ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

(An Autonomous Institution)

ACADEMIC REGULATIONS (R19), COURSE STRUCTURE AND SYLLABI

For the students admitted to

B. Tech., Regular Four Year Degree Programme from the Academic Year 2019-20

and

B. Tech., Lateral Entry Scheme from the Academic Year 2020-21

VISION AND MISSION OF THE INSTITUTION

Vision

We impart futuristic technical education and instil high patterns of discipline through our dedicated staff who set global standards, making our students technologically superior and ethically strong, who in turn shall improve the quality of life of the human race.

Mission

Our mission is to educate students from the local and rural areas and from other states so that they become enlightened individuals, improving the living standards of their families, industry and society. We provide individual attention, world-class quality of Technical education and take care of character building.

ACADEMIC RULES AND REGULATIONS OF FOUR-YEAR B. TECH REGULAR DEGREE PROGRAMME

APPLICABLE FOR THE STUDENT BATCHES ADMITTED FROM THE ACADEMIC YEAR 2019-20

APPLICABLE FOR THE STUDENTS (Lateral Entry) ADMITTED FROM THE ACADEMIC YEAR 2020-21

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1. PREAMBLE

Annamacharya Institute of Technology and Sciences (Autonomous), Rajampet, relentlessly aims to achieve academic excellence by implementing new initiatives in teaching-learning and evaluation processes. Based on the directions of the University Grants Commission (UGC), New Delhi, All India Council for Technical Education (AICTE), New Delhi and Jawaharlal Nehru Technological University Anantapur (JNTUA) Anantapuramu, the institute adopted AICTE and APSCHE model curriculum, with minor modifications to match the needs, expectations, and skillsets of students of the region, in both the under- graduate and post-graduate programmes offered from the academic year 2019-20.

2. APPLICATION AND COMMENCEMENT

- The regulations are quite comprehensive and include definitions of key terms, semester system, credit system, grading system and other relevant details.
- The regulations detailed herein shall apply to all the regular under-graduate programmes offered by the Institute.
- The regulations shall be applicable and come into force to the student batches admitted from the academic year 2019-20 and Lateral Entry students admitted from the academic year 2020-21
- The Institute may revise, amend or change the regulations, scheme of examinations and syllabi, from time to time, if found necessary and on approval by the Academic Council of the Institute, keeping the recommendations of the BoS in view.
- Any or all such amendments shall be effective from such date and to such batches of students including those already undergoing the programme, as may be approved through Academic Council of the Institute.
- These regulations shall be called R19 Regulations.

3. ELIGIBILITY FOR ADMISSION

3.1 ADMISSION INTO ENGINEERING UNDER GRADUATION PROGRAMMES (REGULAR)

The eligibility criteria for admission into engineering under graduate programmes offered at AITS shall be as prescribed by the Government of Andhra Pradesh. The criteria are given below:

- The candidate shall be an Indian National / NRI.
- The candidate should have completed 16 years of age as on 31st December of the academic year for which the admissions are being conducted.
- The candidate should have passed the qualifying examination (10+2) or equivalent as on the date of admission recognized by Board of Intermediate, Andhra Pradesh.
- Seats in each programme in the Institute are classified into two categories i.e., **Category – A** and **Category – B** as per the GOs of Andhra Pradesh.

Category – A Seats

These seats shall be filled through counselling as per the rank secured by a candidate in the Common Entrance Test (EAMCET) conducted by the Government of Andhra Pradesh and as per other admission criteria laid down in the GOs.

Category – B Seats

These seats shall be filled by the Institute as per the GOs issued by the Government of Andhra Pradesh from time to time

3.2 ADMISSION INTO SECOND YEAR (Lateral Entry Scheme)

A candidate shall be admitted into the third semester (II year I semester) based on the rank secured by the candidate in the Engineering Common Entrance Test (ECET) by the Government of Andhra Pradesh and as per other admission criteria laid down in the GOs.

4. Medium of Instruction

The medium of instruction shall be **English** for all the courses including their content delivery and examinations, seminars, presentations and project evaluation as prescribed in the programme curriculum.

5. B.TECH. PROGRAMME STRUCTURE

The structure of the B.Tech. Programmes on offer at AITS are based on the **Choice Based Credit System (CBCS)** as defined by the UGC and the curriculum / course structure as suggested by the AICTE in its Model Curriculum.

Semester Scheme

- The B. Tech Programmes offered at AITS follow **semester scheme** pattern.
- The duration of a B. Tech. Programme shall be of **4 academic** years for 4 year B. Tech programmes **and 3 academic years** for 3 year B. Tech programmes in lateral entry scheme**.**
- Each academic year shall have **2 semesters** i.e., odd and even semesters and shall be counted as first semester, second semester, and third semester and so on up to eighth semester.
- Each semester shall consist of **16 weeks** of academic work excluding internal examinations.
- Each semester is structured to provide credits totalling to **160 credits** for the entire B.Tech. Programme.
- Each semester shall have **Continuous Internal Evaluation (CIE)** and **Semester End Examination (SEE)** for both Theory and Lab courses.
- Each student is required to secure a total of **160 credits with a CGPA ≥ 5** for the completion of the UG programme and the award of the B.Tech. Degree.
- A student after securing admission into a 4 year B.Tech Programme at AITS shall pursue and acquire the B.Tech. degree in a **minimum period of four academic years i.e., 8 semesters** and a **maximum period of eight academic years i.e., 16 semesters** starting from the date of commencement of I year I semester,

failing which the student shall forfeit the seat in B.Tech. Programme.

- A student after securing admission into a 3 year B. Tech Programme (Lateral Entry) at AITS shall pursue and acquire the B.Tech. Degree in a **minimum period of three academic years i.e., 6 semesters** and a **maximum period of six academic years i.e., 12 semesters** starting from the date of commencement of II year I semester, failing which the student shall forfeit the seat in B.Tech. programme

6. PROGRAMMES OFFERED BY THE INSTITUTE

The following B. Tech. programmes are offered as specializations by the Institute from 2019-2020.

SNo	Name of the Program	Programme Code
1	Civil Engineering	01
2	Electrical and Electronics Engineering	02
3	Mechanical Engineering	03
4	Electronics and Communication Engineering	04
5	Computer Sciences and Engineering	05

7. COURSES AND CREDIT STRUCTURE

Credit: A credit is 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/Tutorial) or two hours of practical work/field work/project per week.

Academic Year: Two consecutive (one odd + one even) semesters constitute one academic year.

Choice Based Credit System (CBCS): CBCS provides choice for students to select from the prescribed courses.

Each course is assigned certain number of credits based on following criterion

Type of Class	Semester	
	Periods per Week	Credits
Theory (Lecture/Tutorial)	01	01
	02	02
	03	03
	04	04
Practical	02	01
	03	1.5
	04	02
Innovation/Socially Relevant Project/Entrepreneurship/Internship	N/A	02
Project Work Stage 1	04	02
Project Work Stage 2	12	08

Every course of the B. Tech. programme shall be offered by a specific section / department. The unique codes of the section / department offering the courses are given in the Table.

Course offering Department	Code
Basic Science Courses	C
Humanities Courses	
Management Courses	E
Civil Engineering	1
Electrical and Electronics Engineering	2
Mechanical Engineering	3
Electronics & Communication Engineering	4
Computer Science & Engineering	5

Every B. Tech. Programme of study shall be designed to have theory and laboratory courses. In addition, a student shall carry out internship, project, socially relevant project, and other mandatory courses as prescribed in the curriculum of the Programmes.

7.1 Types of Courses:

TYPE OF COURSES	COURSE CATEGORY	DEPARTMENT				
		CIV	EEE	ME	ECE	CSE
Foundation	Engineering Sciences (ES)	23.5	22.5	22.5	24	23
	Basic Sciences (BS)	25	25	25	25	25
	Humanities & Social Sciences and Management (HS)	10	10	10	10	10
Core	Professional Core (PC)	59.5	60.5	60.5	59	60
Project	Project (PW)	10	10	10	10	10
	Internship	2	2	2	2	2
Elective courses	Professional Elective (PE)	18	18	18	18	18
	Open Elective (OE) (including one MOOCs)	12	12	12	12	12
Mandatory Courses	Mandatory (MC)	-	-	-	-	-
	Total Credits	160	160	160	160	160

7.1.1 Foundation Courses

Engineering Science courses, Basic Science Courses and Humanities courses are termed as Foundation Courses and are mostly offered at I and II Year.

