VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

An Autonomous Institution

Aziznagar Gate, C.B. Post, Hyderabad - 500 075, Telangana.

ACADEMIC REGULATIONS & SYLLABI (R15)

for

B.Tech (ECE) Third Year

(Applicable for the batches admitted from the Academic Year 2017-2018 onwards)

Part – A

ACADEMIC REGULATIONS (R15)

Definitions of Key Words

Academic Year: An academic year is referred as the period consisting of two consecutive semesters with 16 weeks each of instructional period followed by both the semester exams.

Course: A plan of study of a particular subject leading to an examination. All the courses need not carry the same weight. A course may be designed to comprise of lectures/ tutorials/ laboratory work/ field work/ outreach activities/ project work/ vocational training/ viva/ seminars/ assignments/ presentations etc. or a combination of some of these.

Choice Based Credit System (CBCS): Choice Based Credit System (CBCS) is the programme in which the students have a choice to choose from the prescribed courses and can learn at their own pace and the entire assessment is graded-based on a credit system.

Credit Point: It is the product of Grade Point and Number of Credits for a course.

Credit: A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/ field work per week.

Cumulative Grade Point Average (CGPA): It is a measure of overall cumulative performance of a student of all the semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to 2nd decimal place.

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.
Programme: An Educational Programme leading to the award of a Degree.

Semester: Each semester will consist of 16-18 weeks of academic work equivalent to 90 actual teaching days.

Semester Grade Point Average (SGPA): It is a measure of performance of the work done by the student in a semester. It is the ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to 2nd decimal place.

Transcript or Grade Card or Certificate: Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester.

Types of Courses: The Courses in under B.Tech, program may be of three kind's viz., Core, Elective and Mandatory.

a) Core Course:-

There may be a Core Course in every semester, and are to be compulsorily studied by a student and is essential requirement for a given Programme.

b) Elective Course:-

Elective Course is a course which can be chosen by the students from a pool of subjects. In general, the elective course is,

- Supportive to the discipline of study
- Providing an expanded scope of the course subjects
- Nurturing student's proficiency/skill/Research.
- In case an elective is "Discipline centric" and is offered by the student's department itself, the elective is called **Professional elective**.
- On the other hand, if the elective is offered by the other departments or if the choice is given to the students to choose from other disciplines, the elective is called an "**Open Elective**."

c) Mandatory Courses (Non-Credit Courses)

AICTE considers that the Course work of certain subjects is essential and as such for the award of a B.Tech degree a pass in these subjects is made mandatory. Therefore, such types of courses are referred as **mandatory courses**. As the AICTE also feels that only a familiarity with the subject content of these courses is essential, only a pass in each of these courses is required. Therefore, these subjects are included in the curriculum as non-Credit courses.

ACADEMIC REGULATIONS FOR B. TECH. (REGULAR)

Applicable for the students of B. Tech. (Regular) from the Academic Year 2017-18 onwards.

1. Courses of Study:

The following Four year Bachelor of Technology (B.Tech.) Programmes under Choice Based Credit System (CBCS) are offered with effect from the Academic Year 2017-18 onwards:

S. No.	Branch	Branch Code
I	Civil Engineering	01
II	Electrical and Electronics Engineering	02
III	Mechanical Engineering	03
IV	Electronics and Communication Engineering	04
V	Computer Science and Engineering	05
VI	Information Technology	12

2. Admission Procedure

2.1. Admissions will be done as per the norms prescribed by the Government of Telangana State.

2.2. The Government orders with regard to the admissions in vogue shall prevail.

2.3. The candidate should have passed the prescribed qualifying examination on the date of Admission.

3. Award of B. Tech. Degree

A student will be declared eligible for the award of B. Tech. Degree if he/she fulfills the following academic requirements:

3.1 The candidate shall register for 192 credits and secure all the 192 credits by securing a minimum CGPA of 5.0.

3.2 The external examination in all the subjects shall be conducted at the end of each semester for all the eight semesters.

3.3 Students joining the B.Tech. Programme shall have to complete the programme within 8 years from the year of joining. Similarly, the students joining the B.Tech. Programme in the third semester directly through Lateral Entry Scheme (LES) shall have to complete the programme within 6 years from the year of joining otherwise they shall forfeit they will not be permitted to pursue their studies nor will be allowed to write the exams.

4. Course Structure:

4.1 The course shall be of four Academic year's duration, each academic year having two semesters. Each semester shall have a minimum **16** weeks of instruction, with a minimum of **90** Instructional Days per Semester.

4.2 **Credits:**

Credits shall be assigned to each Subject/ Courses in a L: T: P: C (Lecture Periods: Tutorial Periods: Practical Periods: Credits) Structure, based on the following general pattern.

Type of course		Clock hour/week			
		L	**T**	**P**	**C**
Theory	1)	04	01	-	04
	2)	03	01	-	03
	3)	02	01	-	02
Practical		0	0	03	02
Drawing	1)	0	04	-	02
	2)	02	02	-	03
	3)	00	06	-	03
Mini project, Comprehensive Viva Voce Seminar, Major project		-	-	-	15

5. Attendance Requirements

5.1 A student is eligible to write the Semester End examinations only if he / she acquire a minimum of 75% of attendance in aggregate of all the subjects/Courses in that Semester.

5.2 Condonation for the shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted on medical grounds with a documentary evidence approved by the Academic Committee.

5.3 A stipulated fee shall be payable towards condonation of attendance shortage.

5.4 Students, whose shortage of attendance is not condoned, are not eligible to write semester end examinations of that semester. Such students are detained and their registration for the examination stands cancelled.

5.5 A student detained due to shortage of attendance in a semester may seek re-admission into that semester, as and when offered, within four weeks from the date of the commencement of class work with the academic regulations of the batch into which he/she gets admitted.

5.6 A student will be promoted to the next semester if he/she satisfies the attendance requirement of the present semester.

5.7 For all mandatory, non credit courses offered in a semester, a "Satisfactory Participation Certificate" shall be issued to the student, only after securing 75% attendance in such course. Letter Grade shall be allotted for these courses.

The courses offered in 8 semesters spread over 4 years have been classified into 8 categories under CBCS

S.No.	Subject categories	No. of Credits
1	Humanities and Social Sciences (HS) Subjects, English, Management and the courses dealing with personality development	**15**
2	Basic Sciences (BS) Subjects including Mathematics, Physics and Chemistry	**30**
3	Engineering Sciences (ES), Engg. Workshop, Drawing, Fundamentals of computer Science and courses dealing with the basics of Electrical / Electronics/ Mechanical engineering	**30**
4	Professional Core (PC) Subjects, Courses dealing with the concerned engineering branch	**81**
5	Professional Elective (PE) Subjects. The students opt electives offered by the department	**12**
6	Open Elective (OE) Subjects. Courses offered by the other braches representing technically important subjects from emerging areas.	**9**
7	Project Work, Seminar and/ or Internship in Industry or elsewhere along with mini project.	**10+2+3 =15**
8	Mandatory Courses (MC)	**nil**
Total Number of credits		**192**

B.Tech Year wise distribution of credits under CBCS

S.No.	Year	Semester	Credits	Total
1	1st Year	I	25	**48**
		II	23	
2	2nd Year	I	24	**48**
		II	24	
3	3rd Year	I	24	**48**
		II	24	
4	4th Year	I	24	**48**
		II	24	
Total No. of Credits				**192**

6. Promotion regulations

6.1 A student shall be promoted from B.Tech., I Year to II Year only if he/she fulfills the academic requirements of securing 50% of total credits (24 credits out of 48 credits, upto I year II Semester), from all the examinations, whether or not the candidate takes the examinations.

6.2 A student shall be promoted from B.Tech., II Year to III Year only if he/she fulfills the academic requirements of securing 50% of total credits (48 out of 96 credits, up to II year II semester, from all the examinations, whether or not the candidate takes the examinations.

6.3 A student shall be promoted from B.Tech., III year to IV year only if he/she fulfills the academic requirements of securing 50% of total credits (72 out of 144 credits) up to III year II semester), from all the examinations, whether or not the candidate takes the examinations.

7. Minimum Academic Requirements

The following minimum academic requirements are to be satisfied in addition to the requirements mentioned in item no.5.

7.1 A student shall be deemed to have satisfied the minimum academic requirements and has earned the credits allotted to each theory/practical/design/drawing subject/project and secured not less than 35% marks in Semester End Examination (SEE), and minimum 40% of marks in the sum total of the internal evaluation and end examination taken together.

7.2 The student has to pass the failed course by appearing the supplementary examination as per the requirement for the award of degree.

7.3 Students, who fail to earn 192 credits as indicated in the course structure within eight academic years from the year of their admission, shall forfeit their seat in B. Tech. course and their admission stands cancelled.

7.4 A student shall register and put up minimum Attendance and earn all 192 Credits for the award of degree.

7.5 When a student is detained due to shortage of attendance in any semester, no Grade allotments or SGPA/CGPA calculations will be done for that entire Semester in which a student got detained.

7.6 When a Student is detained due to lack of Credits in any year, he may be readmitted after fulfillment of the Academic Requirements, with the Academic Regulations of the Batch into which he gets readmitted for readmitted candidates. If there are any Professional Electives / Open Electives, the same may also be re-registered if offered. However, if those Electives are not offered in later Semesters, then alternate Electives may be chosen from the SAME set of Elective Subjects offered under that category.

7.7 After securing 192 Credits as specified for the successful completion of the entire UGP, an exemption of 6 Credits (two subjects with 3 credits each) may be permitted to drop resulting in 186 Credits for UGP performance evaluation. Accordingly, the performance of student in 186 Credits shall be taken into account for the calculation of 'the final CGPA and shall be indicated in the Grade Card. However, the student's performances in the earlier individual Semesters, with the corresponding SGPA for which already Grade Cards are given, will not be altered. Further, the optional drop out for such 6 Credits shall not be allowed for i) Laboratory courses, ii) Industrial Training/ Mini-Project, iii) Seminar, iv) Major Project v) Open electives.

7.8 A student is eligible to appear in the End Semester Examination in any Subject/ Course, but absent at it or failed (thereby failing to secure P Grade or above), may reappear for that subject/Course at the supplementary exam as and when the examinations are conducted. In such cases, his Continuous Internal Evaluation(CIE) assessed earlier for that subject/Course will be carried over, and added to the marks to be obtained in the supplementary examinations, for evaluating the performance in that subject.

7.9 A student with a final CGPA (at the end of the UGP) < 5.00 will not be eligible for the Award of the Degree.

8 Evaluation - Distribution and weightage of Marks

8.1 The performance of a student in each semester shall be evaluated Subject-wise (irrespective of Credits assigned) for a maximum of 100 marks for Theory or Seminar or Drawing/Design or Industry Oriented Mini-Project or Minor Course, etc. For Practical's a maximum of 75 Marks shall be evaluated. However the B. Tech. Project work (Major Project) will be evaluated for 200 Marks. These evaluations shall be based on 25% CIE (Continuous Internal Evaluation) and 75% SEE (Semester End Examinations) and a Letter Grade corresponding to the % marks obtained shall be given.

8.2 For theory subjects the distribution shall be 25 marks for Continuous Internal Evaluation (CIE) and 75 marks for the Semester End- Examination (SEE).

