron: Reentrant Cavities, Velocity-Modulation Process, Bunching Process, Output Power and Beam Loading. Reflex Klystron: Velocity Modulation, Power Output and Efficiency, Electronic Admittance. Helix Traveling-Wave Tubes (TWTs): Slow-Wave Structures, Amplification Process. Magnetron Oscillators: Cylindrical Magnetron, Linear Magnetron.

**UNIT III:**

TRANSFERRED ELECTRON DEVICES (TEDs): **Introduction, Gunn-Effect Diodes-GaAs Diode,**

Gunn Effect, Modes of Operation, Criterion for Classifying the Modes of Operation, Gunn Oscillation

Modes, Limited-Space-Charge Accumulation (LSA) Mode.

**AVALANCHE TRANSIT-TIME DEVICES:** Read Diode, IMPATT Diodes, TRAPATT Diodes, BARITT Diodes, Microwave Tunnel Diodes.

**UNIT IV:**

**MICROWAVE MEASUREMENTS:** Power, Frequency and Impedance Measurement at Microwave Frequency, Network Analyser and Measurement of scattering parameters, Spectrum Analyser and measurement of spectrum of microwave signal, Noise at microwave frequency and measurement of noise figure, Measurement of Microwave antenna Parameters.

**TEXT BOOKS:**

1. Microwave Devices & Circuits By Samuel Y Liao , 3rd Edition , Pearson Education ,2003
2. Microwave Engineering by D. M. Pozor, 2nd Edition, John Willy & Sons.

**REFERENCE BOOKS:**

1. Foundations for Microwave Engineering By RE Collin, IEEE Press Series, 2003
2. Microwave Engineering By ML Sisodia and V.L. Gupta, New Age International, 2005
3. Principles of Microwave Engineering, Reich, Oudong and Others.
4. Engineering Electromagnetics, 7th Edition, William H. Hayt, Tata McGraw Hill Publishing Company Ltd., New Delhi
5. S. Ramo, J.R. Whinnery and T.V. Duzer, "Fields and Waves in Communication Electronics", Third Edition, Wiley India.

**UNIT- I**

**An introduction to MOS technology:** Introduction to IC technology, Basic MOS transistors, NMOS fabrication, CMOS fabrication and BICMOS technology. Basic Electrical Properties of MOS and BICMOS Circuits:  $I_{ds}$  versus  $V_{ds}$  relationships, threshold voltage  $V_t$ , Transconductance  $g_m$ , Figure of merit  $u_0$ , Pass transistor, NMOS inverter, Pull-up to pull-down ratio, CMOS inverter, BICMOS inverters, Latch-up in CMOS circuits.

**UNIT- II**

**MOS and BICMOS circuit Design processes:** MOS layers, Stick diagrams, Design rules and layout, Sheet resistance  $R_s$ , Standard unit of capacitance, The Delay unit, Inverter delays, Propagation delays, Wiring capacitances, Scaling models, Scaling factors for device parameters.

**UNIT- III**

**Subsystem design and layout:** Architectural issues, Switch logic, Gate Logic, examples of Structured Design (combinational logic).

**Design of an ALU subsystem:** Design of 4-bit adder, adder element requirements, a standard adder element, Implementing ALU functions with an adder. A further consideration of adders: Manchester carry chain, carry select adder, carry skip adder.

**UNIT- IV**

VLSI design flow, Introduction to ASICs, Full Custom ASICs, standard cell based ASICs, Gate array based ASICs, Programmable logic devices, PLAs, PALs, CPLDs and FPGAs.

**VHDL Hardware Description Language:** Program Structure, Types and Constants, functions and Procedures, Libraries and Packages, Structural Design Elements, Dataflow design Elements, Behavioral design Elements, The Time Dimension and Simulation, Synthesis.

**TEXT BOOKS:**

1. Douglas A.Pucknell and Kamran Eshraghian, Basic VLSI Design, Third edition, PHI, 2002.
2. Michael John Sebastian Smith, Application Specific Integrated Circuits, Addison Wesley, 2003.
3. J.Bhasker, A VHDL Primer, Pearson Education, Third edition, 1999.
4. John F Wakerly, Digital Design Principles & Practices, 3rd Edition, Pearson Education, 2002.

**REFERENCE BOOKS:**

1. Neil H E Weste and Kamran Eshraghian, Principles of CMOS VLSI Design, A system perspective, 2nd Edition, Pearson Education, 2002.
2. Stephen Brown and Z Vonko Vranesic, Fundamentals of Digital Logic with VHDL Design, TMH, 2002.

**EC-415/A**

**DSP PROCESSORS**

**L T P M**  
**4 1 0 100**

**UNIT – I**

Realtime concepts, structural level of processing, digital signal processing and DSP systems, comparison between general purpose processors and DSP processors, examples of DSP processors, motivation for the specialized processors.

**UNIT – II**

Numeric representation and arithmetic fixed point versus floating point representation, native data word widths, relation between data word size and instruction word sizes, effects of finite word registers.