7.1.2 Professional Core Courses

Professional Core Course is to be completed by all students of respective programme before they can move

on to the next semester.

7.1.3 Professional Core Electives

University Grants Commission has come up with the Choice Based Credit System (CBCS) in which the students have a choice to choose from the prescribed courses, which are referred as Professional elective and Open Elective courses.

Students have to register for a total of 6 professional core electives courses (PE-1 to PE-6) from the list of track-wise professional elective course as prescribed in the course structure of the programme. The following points are considered for a Professional Elective Course.

- Maximum strength of a class /section for each semester shall be 72.
- A course may be offered to the students, only if a minimum of 24 students (1/3 of the section strength) opt for it.
- The selection of course based on the choice for students shall be on 'first come first serve' through on line and off line registration.
- The Head of the department or concerned shall decide, whether or not to offer such course keeping in view the resources available in the department offering the course.

7.1.4 Open Electives

Choice Based Credit System (CBCS) is promoted in such a way that different open elective courses should be offered by every department in engineering to other departments. This interdisciplinary of learning open elective courses by other department students will have learning awareness and job-oriented benefits. Students require the opportunity to choose any open elective course from different departments and apply their knowledge to acquire jobs in that field of course. Learning and employment benefits are not only through their own course subjects but also through open elective courses.

Every student shall earn prescribed credits by choosing one of the open elective courses from the list of Open Electives given in the Curriculum. Further students from a particular program/branch can opt for one Open Elective (OE1) offered by their concerned department. However, two Open Electives are inter-disciplinary and shall be offered by other branches.

One open elective is to be chosen from the repository of **inter-disciplinary MOOCs** courses offered by NPTEL or any other recognized Institutions/Organization. Students shall consult their class mentors before opting for an open elective course (MOOCs)

The following guidelines are pertaining to Open Elective Courses.

- Maximum strength of a class /section for each semester shall be 72.
- A course may be offered to the students, only if a minimum of 24 students (1/3 of the section strength) opt for it. The minimum number of students is required to register the course to offer opted

course in the department.

- The selection of course based on the choice for students shall be on 'first come first serve' through on line and off line registration.
- The Head of the department or concerned shall decide, whether or not to offer such course keeping in view the resources available in the department offering the course.

7.1.5 Massive Open Online Courses as Open Elective

- MOOCs (Massive Open Online Courses) are introduced to meet with the global requirements and to inculcate the habit of self-learning and in compliance with the UGC guidelines
- A Student shall opt for a MOOC available on several online platforms such as NPTEL, Swayam etc, as an Open Elective.
- Concerned departments **shall declare the list of inter-disciplinary** courses that a student can pursue through MOOCs at the beginning of the corresponding semester.
- Students interested in pursuing MOOCs shall register for the course and submit this information at their department office at the start of the corresponding semester.
- Course content for the selected MOOCs shall be drawn from the respective MOOCs offering Portal.
- Course progress shall be monitored by the Mentors designated by the HoD.
- Grade obtained through the evaluation of the MOOC shall be considered for the CGPA calculation.
- Three credits shall be awarded to the student upon successful completion of MOOC.
- In case a student fails to complete the MOOCs he/she shall re-register for the same with the same provider, already offered that course. In case that provider discontinues to offer the course, Institution shall conduct an offline examination in the same format, which student already appeared in online examination, as per the MOOC syllabus.

7.1.6 Value Added Courses

- Value-added courses / certificate courses offered by Departments or through joint ventures with various industries / organizations to provide ample scope for the students to keep up with the latest technologies pertaining to their chosen field of studies.
- A four or five value added Programmes shall be proposed by the departments one week before the commencement of classes.
- The students are given liberty to choose the list of Value-added courses given as per their interest.
- Students interested in pursuing value added courses shall register for the courses, paying the stipulated fees, at the department office at the beginning of the semester against the courses that are announced by the department.
- Course progress shall be monitored by the course coordinator designated by the HoD.

- Result of value-added courses shall be declared with **"Satisfactory" or "Not Satisfactory"** performance
- Grade obtained through value added course shall not be considered for the CGPA calculation.
- A student shall complete at least TWO Value-added courses in order to be eligible for the award of the degree.
- Value added courses offered by Department / Institution are only valid.
- Value added courses are conducted beyond the working hours/on holidays.
- The duration of the value-added course should not be less than 40 learning hours.

7.1.7 Mandatory Courses

- A student shall pursue mandatory courses as specified in the course structure of the B.Tech. Programme.
- These courses are among the compulsory courses and do not carry any credits.
- A student has to secure 40 marks out of 100 in the Internal Examination, shall be necessary requirement for the student to qualify for the **award of Degree**.
- Result of mandatory courses shall be declared with **"Pass"** or **"Fail"** performance in the Comprehensive Marks Memo.
- No marks or letter grade shall be allotted.
- Attendance in the mandatory course shall be considered while calculating aggregate attendance.

8. Evaluation Process

The performance of a student in each semester shall be evaluated course-wise with a maximum of 100 marks for both Theory and Lab Course.

- For a Theory course, the distribution shall be 30 marks for Internal Evaluation and 70 marks for End-Examinations. The distribution is detailed in 8.1.1.
- For a Lab course, the distribution shall be 30 marks for Internal Evaluation and 70 marks End-Examinations. The distribution is detailed in 8.1.2
- Project stage-I, Socially-relevant project / Internship / Entrepreneurship activity shall be evaluated for 50 marks based on the Presentation/report submitted by the student.
- Project stage-II shall be evaluated for 200 marks. Mandatory courses with no credits shall be evaluated for 100 marks.

8.1 Internal Evaluation

8.1.1 Theory Internal Examinations

For a Theory Course, 30 marks are allotted for Internal Evaluation. Two mid-term examinations (Theory Internal Examinations) shall be conducted for a Theory Course during a semester and they shall be evaluated

for 20 marks. Remaining 10 marks is for continuous evaluation which includes weekly/ fortnightly class tests, homework assignments, problem solving, group discussions, quiz, seminar, mini-project and other means. The method of allotting these marks will be decided by the teacher dealing that subject in consultation with the Head of the Department. Teacher has to announce the evaluation method in the beginning of the semester.

First midterm examination shall be conducted as per the syllabus of I & II units. The second midterm examination shall be conducted as per the syllabus of III, IV and V units.

The question paper shall be of subjective type in which four questions with an internal choice are to be answered. 80 % weightage for the best performance and 20 % for other shall be considered.

For Example:

Marks obtained in I mid-term examination: 19

Marks obtained in II mid-term examination: 10

Final Internal Marks: (19x0.8) + (10x0.2) = 17.2

If the student is absent for any one midterm examination, the final internal marks shall be arrived at by considering 80% weight age to the marks secured by the student in the appeared examination and zero to the other.

For Example:

Marks obtained in first mid: 0 (Absent); Marks obtained in second mid: 18

Final Internal Marks: (18x0.8) + (0x0.2) = 14.4

For Lab Course, there shall be a continuous internal evaluation during the semester for 30 marks. Out of the 30 marks, day-to-day performance of the student in the laboratory shall be evaluated for 20 marks by the concerned laboratory teacher based on experimental correctness/record/viva.

Two Lab Internal examinations shall be conducted for 10 marks by the concerned teacher. Performance of one best out of two tests to be considered.

Note: For some courses namely, Engineering Graphics - I & II and Engineering Graphics & Design, the distribution of internal evaluation and external evaluation marks shall be 30 and 70 respectively.

Of the 30 internal evaluation marks, day-to-day performance of the student shall be evaluated for 20 marks and Mid-term examination carries 10 marks. Day-to-day work shall be evaluated (10 marks for PART-A and 10 marks for PART-B) by the teacher concerned based on the exercises/submissions prepared in the class. Two midterm examinations shall be conducted in a semester for a duration of 2 hours each for 10 marks with a weightage of 80% for better of the two and 20% for the other. The sum of day-to-day evaluation and the midterm examination marks will be the final internal evaluation 30 marks for the subject. End examination shall be from Part-A only for 70 marks.