8.3 For theory subjects, during the semester there shall be 2 midterm examinations. Each midterm examination will be conducted for 20 marks and consists of Part-A (Short Answer Questions) for 6 marks and Part-B (Long Answer Questions) for 14 marks with duration of 90 Minutes. First midterm examination shall be conducted for 2.5 units of syllabus and second midterm Examination shall be conducted for remaining 2.5 units. The Average marks secured by a student in I and II Midterm examination are considered and shall be taken as the final marks secured by the student towards Continuous Internal Evaluation in the theory subject.

8.4 In case a few students are absent due to health reasons or any other unavoidable circumstances, or if the performance of some of the students is very poor, all such cases will be referred to a standing committee consisting of the Controller of examinations (Chairman), HoD of the concerned dept. and the Academic coordinator. On the recommendation of the committee, a makeup test will be conducted on payment of fee fixed by the examination branch.

8.5 In order to improve the attendance and to encourage the students who are regular to the college, 5 marks in each subject will be given to the students as per the percentage of attendance shown in the table,

Table: - Marks for attendance

S.No	Percentage of attendance	Marks to be awarded
1.	Less than 75%	nil
2.	75% to 80%	3
3.	80% to 85%	4
4.	85% and above	5

86 The Semester End Examination will be conducted for 75 marks which consist of two parts viz. i). Part-A for 25 marks, ii). Part –B for 50 marks. Part-A is compulsory, which consists of ten questions (numbered from 1 to 10) two from each unit carrying 2/3 marks each. Part-B consists of five questions (numbered from 11 to 15) carrying 10 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice (i.e., there will be two questions from each unit and the student should answer any one question).

87 For practical subjects there shall be a continuous evaluation during the Semester for 25 marks. Out of the 25 marks for internal evaluation, day-to-day work in the laboratory shall be evaluated for 15 marks and internal practical examination shall be evaluated for 10 marks conducted by the concerned laboratory teacher.

88 The Practical End Semester Examination shall be conducted with an external examiner and the laboratory teacher for 50 marks. The external examiner shall be appointed by the Principal from the panel of examiners recommended by Chairman, Board of Studies in respective Branches.

89 For the subject having design and/ or drawing, (such as Engineering Graphics, Engineering Drawing, and Machine Drawing), the distribution shall be 25 marks for Internal Evaluation (5 marks for day-to-day work and 20 marks for internal tests) and 50 marks for Semester End Examination. There shall be one internal test in a semester and shall be considered for the award of marks for internal test.

8.10. There shall be an industry-oriented mini-Project, to be taken up during the vacation after III year II Semester examination. However, the mini project and its report shall be evaluated in IV year I Semester at the time of practical exams. The industry oriented mini project shall be submitted in report form and should be presented before the committee, which shall be evaluated for 50 marks. The committee consists of an external examiner, Head of the department, the supervisor of mini project and a senior faculty member of the department. There shall be no internal marks for industry oriented mini project.

8.11. There shall be a seminar presentation in IV year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding of the topic, and submit it to the department. It shall be evaluated by the departmental committee consisting of Head of the Department, Seminar Supervisor and a Senior Faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for the seminar.

8.12. There shall be a Comprehensive Viva-Voce in IV year II semester. The Comprehensive Viva-Voce will be conducted by a committee consisting of Head of the Department and two Senior Faculty members of the department and is evaluated for 100 marks. The Comprehensive Viva-Voce is intended to assess the students understanding of the subjects he studied during the B. Tech. course. There will be no External Examiner for the Comprehensive Viva-Voce.

8.13. Out of a total of 200 marks for the major project work, 50 marks shall be for Internal Evaluation and 150 marks for the End Semester evaluation. The End Semester evaluation (viva-voce) shall be conducted by committee. The committee consists of an external examiner, Head of the Department, the supervisor of project and a senior faculty member of the department. The topics for industry oriented mini project, seminar and project work shall be different from each other. The evaluation of project work shall be conducted at the end of the IV year II Semester. The internal evaluation shall be on the basis of two seminars given by each student on the topic of his project.

8.14 . The Laboratory marks and the sessional marks awarded by the faculty are subject to scrutiny by the Institution whenever/wherever necessary. In such cases, the sessional and laboratory marks awarded by the teacher will be referred to a College Academic Committee. The Committee will arrive at a scaling factor and the marks will be scaled accordingly. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved as per the University rules and produced before the Committees of the University as and when asked for.

8.15 Candidates shall be permitted to apply for recounting/revaluation of SEE scripts within the stipulated period with payment of prescribed fee.

9.0. Malpractice Rules

S.No.	Nature of Malpractices /Improper conduct during examinations	Punishment
	If the candidate:	
1. (a)	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 candidate which can be used as an aid in the subject of the examination)	Expulsion fromthe examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate 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 candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	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 candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The hall ticket of the candidate is to be cancelled.

3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester end examinations.
5	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.	Cancellation of the performance in that subject.

6	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 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.	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 the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates 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.
7.	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 the candidate has already appeared including practical examinations and project work & shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

8.	Possess 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 the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If a student of the college, who is not a candidate for the particular examination or any person not connected with the examination or college indulges in any type of malpractice or improper conduct mentioned in clauses 6 to 8.	Student of the college will be expelled from the examination hall and cancellation of the performance in that subject and all other subjects. If the candidate has already appeared including practical examinations and project work shall not be permitted for the remaining examinations of the subjects 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 him/her.
10.	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 the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that the year.
11.	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.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the head of Institute for further action for a suitable punishment.	

All the cases pertaining to malpractices in examinations will be referred to a committee constituted by the Chief Controller of Examination and the committee will suggest action as per the guidelines mentioned above.

10. Grading Procedure:

10.1. Marks will be awarded to indicate the performance of each student in each theory subject, or Lab/Practical, or Seminar, or Project, or Mini-Project, Minor Course etc., based on the % marks obtained in CIE+SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified, and a corresponding Letter Grade shall be given.

10.2. As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed.

Letter Grade	**Performance**	**Grade Points**	**% of marks Secured (Class Intervals)**
O	Outstanding	10	Greater than or equal to 90%
A+	Excellent	9	80% and less than 90%
A	Very Good	8	70% and less than 80%
B+	Good	7	60% and less than 70%
B	Average	6	50% and less than 60%
C	Pass	5	40% and less than 50%
F	Fail	0	Below 40%
Ab	Absent	0	Absent

10.3. A student obtaining F Grade in any subject shall be considered 'Failed' and will be required to reappear as 'Supplementary Candidate' in the end Semester Examination (SEE), as and when offered. In such cases; his Internal Marks (CIE Marks) in those Subject(s) will remain same as those he obtained earlier.

10.4. A Letter Grade does not imply any specific % of Marks.

10.5. In general, a student shall not be permitted to repeat any Subject/Course (s) only for the sake of 'Grade Improvement' or 'SGPA/CGPA Improvement'. However, he has to repeat all the Subjects/Courses pertaining to that Semester, when he is detained.

10.6. A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course (excluding Mandatory non-credit Courses). Then the corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/ course. Credit Points (CP) = Grade Point (GP) x Credits for a Course.

10.7. The Student passes the Subject/ Course only when he gets GP $\geq$ 4 (P Grade or above).

11. Registration/Dropping

11.1. Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the academic calendar. It is absolutely necessary for the student to register for courses in time.

11.2. The student has to register for a minimum of 20 credits and may register up to a maximum of 28 credits based on the advice of the Faculty Advisor. On an average, a student is expected to register for 24 credits.

11.3. A student at the end of II year II semester either having CGPA of $\geq$ 7.0 or having passed all previous courses in the first attempt with a minimum SGPA $\geq$ 5.0 is allowed to register for an additional course/ credits from the offered open electives.

11.4. A series of open Electives will be offered to the students of III year I & II sems. and IV year I sem., which can be registered by the students as and when the notifications are issued at the end of II year II sem. and III year II sem. Prior permission for registration of open Electives as an additional course is compulsory.

11.5. A student would be allowed to register for an additional course only if he/she satisfies the prerequisites.

11.6. Departments will notify at the time of registration about the minimum number of students to be enrolled for a particular open elective to be offered.

11.7. Any student may be barred from registering for any course for specific reasons like disciplinary reasons or any other activities carried out by a student, which detrimental to the discipline of the college.

11.8. Dropping of Courses: Within four weeks after the commencement of the semester, the student may, in consultation with his / her faculty advisor, drop one or more courses without prejudice to the minimum number of credits. The dropped courses are not recorded in the Grade Card.

11.9. After Dropping, minimum credits registered shall be 20.

12. Earning of Credits

A student shall be considered to have completed a Course successfully and earned the credits if he/she secures an acceptable letter grade in the range 'O' to 'P'. Letter grade 'F' in any Course implies failure of the student in that Course and no credits earned.

13. Passing Standards:

13.1. A student shall be declared successful or 'passed' in a Semester, only when he gets a SGPA $\geq$ 5.00 (at the end of that particular Semester); and a student shall be declared successful or 'passed' in the entire UGP, only when he/she gets a CGPA $\geq$ 5.00; subject to the condition that he secures a GP $\geq$ 4 (P Grade or above) in every registered Subject/ Course in each Semester (during the entire UGP) for the Degree Award, as required.

13.2. (i) In spite of securing P Grade or above in some (or all) Subjects/ Courses in any Semester, if a Student receives a SGPA $<$ 5.00 and/ or CGPA $<$ 5.00 at the end of such a Semester, then he 'may be allowed' (on the 'specific recommendations' of the Head of the Department and subsequent approval from the Principal) to be promoted to the next year in the course.
(ii) If a student gets **P** grade or an SGPA is less than 5, is eligible to re appear for one or more of the same Subject(s)/ course(s) in which he has secured P Grade(s) in that Semester, at the Supplementary Examinations to be held in the next subsequent Semester(s). In such cases, his Internal Marks (CIE Marks) in those Subject(s) will remain same as those obtained earlier. In these considerations, the newly secured Letter Grades will be recorded and taken into account for calculation of SGPA and CGPA, only if there is an improvement.

13.3. A Student shall be declared successful or 'passed' in any Non-Credit Subject/ Course, if he secures a 40% marks or **P** grade in the end sem exam conducted by the college along with the other examinations.

13.4. After the completion of each Semester, a Grade Card or Grade Sheet (or Transcript) shall be issued to all the registered students of that semester, indicating the Letter Grades and Credits earned. It will show the details of the courses registered (Course Code, Title, No. of Credits, Grade Earned etc.), Credits earned, SGPA, and CGPA.

14. Eligibility for the award of B.Tech. Degree

A student shall be eligible for award of the B.Tech degree if he/she fulfils all the following Conditions:

14.1. The students should successfully complete all the components prescribed in the Programme of study to which he/ she is admitted.