**UNIT – III**

Key features of TMS 320C6713 processor, architecture and addressing modes of 6713 processor, instruction set of TMS 320C6713 processor.

**UNIT – IV**

Programming the TMS 320 c 6713 processor, implementation of circular convolution, linear convolution , FFT algorithms,. FIR filters, IIR filters and multi rate filters on the DSP processor.

**Text Books:**

John G Ackenhusin, Realtime signal processing, Printice Hall of India, 1999.  
Phil Lapsly, Jeff Bier, Amit Sheham, dDSP processor fundamentals and architectures and features, S Chand & Co. New Delhi.

**References:**

TMX 32C 67133 User Guide.

**UNIT – I**

**Introduction:** History of Neural Networks, Structure and functions of biological and artificial neuron, Neural network architectures, Learning methods, evaluation of neural networks

**UNIT – II**

**Supervised Learning – I:** Single layer networks, McCulloch – Pitts Neuron Model, Perceptron learning, Delta learning, Widrow – Hoff learning rules, Linear separability, Adaline and modifications.

**UNIT – III**

**Supervised Learning – II:** Multi layer networks: Architectures, Madalines, Backpropagation algorithm, importance of learning parameter and momentum term, radial basis functions, polynomial networks.

**Unsupervised Learning:** Winner – Take – all learning, out star learning, learning vector quantizers, counter propagation networks, Kohonen self organizing networks, Grossberg layer, adaptive resonance theory, Hamming Net.

**UNIT – IV**

**Associative Memories:** Hebbian learning rule, continuous and discrete, Hopfield networks, recurrent and associative memory, Boltzman machines, Bi-directional associative memory.

**Applications of Neural Networks :** Optimization, Travelling Salesman, Problem solving simultaneous linear equations, Applications in pattern recognition and Image Processing

**TEXT BOOKS:**

1. Kishan Mehrotra, Chelkuri K. Mohan, Sanjav Ranka, elements of Artificial Neural Networks, Tenram International
2. J.M. Zurada Introduction to Artificial Neural Systems, Jaico Publications
3. B. Yegnanarayana, Artificial Neural Networks, PHI, New Delhi
4. Wasserman: Neural Computing – Theory and Practice.
5. S.N.Deepa S.N.Sivanandam, Principles of Soft Computing, Second Edition.

**UNIT – I****PRODUCTION AND CLASSIFICATION OF SPEECH SOUNDS:**

Anatomy and Physiology of Speech Production, Categorization of Speech Sounds. Acoustics of Speech Production: Physics of Sound, Uniform tube model, A Discrete-Time model based on Tube Concatenation.

Time-Domain Models for Speech Processing: Short-Time energy, average zero crossing rate, Pitch period estimation using autocorrelation.

**UNIT – II****SHORT TIME FOURIER TRANSFORM ANALYSIS AND SYNTHESIS:**

Short Time Analysis, Signal estimation from STFT, Frequency Domain Pitch Estimation, A Correlation based Pitch Estimator, Pitch estimation based on a Comb Filter.

**DIGITAL REPRESENTATIONS OF THE SPEECH WAVEFORM:**

Instantaneous quantization, Delta Modulation, DPCM.

**UNIT – III****HOMOMORPHIC SIGNAL PROCESSING:**

Homomorphic Systems for Convolution, Complex Cepstrum of Speech-like Sequences, Spectral root Homomorphic Filtering, Short-Time Homomorphic Analysis, Short-time Speech Analysis and Analysis/Synthesis Structures.

**UNIT – IV****SPEECH CODING:**

Linear Prediction, Error minimization, Autocorrelation method, Levinson Recursion, Lattice filter formulation of the inverse filter. Vector Quantization, Distortion Measure, Sub-band coding

**SPEAKER RECOGNITION:**

Spectral features for Speaker Recognition, Mel- Cepstrum, Speaker Recognition Algorithms, Minimum – distance classifier.

**TEXT BOOKS:**

1. Thomas F Quatieri, Discrete-Time Speech Signal Processing Principles and Practice, Pearson Education, 2002.
2. L R Rabiner and R W Schafer, Digital Processing of Speech Signals Pearson Education, 2002.

**UNIT – I**

**INTRODUCTION AND ORBITAL ASPECTS OF SATELLITE COMMUNICATIONS:**

A brief history of Satellite Communications, Types of Orbits, Orbital Mechanics: Developing the Equation of the orbit, Kepler's laws of planetary motion, locating the satellite in the orbit, locating the Satellite with respect to the Earth, Orbital elements, Look angle determination, Orbital perturbations, launch and launch vehicles, Orbital effects in Communication System performance.

**UNIT – II**

**SATELLITE SUBSYSTEMS:**

Introduction, Attitude and Orbit Control System (AOCS), Telemetry, Tracking, Command and Monitoring (TTC&M), Power Systems, Communication Subsystems, Satellite Antennas

**MULTIPLE ACCESS TECHNIQUES:**

Introduction, FDMA, TDMA, DAMA and CDMA Satellite Systems Encoder, Decoder, Comparison between FDMA, TDMA & CDMA.