8.1.3 Internal Evaluation of Mandatory Courses

Mandatory courses are offered with no credits. However, a student has to complete Mandatory Courses in order to be eligible for the award of the Degree. There shall be an Internal Examination for 100 marks. A student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examination. In case, the student fails, a supplementary examination shall be conducted.

8.1.4 Make-up Internal Evaluation

The student who has missed both the Theory Internal examinations will be permitted to appear for a Make-up Internal examination in the event of his/her producing satisfactory evidences of medical ailment. One Make-up internal test shall be conducted immediately after the II Mid-term examination in the same semester, covering the total syllabus of FIVE Units in the respective course.

This Make-up examination will be given a weightage of 80%. Make-up tests shall be conducted outside the working hours and there can be even two such examinations on a day.

Student absent for I mid examinations with valid reasons he/ she should produce a supporting document to the department within a week after completion of last mid examination. And the same student absent for same subject in II mid examination, he/ she should produce a supporting document to the department immediately in order to giving the provision for makeup examination.

Make-up internal examinations are not for improvement of marks in Theory Internal examinations. There shall be no make-up internal examinations for a Lab course

8.2 End Evaluation

8.2.1 Theory End Evaluation

As specified in 8.0, Theory End Evaluation is done for 70 marks. End examination of theory subjects shall be conducted at the end of semester. There shall be Regular and Supplementary End Examinations. Theory End Examination shall be conducted for 70 marks and is of 3 hours duration. The question paper shall be of subjective type with 5 questions, one question from each unit, with internal choice. All questions carry equal marks of 14 each.

8.2.2 Lab End Examination

As specified in 8.0, Lab End Evaluation is done for 70 marks, in the form a Lab End Examination that shall be conducted for 3 hours in respective Laboratory. Each lab course will have its own evaluation procedure and weightage.

8.2.3 Supplementary Theory/Lab End Examinations

- Supplementary examination shall be conducted along with regular semester end examinations.
- During Semester End Examinations of even semester, supplementary examinations of odd semester shall be conducted and during semester end examinations of odd semester, supplementary

examinations of even semester shall be conducted.

- The same schedule is applicable to Supplementary Lab End Examinations. Supplementary examination shall be conducted along with the next batch of students or separately.
- Advanced supplementary shall be conducted only for Final Year II semester Students in view of their higher education pursuits and placement opportunities.
- In case of seminars and comprehensive viva-voce examinations, supplementary seminar / comprehensive viva-voce will be conducted along with the next batch of students. If the next batch of students is not available, a separate supplementary examination will be conducted.

8.2.4 Challenge Evaluation, Revaluation and Recounting

Students may visit Examination Section Webpage for Norms and Procedures for Challenge Evaluation, Revaluation and Recounting of Answer Scripts. (Refer to Appendix II)

9.0 Internship and Project Evaluation

9.1 Innovative project / Socially relevant project / Entrepreneurship / Internship (Industry / Govt. / NGO / MSME / Online)

Innovative project / Socially relevant project / Entrepreneurship / Internship (Industry / Govt. / NGO / MSME / Online) activity carries 2 credits. A student can take part in any one of the activities during 6th Semester or during the summer break between 6th and 7th semester.

The student shall submit a certificate in support of his/her participation/activity to the Head of the Department. Such certificate shall be considered for the award of 2 credits by a departmental committee consisting of Head of the Department along with two senior faculty members of the Department. If a student fails to submit Certificate of participation, he will be declared FAIL in this activity, till any such certificate is submitted to the Head of Department or any such activity is undertaken by the student.

Innovative Project: A solution of practical consequence to an existing problem which

- lacks a feasible solution or a solution of practical consequence which is capable of replacing a solution to an existing problem which satisfy one or a few of these properties, easily implementable/sustainable/environmentally friendly/cheaper/outreach to remote locations inaccessible by the current solution
- solves the problem creates by the current solution/Industrial applicable solution
- minimises the attrition rate of the instruments (eg solar lamps in remote locations, which can be easily assembled in the remote location).

A part of the solution to an existing problem satisfying the above conditions. An activity rendering added benefits to a current usage of a product.

Socially Relevant Project: A student can pursue a socially relevant project/internship to solve pressing problems of the society. These innovative projects shall contribute to the national development goals and priorities. Topics/ representative activities can be found on Departmental Webpage/Curriculum/Head of the Department. Innovative Project / Socially relevant project can be taken up by an individual student or by a team of 5 students.

Entrepreneurship: Entrepreneurship activities (start-up ideas) are encouraged to trigger an entrepreneurial culture and inculcate entrepreneurial values and influence the mind-set of engineering students towards entrepreneurship. Entrepreneurship activity shall be evaluated upon submission of a detailed report by the student and if found satisfactory the student shall be awarded 2 credits and the entrepreneurial idea shall be incubated in Institute Innovation Cell to help entrepreneurs navigate the transition from ideas to successful businesses. (Entrepreneurship activity is a certification course/programme)

Internship (Industry / Govt / NGO / MSME / Online)

During the summer vacation during 6th semester, students are ready for industrial experience. Therefore, they may choose to undergo Internship with industry related activities. Students may choose either to work on entrepreneurial activities resulting in start-up or undergo internship with industry/ NGOs/ Government organizations/ Micro/ Small/ Medium enterprises to make them ready for the industry. The student shall submit a certificate in support of his/her participation to the Head of the Department. Such certificate shall be evaluated for the award of 2 credits by committee consisting of Head of the Department along with two senior faculty members of the Department. The duration of the participation and guidelines for the activity shall be decided by the respective Head of the Department.

Detailed guidelines are given in Appendix I.

9.2 Project Work Stage I

Project Stage I consists of a presentation of **Abstract of the main project** in the 7th Semester. After selecting specific topic, the student shall collect the information and prepare a report, showing his/her understanding of the topic and submit the same to the department before presentation. Project shall be evaluated for a total of 200 marks. Out of which, project work stage–I shall be evaluated for 50 marks at the end of 7th semester for the award of 2 credits in **7th Semester** and project stage-II for 150 marks in 8th semester.

The technical presentation/report shall be evaluated by a committee consisting of Head of the Department along with two senior faculty members of the Department. A student shall acquire 2 credits assigned, if his report for Stage I is declared Satisfactory by the committee based on Rubrics set by the Department for evaluation.

If a student fails in Project work stage-I, a re-examination shall be conducted within a month. In case he/she fails in the re-examination also, he/she shall not be permitted register for Project Stage-II.

9.3 Project Work Stage II

Out of a total of 150 marks for the **Project work stage –II**, The internal evaluation shall be carried for 50 marks done by a committee consisting of HOD, Project Supervisor and senior faculty member of the department and the remaining 100 marks shall be awarded by a committee consisting of HOD, project Supervisor and an External Examiner nominated by the Principal or Dean Academics.

Project work shall start in 7th semester and shall continue in the 8th semester. A student shall acquire 8 credits assigned to project work. The evaluation of project work shall be conducted at the end of **the 8th semester.**

The internal evaluation shall be done on the basis of two seminars conducted in a semester as per the academic calendar and stipulated rubrics. In case, if a student fails in Project work, a re-examination shall be conducted within a month. In case he/she fails in the re-examination also, he/she shall not be permitted register for Project work. Further such students shall re-appear as and when next year 8th semester supplementary examinations are conducted.

10. ATTENDANCE REQUIREMENTS AND DETENTION POLICY

- A student shall maintain a minimum required attendance of 75% in AGGREGATE.
- Shortage of attendance up to 10% i.e., attendance between 65% to 75% in aggregate, may be condoned by the Institute Academic Committee based on the rules prescribed by the Academic Council of the Institute from time to time.
- A stipulated fee shall be payable towards condonation of shortage of attendance.
- Shortage of attendance below 65 % shall in no case be condoned. A stipulated fee shall be payable towards condonation of shortage of attendance to the Institute as per following slab system

  1stSlab: Less than 75% attendance but equal to or greater than 70% a normal condonation fee can be collected from the student.