14.2. The student should also obtain CGPA greater than or equal to 5.0.

14.3. Not having any pending disciplinary action.

15. Evaluating of Grade Point Averages:

15.1. SGPA and CGPA the *credit index* can be used further for calculating the Semester Grade Point Average *(SGPA)* and the Cumulative Grade Point Average *(CGPA)*, both of which being important performance indices of the student. While *SGPA* is equal to the *credit index* for a semester divided by the total number of *credits* registered by the student in that semester, *CGPA* gives the sum total of *credit indices* of all the previous semesters divided by the total number of *credits* registered in all these semesters. Thus, The Grade Point Average (GPA) will be calculated according to the formula:

$$GPA = \frac{\sum CiGi}{\sum Ci}$$

where Ci = number of credits for the course i, Gi = grade points obtained by the student in the course.

15.2. Semester Grade Point Average (SGPA) is awarded to candidates considering all the courses of the semester. Zero grade points are also included in this computation. SGPA is rounded off to TWO Decimal Places.

SGPA will be computed as follows;

$$\frac{\sum [(\text{Course } \textit{credits}) \text{ X } (\textit{Grade points})] \text{ (for all Courses passed in that semester)}}{\sum [(\text{Course } \textit{credits})] \text{ (for all courses registered in that semester)}}$$

15.3. To arrive at Cumulative Grade Point Average (CGPA), the formula is used considering the student's performance in all the courses taken in all the semesters completed up to the particular point of time. CGPA is rounded off to TWO Decimal Places.

CGPA will be computed as follows:

$$\frac{\sum [(\text{Course } \textit{credits}) \text{ X } (\textit{Grade points})] \text{ (for all Courses passed up to that semester)}}{\sum [(\text{Course } \textit{credits})] \text{ (for all Courses registered until that semester)}}$$

CGPA is thus computed from the I Year First Semester onwards, at the end of each Semester, as per the above formula. However, the SGPA of I year I Semester itself may be taken as the CGPA, as there are no cumulative effects.

15.4. Illustrative Example:

An illustrative example given in below Table below indicates the use of the above two equations in calculating SGPA and CGPA, both of which facilitate the declaration of academic performance of a student, at the end of a semester and at the end of successive semesters respectively . Both of them shall be normally calculated up to the second decimal position, so that the *CGPA,* in particular, can be made use of in rank ordering the student's performance in a class. If two students get the same *CGPA*, the tie should be resolved by considering the number of times a student has obtained higher *SGPA;* But, if it is not resolved even at this stage, the number of times a student has obtained higher grades like O, A, B etc shall be taken into account in rank ordering of the students in a class.

Year and Semester	Course No.	Credits	Grade	Grade Points	Credit Points
I Year I sem	XX101	5	A	8	40
I Year I sem	XX102	4	F	0	00
I Year I sem	XX103	3	A+	9	27
I Year I sem	XX104	4	F	0	00
I Year I sem	XX105	5	C	5	25
I Year I sem	XX106	5	P	4	20
Total		26(18*)			112
SGPA = 112/26 = 4.31				**CGPA = 4.31**	
I Year II Sem	XX107	5	B+	7	35
I Year II Sem	XX108	4	A	8	32
I Year II Sem	XX109	3	C	5	15
I Year II Sem	XX110	5	P	4	20
I Year II Sem	XX111	4	A+	9	36
I Year II Sem	XX112	2	F	0	00
I Year II Sem	Xx113	2	A	8	16
Total		25(23*)			154
SGPA = 154/25 = 6.16		**CGPA = 266/51 = 5.22**			

*Total No. of credits excluding those with 'F'; this is particularly important to keep track of the number of credits earned by a student up to any semester.

16. Award of Class

16.1. 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:

CGPA	Class Awarded	
≥8.00	First Class with Distinction	From the CGPA secured from 192 credits
≥6.50 - <8.00	First Class	
≥5.50 - <6.50	Second Class	
≥5.00 - <5.50	Pass Class	

16.2. The marks obtained in Internal Evaluation (IE) and Semester End Examination (SEE) will be shown in the memorandum of marks.

16.3. For the purpose of awarding first Class with Distinction (CGPA ≥ 8.0), the student must obtain the minimum required CGPA within 4 academic years or within 3 academic years in case of Lateral Entry candidates by clearing all the courses.

16.4. Candidates detained/ prevented from writing the semester end examinations due to any reason in any semester are not eligible for the award of First Class with Distinction. Such candidate's even if the CGPA ≥ 8.0 shall be placed in first class.

16.5. For the purpose of awarding First, Second and Pass Class, CGPA obtained in the examinations appeared within the maximum period allowed for the completion of course shall be considered as per the regulations.

16.6. A student with final CGPA (at the end of the UGP) < 5.00 will not be eligible for the award of the Degree.

16.7. The CGPA can be converted to equivalent percentage of marks by using the equation., % of Marks = (CGPA - 0.5) X 10.

17. Consolidated Grade Card

A consolidated grade card containing credits & grades obtained by the candidates will be issued after completion of the four years B. Tech Programme.

18. Withholding of Results

If a student is having any indiscipline related issues pending, the result of the student will be withheld and will not be allowed to move into the next semester. His/ her degree will be withheld in such cases and the matter will be referred to the academic council for final decision.

19. Transitory Regulations

19.1. Discontinued, detained for attendance, detained for want of credits, or failed students are eligible for readmission as and when the course is offered during the subsequent academic year as per the college admission procedures.

19.2. Students on transfer from a non- autonomous or from an autonomous college shall complete all the courses of the concerned programme not covered in the earlier organization. However, he/she should take the remaining courses in the programme along with the other students.

19.3. There shall be no branch transfers after the cutoff date of admissions made in the B.Tech. I year.

20. Transcripts

After successful completion of the total programme of study, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee.

21. Supplementary Examinations

In addition to the Regular end semester examinations, Supplementary Examinations for the previous semesters will be conducted along with end sem. Examinations. A student can appear for any number of supplementary examinations till he/she clears all courses which he/she could not clear in the first attempt. However the maximum stipulated period cannot be relaxed under any circumstances.

22. Graduation Ceremony

23.1. The College shall have its own annual Graduation Ceremony for the award of degree to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute.

23.2. The College shall institute Prizes and Awards to meritorious students, for being given away annually at the Graduation Ceremony.

24. Termination from the Program

The admission of a student to the program may be terminated and the student may be asked to leave the Institute in the following circumstances:

24.1. The student fails to satisfy the requirements of the program within the maximum period stipulated for that program.

24.2. The student fails to satisfy the norms of discipline specified by the institute from time to time.

25. Non-Credit Courses (Mandatory Courses)

25.1. Requirement of 75% attendance as per the college regulations is compulsory of completing the mandatory courses.

25.2. Specified number of Mandatory Courses among the designated ones is compulsory requirement for all the students for the award of B.Tech. Degree.

25.3. Although these courses do not carry any credits, performance in these subjects is evaluated following the procedure adopted for other subjects with the same marks. However, their performance will be indicated in the student's memo of marks as Satisfactory/ Unsatisfactory.

25.4. Although mandatory courses are Non-Credit Course, all the students should secure a minimum of 40% marks in the end sem. exam conducted by the college along with the other examinations for the award of B.Tech., degree.

26. Amendments

The Academic regulations here under are subject to amendments as may be made by the Academic Council of the College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already undergoing the program) as may be decided by the Academic Council.

27. General

27.1. Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

27.2. The academic regulation should be read as a whole for the purpose of an interpretation.

27.3. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

27.4. The college may change the academic regulations, course structure & syllabi at any time.

ACADEMIC REGULATIONS FOR B. TECH. (LATERAL ENTRY STUDENTS)

Applicable for the students admitted into II year B. Tech. (Lateral Entry Scheme) from the Academic Year 2016-17 and onwards.

1. Eligibility for award of B. Tech. Degree (LES)

1.1 The LES candidates shall pursue a course of study for not less than three academic years and not more than six academic years.

1.2 The candidate shall register for 144 credits and secure 144 credits by securing a minimum CGPA of 5.0 from the exams. of B.Tech. II to IV year for the award of B.Tech. Degree.

1.3 The students, who fail to fulfill the requirement for the award of the degree in six Academic years from the year of admission, shall forfeit their seats. The attendance regulations of B. Tech. (Regular) shall be applicable to B.Tech.(LES).

2. Promotion Rule

2.1. A student shall be promoted from B.Tech., II Year to III Year if he/she gets at least a minimum of 24 out of 48 credits, up to II year II semester, from all the examinations, whether or not the candidate takes the examinations.

2.2. A student shall be promoted from III year to IV year if he/she gets a minimum of 48 out of 96 credits, up to III year II semester, from all the examinations, whether or not the candidate takes the examinations.

2.3. A student shall register and put up minimum attendance in all 144 credits and earn all 144 credits to be eligible for the award of B.Tech degree.

2.4. A student, who fails to earn 144 credits as indicated in the course structure within six academic years, shall forfeit his/her admission in B.Tech. Course.

3. Award of Class

A student, who satisfies all the requirements prescribed for the completion of the B.Tech. program, is eligible for the award of the said degree, in any one of the following four classes:

CGPA	Class Awarded	
≥8.00	First Class with Distinction	From the CGPA secured from 144 credits
≥6.50 - <8.00	First Class	
≥5.50 - <6.50	Second Class	
≥5.00 - <5.50	Pass Class	

4. All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B.Tech. (Lateral Entry Scheme).

5. The malpractice rules and procedures for evaluating the SGPA and CGPA mentioned under points 9 - 27, are also applicable to the later entry students.

Part – B

Course Structure & Syllabi

of

B.Tech., III Year I Semester

Academic Calendar of II/III B.Tech (I & II Sem.) for the Academic Year, 2017-18

II/III YEAR I SEMESTER		**Commencement of Class Work 12-06-2017**	
	From	**To**	**Duration**
Registrations	12.06.2017	17.06.2017	1 Week
I Spell of Instruction	19.06.2017	14.08.2017	8 Weeks
I Mid Examinations	16.08.2017	19.08.2017	4 Days
II Spell of Instruction	21.08.2017	23.09.2017	5 Weeks
Dussehra Holidays	24.09.2017	02.10.2017	10 Days
II Spell of Instruction Continuation	03.10.2017	21.10.2017	3 Weeks
II Mid Examinations	23.10.2017	26.10.2017	4 Days
Preparation & Practical Examinations	27.10.2017	04.11.2017	10 Days
III Mid Examinations (Lateral Entry/ Re-Admitted/Betterment)	06.11.2017	09.11.2017	4 Days
End Semester Examinations	13.11.2017	25.11.2017	2 Weeks
Supply Exams	27.11.2017	09.12.2017	2 Weeks
II/III YEAR II SEMESTER		**Commencement of Class Work 11-12-2017**	
I Spell of Instruction	11.12.2017	06.02.2018	8 Weeks 3 Days
I Mid Examinations	07.02.2018	10.02.2018	4 Days
II Spell of Instruction	12.02.2018	09.04.2018	8 Weeks
II Mid Examinations	10.04.2018	13.04.2018	4 Days
Preparation and Practical Examinations	16.04.2018	21.04.2018	1 Week
End Semester Examinations	23.04.2018	05.05.2018	2 Weeks
Supplementary Examinations	07.05.2018	19.05.2018	2 Weeks
Summer Vacation	14.05.2018	09.6.2018	3 Weeks