**UNIT – III**

**SATELLITE LINK DESIGN:**

Basic transmission theory, System Noise Temperature and G / T ratio. Design of Uplink and Down link models, Design of Satellite links for specified C / N ratio.

**EARTH STATION TECHNOLOGY:**

Earth Station Design, Design of large antennas, Small earth station Antennas, Propagation Effects on Satellite: Quantifying Attenuation and Depolarization, Rain and Ice Effects, Prediction of Rain Attenuation.

**UNIT – IV**

**VSAT SYSTEMS:**

Introduction, overview of VSAT Systems, Network Architectures, One –way Implementation, Split – Two-Way (Split IP) Implementation, Two-Way Implementation, Access Control Protocols, Delay Considerations, Basic Techniques: Multiple Access Selection, Signal Formats, Modulation, Coding, and Interference Issues.

**VSAT Earth Station Engineering:** Antennas, Transmitters and Receivers, Calculation of Link Margins for a VSAT Star Network, System Design Procedure.

Introduction, GPS Position Location Principles, Position Location in GPS, GPS Time, GPS Receivers and Codes.

**TEXT BOOKS:**

- 1) T Pratt and W Bostian, Satellite Communications, 2nd Edition, John Wiley,
- 2) W Tomasi, Advanced Electronic Communication Systems, 4th Edition, Pearson Education, 2002.
- 3) Taub and Schilling, Principles of Communication Systems, TMH, 2003.
- 4) Simon Haykin, Communication Systems, 4th Edition, John Wiley & Sons, 2004.

**REFERENCE BOOKS:**

1. D C Agarwal, Satellite Communications, Khanna Publishers, 2003.
2. Robert M Gagliardi, Satellite Communications.

**EC – 416/A**

**APPLIED ELECTRONICS (OPEN ELECTIVE)**

**L T P M**  
**4 0 0 100**

**UNIT -1**

Microphones, Headphones and Headsets, Loud Speakers, Disc Recording and Reproduction , Amplifying Systems Equalizers and Mixers, Electronic Music Synthesizers.

**UNIT – II**

Commercial Sound, Theatre Sound System, Audio Systems , Color TV standards and Systems, Remote Controls, Video Systems.

**UNIT – III**

Electronic Gadgets and Home Appliances:  
Telecommunication Systems, Switching Systems, Modulation Techniques, Carrier Systems, Fibre Optics

**UNIT –IV**

Data Services, Mobile Systems, Facsimile fax, Xerography

**Text Book:**

1. Consumer Electronics by S.P.Bali, Pearson Education, ISBN: 9788131717592.

**Reference Books:**

1. Consumer Electronics for Engineers by Philip Herbert Hoff, Cambridge University Press (July 28, 1998), **ISBN-10:** 0521582075
2. Digital Consumer Electronics Handbook by Ronadl K.Jurgen, (Editor) by McGraw Hill Professional Publishing, 1997. **ISBN-10:** 0070341435

**UNIT I****Digital communication and Broadband communications**

**Digital communication:** Digital fundamentals, fundamentals of data communications, data sets and sets and interconnection requirements, network and control consideration.

**Broadband communications:**

Multiplexing, short and medium-haul systems, long haul systems elements of long distance telephony.

**UNIT II****Microwave tubes and Circuits & Radar systems**

**Microwave tubes:** Microwave triodes, multicavity klystron, reflex klystron, magnetron, travelling-wave tube(TWT) types performance and applications, other microwave tubes like crossed-filed amplifier, backward-wave oscillator.

**Radar systems:** Basic principles, pulsed systems, other Radar systems

**UNIT III****Fiber optical technology and Antennas**

**Fiber optical technology** Introduction to light, the optical fiber and fiber cables, fiber optic components and systems, installation, testing and repairing.

**Antennas:** Basic considerations, wire radiators in space, terms and definitions, effects of ground on antennas.

**UNIT IV****Radio receivers and Transmission lines**

**Radio receivers:** Receiver types, AM receivers, Communications Receivers, FM Receivers, Single and independent-Sideband Receivers

**Transmission lines:** Basic principles, the smith chart and its applications, transmission-line components

**TEXT BOOKS:**

- 1) Electronic communication systems by KENNEDY 4th edition
- 2) Communication Systems by Simon Haykin 3rd edition

**REFERENCE BOOKS:**

- 1) Communication systems and techniques by Mischa Schwartz, Willam R.Bennett, Seymour Stein.
- 2) Communication systems by Marcelo S.Alencar, Valdemar C.da Rocha,

VHDL Modeling and Synthesis of the following Experiments

1. Logic Gates
2. Combinational Logic
3. JK, D, T, and SR flip-flops with preset and clear inputs
4. 4-bit shift register and bidirectional shift register with parallel load
5. 4-bit Ripple/Synchronous counters
6. 4-bit carry look ahead adder
7. Implementation Moore and Mealy state machines
8. Implementation of two 4-bit numbers multiplication using Booth's algorithm
9. Traffic light controller
10. Implementation of two floating-point numbers addition
11. Implementation of two floating-point numbers multiplication
12. Construct an 8-bit dedicated data path to generate and add the numbers from n down to 1, where 'n' is an 8-bit user input number
13. Construct an 8-bit dedicated control unit to generate and add the numbers from n down to 1, where 'n' is an 8-bit user input number
14. Construct an 8-bit general data path to generate and add the numbers from n down to 1, where 'n' is an 8-bit user input number
15. Construct an 8-bit general control unit to generate and add the numbers from n down to 1, where 'n' is an 8-bit user input number