  2ndSlab: Less than 70% but equal to or greater than 65%, double the condonation fee can be collected from the student.

- Students whose shortage of attendance is not condoned OR who have not paid the stipulated fee OR who have not cleared any other due to the Institute in any semester are not eligible to write the Semester End Examination (SEE).
- Students, who do not meet the minimum required attendance of 65% in a semester, shall be detained in that semester and their registration for that semester shall stand cancelled. They shall not be promoted to the next semester.
- Students detained in a semester shall seek re-admission into that semester as and when offered.
- Academic regulations applicable to the semester in which re-admission is sought shall be applicable to the re-admitted student.

- In case, there are any professional electives and /or open electives, the same may also be re- registered, if offered. However, if those electives are not offered in the later semesters, then alternate electives may be chosen from the same set of elective courses offered under that category.

  Any student against whom any disciplinary action is pending shall not be permitted to attend semester end examination (SEE) in that semester.

11. Minimum Academic Requirements and Award of the Degree

The following Academic Requirements have to be satisfied in addition to the attendance requirements mentioned in section 10.

11.1 A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory and lab courses, and project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the total of the internal and end examination marks taken together. In case of mandatory courses, he/she shall secure 40% of the total marks.

11.2 A student admitted in 4 year B. Tech programme, shall be promoted from 4th to 5th Semester only if he/she fulfills the academic requirements of securing a minimum of 50% credits from I year I and II-Semesters, II year I and II-Semesters examinations conducted till that time. A student admitted in 3 year B. Tech programme, shall be promoted from 4th to 5th Semester only if he/she fulfills the academic requirements of securing a minimum of 50 % credits from II year I and II-Semesters examinations conducted till that time.

11.3. A student admitted in 4 year B. Tech programme, shall be promoted from 6th to 7th Semester only if he/she fulfills the academic requirements of securing a minimum of 50% credits from I year I & II-Semesters, II year I & II-Semesters and III year I & II-Semesters examinations conducted till that time.

A student admitted in 3 year B. Tech programme, shall be promoted from 6th to 7th Semester only if he/she fulfills the academic requirements of securing a minimum of 50% credits from II year I & II-Semesters and III year I & II-Semesters examinations conducted till that time. And in case a student is detained for want of credits for particular academic year by sections 11.2 and 11.3 above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the 5th semester or 7th semester as the case may be.

11.4 A student shall register and put up minimum academic requirement of all 160 credits and earn all 160 credits for the award of B. Tech degree

11.5 A student shall be qualified in two certificate courses (value-added courses) of 40 hours duration each during his/her course of study. Please refer to Value-added Courses description.

11.6 Students who fail to earn 160 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 shall stand cancelled.

12. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

The performances of students in each of the courses in the Programme are expressed in terms of letter grades based on an absolute grading system. We use 10-point grading system with letter grades. They are given in the following table.

Marks Obtained	Letter Grade	Description	Grade Points (GP)
≥90	S	Superior	10
≥80 and ≤89.99	E	Excellent	9
≥70 and ≤79.99	A	Very Good	8
≥60 and ≤69.99	B	Good	7
≥50 and ≤59.99	C	Average	6
≥40 and ≤49.99	D	Pass	5
≤40	F	Fail	--
Absent in the exam(s)	AB	Absent	--

A student is eligible for the award of the B.Tech. Degree with the class as mentioned in the following table

CGPA	Class
≥7.5	First class with Distinction
≥6.5 and <7.5	First Class
≥5.5 and <6.5	Second Class
≥5.0 and <5.5	Pass

For mandatory courses, student shall be awarded “pass” or “fail “without any credit. This shall not be counted for the computation of SGPA/CGPA

12.1 Computation of SGPA

The performance of each student at the end of each semester shall be indicated in terms of SGPA. The SGPA shall be calculated as follows:

$$SGPA = \frac{Total\ earned\ weighted\ grade\ points\ in\ a\ semester}{Total\ credits\ in\ a\ semester}$$

$$SGPA = \frac{\sum_{i=1}^{p} C_{i.}.G_i}{\sum_{i=1}^{p} C_i}$$

Where

$C_{i.}$ = Number of credits allotted to a particular curse ‘i’

G_i= Grade point corresponding to the letter grade awarded to the course i

$i = 1,2,\ldots.p$ represent the number of courses in a particular semester.

Note: SGPA is calculated and awarded to those students who pass all the courses in a semester.

12.2 Computation of CGPA

The performance of a student shall be obtained by calculating Cumulative Grade Point Average (CGPA), which is weighted average of the grade points obtained on all courses during the course of study

$$CGPA = \frac{Total\ earned\ weighted\ grade\ points\ for\ the\ entire\ programme}{Total\ credits\ for\ the\ entire\ program}$$

$$CGPA = \frac{\sum_{j=1}^{m} C_{j.}.\ G_j}{\sum_{j=1}^{m} C_j}$$

Where

$C_{j.}$ = Number of credits allotted to a particular semester 'j'

G_j = Grade point corresponding to the letter grade awarded to the semester j

$j = 1,2,\ldots$.m represent the number of semester of the entire programme.

12.3 Grade Card

The grade card issued shall contain the following

- The credits for each course offered in that semester
- The letter grade and grade point awarded in each course
- The SGPA and CGPA
- Total number of credits earned by the student up to the end of that semester

Example: - Computation /calculation of SGPA

Course name	Credits (C)	Letter grade	Grade point (GP)	Credit point (CP=C*GP)
Course 1	4	A	9	4x9=36
Course 2	3	S	10	3*10=30
Course 3	2.5	S	10	2.5*10=25
Course 4	1.5	C	6	1.5*6=9
Course 5	1	D	5	1*5=5
Total	12			105

Therefore, SGPA= $\frac{105}{12}$ 8.75

Example Illustration of CGPA

Semester 1	Semester 2	Semester 3	Semester 4	Semester 5
Credit: 20 SGPA : 8.75	Credit : 20 SGPA : 8.25	Credit : 22 SGPA : 7.89	Credit: 23 SGPA : 8.21	Credit : 22 SGPA : 7.86

Thus, CGPA = $\frac{20*8.75+20*8.75+22*7.89+23*8.21+22*7.86}{107} = 8.34$

Similarly, compute CGPA obtained at the end of 8th semester shall be the final CGPA secured by the student for the entire programme.

12.4 Conversion of SGPA into percentage

In case of a specific query by students/employers regarding Semester Grade Point Average (SGPA)/ Cumulative Grade Point Average (CGPA) into percentage, the following formulae will be adopted for notional conversion of CGPA into percentage.

Percentage = 9.5 * CGPA

13. Transcripts

After successful completion of the entire 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 payment of requisite fee. Partial transcript will also be issued up to any point of study to a student on request.

14. Transitory Regulations

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

Candidates who are permitted to avail gap year shall be eligible for re-joining into the succeeding year of their B. Tech from the date of commencement of class work, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

15. Readmission of Students

A student who has satisfied the minimum attendance requirement in any semester may repeat that semester, after obtaining written permission from the Principal and cancelling the previous record of attendance and academic performance (viz; internal evaluation and external evaluation marks) of the semester or year. This facility may be availed by any student at the maximum twice for a 4 year B. Tech, and only once by Lateral Entry student & PG student during the entire course of study

16. Minimum Instruction Days for a Semester

The minimum instruction days including exams for each semester shall be 16 weeks.

17. Student transfers

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the affiliating University from time to time.

18. Announcement of results

- Results review committee comprising of University nominee, Principal, Dean Academics, Chairmen of various boards of studies, Controller of Examinations and Deputy Controller of Examinations will monitor the results and gives the permission for announcement of results.
- After review meeting results are loaded in to Institution website from which students can access their results by entering Hall Ticket number. And also results in form of hard copy are available with respective Heads of the departments.

19. General Instructions:

- The academic regulations should be read as a whole for purpose of any interpretation.
- Malpractices rules-nature and punishments are appended.
- Where the words "he", "him", "his", occur in the regulations, they also include "she", "her", "hers", respectively.
- In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal/ Governing body is final.
- Any legal issues are to be resolved in Rajampet Jurisdiction.
- The Institute may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Institute.