B.TECH ECE III YEAR COURSE STRUCTURE

S. No.	Subject Code	Subject Name	Lectures			Credits
			L	T	P	
		III/I Semester				
1	**A15413**	Analog Communications	4	0	0	3
2	**A15414**	Linear & Digital IC Applications	3	1	0	4
3	**A15415**	Control Systems Engineering	3	1	0	3
4	**Professional Elective -1**	**A15416** - Computer Organization and Architecture	4	0	0	3
		A15417 - Soft Computing				
		A15418 - Biomedical Instrumentation				
5	**Open Elective-1**	**A15419**- Introduction to Microcontrollers & Applications	4	0	0	3
		A15420 - Basic Electronics & Instrumentation				
6	**A15487**	Analog Communications Lab	0	0	3	2
7	**A15488**	Linear & Digital IC Applications Lab	0	0	3	2
8	**A15089**	Advanced Communication Skills Lab	0	0	3	2
9	**MC-III**	Quantitative Methods & Logical Reasoning	2	0	0	2
	Total		**20**	**2**	**9**	**24**
		III/II Semester				
1	**A16018**	Managerial Economics and Financial Analysis	4	0	0	3
2	**A16422**	VLSI Design	3	1	0	3
3	**A16423**	Digital Signal Processing	3	1	0	3
4	**A16424**	Microprocessors and Microcontrollers	4	0	0	3
5	**Professional Elective2**	**A16425** - Optical Communications	4	0	0	3
		A16426 - Programming in MATLAB				
		A16427 - Satellite & Wireless Communications				
6	**Open Elective-2**	**A16428** - Fundamentals of Embedded Systems	4	0	0	3
		A16429 - Principles of Communications				
7	**A16489**	Microprocessors and Microcontrollers Lab	0	0	3	2
8	**A16490**	Digital Signal Processing & e-CAD Lab	0	0	3	2
9	**MC-IV**	Personality Development & Behavioural Skills	2	0	0	2
	Total		**24**	**2**	**6**	**24**

ANALOG COMMUNICATIONS

L	T	P	C
4	0	0	3

Pre Requisites

- Signals and Systems
- Electronic Devices And Circuits
- Probability Theory and Stochastic Process

Course objectives

In this course it is aimed to introduce to the students with

- To illustrate the types of communication systems and need for Modulation.
- To enumerate the time and frequency domain analysis of basic modulation schemes and their importance.
- To analyze the effect of noise on different modulation techniques.
- To understand the Characteristics of Receiver and its types.

UNIT-I

Amplitude Modulation: Introduction to communication system - Need for modulation - Amplitude Modulation - Time - frequency domain description- power relations. Generation of AM waves - Detection of AM Waves -Double side band suppressed carrier modulators - time -frequency domain description - Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB - SC Modulated waves.

UNIT-II

SSB Modulation: Frequency domain description - Frequency discrimination - Generation of AM SSB Modulated Wave - Time domain description- Demodulation of SSB - Waves Vestigial side band modulation: Frequency description – Generation- Time domain description, Envelope detection - Comparison of AM Techniques - Applications.

UNIT-III

Angle Modulation Concepts: Basic concepts -FM: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave - Narrow band FM - Wide band FM - Constant Average Power - Transmission bandwidth of FM - Wave Generation of FM Waves- direct indirect Method - Detection of FM Waves - FM transmitter block diagram -Comparison of FM & AM.

UNIT-IV

Noise: Noise - Analog noises - Resistive noise (thermal) - shot noise - extraterrestrial noise - white noise - Narrow band noise- arbitrary noise sources - modeling of noise sources - average noise bandwidth - effective noise temperature - average noise figures - cascaded networks. Noise in DSB & SSB System AM System - Angle Modulation System - Threshold effect - noise triangle -Pre-emphasis - De-emphasis.

UNIT-V

Receivers: Radio Receiver - Receiver Types - RF section - Characteristics - Frequency changing and tracking - Intermediate frequency –AGC - FM Receiver - Comparison with AM Receiver - Amplitude limiting.

Pulse Modulation: Types of Pulse modulation, PAM- PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM, Time Division Multiplexing.

TEXT BOOKS

1. Principles of Communication Systems – H Taub& D. Schilling, GautamSahe. TMH, 2007 3rd Edition.
2. Principles of Communication Systems - Simon Haykin. John Wiley, 2nd Edition.

REFERENCES

1. Electronics & Communication System - George Kennedy and Bernard Davis, 4th Edition TMH 2009.
2. Analog Communications- KN Hari Bhat & Ganesh Rao, Pearson Publications, 2nd Edition 2008.
3. Communication Systems Second Edition - R.P. Singh. SP Sapre, TMH, 2007.
4. Communication Systems - B.P Lathi, BS Publication, 2006.

Course Outcomes

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

CO1: Understand the importance of probability theory and the properties of Fourier Transform for the Analysis of Analog Communication Systems.

CO2: Interpret the Time and Frequency domain analysis of different analog modulation schemes.

CO3: Analyze the given communication system for computing the transmission bandwidth, Power requirement based on the used modulation schemes.

CO4: Design and Utilize different modulation and demodulation schemes used in Real time.

CO5: Differentiate the various divergent noise and its effects on analog modulation schemes, also the various types of receiver characteristics.

L T P C
3 1 0 4

LINEAR AND DIGITAL IC APPLICATIONS

Pre Requisites

- Switching Theory and logic Design
- Pulse and Digital Circuits
- Electrical Circuits

Course Objectives

In this course it is aimed to introduce to the students with

- To introduce the basic building blocks of linear integrated circuits & its applications.
- To elaborate the theory of ADC and DAC with its specifications.
- To explain and develop the applications of Timers (555), PLL (565) and Voltage regulators (78XX, 79XX).
- To relate the various Logic families.
- To summarize the combinational and sequential logic circuits using 74XX IC's.

UNIT-I

Operational Amplifier: Introduction, Classification of IC's, IC chip size and circuit complexity, Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp

Applications of Op-Amp: Inverting, Non-Inverting, Differential modes, Instrumentation, Sample and Hold Circuit, AC Amplifier, Differentiator and Integrator, Comparator, Schmitt Trigger, waveform Generators - Triangular, Saw tooth, Square wave.

UNIT-II

Active filters: Introduction to Active Filters, Characteristics of Band pass, Band rejects and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters,

D to A and A to D Converters: Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications

UNIT-III

Timer and Phase Locked Loops: IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications. IC565 PLL - Block Schematic, Description of Individual Blocks, VCO Applications.

Voltage regulator: Introduction to Voltage Regulators, Features & Internal Operation of 723 Regulator, Three Terminal Voltage Regulators (78XX,79XX).

UNIT-IV

Digital Integrated Circuits: Comparison of Various Logic Families, TTL Logic ,CMOS Logic TTL Driving CMOS & CMOS Driving TTL, Combinational Logic ICs - Specifications and Applications of TTL-74XX Series ICs - Code Converters, Decoders, Demultiplexers, LED & LCD decoders with drivers , Encoder, Multiplexer, Demultiplexer, Parallel Binary Adder/ Subtractor, Magnitude Comparators.

UNIT-V

Sequential Logic IC's and Memories: 74XX Series ICs - All Types of Flip-flops, Conversion between Flip-flops Synchronous Counters, Decade Counters, Shift Registers, Applications of Shift Registers

TEXT BOOKS

1. D. Roy Choudhury, Shail B. Jain (2012), Linear Integrated Circuit, 4th editin, New Age International Pvt. Ltd.,
2. Floyd, Jain (2009), Digital Fundamentals, 8th edition, Pearson Education

REFERENCES

1. Ramakant A. Gayakwad, (2012), OP-AMP and Linear Integrated Circuits, 4th edition,.
2. Sergio Franco (1997), Design with Operational Amplifiers and Analog Integrated Circuits, McGraw Hill.
3. Gray, Meyer (1995), Analysis and Design of Analog Integrated Circuits, Wiley International.
4. John F. Wakerly (2007), Digital Design Principles and practices, Prentice Hall / Pearson Education.

Course Outcomes

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

CO1: Ability to elucidate the characteristics of ideal and practical operational amplifier

CO2: Apply knowledge of mathematics to analyze operational amplifier in inverting and non-inverting configuration modes and develop the applications of IC 741.

CO3: Examine and infer the functionality of 555 timer and 565 PLL Integrated circuits.

CO4: Interpret the concepts and features of Analog to Digital and Digital to Analog converter in Integrated circuits form.

CO5: Evaluate the various Combinational and sequential logic using 74XX Digital Integrated circuits.

L T P C
3 1 0 3

CONTROL SYSTEMS ENGINEERING

Pre Requisites

- Signals & Systems
- Mathematics-I

Course Objective

In this course it is aimed to introduce to the students with

- To introduce the basic concepts of control theory on systems.
- To obtain the basic knowledge on mathematical modeling of systems.
- To contrast the time & frequency domain analysis of control systems.
- To state the effects of stability on Analog systems.
- To understand the modeling of nonlinear control systems using space state approach.

UNIT-I

Introduction: Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems

Transfer Function Representation: Transfer Function Representation- Block diagram representation of systems -Block diagram algebra – Representation of System by Signal flow graph – Reduction using mason's gain formula.

UNIT-II

Time Response Analysis: Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of Proportional derivative, proportional integral systems, PID Controller

UNIT-III

Stability Analysis in S-Domain: The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability

Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT-IV

Frequency Response Analysis: Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots. Polar Plots, concept of Nyquist Stability Criterion. Introduction to Compensation techniques

UNIT-V

State Space Analysis Of Continuous Systems: Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts ofControllability and Observability

TEXT BOOKS

1. Automatic Control Systems 8th edition – B. C. Kuo 2003– John wiley and sons.,
2. Control Systems Engineering – I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 2nd edition.

REFERENCES

1. **Control Systems 2nd Edition, A. Anand Kumar-** Prentice Hall of India Pvt. Ltd.,
2. Control Systems Engineering,-Palani 2nd Edition Mcgraw Hill Education
3. Control Systems by N.K.Sinha, New Age International (P) Limited Publishers, 3rd Edition.
4. Control Systems Engg. by NISE 3rd Edition – John wiley
5. "Modelling& Control Of Dynamic Systems" by Narciso F. Macia George J. Thaler, Thomson Publishers.

Course Outcomes

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

CO1: Demonstrate and understand the fundamentals of control systems.

CO2: Determine and use models of physical systems in different forms suitable for use in the analysis and design of control systems.

CO3: Relate the time and frequency-domain responses of first and second-order systems to step and sinusoidal inputs.

CO4: Examine the stability of a closed-loop control system

L T P C
4 0 0 3

COMPUTER ORGANIZATION AND ARCHITECTURE
(Professional Elective-I)

Pre Requisites

- Switching theory & Logic Design

Course Objectives

In this course it is aimed to introduce to the students with

- To understand the basic structure and operation of a digital computer.
- To Interpret the various memory system and input / output organization involved in system design
- To illustrate the basics of Basic Computer design
- To explain the various features of Microprogrammed control, arithmetic operations and the process involved in Multiprocessor for system design.

UNIT-I

Structure Of Computers: Computer types, functional units, basic operational concepts, V onNeumann architecture, bus structures, software, performance, multiprocessors and multicomputer, data representation, fixed and floating point and error detecting codes.