**Experiments Based on Microwave Engineering**

- 1) To study microwave components.
- 2) To plot the V-I characteristics of Gunn Diode and determine the Threshold voltage.
- 3) To study the characteristics of reflex klystron oscillator.
- 4) Measurement of guided wavelength of the given Rectangular wave guide (Klystron or Gunn or both)
- 5) Calculate Low VSWR and High VSWR using VSWR Meter.
- 6) Attenuation and power measurement due to component under test and with the frequency.
- 7) Measure an unknown Impedance of a given load. (using smith chart also )
- 8) Measurement of scattering parameters of Magic Tee or Circulators.
- 9) Scattering coefficient measurement using the Vector Network Analyzer.
- 10) To demonstrate Spectrum Analysis measurement techniques of a signal source and measure frequency using spectrum analyzer.
- 11) Gain of Horn Antenna, radiation Pattern and beam width.
- 12) To measure the dielectric constant of given solid material.
- 13) To measure coupling coefficient, Insertion loss & Directivity of a Directional coupler.
- 14) To measure the Q – factor of the given wave guide.
- 15) To determine isolations, coupling coefficients and input VSWR's for E and H plane waveguide Tee and Magic Tee junctions

**UNIT I**

**CELLULAR MOBILE RADIO SYSTEMS:** Introduction to Cellular Mobile System, uniqueness of mobile radio environment, operation of cellular systems, consideration of the components of Cellular system, Hexagonal shaped cells, Analog and Digital Cellular systems.

**CELLULAR CONCEPTS:** Evolution of Cellular systems, Concept of frequency reuse, frequency reuse ratio, Number of channels in a cellular system, Cellular traffic: trunking and blocking, Grade of Service; Cellular structures: macro, micro, pico and femto cells; Cell splitting, Cell sectoring.

**INTERFERENCE:** Types of interferences, Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni directional Antenna system, design of Antenna system, antenna parameters and their effects, diversity receiver, non-cochannel interference-different types.

**UNIT II**

**FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT:** Numbering and grouping, setup access and paging channels, channel assignments to cell sites and mobile units: fixed channel and non-fixed channel assignment, channel sharing and borrowing, overlaid cells.

**CELL COVERAGE FOR SIGNAL AND TRAFFIC:** Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation, antenna height gain, form of a point to point model.

**UNIT III**

**CELL SITE AND MOBILE ANTENNAS :** Sum and difference patterns and their synthesis, omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas.

**HANDOFF STRATEGIES**

Concept of Handoff, types of handoff, handoff initiation, delaying handoff, forced handoff, mobile assigned handoff, intersystem handoff, vehicle locating methods, dropped call rates and their evaluation.

**UNIT IV**

**DIGITAL CELLULAR NETWORKS:** GSM architecture, GSM channels, multiple access schemes; TDMA, CDMA, OFDMA; architecture of 3G cellular systems.

**TEXTBOOKS:**

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2nd Edn., 2006.
2. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition, 2007.

**REFERENCES:**

1. Wireless Communications – Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.
2. Wireless and Mobile Communications – Lee McGraw Hills, 3rd Edition, 2006.
3. Mobile Cellular Communication – G Sasibhushana Rao Pearson
3. Wireless Communication and Networking – Jon W. Mark and Weihua Zhqung, PHI, 2005.
4. Wireless Communication Technology – R. Blake, Thompson Asia Pvt. Ltd., 2004.

**UNIT – I****INTRODUCTION:**

Historical development, Elements of an Optical Fiber transmission link, Advantages of Optical Fibers, Applications of Optical Fiber, Ray Theory Transmission, Total internal reflection, Acceptance angle, Critical angle, Numerical Aperture, Fiber types : Step Index, Graded Index : Modes of Propagation : single mode and multimode fibers, Fiber materials.

**UNIT – II****TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS:**

Attenuation, absorption, scattering and bending losses in fibers, Dispersion: Inter model and intra model.

**FIBER OPTIC COMPONENTS:**

Splicing, Connectors, Connection losses, Fiber Optic couplers, Fiber Optic Switches.

**UNIT – III****OPTICAL SOURCES:**

General characteristics, Principles of Light Emission. Light Emitting Diodes types-Planar, Dome, Surface emitting, Edge emitting Super luminescent LED's, Lens coupling to fiber, LED Characteristics – Optical output power & efficiency, output spectrum, modulation bandwidth, reliability.

LASER: Working of DH injection laser, DFB laser and Threshold condition for

lasing. DETECTORS: Principles of photo detection. PIN Photodiode, Avalanche Photodiode and their characteristics.