Appendix-I: Internship Guidelines

The Head of the Department will arrange internship for students in industries/organization after fifth semester or as per AICTE/ affiliating University guidelines. Institutions may also device online system for arranging &managing internships. The general procedure for arranging internship is given below:

Step 1: Request Letter/ Email from the office of HOD of the department should go to industry to allot various slots of 4-6 weeks during summer vacation as internship periods for the students. Students request letter/profile/ interest areas may be submitted to industries for their willingness for providing the training.

Step 2: Industry will confirm the training slots and the number of seats allocated for internships via Confirmation Letter/ Email. In case the students arrange the training themselves the confirmation letter will be submitted by the students in the office of Training & Placement through concerned department. Based on the number of slots agreed to by the Industry.

Step 3: Students on joining Training at the concerned Industry / Organization, submit the Joining Report/ Letters / Email.

Step 4: Students undergo industrial training at the concerned Industry / Organization. In-between Faculty Member(s) evaluate(s) the performance of students once/twice by visiting the Industry/Organization and Evaluation Report of the students is submitted in department office/TPO with the consent of Industry persons/ Trainers.

Step 5: Students will submit training report after completion of internship.

Step 6: Training Certificate to be obtained from industry.

Step 7: List of students who have completed their internship successfully will be issued by concerned Department.

For more details refer:

https://www.aicte-india.org/sites/default/files/AICTE%20Internship%20Policy.pdf

Appendix II: Norms and Procedures for Challenge Evaluation/Revaluation/Recounting

Revaluation / Recounting:

- The students who wishes to apply for Revaluation/Recounting of his/her answer-books(s) must submit his/her application on the prescribed from together with the requisite fee to the Controller of Examinations before expiry of 15 days excluding the date of the declaration of his/her examination result. Application not received in the prescribed form or by the due date or without the requisite fee shall be rejected.
- After Recounting / Revaluation, records are updated with changes if any and the student will be issued a revised memorandum of marks. If there are no changes, the student shall be intimated the same through a notice.
- No Revaluation / Recounting for Laboratory Examination.
- The students are informed to be more careful in furnishing the information while applying for Recounting / Revaluation. The applications with insufficient information will be summarily rejected and the student has to forfeit the amount paid in this connection.

Challenge valuation:

- Applications are invited from the students, who wish to apply for Challenge Valuation in the subjects of the B.Tech Regular and Supplementary examinations
- The student will apply for Challenge valuation in a specified application and should be routed through the HOD concerned.
- The students who have applied for the revaluation for a paper(s) of an examination are only eligible for the Challenge Valuation of that paper(s) of that examination.
- A Fee of Rs. 10000/- (Ten Thousand Rupees Only) for each paper is to be paid within the last date for challenge valuation.
- A Xerox copy of the answer script will be provided to the student on receipt of the payment of fee and date and time of the valuation will be informed to the student, so that valuation will be done in the presence of the teacher attended in support of the student nominated by the HOD concerned.
- The HOD concerned will nominate a teacher of the concerned subject to observe the valuation in support of the student. This will be done on the request of the student.
- If the marks obtained in the challenge valuation are more than or equal to 15% of the maximum marks with respect to the original marks obtained in the first valuation, then the marks obtained in the Challenge valuation will be awarded to the student and the institute will pay back Rs 9,000 (Nine thousands rupees only) to the student. If the student status changes from fail to pass, an amount of Rs. 5000 will be refunded to the student. Otherwise there will not be any change in the result of the student and original marks will be retained and the student will forfeit the fee paid.
- No Challenge valuation for Laboratory Examination

APPENDIX III: Rules for Disciplinary Action for Malpractices / Improper Conduct in Examinations

Malpractices identified by squad or special invigilators or invigilators

Punishments shall be given to the students as per the above guidelines. The case is to be referred to the malpractice committee.

Malpractice committee

1. The Principal, Chairman
2. Dean, Academics, Member
3. Invigilator, Member
4. Subject expert, Member
5. Concerned Head of the Department, Member
6. Controller of Examinations, Member Secretary

Note:

Whenever the performance of a student is cancelled in any subject/subjects due to Malpractice, he has to register for End Examinations in that subject/subjects consequently and has to fill all the norms required for the award of Degree.

	Nature of Malpractices/Improper conduct	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 from the 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 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 and sent to the University.
7.	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 for four consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. 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 four consecutive semesters from class work and all University examinations, if his

		involvement is established. Otherwise, the candidate is debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. 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 University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
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 marks.	Cancellation of the performance in that subject only.
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 student 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. If the candidate physically assaults the invigilator/officer-in-charge of the Examinations, then the candidate is also debarred and forfeits his/her seat. 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 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 University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
10.	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 students of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in nay malpractice or improper conduct mentioned in class 6 to 8.	Student of the colleges 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. Person (s) who does not belong to the College will be handed over to police and, a police case will be registered against them.
11.	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 semester/year.
12.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject only or in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester / year examinations, depending on the recommendation of the committee.
13.	If any malpractice is detected which is not covered in the above clauses 1 to 12 shall be reported to the University for further action to award suitable punishment.	

Activities (Non-Credit) as per AICTE Guidelines
List of Activities

1. Physical and Health

1.1 Physical Activities: (a) Games and Sports, (b) Gardening (c) Tree Plantation (d) Yoga:
1.2 NCC/NSS: Standard procedure

2. Culture

2.1 Learning an art form: music, dance, theatre, painting, and other art forms
2.2 Heritage: Visit to museum, archaeology sites, cultural walks, tours, local traditions
2.3 Intangible Cultural Heritage: Festivals, Food ways, Local Games

3. Literature & Media

3.1 Literature, Cinema and Media: workshop, reading multiple news sources, analyse ads
3.2 Group reading: Group sits and each person reads aloud (if possible, with proper modulation) taking turns. This if done properly for an hour one may complete 30-40 pages in an hour

4. Social Service

4.1 Social Awareness: Artisans-relates to engg., visit to hospitals, orphanages, police station, courts, trauma centres, consumer forums
4.2 Social Service: teach in neighbourhood, adopt an underprivileged school, village stay / visit (NSS), cleanliness drive, and skill transfer

5. Self-Development

5.1 Spiritual, Mindfulness & Meditation
5.2 Religion and Inter-faith: Reading of books on religious texts of different faiths by famous authors, organizing lecture on interfaith issues covering philosophies and chronology and contemporary situations world over at a given time
5.3 Human Values
5.4 Behavioural and Interpersonal skills: Motivational lectures, Group Discussions/activities, Case Study, Games/Stimulation Exercises, Role-Playing, Mindfulness training.
5.5 Lectures: Areas could be from science, engineering, social sciences, arts or even politics.

6. Nature

6.1 Nature Club: bird watching, recognizing plants at institute/at home, recognizing local animals, appreciating biodiversity
6.2 Environment Protection (non-credit course)

7. Innovation

7.1 Project based – Sc. Tech., Social, Design & Innovation: (a) Exposure to social problems (which are amenable to technological solutions) (b) Design & Innovation (to address above problems)

First 3-weeks – Induction Program will have Physical activities (*), Learning an art form (*), Literature & Cinema, Social Awareness (*) Lectures, Visits to local areas, Universal Human Values (*)

(*) It is the core part of Induction Program (Besides Familiarization to the College, Department and Branch career opportunities)

After first 3 weeks (1st semester)

Based on student interest – the above may be continued

Universal Human Values Groups – Meet once a week with 1st year students with the same faculty mentor & senior student guide.

Semester 2 to 4

Every student should register for some activity mentioned above in every semester. Spend 3-5 hours per week on the activity.

1. Environment Science (mandatory non-credit course prescribed at 1/2 semester)
2. Constitution of India (mandatory non-credit course prescribed at 3/4 semester)
3. Essence of Indian Traditional Knowledge (mandatory non-credit course prescribed at 3/4 semester)

For mandatory non-credit courses, these will be graded as Pass or Fail (P/F). Thus, the grades obtained will not affect the grade point average. However, they will appear on the grade sheet.