Register Transfer and Micro Operations: Register transfer language, register transfer, bus and memory transfers, arithmetic micro operations, shift micro operations, arithmetic logic shift unit

UNIT-II

Basic Computer Organization and Design: Instruction codes, computer registers, computer instructions, instruction cycle, timing and control, memory reference instructions, input, output and interrupt.

Central Processing Unit: stack organization, instruction formats, addressing modes, dat a transfer and manipulation, program control, reduced instruction set computer (RISC).

UNIT-III

Micro Programmed Control:

Control memory, address sequencing, microprogram example, and design of control unit.

Computer Arithmetic: Addition and subtraction, multiplication and divisionalgorithms, floatingpointarithmetic operation, decimal arithmetic unit, and decimal arithmetic operations.

UNIT-IV

The Memory System: Basic concepts, semiconductor RAM types of read only memory (ROM), cache memory, performance considerations, virtual memory, secondary storage raid, direct memory access (DMA).

UNIT-V

Multiprocessors: Characteristics of multiprocessors, interconnection structures, inter Processor arbitration, inter processor communication and synchronization, cache Coherence, shared memory multiprocessors.

TEXT BOOKS

1.M. Moris Mano (2006), Computer System Architecture, 3rd edition, Pearson/PHI, India
2.Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), Computer Organization, 5th edition, McGraw Hill, New Delhi, India.

REFERENCES

1.William Stallings (2010), Computer Organization and Architecture- designing for performance, 8th edition, Prentice Hall, New Jersy.
2.Andrew S. Tanenbaum (2006), Structured Computer Organization, 5th edition, Pearson Education Inc, New Jersey.
3.Sivarama P. Dandamudi (2003), Fundamentals of Computer Organization and Design Springer Int. Edition, USA.

Course Outcomes

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

CO1: Recall the structure and organization involved in digital computer design.

CO2: Identify the different memory and input- output system involved in system design.

CO3: Understand the basics of computer organization and its design on program control and computer arithmetic operations.

CO4: Comprehend the various details of multiprocessor in computer design

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4 0 0 3

SOFT COMPUTING
(Professional Elective-I)

Pre Requisite

- Switching Theory and Logic Design

Course Objectives

In this course it is aimed to introduce to the students with

- To familiarize with various soft computing frameworks for engineering applications.
- To introduce the ideas of different neural networks and to provide the mathematical model of various networks.
- To illustrate and analyze the concepts of fuzzy logic involved in various systems
- To interpret the various stages involved in optimization of engineering problems using Genetic Algorithm.

UNIT-I

Introduction: Introduction of soft computing - soft computing vs. hard computing- Soft computing techniques- Hybrid Systems-Applications of soft computing.

Biological Neural Network-Neuron- Nerve structure and synapse- Artificial Neuron and its model- - Neural network architecture- single layer and multilayer feed forward networks- Supervised and unsupervised Learning- activation functions-Basic Terminologies of ANNs.

UNIT-II

Artificial Neural Networks: McCulloch Pitts neuron model- Hebb net – Perception - Adaline and Madaline- Radial Basis Function Network- Pattern Association – Hetero Associative neural network – Auto associative net - Hopfield networks – Kohonen's self-organization maps – Counter propagation – Back propagation neural network.

UNIT-III

Introduction to Fuzzy Logic: Introduction to Classical and Fuzzy sets – fuzzy set operations- fuzzy relations – Membership functions Fuzzification- inference and defuzzification – Fuzzy to crisp conversion – fuzzy rules – fuzzy approximate reasoning.

UNIT-IV

Fuzzy Logic Control System: Introduction to fuzzy logic modeling and control- Fuzzy logic controller –- Fuzzy knowledge and rule bases- Fuzzy decision making logic – design of fuzzy logic controller – Fuzzy based Temperature controller –Fuzzy modeling and control schemes for nonlinear systems

UNIT-V

Genetic Algorithm: Introduction –-Biological Background-Basic Operators and Terminologies in GAs –-- Fitness Computations, Encoding, Selection, Cross over, Mutation – Simple GA -Generational cycle – General Genetic Algorithm – Convergence of GA – Constraints in GA – Classification of Genetic Algorithm –Applications and limitations of GA - Simple problems.

TEXT BOOKS

1. J.S.R.Jang, C.T.Sun and E.Mizutani, Neuro-Fuzzy and Soft Computing, PHI, 2004, Pearson Education.
2. LaureneFausett, Fundamentals of Neural Networks, Prentice Hall, Englewood cliffs.N.J.
3. Timothy J.Ross, Fuzzy logic with Engineering Applications; McGraw Hill, 1997.
4. Goldberg, D.E "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y, 1989.
5. S.N. Sivanandan and S.N. Deepa, Principles of Soft Computing, Wiley India, 2007. ISBN: 10: 81-265-1075-7

REFERENCES

1. Klir G.J. and Yuan B.B, Fuzzy sets and fuzzy logic, Prentice Hall of India, 1997. 2. Kosko.B, "Neural Networks and Fuzzy systems", PHI, 1992.
2. Driankov D., Helledorn H., M.Reinframe, "An Introduction to Fuzzy Control", Narosa Publishing Co., 1996.
3. S. Rajasekaran and G.A.V.Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI, 2003. 2. Timothy J.Ross, Fuzzy Logic with Engineering Applications, McGraw-Hill, 1997.

Course Outcomes

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

CO1: Learn about soft computing techniques and their applications

CO2: Analyze various neural network architectures

CO3: Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems

CO4: Analyze and apply genetic algorithms to combinatorial optimization

CO5: Assess and compare solutions by various soft computing approaches for a given problem.

CO6: Efficiently utilize existing software tools to solve real time problems using a soft computing approach

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BIOMEDICAL INSTRUMENTATION
(Professional Elective-I)

Pre Requisites

- Electronic Measurement and Instrumentation
- Pulse and Digital Circuits

Course Objectives

In this course it is aimed to introduce to the students with

- To explain the need for biomedical instrumentation and difficulties involved in Living system measurement.
- To identify the electrode theory on living system and the responses from it.
- To illustrate the various measurements involved in human cardiovascular and respiratory system.
- To interpret the technique involved in Bio telemetry.

UNIT-I

Introduction: The age of Biomedical Engineering, Development of Biomedical Instrumentation, Man–Instrumentation system, Components, Physiological system of the body, Problem encountered in measuring a living system. Transducers & Electrodes: The Transducers & Transduction principles, Active transducers, Passive Transducers, Transducer for Biomedical Applications.

UNIT-II

Sources of Bioelectric potentials: Resting & Action potentials, propagation of active potential, The Bioelectric potentials-ECG, EEG, EMG, and Invoked responses Electrodes: Electrode theory, Biopotential Electrodes–Microelectrodes Body surface electrodes, Needle Electrodes, Biochemical Transducers, Reference electrodes, PH electrodes, Blood Gas electrodes.

UNIT-III

Cardiovascular Measurements: Electrocardiography – ECG amplifiers, Electrodes & leads, ECG recorders - Three channel, Vector Cardiographs, ECG system for stress testing, Continuous ECG recording (Holter recording), Blood pressure measurement, Blood flow measurement, Heart sound measurements. Patient Care & Monitoring-Elements of Intensive Care monitoring, patient monitoring displays, Diagnosis, Calibration & Reparability of patient monitoring equipment, pacemakers & Defibrillators.

UNIT-IV

Measurements in Respiratory system: Physiology of respiratory system Measurement of breathing mechanics- Spiro meter, Respiratory Therapy equipment's: Inhalators ventilators & Respirators, Humidifiers, Nebulizers & Aspirators. Diagnostic Techniques: Ultrasonic Diagnosis Echocardiography, Echo Encephalography, Ophthalmic scans, X-Ray & Radio-isotope Instrumentation, Computerized Axial Tomography Scanners

UNIT-V

Bio Telemetry: The components of Biotelemetry system Implantable units, Telemetry for ECG measurements during exercise, for Emergency patient monitoring. Physiological Effects of Electric Current Safety of Medical Electronic Equipments, Shock hazards from Electrical equipment and prevention against them.

TEXT BOOKS

1. Cormwell / "Biomedical Instrumentation and Measurements"/ Prentice Hall (India).

REFERENCES

1. Khandpur R.S./ "Biomedical Instrumentation"/ Tata McGraw-Hill.
2. Tompkins / "Biomedical DSP: C Language Examples and Laboratory Experiments for the IBM PC"/ Prentice Hall (India).

Course Outcomes

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

CO1: Summarize the requirement of biomedical instrumentation and adversity involved in human measurement.

CO2: Utilize the concept of electrode and its responses used in real time.

CO3: Outline the divergent responses involved in cardiovascular and respiratory system.

CO4: Compare the various processes involved in bio telemetry.

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ANALOG COMMUNICATIONS LAB

Note: Minimum 12 Experiments have to be conducted

1. Amplitude Modulation & Demodulation
2. DSB-SC Modulator & Detector
3. SSB-SC Modulator & Detector
4. Frequency Modulation & Demodulation
5. Study of Spectrum analyser & analysis of AM & FM Signals
6. Pre-emphasis & De-emphasis
7. Time Division Multiplexing & Demultiplexing
8. Frequency Division Multiplexing & Demultiplexing
9. Verification of sampling theorem
10. Pulse Amplitude Modulation &Demodulation
11. Pulse Width Modulation &Demodulation
12. Pulse Position Modulation &Demodulation
13. Frequency Synthesizer
14. AGC Characteristics
15. PLL as FM Demodulator

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LINEAR & DIGITAL IC APPLICATIONS LAB

Note: Minimum 12 Experiments have to be conducted (six from each part)

Part – A: Linear IC Applications

1. OP AMP Applications-Adder, Subtractor, Comparator Circuits.
2. Integrator and Differentiator Circuits using IC741
3. Active Filter Applications- LPF, HPF [First Order]
4. IC741 Waveform Generators-Sine, Square wave and Triangular waves.
5. IC 555 Timer-Monostable and Astable Multivibrator Circuits
6. Schmitt Trigger Circuits - Using IC 741
7. Calculation of Capture Range & Lock Range Using IC 565 PLL
8. Voltage Regulator using IC 723.

Part – B: Digital IC Applications

1. Verification of all the logic gates
2. Verification of all Flip-Flops(SR,JK,D&T)
3. Verification of Full adder & Full Subtractor
4. Verification of 4X1 Multiplexer & Demultiplexer
5. Verification of 4-bit Magnitude comparator
6. Verification of2X4 Decoder
7. Verification of4-bit Decade counter
8. Verification ofUniversal Shift Register

Part – C

Syllabi of

B.Tech., III Year II Semester

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VLSI DEISGN

Prerequisites

- Electronic devices &circuits
- Switching Theory and logic design

Course Objectives

In this course it is aimed to introduce to the students with

- To enumerate different steps involved in Integrated Circuits technology for MOS transistor and explain the primary and secondary effects of MOSFET and BICMOS.
- To outline the design process involved in VLSI design flow for design of MOS transistors.
- To interpret the alternate forms of CMOS gate circuits in combinational, sequential circuit and Data path Design.
- To Understand basic programmable logic devices and testing of CMOS circuits.