**UNIT – IV****OPTICAL FIBER SYSTEMS:**

Optical Transmitter Circuits - source limitations, LED drive circuits.

Optical Receiver operation-Digital system transmission, error sources, receiver configuration, Preamplifier types, Digital receiver performance probability of error, Quantum limit, System considerations – Link power budget, rise time budget, Direct intensity modulation, Advanced Multiplexing Strategies – OTDM, WDM.

**OPTICAL FIBER MEASUREMENTS:**

Numerical Aperture, attenuation, refractive index, dispersion losses, cutback and OTDR.

**TEXT BOOKS:**

1. John M Senior, Optical Fiber Communications: Principles and Practice, 2nd Edition, PHI, 2002.
2. Henry Zanger and Cynthia Zanger, Fiber Optics: Communication and other Applications, Maxwell Macmillan Edition.
3. JC Palais, Fiber Optic Communications, 2nd Edition, PHI, 2001.
4. W.Tomasi, Advanced Electronic Communication Systems, Pearson Education, 2002.

**UNIT I**

**TELECOMMUNICATION SWITCHING SYSTEMS:** Evolution of Telecommunications  
Simple Telephone Communication Basics of Switching System Electronic Space Division  
Switching Stored Program Control Centralized SPC Distributed SPC Software Architecture Two  
Stage Networks Three Stage Networks N Stage Networks Time Division Switching Basic Time  
Division Time Switching Combination Switching Three Stage Combination Switching N Stage  
Combination Switching

**UNIT II**

**TELEPHONE NETWORKS:** Subscriber Loop Systems Switching Hierarchy and Routing  
Transmission Plan Signaling Techniques In-channel Signaling Common Channel Signaling  
Network Traffic Load and Parameters Grade Of Service and Blocking Probability

**FUNDAMENTAL CONCEPTS OF DATA COMMUNICATIONS:** Data Communications  
Codes Bar Codes Character Synchronization Data Communications Hardware Data  
Communications Circuits Line Control Unit Serial Interfaces

**UNIT III****DATA-LINK PROTOCOLS AND DATA COMMUNICATIONS NETWORKS:**

Introduction Data Link Protocol Functions Character- and Bit- Oriented Data Link Protocols  
Asynchronous Data-Link Protocols Synchronous Data- Link Protocols Synchronous Data-Link  
Control High-Level Data-Link Control Public Switched Data Networks Asynchronous Transfer  
Mode

**DIGITAL T-CARRIERS AND MULTIPLEXING:** Time-Division Multiplexing T1 Digital  
Carrier North American Digital Hierarchy Digital Carrier Line Coding T Carrier Systems  
European Digital Carrier System Digital Carrier Frame Synchronization Bit Versus Word  
Interleaving Statistical Time Division Multiplexing Frequency Division Multiplexing FDM  
Hierarchy Composite Baseband Signal Formation of a Master Group

**UNIT IV**

**ISDN:** What Is ISDN? ISDN Components ISDN Channel Types Basic and Primary Rate  
Interfaces ISDN Protocols ISDN Features Services and Applications Other ISDN Initiatives

**DIALUP AND HOME NETWORKING:** What Is Dialup Networking? Analog Modem  
Concepts DSL Service Cable Modems Home Networking Concepts and Issues

**NETWORK CONVERGENCE:** What Is Network Convergence? Networking Issues and  
Convergence Effects of Network Convergence on Business Convergence At Home

**TEXT BOOKS:**

- 1) T Viswanathan, Telecommunication Switching Systems and Networks, PHI, 2004
- 2) Wayne Tomasi, Advanced Electronic Communications Systems, Pearson, 6th Edition, 2004
- 3) Machael A. Gallo and William M. Hancock, Computer Communications and Networking Technologies, Cengage Learning, 1st Edition, 2002

**REFERENCE BOOKS:**

- 1) J E Flood, Telecommunications Switching, Traffic and Networks, Person, 1999
- 2) Ray Horak, Communication Systems and Networks, 3rd Edition, Wiley, 2002

**UNIT – I****Introduction**

Wireless Technology in the Future- Orthogonal Frequency-Division Multiplexing- WLANs: MAC in WLAN Standards, QoS over WLANs, Security in IEEE 802.11-WPANs: Technical Challenges of a WPAN Technology, Enabling Technologies, Ongoing Research, Research Issues for Future WPAN Technology.

**UNIT – II**

**Channel Model for OFDM Systems :** Introduction, Characterization of the Mobile Radio Channel, FD Channel Modeling, FD Channel Simulation, Application to Millimeter-Wave Radio Channels.

**Basics of OFDM and Synchronization:** OFDM Introduction and System Model, Performance of an Uncoded OFDM System.

**UNIT – III****Peak Power Problem**

Introduction, Distribution of the PAPR, Clipping and Peak Windowing: Required Backoff with a Non ideal Power Amplifier, Coding and Scrambling. Peak Cancellation, PAPR Reduction Codes: Generating Complementary Codes, Minimum Distance of Complementary Codes, Maximum-Likelihood Decoding of Complementary Codes, Suboptimal Decoding of Complementary Codes, Large Code Lengths, Symbol Scrambling.