Semester 5 to 8

Every student should register for some activity mentioned above in every semester. Spend 3-5 hours per week on the activity. For activities, suitable registration system in case of the semesters will be developed.

INDUCTION PROGRAMME (Zero Semester)

Induction programme for newly admitted students is conducted in line with AICTE/UGC Induction programme policy, every year before the commencement of the first semester classes. The objective of the Induction programme is to demystify what is expected of students in Intermediate level and to provide adequate foundation in the core applied science subjects and English limited to moderate level so that students do not face any difficulty when the classes commence.

The syllabus for the course is framed in such a way that equal importance is given to both Engineering discipline and personality development which includes soft skills, sports and cultural Activities. The duration of the induction programme is **THREE** weeks. The students are trained in Foundation courses, basics of programming and English apart from other co-curricular and extra-curricular activities.

The objective of the Induction Programme is to work closely with the newly joined students in order to facilitate the following:

- Make the students feel comfortable in the new environment
- Allow them to explore their academic interests and activities
- Reduce competition and make them work for excellence
- Promote bonding within them
- Build relations between teachers and students
- Give a broader view of life
- Build character

Phase	Course Code	Name of the course	Lecture	Practical
Regular Phase	19A501	Proficiency classes: Familiarity with a computer	2	2
Regular Phase	19AC01	Proficiency classes: English Communication Skills	2	2
Regular Phase	19A502	Basics of Programming and Lab	3	2
Regular Phase	19AC02	Foundation classes in Mathematics	3	0
Regular Phase	19AC03	Foundation classes in Physics	3	2
Regular Phase	19AC04	Foundation classes in Chemistry	3	2
Regular Phase	19AC05	Universal Human Values	2	0
Regular Phase	19A301	Fundamentals of Engineering Drawing	1	0
Regular Phase	-	Physical education activities – Sports and Games	0	1
Non daily	-	Creative Arts		
Non daily	-	Lectures by eminent personalities		
Non daily	-	Visits to local area		
Non daily	-	Extra-curricular activities		

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET (AUTONOMOUS)

Department of Electronics and Communication Engineering

VISION AND MISSION OF THE DEPARTMENT

Vision

To offer educational experiences that makes the students globally competent, socially responsible and bring in answers to ever-ebbing problems in the field of Electronics & Communication Engineering.

Mission

To offer high quality premier education in the field of Electronics & Communication Engineering and to prepare students for professional career and higher studies. To promote excellence in technical research, collaborative activities and positive contributions to society.

PROGRAM EDUCATIONAL OBJECTIVES:

PEO1: Work efficiently as Communication Engineers, including supportive and leadership roles on Multidisciplinary teams

PEO2: Communicate effectively, recognize and incorporate societal needs and constraints in their professional endeavors, and practice their profession with high regard to legal and ethical responsibilities,

PEO3: Engage in life-long learning, such as graduate study, to remain current in their profession and be leaders in our technological society.

PROGRAMME OUTCOMES

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFC OUTCOMES

1. Professional Skills: An ability to understand the basic concepts in electronics and communication engineering and to apply them to various areas like electronics, communication, signal processing, VLSI, embedded systems etc., in the design and implementation of complex system

2. Problem-solving skills: An ability to solve complex electronics and communication engineering problems, using latest hardware and software tools along with analytical skills to arrive cost effective and appropriate solutions.

3. Successful Career and Entrepreneurship: An understanding of social-awareness & environmental-wisdom along with ethical responsibility to have a successful career and to sustain passion and zeal for real-world applications using optimal resources as an entrepreneur.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(AUTONOMOUS)

Department of Electronics and Communication Engineering
I Year - Zero Semester

Phase	Course Code	Name of the course	Lecture	Practical
Regular Phase	19A501	Proficiency classes: Familiarity with a computer	2	2
Regular Phase	19AC01	Proficiency classes: English Communication Skills	2	2
Regular Phase	19A502	Basics of Programming and Lab	3	2
Regular Phase	19AC02	Foundation classes in Mathematics	3	0
Regular Phase	19AC03	Foundation classes in Physics	3	2
Regular Phase	19AC04	Foundation classes in Chemistry	3	2
Regular Phase	19AC05	Universal Human Values	2	0
Regular Phase	19A301	Fundamentals of Engineering Drawing	1	0
Regular Phase	-	Physical education activities – Sports and Games	0	1
Non daily	-	Creative Arts		
Non daily	-	Lectures by eminent personalities		
Non daily	-	Visits to local area		
Non daily	-	Extra-curricular activities		

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(AUTONOMOUS)

Department of Electronics and Communication Engineering
Course Structure for R19 Regulations

I Year I Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	BS	19AC12T	Applied Physics	2	1	0	3
2	BS	19AC11T	Algebra and Calculus	3	1	0	4
3	ES	19A511T	Problem Solving and C programming	3	--	0	3
4	ES	19A411T	Essentials of Electrical & Electronics Engineering	2	--	0	2
5	ES	19A312T	Engineering graphics& design	1	--	3	2.5
Lab Courses							
6	BS	19AC12L	Applied Physics lab	--	--	3	1.5
7	ES	19A313L	Engineering & IT workshop	--	--	3	1.5
8	ES	19A511L	C Programming lab	--	--	3	1.5
9	ES	19A411L	Essentials of Electrical & Electronics Engineering Lab	--	--	2	1
							20

I Year II Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	HS	19AC25T	Functional English and Life skills	3	--	--	3
2	ES	19A522T	Programming through Python	3	--	--	3
3	BS	19AC24T	Engineering Chemistry	3	--	--	3
4	BS	19AC21T	Differential Equations and vector calculus	3	1	--	4
5	PC	19A421T	Electronic Devices and Circuits	2	--	--	2
6	MC	19AC26T	Environmental Science	3	--	--	0
Lab Courses							
7	HS	19AC25L	Communicative English Lab	--	--	3	1.5
8	ES	19A522L	Programming through Python Lab	--	--	2	1
9	BS	19AC24L	Engineering Chemistry lab	--	--	3	1.5
10	PC	19A421L	Electronic Devices and Circuits Lab	--	--	2	1
							20

II Year I Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	BS	19AC31T	Partial differential equations & Complex variables	3	--	--	3
2	PC	19A431T	Electronic Circuits	3	--	--	3
3	ES	19A237T	Electrical Circuits and Technology	3	--	--	3
4	ES	19A432T	Random Variables Theory	2	--	--	2
5	PC	19A433T	Digital Design	3	--	--	3
6	PC	19A434T	Signals and systems	3	1	--	4
Lab Courses							
7	ES	19A237L	Electrical Circuits and Technology Lab	--	--	3	1.5
8	PC	19A431L	Electronic Circuits Lab	--	--	3	1.5
9	PC	19A434L	Basic Simulation lab	--	--	3	1.5
10	MC	19AC35T	Essence of Indian tradition knowledge	3	--	--	--
							22.5

II Year II Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PC	19A441T	Analog IC applications	3	--	--	3
2	BS	19AC42T	Numerical methods and transform techniques	3	--	--	3
3	ES	19A442T	Control Systems	2	--	--	2
4	PC	19A443T	Analog Communication Systems	3	--	--	3
5	PC	19A444T	Field Theory and Transmission Lines	3	1	--	4
6	BS	19AC44T	Life Sciences for Engineers	2	--		2
Lab Courses							
7	PC	19A441L	Analog IC applications lab	--	--	3	1.5
8	PC	19A443L	Analog Communication Systems Lab	--	--	3	1.5
9	PC	19A445L	Digital Design Lab	--	--	3	1.5
10	MC	19AC47T	Constitution of India	3	--	--	--
							21.5

III Year I Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PC	19A451T	Microprocessors and Interfacing	3	--	--	3
2	PC	19A452T	Antennas & Wave Propagation	3	--	--	3
3	PC	19A453T	Digital signal processing	3	--	--	3
4	PC	19A454T	Digital Communication	3	--	--	3
5	PE	19A45AT	Industrial Electronics	3	--	--	3
		19A45BT	Advanced Digital Design Concepts				
		19A45CT	Data Communication Systems				
6	OE	19A45DT	Testing & Testability	3	--		3
		19A45ET	Digital system Design				
		19A45FT	Electronic Measurements & Instrumentation				
Lab Courses							
7	PC	19A451L	Microprocessors and Interfacing Lab	--	--	3	1.5
8	PC	19A454L	Digital Communication Lab	--	--	2	1
9	HS	19AC52L	Professional Communication skills Lab	--	--	3	1.5
							22