UNIT-I

Introduction: Introduction to IC Technology — MOS – PMOS – NMOS – CMOS - BiCMOS

Basic Electrical Properties: Electrical Properties- MOS- primary characteristics - threshold Voltage – Secondary characteristics- Ratioed Circuits- CMOS, BiCMOS Inverter – analysis- design- Pass transistors.

UNIT-II

VLSI Circuit Design Processes: VLSI Design Flow - MOS Layers - Stick Diagrams - Design rules - wires – Contacts – Transistors- Layout Diagrams – NMOS – PMOS - CMOS Inverters – Gates - Scaling of MOS circuits.

UNIT-III

Gate Level Design: Logic Gates – Transmission gate- Switch logic - Alternate gate circuits, Latches- Time delays - Driving large capacitive loads - Wiring capacitance, Fan — in, Fan — out, Choice of layers.

UNIT-IV

Data Path Subsystems: Subsystem Design – Shifters – Adders – ALU^s- Multipliers- Parity generators- Comparators - Zero/One Detectors - Counters.

Array Subsystems: SRAM – DRAM –ROM - Serial Access Memories.

UNIT-V

Programmable Logic Devices: ROM – PLA - PAL-Design Approach - CPLDs – FPGA - Parameters influencing low power design.

CMOS Testing: CMOS Testing – Need - Test Principles- Design Strategies - Chip level Test Techniques.

TEXT BOOKS

1. Essentials of VLSI Circuits and Systems — Kamran Eshraghian, EshraghianDougles and A. Pucknell, PHI, 2005 Edition.
2. CMOS VLSI Design — A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.
3. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.

REFERENCES

1. CMOS logic circuit Design – John .P. Uyemura, Springer, 2007.
2. VLSI Design- K. Lal Kishore, V. S. V. Prabhakar, I.K International, 2009.
3. Introduction to VLSI — Mead & Convey, BS Publications 2010.
4. Fundamentals of Digital Logic with Verilog Design-Stephen Brown,ZvonkoVranesic,ThirdEdition,TMH

Course Outcomes

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

CO1: Explain the fabrication process involved in Integrated Circuit Technology and label the effects of current and voltage in MOS transistors.

CO2: Summarize the divergent techniques involved in design of VLSI circuits using Design Rules.

CO3:List various Static and dynamic CMOS gate circuits involved in System design.

CO4: Illustrate the process involved in programmable logic design and testing methods.

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DIGITAL SIGNAL PROCESSING

Pre Requisite

- Signals and Systems
- Mathematics-I

Course objectives

In this course it is aimed to introduce to the students with

- To understand the basic concepts of discrete signals, systems, representations and its application using Z transform.
- To recite the relationship between the various Transforms applied on Discrete Time signals & systems.
- To illustrate Discrete Fourier transform (DFT) and analyze it for faster computation on time and frequency domains.
- To identify, express, design filters (FIR / IIR) and realize its structure
- To define the effects of limit cycle oscillations in feedback systems and apply the concepts of multirate signal processing on signals.

UNIT-I

Introduction to digital signal processing: Discrete time signals – Systems –classification – Analysis of Discrete Time invariant Systems- difference equations- Frequency domain representation.

Realization of Digital Filters: Application of Z-transforms, solution of difference equations of digital filters - system function - stability criterion - frequency response of stable systems

UNIT-II

Discrete Fourier Transform: DTFS- DTFT **–**DFT-Complexity calculation- Properties of DFT- linear convolution- Circular convolution- Sectioned convolution- Relation between DTFT, DFS, DFT and Z-Transform.

Fast Fourier Transform: Fast Fourier Transform (FFT), Radix-2 decimation-in-time and decimation-in-frequency FFT Algorithms, Inverse FFT- Convolution of sequences using FFT.

UNIT-III

IIR DIGITAL FILTERS: Analog filter approximations –Butterworth and Chebyshev-Design of IIR digital filters from analog filters- Impulse invariant technique – warping effect- bilinear transformation method - Spectral transformations, realization of IIR filters- direct, canonic, cascade and parallel forms.

UNIT-IV

FIR DIGITAL FILTERS: Characteristics of FIR Digital filters - frequency response – Gibbs Phenomenon- Design of FIR filters - window techniques – Frequency Sampling - Comparison of IIR and FIR filters, realization of FIR filters- direct& cascade forms.

UNIT-V

FINITE WORD LENGTH EFFECTS: Quantization- Quantization error- Types- Limit cycles- Overflow oscillations -Scaling

MULTIRATE SIGNAL PROCESSING: Introduction - down sampling- Decimation – upsampling – Interpolation -Sampling Rate Conversion

TEXT BOOKS

1. Digital Signal Processing_Tarun Kumar Rawat,Oxford Publications-2015
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.
3. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI

REFERENCES

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006
2. Digital Signal Processing: Ashok Ambardar , Satya Prasad , Cenage Learning.
3. Fundamentals of Digital Signal Processing using Mat lab – Robert J. Schilling, Sandra L. Harris, Thomson, 2007.

Course Outcomes

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

CO1: Define the different discrete time signals and show the methods of applying Z-transforms on Discrete Time Linear Time Invariant systems (DTLTI).

CO2: Able to compute the divergence between the transforms (DTFS/DTFT/DFT) and illustrate the effects of each on Discrete time signals.

CO3: Interpret the methodology of Discrete Fourier transform with its properties and methodology of faster computations.

CO4: List, Differentiate Design and implement the different methods involved in Filter design (FIR/IIR).

CO5: State the effects of different quantization noise on recursive systems and enumerate the role of multirate signal processing on discrete time signals.

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MICROPROCESSORS AND MICROCONTROLLERS

Pre Requisite

- Switching Theory and Logic Design

Course Objective

In this course it is aimed to introduce to the students with

- To describe and interpret the 8086 architecture with its internal features.
- To list and analyze the techniques involved in assembly language programming of 8086
- To design various interfacing Peripheral Integrated circuits with 8086 along with their applications.
- To illustrate the basic concepts of 8051 microcontroller and its features

UNIT-I

8086 Architecture: Introduction to 8085 microprocessor- 8086 architecture –Signal descriptions-Minimum- Maximum mode - timing diagrams - memory segmentation- programming model - interrupt structure.

UNIT-II

Assembly language programming using 8086: Instruction formats - addressing modes - instruction set - assembler directives - simple programs- Memory interfacing.

UNIT-III

Concepts, Modes and Interfacing of Peripheral IC's8086:8255 PPI – 8257 DMA- 8251 USART- 8259 PIC

Interfacing of Peripheral Devices with 8086: Matrix Keyboard- Display- LED – LCD- stepper motor, DAC- ADC.

UNIT-IV

Introduction to Microcontrollers: Overview of 8051 microcontroller - architecture – ports - memory organization - addressing modes - instruction set - simple programs.

UNIT-V

8051 Real Time Control: Interrupts - timer/counter - serial communication- SFR's- programming

TEXT BOOKS

1. DV Hall, Microprocessors and interfacing, TMGH 2nd ed 2006.
2. Kenneth J Ayala, The 8051 microcontroller, 3rd ed, Cengage learning 2010.

REFERENCES

1. Advanced microprocessors and peripherals- A .K Ray and K.M .Bhurchandani TMH, 2nd ed,2006
2. The 8051 microcontrollers, architecture and programming and applications-K. Uma Rao, AndhePallavi, Pearson 2009
3. Micro computer system 8086/8088 family architecture, programming and design,- by Liu and GA Gibson, PHI 2nd ed
4. Microcontrollers and applications, Ajay V Deshmukh , TMGH 2005
5. The 8085 Microprocessor: Architecture, programming and interfacing- K UdayKumar, BS Umashankar, 2008, pearson.

Course Outcomes

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

CO1: Memorize the internal organization of 8086

CO2: Apply the divergent techniques involved in assembly level language programming of 8086 for different data manipulation applications.

CO3: Summarize various interfacing integrated circuits for peripheral devices using 8086.

CO4: List and express the internal features of 8051 with its programming.

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OPTICAL COMMUNICATIONS
(Professional Elective-II)

Pre Requisite

- Analog Communications
- Electro Magnetic Waves & Transmission Lines

Course Objective

In this course it is aimed to introduce to the students with

- To explain the theory of optical fiber waveguides and the materials used for its construction.
- To interpret the signal degradation in optical fibers and its connectivity.
- To outline various types of signal sources and coupling required for optical fiber communications.
- To infer the theory behind photo detectors and performance of digital receivers.
- To relate the role of optic fibers in digital system communication with various multiplexing techniques involved in it.

UNIT-I

Introduction: Historical development, the general system, advantages of optical fiber communications.

Optical Fiber Wave Guides: Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays. Cylindrical fiber-Modes, Mode coupling, Step Index fibers, Graded Index fibers. Single mode fibers- Cut off Wavelength, Mode Field Diameter, and Effective Refractive Index. Graded Index Fiber Structure. Fiber materials.

UNIT-II

Signal Degradation In Optical Fibers: Attenuation, Signal Distortion in Fibers, Characteristics of Single-Mode Fibers.

Optical Fiber Connection: Introduction, Fiber alignment and joint loss, Fiber Splicing, Optical fiber Connectors.

UNIT-III

Optical Sources: Topics from Semiconductor Physics, Light Emitting Diodes, Laser Diodes, Line Coding, Line Source Linearity, Reliability Considerations.

Power Launching and Coupling: Source to Fiber Power Launching, Launching Schemes for Coupling Improvement.

UNIT-IV

Photo Detectors: Physical principles of Photodiodes, Photo detector Noise, Detector response time, Avalanche Multiplication Noise, Structure for In GaAs APDs, Temperature Effect on Avalanche gain, Comparison of Photo detectors.

Optical Receiver Operation: Fundamental receiver operation, Digital receiver performance, Eye Diagrams, Analog receivers.

UNIT-V

Optical Fiber Systems: Introduction, the Optical Transmitter circuit, the Optical Receiver circuit, System design considerations.

Digital Links: Point-to- point links.

Advanced Multiplexing Strategies: Optical time division multiplexing, subcarrier multiplexing, orthogonal frequency division multiplexing, wavelength division multiplexing.

TEXT BOOKS

1. Gerd Keiser (2010), Optical Fiber Communications, 4th edition, McGraw-Hill International Edition.
2. John M. Senior (2005), Optical Fiber Communications, 2nd edition, Prentice Hall of India, New Delhi.

RERFERENCES

1. D. K. Mynbaev, S. C. Gupta, Lowell L. Scheiner (2005), Fiber Optic Communications, Pearson Education, India.
2. S. C. Gupta (2005), Optical Fiber Communication and its Applications, Prentice Hall of India, New Delhi.

Course Outcomes

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

CO1: Recognize the constructional materials of Optical fibers and its impact on communications.

CO2: Summarize the channel impairments (like losses and dispersion)that occur in an opticalcommunications.

CO3: Compare the different signal sources used for optical communications with its methodology of coupling.

CO4: Illustrate the methodology and construction of photodetectors and the performance of digital receivers using optic fiber.

CO5: Contrast the communication performed in the optic fiber systems and recall the divergent multiplexing techniques involved in it.