**UNIT – IV****A Novel Hybrid OFDM Concept**

Detailed Structure of Various Multiple-Access Schemes, Comparison to MCCDMA, Analytical Performance in Fading Channels and Simulation in AWGN Channels, Performance in Fading Channels with Perfect Estimation, Performance in Fading Channels with Realistic Estimation.

**TEXT BOOK:**

1. Ramjee Prasad, "OFDM for wireless Communication Systems", Artech House Publishers, 2004.

**REFERENCE BOOKS:**

1. Lajos Hanzo, M. Yunster, B.J. Cho! and T. Keller," OFDM and MC - COMA for Broadband Mult User Communications - WLANs and Broadcasting", John Wiley and sons, IEEE press, 2003.

**UNIT – I**

Direct Sequence Systems, definitions and concepts, Spreading sequences and waveforms, Systems with PSK Modulation, Quaternary Systems, Pulsed Interference, Rejection of Narrowband Interference.

**UNIT – II**

Frequency Hopping Systems, Concepts and Characteristics, Modulations, Codes for partial band interference, Frequency Synthesizers.

**UNIT – III**

Code Synchronization, Acquisition of Spreading sequences, Serial Search Acquisition, Acquisition correlator, code Tracking, Frequency Hopping Patterns.

**UNIT – IV**

Detection of Spread Spectrum Signals, Detection of Direct sequence signals, Detection of Frequency Hopping Signals.

**Text Book:**

1. Principles of Spread Spectrum Communication Systems by Don.J.Torrieri, Springer Publishers,2005.

**References:**

1. Introduction to spread-spectrum communications by Roger L. Peterson, Rodger E. Ziemer, David E. Borth, Prentice Hall, 1995.
2. Spread Spectrum in Communications, R.Skaug, J.F.Hjelmstad, Published by Institution of Electrical Engineers

**UNIT -I: Introduction to RF Electronics:** The Electromagnetic Spectrum, units and Physical Constants, Microwave bands – RF behavior of Passive components: Tuned resonant circuits, Vectors, Inductors and Capacitors – Voltage and Current in capacitor circuits – Tuned RF / IF Transformers.

**UNIT -II: Transmission Line Analysis:** Examples of transmission lines- Transmission line equations and Biasing- Micro Strip Transmission Lines- Special Termination Conditions- sourced and Loaded Transmission Lines. Single And Multiport Networks: The Smith Chart, Interconnectivity networks, Network properties and Applications, Scattering Parameters.

**Matching and Biasing Networks:** Impedance matching using discrete components – Micro strip line matching networks, Amplifier classes of Operation and Biasing networks.

**UNIT-III : RF Passive & Active Components:** Filter Basics – Lumped filter design – Distributed Filter Design – Diplexer Filters- Crystal and Saw filters- Active Filters – Tunable filters – Power Combiners / Dividers – Directional Couplers – Hybrid Couplers – Isolators. RF Diodes – BJTs- FETs- HEMTs and Models.

**RF Transistor Amplifier Design:** Characteristics of Amplifiers – Amplifier Circuit configurations, Amplifier Matching Basics, Distortion and noise products, Stability Considerations, Small Signal amplifier design, Power amplifier design, MMIC amplifiers, Broadband High Power multistage amplifiers, Low noise amplifiers, VGA Amplifiers.

**UNIT -IV: Oscillators:** Oscillator basics, Low phase noise oscillator design, High frequency Oscillator configuration, LC Oscillators, VCOs, Crystal Oscillators, PLL Synthesizer, and Direct Digital Synthesizer. RF Mixers:Basic characteristics of a mixer – Active mixers- Image Reject and Harmonic mixers, Frequency domain considerations.

### TEXT BOOKS

- 1) RF Circuit design: Theory and applications by Reinhold Ludwig, Pavel Bretchko. Pearson Education Asia Publication, New Delhi 2001.
- 2) Radio Frequency and Microwave Communication Circuits – Analysis and Design – Devendra K. Misra, Wiley Student Edition, John Wiley & Sons

### REFERENCE BOOKS

- 1) Radio frequency and Microwave Electronics – Mathew M. Radmangh, 2001, PE Asia Publ.
- 2) RF Circuit Design – Christopher Bowick, Cheryl Aljuni and John Biyler, Elsevier
- 3) Secrets of RF Design – Joseph Carr., 3rd Edition, Tab Electronics.
- 4) Complete Wireless Design – Cotter W. Sawyer, 2nd Edition, Mc-Graw Hill.
- 5) Practical RF Circuit Design for Modem Wireless Systems Vol.2 -Less Besser and Rowan

**UNIT – I****INTRODUCTION:**

Introduction to Embedded Systems, Processor Technology, Role of Processor Selection in Embedded Systems, Design Technology, Design of custom single purpose processor, optimization of custom single purpose processor, RT level - combination logic and sequential logic.

Design cycle in the development phase for an Embedded System, Using of target system or its Emulator and in-Circuit emulator, Use of software tools for development of an Embedded Systems.