III Year II Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PC	19A462T	VLSI Design	3	--	--	3
2	PC	19A463T	Microwave Engineering	3	--	--	3
3	PE	19A46AT	Digital Design Through Verilog HDL	3	-	-	3
		19A46BT	Radar Engineering				
		19A46CT	Ad-hoc Wireless Networks				
4	PE	19A46DT	Optical Fiber Communication	3	--	--	3
		19A46ET	Digital Image Processing				
		19A46FT	Cellular and Mobile Communications				
5	OE	19A46IT	OE-2-MOOCS	3	--	--	3
6	HS	19AC61L	General Aptitude	--	--	2	1
7	HS	19AC63T	UHV-II	1	1	--	2
Lab Courses							
8	PC	19A462L	VLSI Design Lab	--	--	3	1.5
9	PC	19A464L	Digital Signal Processing Lab	--	--	3	1.5
10	PW	19A464I	Internship	--	--	--	2
							23

IV Year I Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PC	19A471T	Embedded systems	3	--	--	3
2	PE	19A47AT	DSP Processors and Architectures	3	-	-	3
		19A47BT	ASIC Design				
		19A47CT	Wireless Communication & Networks				
3	PE	19A47DT	Digital IC Design	3	-	-	3
		19A47ET	FPGA Architectures & Applications				
		19A47FT	Coding theory and Techniques				
4	OE	19A17GT	Basic Civil Engineering	3	--	--	3
		19A17HT	Water Resources and conservation				
		19A27HT	Fuzzy Logic and Neural networks				
		19A27GT	Energy Management and conservation				
		19A37JT	Introduction to Mechatronics				
		19A37KT	Fundamentals of Robotics				
		19A37LT	Non-Conventional sources of Energy				
		19A57ET	Artificial Intelligence				
		19A57FT	Cyber Security				
5	HS	19A373T	Management Science	3	--	--	3
Lab Courses							
6	PC	19A472L	Microwave Engineering Lab	--	--	2	1
7	PC	19A471L	Embedded Systems Lab	--	--	2	1
8	PW	19A473P	Project phase-1	--	--	2	2
							19

IV Year II Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	OE	19A18DT	Disaster Management	3	--	--	3
		19A18ET	Building Planning and Construction				
		19A28ET	System modeling and simulation				
		19A28DT	Battery energy storage systems				
		19A38ET	Entrepreneurship development				
		19A38FT	Optimization in Engineering				
		19A38GT	Total Quality Management				
		19A58ET	Internet of things				
		19A58FT	Web Programming				
2	PE	19A48AT	Mixed Signal IC applications	3	--	--	3
		19A48BT	Satellite Communications				
		19A48CT	Nano Electronics				
Lab Courses							
3	PW	19A481P	Project phase-2	--	--	--	8
							14

OPEN ELECTIVE COURSES offered by ECE

S. No.	Category	Course Code	Course Title	Offered to
1	OE	19A46GT/19A47GT	Electronic Circuits and its applications	CE, ME & CSE/EEE
2	OE	19A46HT/19A47HT	Basics of Communication systems	CE, ME & CSE/EEE
3	OE	19A48DT	Introduction to Digital design	ALL
4	OE	19A48ET	Industrial Electronics	ALL

List of Value-added courses:

1. Introduction to MATLAB and its applications
2. PCB Design 3. Advanced VLSI Technologies
4. Embedded System Design using advanced processors
5. Antenna Design and its applications

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Applied Physics
Category	BS
Couse Code	19AC12T
Year	I B.Tech.
Semester	I Semester (Common to ECE & EEE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	-	3

Course Objectives:

- To impart knowledge in basic concepts of wave optics, electromagnetic theory and fiber optics.
- To explain the significant concepts of dielectrics, magnetic materials, semiconductors and superconductors in the field of engineering and their potential applications.
- To familiarize the applications of nanomaterials relevant to engineering branches.

Unit 1 Wave Optics 9

Interference-Principle of Superposition-Interference of light- Conditions for sustained Interference -Interference in thin films (reflected light)-Newton's Rings-Determination of Wavelength- Engineering applications of interference.

Diffraction-Fraunhofer Diffraction-Single and double slit Diffraction -Diffraction Grating – Grating Spectrum -Determination of Wavelength-Engineering applications of diffraction.

Polarization-Polarization by double refraction-Nicol's Prism--Half wave and Quarter wave plate- Engineering applications of Polarization.

Unit 2 Dielectric and Magnetic materials 9

Introduction-Dielectric polarization-Dielectric polarizability- Susceptibility and Dielectric constant- Types of polarizations: Electronic and Ionic (quantitative), Orientation polarizations(qualitative) -Frequency dependence of polarization-Lorentz(internal) field-Claussius -Mosotti equation-Applications of Dielectrics - ferroelectricity.

Introduction- Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment -Classification of Magnetic materials-Weiss theory of ferromagnetism (qualitative)-Hysteresis-soft and hard magnetic materials-Magnetic device applications (Magnetic bubble memory).

Unit 3 Electromagnetic Waves and Fiber Optics 9

Divergence and Curl of Electric and Magnetic Fields-Gauss theorem for divergence and stoke's theorem for curl-Maxwell's Equations(quantitative)- Electromagnetic wave propagation (non-conducting medium)-Poynting's Theorem (qualitative).

Introduction to Optical Fibers-Total Internal Reflection-Critical angle of propagation-Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile- Propagation of electromagnetic wave through optical fiber –modes-importance of V number-attenuation-Block diagram of fiber optic communication- Medical Applications-Fiber optic Sensors.

Unit 4 Semiconductors 9

Origin of energy bands - Classification of solids based on energy bands – Intrinsic semi-conductors - density of charge carriers-Fermi energy – Electrical conductivity - extrinsic semiconductors - P-type & N-type - Dependence of Fermi energy on carrier concentration and temperature- Direct and Indirect band gap semiconductors-Hall effect- Hall coefficient - Applications of Hall effect - Drift and Diffusion currents – Einstein's relation - Applications of Semiconductors.

Unit 5 Superconductors and Nano materials 9

Superconductors-Properties- Meissner effect -Types of Superconductors - BCS Theory-Josephson effect (AC & DC) - Applications of superconductors.

Nano materials – significance of nanoscale - properties of nanomaterials: physical: mechanical, magnetic, Optic, Thermal - synthesis of nanomaterials: top-down-ball milling-Bottom-up-Chemical vapor deposition- characterization of nanomaterials: X-ray diffraction (XRD) - Scanning Electron Microscope (SEM) - Applications of Nano materials.

Prescribed Text Books

1. M.N. Avadhanulu, P. G. Kshirsagar & TVS. Arunmurthy "A Text book of Engineering Physics", S. Chand Publications,11th editioin,2019
2. H. K. Malik & A .K. Singh "Engineering Physics",- McGraw Hill Publishing Company Ltd, 2018

Reference Text Books:

1. T Pradeep "A Text book of Nano Science and Nano Technology"- Tata Mc Graw Hill 2013
2. David J. Griffiths, "Introduction to Electrodynamics"- 4/e, Pearson Education,2014
3. Gerd Keiser "Optical Fiber Communications"- 4/e, Tata McGrawHill ,2008
4. Charles Kittel "Introduction to Solid State Physics",Wiley Publications,2011
5. S.M.Sze "Semiconductor devices-Physics and Technology"-Wiley,2008

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Explain the concepts of interference, diffraction and polarization and identify their applications in engineering field.	L2 & L3
2. Summarize the various types of polarization of dielectrics, classification of magnetic materials and the applications of dielectric and magnetic materials.	L2
3. Apply electromagnetic wave propagation in different guided media and fiber optics concepts in various fields with working principle.	L3 & L2
4. Outline the properties of various types of semiconductors and identify the behavior of semiconductors in various fields.	L2
5. Explain various concepts of superconductors and nanomaterials with their applications in various engineering branches.	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC12T .1	3	2	2	-	-	-	-	-	-	-	-	
19AC12T .2	3	2	2	-	-	-	-	-	-	-	-	2
19AC12T .3	3	2	2	-	-	-	-	-	-	-	-	2
19AC12T .4	3	1	-	-	-	-	-	-	-	-	-	
19AC12T .5	3	2	2	-	-	-	-	-	-	-	-	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Algebra and Calculus
Category	BS
Couse Code	19AC11T
Year	I B.Tech.
Semester	I Semester (Common to CE, EEE, ME, ECE& CSE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	1	-	4

Course Objectives:

- This course will illuminate the students in the concepts of calculus and linear algebra.
- This course will equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Unit 1 Matrix Operations and Solving Systems of Linear Equations 9

Rank of a matrix by echelon form - solving system of homogeneous and non-homogeneous linear equations by rank method - Eigen values and Eigen vectors - their properties.