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PROGRAMMING IN MATLAB
(Professional Elective-II)

Pre Requisite

- Programming in C
- Engineering Mathematics
- Probability Theory and Stochastic Process

Course Objective

In this course it is aimed to introduce to the students with

- To illustrate the various parameters for programming in MATLAB
- To elaborate the various loop and control statements involved in MATLAB Programming.
- To interpret the graphical representation, file handling and advanced commands of MATLAB.
- To Understand the need for Simulink in various domains of Electronics and Communication.

UNIT-I

Introduction to MATLAB: Menus & Tool bars, Variables - Matrices and Vectors - initializing vectors - Data types- Functions - User defined functions - passing arguments - writing data to a file-reading data from a file - using functions with vectors and matrices- cell arrays & structures - Strings - 2D strings-String comparing - Concatenation - Input and Output statements - Script files.

UNIT-II

Loops & Control Statements: Introduction; Relational & Logical operations - Example programs - Operator precedence - Control & Decision statements- IF - IF ELSE - NESTED IF ELSE - SWITCH - TRY & CATCH - FOR -WHILE - NESTED FOR - FOR with IF statements, MATLAB program organization, Debugging methods - Error trapping.

UNIT-III

PLOTS IN MATLAB & GUI: Basic 2D plots, Labels, Line style, Markers, plot, subplot, LOG, LOG-LOG, SEMILOG-POLAR-COMET, Grid axis, labeling, fplot, ezplot, ezpolar, polyval, exporting figures, HOLD, STEM, BAR, HIST, Interactive plotting, Basic Fitting Interface – Polyfit - 3D plots – Mesh - Contour - Example programs. GUI-Creation Fundamentals - Capturing mouse actions.

UNIT-IV

MISCELLANEOUS TOPICS: File & Directory management - Native Data Files - Data import & Export - Low Level File I/O - Directory management - FTP File Operations - Time Computations -Date & Time - Format Conversions - Date & Time Functions - Plot labels - Optimization - zero Finding - Minimization in one Dimension - Minimization in Higher Dimensions- Practical Issues. Differentiation & Integration using MATLAB, 1D & 2D Data Interpolation

UNIT-V

SIMULINK & APPLICATIONS: How to create & run Simulink, Simulink Designing - Using SIMULINK Generating an AM signal & 2nd order systems - Designing of FWR & HWR using Simulink - Creating a subsystem in Simulink. Applications Programs - Frequency response of FIR & IIR filters. Open Loop gain of OPAMP, I/P characteristics of BJT, PCM, DPCM.

TEXT BOOKS

1. RudraPratap, "Getting Started with MATLAB 6.0" ,1st Edition, Oxford University Press-2004.
2. Duane Hanselman ,BruceLittleField, "Mastering MATLAB 7" , Pearson Education Inc, 2005

REFERENCES

1. William J.Palm, "Introduction to MATLAB 6.0 for Engineers", Mc Graw Hill & Co, 2001
2. M.Herniter, "Programming in MATLAB", Thomson Learning, 2001
3. John OkyereAltla, "Electronics and circuit analysis using MATLAB" - CRC press, 1999
4. K.K.Sharma, "MATLAB Demustifyied" -Vikas Publishing House Pvt Ltd.

Course Outcomes

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

CO1: Develop codes on various domains of Electronics and Communication Engineering
CO2: Handle the advanced commands in appropriate fields of engineering
CO3: Visualize the impact of parameters during simulation
CO4: Cater the industrial needs pertaining to the semiconductor technologies.

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SATELLITE AND WIRELESS COMMUNICATIONS
(Professional Elective-II)

Pre Requisite

- Signals and Systems
- Analog Communications

Course Objective

In this course it is aimed to introduce to the students with

- To explain the types of satellite communication and various orbital aspects involved in it.
- To illustrate the students with the knowledge of sub system design and validate the connectivity using link budget with the techniques in earth tracking.
- To compare the various types of wireless networks involved in communications .
- To interpret the various layers of wireless LAN, WAN standards.

UNIT-I

Introduction: Origin of satellite communication, Historical background, Basic concepts of satellite communications, Frequency allocations for satellite services, Applications, Indian scenario in communication satellites.

Orbital aspects of Satellite Communication: Introduction to geo-synchronous and geo-stationary satellites, Kepler's laws, locating the satellite with respect to the earth, sub-satellite point, look angles, mechanics of launching a synchronous satellite, Orbital effects in communication system performance

UNIT-II

Satellite sub-systems: Attitude and Orbit control systems, Telemetry, Tracking and command control system, Power supply system, Communication subsystems, Space craft antennas.

Satellite link design: Basic transmission theory - system noise temperature - G/T ratio, design of down link – uplink - satellite links - C/N - satellite data communication protocols - Nano satellites - micro satellites

UNIT-III

Earth station Technology: Transmitters – Receiver – Antennas - Tracking systems, Terrestrial interface.

Introduction to wireless communication: Mobile radio communication, Examples of wireless communication systems, Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in wireless networks, wireless data services.

UNIT-IV

Mobile wireless communication systems: Evolution of 1G/2G/3G/4G – 2G cellular networks – CDMA- GSM - 3G wireless networks, wireless in local loop, wireless local area networks - Wi-Fi, Personal area networks- ZIGBEE – WMAN - Bluetooth.

Wireless LAN: Historical overviews of the land industry, evolution of the wan industry, wireless home networking IEEE 802.11 the PHY layer, Mac layer wireless ATM, Hyperlink, Hyper Lan-2

UNIT-V

Wireless MAN: mechanism to support at mobile environment, communication in the infrastructure , iIS-95 CDMA forward channel, IS-95 CDMA risers channel, packet and frame formats in IS-95,IMT -20000

TEXT BOOKS

1. Satellite communications – Pratt, 2nd ed., 2006, wiley publications
2. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI
3. Mobile Cellular Communication – GottapuSasibhushana Rao, Pearson Education, 2012.

REFERENCES

1. Satellite communications- Dennis Roddy, 4 edition
2. Principles of Wireless Networks – KavehPahLaven and P. Krishna Murthy, 2002, PE.
3. Wireless Communication and Networking – William Stallings, 2003, PHI.
4. Wireless Communications and Networking – Vijay K. Gary, Elsevier.

Course Outcomes

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

CO1: Understand the concepts and orbital aspects of satellite communication.

CO2: Summarize the aspects of subsystem design and its involvement in ground tracking with suitable link margins.

CO3: Outline the fundamentals and principles of wireless communications and networking.

CO4: Relate and contrast the different layers involved in data communication of WLAN and WWAN.

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MICROPROCESSOR AND MICROCONTROLLERS LAB

Note: Minimum 12 Experiments have to be conducted

The following programs/experiments are written for assembler and execute the same with8086 and 8051 kits

1. Programs for 16 bit arithmetic operations for 8086 (using various addressing modes)
2. Program for sorting an array for 8086
3. Program for searching for a number or character in a string for 8086
4. Program for String manipulations for 8086
5. Program for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086
7. Parallel communication between two microprocessors using 8255.
8. Serial communication between two microprocessor kits using 8251.
9. Interfacing to 8086 and programming to control stepper motor.
10. Programming using arithmetic, logical and bit manipulation instructions of 8051
11. Program and verify Timer/Counter in 8051.
12. Program and verify interrupt handling in 8051.
13. UART operation in 8051.
14. Communication between 8051 kit and PC.
15. Data transfer from peripheral to memory through DMA controller 8237/8257

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DIGITAL SIGNAL PROCESSING & e-CAD LAB

Note: Minimum 12 Experiments have to be conducted (eight from each part)

Part-A: DSP Lab Experiments

1. Generation of Sinusoidal waveform/Signal based on recursive difference equations.
2. To Find DFT/IDFT of given DT signal
3. Implementation of FFT of given sequence
4. Determination of Power Spectrum of a give signal (s)
5. Implementation of LP & HP FIR filter for a given sequence
6. Implementation of LP& HP IIR filter for a given sequence
7. Generation of DTMF signals
8. Implementation of I/D sampling rate converters
9. Noise removal: Add noise above 3 KHz and then remove, interference suppression using 400 Hz tone.
10. Impulse response of first order and second order systems.

Part-B: e-CAD Lab Experiments

1. HDL code to realize all the logic gates
2. Design of the 2 to 4 decoder
3. Design of 8 to 3 encoder (without and with parity)
4. Design of 8 to 1 multiplexer& 1 to 8 Demultiplexer
5. Design of 4 bit binary to gray converter
6. Design of 4-bit comparator
7. Design of full adder using 3 modeling styles
8. Design of flip flops SR, D, JK, and T
9. Design of 4 bit binary, BCD counters (synchronous/asynchronous reset)
10. Finite state machine design

Part – D

OPEN ELECTIVES

&

GENERAL SUBJECTS

OPEN ELECTIVES

Introduction

The B.Tech course structure under CBCS consists of 4 Professional Electives and 3 open electives. Each professional elective offered by the students own department gives a choice of three to four courses out of which the student is to select one course. Similarly under open elective system, the student is offered one course each in 3 semesters viz., 3/1, 3/2 & 4/1 with 3 credits.

The six engg. and along with MBA depts. of the college have been divided into four groups
Group- I - ECE & EEE
Group –II - CSE & IT
Group –III - Mechanical & Civil
Group –IV- MBA
Under CBCS, a student from a particular group cannot opt the courses offered by that particular group.

Details of the Courses offered by different Groups -1
Courses offered by Group -1 Departments

ECE
III Year – I Semester
1. Introduction to Microcontrollers & Applications
2. Basic Electronics & Instrumentation
III Year – II Semester
1. Fundamentals of Embedded Systems
2. Principles of Communications

EEE
III Year – I Semester
1. Non Conventional Energy Sources
2. Energy Management
III Year – II Semester
1. Principles of Electrical Power Utilization
2. Energy Auditing &Conservation

Courses offered by Group-2 Departments

CSE/IT

III Year – I Semester

1. Java Programming
2. Operating Systems

III Year – II Semester

1. Database Management Systems
2. Software Engineering

Courses offered by Group-3 Departments

MECH

I Semester

1. Elements of Mechanical Engineering
2. Industrial Engineering

II Semester

1. Basic Automobile Engineering
2. Material Science and Engineering

CIVIL

I Semester

1. Remote Sensing and GIS
2. Smart City

II Semester

1. Green Building
2. Environmental Pollution and Control Methods

Courses offered by Group-4 Department

MBA

I Semester

Total engineering Quality Management

II Semester

Basics of Banking and Capital Market

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MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

PRE REQUISITES:

- Probability and statistics
- Operation research
- Mathematics-I
- Environmental studies

Course Objectives: To enable the student to understand, with a practical insight,

- The importance of certain basic issues governing the business operations namely demand and supply, production function, cost analysis,
- analysis of markets, forms of business organizations,
- Significance of capital budgeting and financial accounting and financial analysis.

UNIT –I:

Introduction to Managerial Economics& Demand Analysis:

Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting.

UNIT –II:

Production & Cost Analysis:

Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost concepts (Opportunity cost vs outlay costs, Fixed, variable and semi variable costs, marginal cost vs average cost, out of pocket vs book cost, imputed cost, implicit & explicit cost, incremental and decremental cost, sunk vs future cost, separable and joint costs) Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

UNIT –III:

Markets & New Economic Environment:

Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. Pricing: Objectives and Policies of Pricing. Methods of Pricing. Business: Features and evaluation of different forms of Business Organization: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, New Economic Environment: Changing Business Environment in Post-liberalization scenario.