**UNIT – II****RTOS AND OVERVIEW:**

Real Time Operating Systems: Architecture of Kernel, Task, Task States and Task Scheduler, Message Queues, Event Registers, Pipes, Signals, Semaphores, Memory Management, Interrupt Routines in an RTOS environment, Basic Design Using RTOS.

**UNIT – III****EMBEDDED SYSTEM DEVELOPMENT USING PIC MICROCONTROLLER:**

**Introduction to PIC:** Types of Memory Organizations, Various PIC Series, Present usage of PIC $\mu$ c, microC PRO to Program PIC, Merits and De Merits of PIC.

**PIC16C74A** Architecture, Memory Organization, Register Organization, Pin Description, Various Internal Peripherals (Timers, ADC, CCP, USART).

**Interfacing to PIC16C74A:** LEDs, Switch, LM35 & STEPER MOTOR.

**UNIT – IV****NETWORKS FOR EMBEDDED SYSTEMS:**

The I<sup>2</sup>C Bus, The CAN bus, SHARC link ports, Ethernet, Bluetooth: specification, Core protocol, IEEE 1149.1 (JTAG) Testability.

**TEXT BOOKS:**

1. Raj kamal "Embedded systems architecture, programming and design" Tata McGraw-Hill Publishing company Limited.
2. Embedded System Design: A Unified Hardware/Software Introduction  
Frank Vahid and Tony Givargis
3. Ajay V Deshmukh, "Microcontrollers: Theory and Applications" Tata McGraw-Hill Publishing company Limited.
4. K. D. K. K. PRASAD "Real time embedded systems".

**Reference Books:**

5. Peatman, J.B.,—Design with PIC Micro Controllers|Pearson Education, 3rd Edition, 2004.
6. Mazidi, M.A.,—PIC Microcontroller| Rollin Mckinlay, Danny causey Printice Hall of India, 2007.
7. Manish K Patel "The 8051 Microcontroller based embedded systems" Tata McGraw- Hill publishing company Ltd

**Unit - I**

Introduction: Nature of Radar. Maximum Unambiguous Range. Radar Waveforms, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Related Problems. Radar Equation: Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise and SNR, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets-sphere, cone-sphere). Transmitter power.

**Unit - II**

PRF and Range Ambiguities, System Losses (Qualitative treatment). Related Problems. CW and Frequency Modulated Radar: Doppler effect, CW Radar Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirement, Applications of CW radar. FMCW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Measurement Errors, Multiple Frequency CW Radar.

**Unit - III**

MTI and Pulse Doppler Radar: Introduction, Principle, MTIR Radar with- Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers Filter Characteristics, Blind Speeds, Double Cancellation staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance. Non-coherent MTI, MTI versus Pulse Doppler Radar. Tracking Radar : Tracking with Radar, Sequential Lobing, Conical Scan, Mono-pulse Tracking.

Radar Amplitude Comparison Mono-pulse (one and two coordinates), Phase Comparison Mono-pulse. Target Reflection Characteristics and Angular Accuracy. Tracking in Range Acquisition and Scanning Patterns. Comparison of Trackers. Radar Antennas Antenna Parameters, Reflector Antennas, Lens Antennas, Lens Antennas Coscant- Squared Antenna Pattern, Radomes.

**Unit IV**

Electronically Steered Phased Array Antennas, Phase Shifters, Frequency scan Arrays, Radiation for Phased Array, Architecture for Phased Arrays. Detection of Radar Signals in Noise: Introduction, Matched Filter Receiver Response Characteristics and Derivation, Correlation detection, Detection criteria, Detector Characteristics, Automatic Detection, Constant False Alarm Rate Receiver

Radar Receivers Noise Figure and Noise Temperature. Displays types. Duplexer Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas- Basic Concepts, Radiation Pattern. Beam Steering and Beam Width changes, Series versus Parallel Feeds. Applications, Advantages and Limitations.

**Text Books**

1. Introduction to Radar Systems Merrill I. Skolnik, SECOND EDITION, McGraw Hill, 1981.
2. Radar Engineering and fundamentals of Navigational Aids-G.S.N.Raju, I.K International, 2008.

**Reference Books**

1. Introduction to Radar Systems Merrill I. Skolnik, THIRD EDITION, Tata McGraw Hill, 2001.
2. Radar: Principles, Technologies, Applications- Byron Edde, Pearson Education.

**UNIT – I**

**Introduction :** Evaluation of Mobile Radio Communication, Mobile Radio Systems around the world, Examples of Wireless Communication Systems: Paging systems, Cordless Telephone Systems, Cellular Telephone Systems

**Modern Wireless Communication Systems :** Second generation cellular networks, third generation networks, Wireless Local Loop (WLL) LMDS, Wireless Local Area Networks (WLAN), Bluetooth & Personal Area Networks

**UNIT – II**

**The Cellular Concept – System Design Fundamentals :** Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems.

**Mobile Radio Propagation:** Large-Scale Path Loss: Introduction, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection, Ground Reflection, Diffraction Scattering, Practical Link Budget Design Using Path Loss Models, Outdoor Propagation Models-(Longley\_Rice Model & Durkin's Model\_ A Case Study), Indoor Propagation Model (Partition Losses (Same Model ) & Partition Losses between Floors), Signal Penetration into Buildings, Ray Tracing and Site Specific Modeling

**UNIT – III**

**Mobile Radio Propagation :** Small-Scale Fading and Multipath : Small-Scale Multipath Propagation, Impulse Response Model of a Multipath Channel, Small-Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of Small Scale Fading, Rayleigh and Ricean Distributions, Statistical Models for Multipath Fading Channels, Theory of Multipath Shape Factors for Small-Scale Fading Wireless Channels, Examples of Fading Behavior, Second-Order Statistics Using Shape Factors, Applying Shape Factors to Wideband Channels, Revisiting Classical Channel Models with Shape Factors

**UNIT – IV**

Review of the Modulation Techniques for mobile radio, Review of the Multiple Access techniques for Wireless Communication, Wireless data networking, Wireless Data Services, AMPS, Global System for Mobile(GSM)

**Text Books:**

1. TS Rappaport, wireless communications: principles and practice, Pearson education 2nd edition.
2. J G Proakis, Digital Communication, McGraw Hill, 1995.
3. GE Stuber, Principles of Mobile Communications, Kluwer academic 1996

**UNIT – I**

**Source Coding :** Mathematical models of Information, A Logarithmic Measure of information, Average and Mutual Information and Entropy, coding for Discrete memoryless Sources, Properties of Codes, Huffman Code, Run Length Codes, Lempel-Ziv Codes, Shanon – Fano coding.

**UNIT – II**

**Channel Coding :** Introduction to Linear Block Codes, Generated Matrix, Systematic Linear Block Codes, Encoder Implementation of Linear Block Codes, Parity Check Matrix, Syndrome Testing, Error Detecting and Correcting Capability of Linear Block Codes, Hamming Codes, Probability of an Undetected Error for Linear Codes Over a BSC- Perfect Codes.

**UNIT – III**

**Cycle Codes :** Algebraic Structure of Cyclic Codes, Binary Cyclic Code Properties, Encoding in Systematic Form, Syndrome Computation and Error Detection, Decoding of Cyclic Codes, Cyclic Hamming Codes

**BCH Codes :** Description of the Codes, Minimum Distance and BCH Bounds, Decoding Procedure for BCH Codes, Implementation of Galors Field Arithmetic, Implementation of Error Correction.

**UNIT-IV**

**Convolutional Codes :** Encoding of Convolutional Codes, Structural Properties of Convolutional Codes, State Diagram, Tree Diagram, Trellis Diagram, Maximum, Likelihood Decoding of Convolutional Codes, Viterbi Algorithm, Sequential decoding algorithm.

**Text Books :**

1. Error Control Coding – Fundamentals and Applications by SHU LIN and Daniel J. Costello, JR., Prentice Hall Inc
2. Simon Haykin – Communication Systems, 4th edition
3. Digital Communications – Fundamentals and Applications by Bernard Sklar, Pearson Education Asis, 2003.
4. Digital Communications – John G. Proakis, Mc. Graw Hill Publications
5. J. Das, Sk. Mallik, PK Chattergee – Princiiples of Digital Communication, NAI (P) Ltd, 2000

**UNIT – I**

Introduction to verilog HDL and Level of Abstraction. Hierarchical Modeling Concepts- Design Methodologies Modules and instances.  
Simulation Demonstration. Basic concepts, Data types, System Tasks and Compiler Directives.

**UNIT – II**

Modules and Ports- List of ports, Port Declaration, Port Connections Rules, Inputs, outputs, inout, Gate-Level Modeling-Gate types, Gate Delays and Dataflow Modeling-Continuous Assignments, Delays, Expression, Operators, and Operands, Synthesis Demonstration.

**UNIT – III**

Behavioral Modeling- Structured Procedures, Procedure Assignment, Timing Controls and Conditional Statements, Tasks and Functions.

**UNIT – IV**

Logic Synthesis with verilog HDL-Synthesis Design flow, RTL and Test Bench Modeling Techniques and Timing and Path Delay Modeling, Timing Checks, Switch Level Modeling

**TEXT BOOK:**

1. Samir Palnitkar, Verilog HDL, Pearson Education India, 2001.

**EC 461**

**OPTICAL COMMUNICATION LAB**

1. Study of Handling of Fibers
2. Characteristic of LASER and LED diodes
3. Characteristic of Photo Diode and Avalanche Photo Diode.
4. Measurement of Numerical Aperture
5. Measurement of Coupling and Bending Losses of a Fiber
6. Measurement of Fiber Dispersion
7. Analog Link Set up using a Fiber
8. Digital Link Set up using a Fiber
9. Characteristics of Time Division Multiplexing Link using Fiber Optics
10. Characteristics of Wave Length Division Multiplexing Link using Fiber Optics
11. Analog and voice communication through optical link
12. Study Of BER and Q- Factor

**EC 462**

**PROJECT WORK**