UNIT-IV: Introduction to Financial Accounting & Financial Analysis:

Accounting concepts and Conventions Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).Financial Analysis: Analysis and Interpretation of Liquidity Ratios (current ratio, quick ratio), Activity Ratios(inventory turnover ratio, debtors turnover ratio), and Capital structure Ratios(debt equity ratio, interest coverage ratio) and Profitability ratios(gross profit ratio, net profit ratio, operating profit ratio, P/E ratio, EPS). Du Pont Chart.

UNIT –V: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital, Capital Budgeting: features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR), Net Present Value Method (simple problems), IRR and PI method.

Outcomes: At the end of the course the students is expected

- To understand and enhance the knowledge regarding managerial economics concepts and obtaining optimal solutions.
- To get an idea of analysis of firm's financial position with the techniques of financial analysis and ratio analysis.

TEXT BOOKS:

1. Aryasri: Managerial Economics and Financial Analysis, TMH, 2012.
2. Vijay Kumar & Appa Rao, Managerial Economics & Financial Analysis, Cengage 2011.
3. J.V.Prabhakar Rao & P.V.Rao, Managerial Economics & Financial Analysis, Maruthi Publishers, 2011.

REFERENCE BOOKS:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2012.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, Pearson, 2012.
3. Lipsey & Chrystel, Economics, Oxford University Press, 2012
4. Domnick Salvatore: Managerial Economics in a Global Economy, Thomson, 2012.
5. Narayanaswamy: Financial Accounting—A Managerial Perspective, Pearson, 2012.
6. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2012.
7. Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2012.
8. Dwivedi: Managerial Economics, Vikas, 2012.
9. Kasi Reddy, Saraswathi, MEFA, PHI Learning, 2012.
10. Shailaja & Usha : MEFA, University Press, 2012.

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ADVANCED COMMUNICATION SKILLS (ACS) LAB
(Common to all branches)

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.
The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.

Objectives:
This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educational English speakers and respond appropriately in different socio-cultural and professional contexts.

Syllabus:

The following course content to conduct the activities is prescribed for the Advanced Communication Skills (ACS) lab:

1. **Activities on Fundamentals of inter-personal Communication and Building Vocabulary –** Starting a conversation – responding appropriately and relevantly – using the right body language - Role Play in different situations & Discourse Skills – using visuals – Synonyms and antonyms, word roots, one word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. **Activities on Reading Comprehension** – General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.
3. **Activities on Writing Skills –** Structure and presentation of different types of writing – letter writing/ Resume writing/ e-correspondence/ Technical report writing / Portfolio writing – planning for writing – improving one's writing.

4. **Activities on Presentation Skills –** Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/e-mails/assignments etc.
5. **Activities on Group Discussion and interview Skills –** Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation. Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video – conference and Mock Interviews.

Books Recommended:

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University 2009.
2. Advanced Communication Skills Laboratory Manual by Sudha Rani, D. Pearson Education 2011.
3. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
4. Business and Professional Communication: Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.
5. The Basics of Communication: A Relational Perspective. Steve Duck & David T. Mc Mahan. Sage South Asia Edition. Sage Publications. 2012.
6. English Vocabulary in Use series, Cambridge University Press. 2009
7. Management Shapers Series by Universities Press (India) Pvt. Ltd. Himayatnagar, Hyderabad. 2008.
8. Handbook for Technical Communication by David A. McMurrey & Joanna Buckley. 2012. Cengage Learning.
9. Communication Skills by Leena Sen.PHI Learning Pvt. Ltd. New Delhi. 2009.
10. Handbook for Technical Writing by David A McMurrey & Joanna Buckley Cengage Learning. 2008.
11. Job Hunting by Colm Downess, Cambridge University Press 2008.
12. Master Public Speaking by Anne Nicholls, JAICO Publishing House, 2006.
13. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill. 2009.
14. Books on TOEFL/GRE/GMAT/ICAT/IELTS by Barron's/DELTA/Cambridge University Press.
15. International English for Call Centres by Barry Tomalin and Suhashini Thomas Macmillan Publishers. 2009.

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PERSONALITY DEVELOPMENT AND BEHAVIOURAL SKILLS

Course Objectives

- To enable students to communicate with outside and peer group members in an effective manner.
- To enable the students to give better presentation and explanation on their projects, posters and assignments - this makes them industry ready.
- To perform better during Campus Recruitment and various interviews they face in their career.

Course Outcomes

At the end of the course a student is expected:

- To communicate with more confidence using better spoken and written English
- To give better presentation and explanation with the use of digital inventions
- To perform well during Campus Drives and different Interviews

Course Outcomes

Unit – I

Personality Development: Definition - Various Aspects of Personality Development - Behavioural Traits. Importance of Soft skills-Soft skills for a future Entrepreneur - Qualities of a good leader - Stress Management - Success stories.

Unit – II

Non Verbal Communication: Kinesics Haptics Proxemics Vocalics Oculesics Body Language in Interviews.

Unit - III

Team Dynamics: Different Types of Teams-role of an individual - Communicating as a group or team leader - Individual Presentations/Team Presentation. Case Studies: Project Presentations.

UNIT-IV

Technical Report Writing: Formats - Effective Resume Preparation - Covering Letter - Statement of Purpose (SoP).

UNIT-V

Role of Multimedia in Communication: Communication in a Digital Edge (Video Conference Etc.)

E-Correspondence: Recent Trends in Professional Communication - Social Networking: Importance, Effects.

Blogging: Creating of Blogs - Technical and Non – technical blogs – Success Stories and Case Studies.

Reference Books

1. Barun, K Mitra, Personality Development and Soft Skills, Oxford University Press, 2nd Edition, 2016.
2. Gopalaswamy Ramesh, the Ace of Soft Skills: Attitude, Communication and Etiquette for Success, Pearson Education, 2013.
3. Krishna Mohan & Meera Banerji, Developing Communication Skills, Macmillan India Ltd, 2008.
4. Krishna Mohan & Meenakshi Raman, Effective English Communication, Tata McGraw-Hill Publishing Company Ltd, 2008.
5. Arati Gurav, 50 Mantra's of Personality Development, Buzzingstock Publishing House, 2013.
6. P. Kiranmai Dutt & Geetha Rajeevan, Basic Communication Skills, Cambridge University Pvt. Ltd2007.
7. S.C. Sood, Mita Bose, Naresh Jain, Developing Language Skills, Manohar Publications, 2007, T.M. Farhathullah, Communication Skills for Technical Students, Orient Longman Pvt Ltd, 2002.

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QUANTITATIVE METHODS & LOGICAL REASONING

Course Objectives:

1. The objective of this course is to enhance the problem solving skills in the areas of **'Quantitative Aptitude'** and **'Reasoning'** which will enable the students to better preparation for **Campus Placements** and competitive examinations.
2. To improve the logical thinking and mathematical ability of the students.

Course Outcomes:

At the end of the completion of the course a student is expected

1. To solve basic and complex mathematical problems in short time.
2. To perform well in various competitive exams and placement drives.

Quantitative Aptitude and Reasoning:

Unit – I

1. Number System:

Speed math's, Numbers, Factors, prime & Co primes, LCM & HCF, Divisibility rules, finding unit place digit and last two digits of an expression

2. Simple Equations:

Definition of Linear equation, word problems

3. Ratio, Proportion and Variations:

Definition of ratio, ratio of Proportion, Comparison of ratios, Compound ratio, Direct and indirect proportion

4. Percentages:

Converting fractions and decimal into percentages, successive percentage, populations, expenditure and savings

5. Profit and loss:

Relation between Cost price and selling price, Discount and Marked price, Gain or Loss percentages on selling price

6. Simple and Compound Interest:

Problems on interest (**I**), amount (**A**), Principal (**P**) and rate of interest(**R**)
Difference between the simple interest and compound interest for 2 and 3 years.

Unit-II

1. Partnership:

Relation between partners, period of investment and shares

2. Averages and Ages:

Average of different groups, change in averages by Adding, deleting and Replacement of objects, problems on ages.

3. Allegation and mixtures:
Allegation rule, Mean value of the mixture, Replacement of equal amount of quantity.
Time and Work:
Men and Days, Work and Wages, pipes and cisterns, hours and work, Alternate day's concept,
Time and Distance:
Difference between the average and Relative speeds, reaching the destination late and early, Stoppage time per hour, time and distance between two moving bodies
Trains, Boats and Streams:
Train crossing man, same and opposite directions, Speed of boat and stream,

Unit-III
1. Progressions:
Arithmetic, Geometric and Harmonic Progressions, Arithmetic Mean, Geometric Mean and Harmonic Mean and their relations.

2. Quadratic Equations:
General form of Quadratic equation, finding the roots of Quadratic equation, Nature of the Roots.

3. Mensurations:
2D geometry- perimeter, areas, 3D geometry - surface areas, volumes

4. Permutation and Combination:
Fundamental rules, problems on permutations & combinations.

5. Probability
Definition of probability, notations and formulae, problems on probability.

6. Data Interpretation and Data Sufficiency:
Tabular and Pie-charts, Bar and Line graphs, Introduction to data sufficiency, problems on data sufficiency.

Unit-IV
1. Deductions:
Statements and conclusions using Venn diagram and Syllogism method

2. Connectives:
Definition of simple and compound statements, Implications and negations for compound statements.

3. Series completion:
Number series, Alphabet series, letter series.

4. Coding and Decoding:
Letter coding, Number coding, Number to letter coding, Matrix coding, Substitution, Mixed letter coding, Mixed number coding, Deciphering individual letter codes by analysis.

5. Analytical Reasoning Puzzles:
Problems on Linear, Double line-up and Circular arrangements, Selections and Comparisons.

6. Blood Relations:
Defining the various relations among the members of a family, Solving Blood Relation Puzzles by using symbols and notations. Problems on Coded relations.

Unit-V

1. Direction sense test:
Sort of directions in puzzles distance between two points, problems on shadows, Application of triangular triplets.

2. Clocks:
Relation between minute-hour hands, angle vs time, exceptional cases in clocks

3. Calendars:
Definition of a Leap Year, Finding the Odd days, Finding the day of any random calendar date, repetition of calendar years.

4. Cubes and Dices:
Finding the minimum and maximum number of identical pieces and cuts, painting of cubes and cuts, problems on dice.

5. Venn diagrams:
Circular representation of given words, Geometrical representation of certain class, set theory based problems.

6. Number, Ranking and Time sequence test:
Number test, Ranking test, Time sequence test.

Text Books:

1. GL Barrons, Mc Graw Hills, Thorpe's verbal reasoning, LSAT Material
2. R S Agarwal, S.chand, 'A modern approach to logical reasoning'
3. R S Agarwal, S.Chand, 'Quantitative Aptitude'

Reference Books:

1. Quantitative Aptitude-G.L BARRONS
2. Quantitative Aptitude-Abhijit Guha Mc Graw Hills.
3. Quantitative Aptitude-U.Mohan Rao SCITECH.