Unit 2 9

Cayley-Hamilton theorem (without proof) - finding inverse and power of a matrix by Cayley-Hamilton theorem - diagonalization of a matrix, quadratic forms and nature of the quadratic forms - reduction of quadratic form to canonical forms by orthogonal transformation

Unit 3 Functions of several variables 9

Partial derivatives - total derivatives - chain rule - change of variables – Jacobian - maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers for three variables.

Unit 4 Mean value theorems and curve tracing 9

Taylor's and Maclaurin's theorems (without proofs) – simple problems.
Curve tracing – Cartesian and polar curves.

Unit 5 Multiple Integrals and Special Functions 9

Double integrals: Evaluation - change of order of integration - change of variables (Cartesian to polar) - areas enclosed by plane curves and Evaluation of triple integral.
Beta and Gamma functions and their properties - relation between beta and gamma functions.

Prescribed Text Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
3. Higher Engineering Mathematics, Ramana B.V., Tata McGraw

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Apply the knowledge to solve System of linear equations.	L3
2. Develop the use of matrix algebra techniques that is needed by engineers for practical applications	L3
3. Classify the functions of several variables which is useful in optimization	L4
4. Understand mean value theorems to real life problems and will understand the applications of curve tracing	L2

5. Solve important tools of calculus in higher dimensions and be familiar with 2-dimensional, 3- dimensional coordinate systems and also learn the utilization of special functions — L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC11T.1	3	3	-	-	-	-	-	-	-	-	-	3
19AC11T.2	3	2	-	-	-	-	-	-	-	-	-	3
19AC11T.3	3	3	-	-	-	-	-	-	-	-	-	2
19AC11T.4	3	3	-	-	-	-	-	-	-	-	-	2
19AC11T.5	3	3	-	-	-	-	-	-	-	-	-	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Problem Solving and C programming
Category	ES
Couse Code	19A511T
Year	I B.Tech.
Semester	I Semester (Common to CE, EEE, ME, ECE & CSE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	-	3

Course Objectives:

- Understanding the steps in problem solving and formulation of algorithms to problems.
- Develop programming skills as a means of implementing an algorithmic solution with appropriate control and data structures.
- Develop intuition to enable students to come up with creative approaches to problems.
- Develop programs using pointers, structures and unions
- Manipulation of text data using files

Unit 1 9

Problem Solving: Steps to solve problems, algorithm, Pseudo code, Flowchart with examples, Program Development Environments.
Introduction to programming: Programming languages and generations.
Introduction to C: Introduction, structure of C program, keywords, identifiers, Variables, data types, constants, I/O statements, operators, precedence and associatively

Unit 2 9

Introduction to decision control statements: Selective, looping and nested statements, jumping statements.
Arrays: Introduction, declaration of arrays, accessing and storage of array elements, searching (linear and binary search algorithms) and sorting (selection and bubble) algorithms, multidimensional arrays, matrix operations.

Unit 3 9

Strings: Declaration and Initialization, String Input / Output functions, String manipulation functions.
Functions: Types of functions, recursion, scope of variables and storage classes.
Preprocessor Directives: Types of preprocessor directives, examples.

Unit 4 9

Pointers: Understanding computer's memory, introduction to pointers, declaration pointer variables, pointer arithmetic, pointers and strings, array of pointers, function pointers, dynamic memory allocation, advantages and drawbacks of pointers.

Unit 5 9

Structures: Structure definition, initialization and accessing the members of a structure, nested structures, array of structures, structures and functions, structures and pointers, self-referential structures, unions and enumerated data types.
Files: Introduction to files, file operations, reading and writing data on files, error handling during file operations.

Prescribed Text Books

1. C Programming and Data Structures. B.A. Forouzan, R. F.Gilberg,Cengage learning, Indian edition.
2. C and Data Structures, E.Balaguruswamy, Tata McGraw Hill.
3. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education.

Reference Text Books

1. LET US C, Yeswanth Kanitkar, Ninth Edition, BPB Publication
2. Byron Gottfried, Schaum's" Outline of Programming with C", McGraw-Hill.

3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
4. A K Sharma “Computer Fundamentals and Programming”, 2nd Edition, University Press, 2018.
5. PradeepDey and Manas Ghosh, “Programming in C”, Oxford Press, 2nd Edition, 2017
6. ReemaTharaja “Introduction to C Programming”, Second Edition, OXFORD Press, 2015.

Course Outcomes:

At the end of the course, students will be able to	Blooms Level of Learning
1. Formulate solutions to problems and represent those using algorithms/Flowcharts.	L3
2. Choose proper control statements and use arrays for solving problems.	L3
3. Decompose a problem into modules and use functions to implement the modules.	L4
4. Apply and use allocation of memory for pointers and solve the problems related to manipulation of text data using files and structures.	L3
5. Develop the solutions for problems using C programming Language.	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19A511T.1	1	2	2	3	-	1	-	-	-	-	-	-
19A511T.2	3	3	3	3	3	-	-	-	1	-	-	-
19A511T.3	3	2	1	2	1	-	-	-	1	-	-	2
19A511T.4	2	3	2	2	3	-	-	-	1	-	1	2
19A511T.5	3	2	2	2	2	-	-	-	1	-		2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Essentials of Electrical & Electronics Engineering
Category	ES
Course Code	19A411T
Year	I B.Tech.
Semester	I Semester (Common to ECE & EEE)

Lecture Hours	Tutorial Hours	Practical	Credits
2	-	-	2

Course Objectives:
- To learn the basic fundamentals of circuit components, circuit laws and network theorems
- To understand the concepts of semiconductor diode and its applications
- To understand the basic concepts of Bipolar Junction transistor

Unit 1 Circuit Elements 9
Sources: Voltage and Current Sources, Resistors-Types- resistance color coding-potentiometer-types, Capacitors-types-uses of capacitors, Inductors-types, Ohm's Law-R, L, C Voltage, Current, Power & Energy.

Unit 2 Network Theorems (D.C. Excitation Only) 9
Ohm's law, Kirchhoff laws-network reduction techniques-series, parallel, series parallel circuits-source transformations. Thevenin'sTheorem- Norton's Theorem- Superposition Theorem-maximum power transfer theorem.

Unit 3 Semiconductor Diodes 9
Energy Band Diagram of Semiconductors (Intrinsic & Extrinsic), PN Diode, Drift & Diffusion currents, V-I Characteristics of PN Junction Diode (Ideal, Simplified and Piece-wise, Practical), Temperature Dependency, Transition and Diffusion Capacitances, Breakdown Mechanisms in semiconductor diodes, Zener diode characteristics &Zener diode acts as a regulator.

Unit 4 Diode Applications 9
Half Wave and Full Wave Rectifiers – General Filter Considerations – Capacitor Filter – RC Filter, Choke Filter, LC Filter, π-Filter.

Unit 5 Introduction of BIT 9
Transistor constructions – types. Transistor operation in CB, CE and CC configurations and their Characteristics, Multimeter, CRO, DSO, Function Generator

Prescribed Text Books:
1. "Electronic Devices and Circuits" David A Bell, Fifth Edition, 2008, Oxford University Press
2. "Circuits & Network Analysis & Synthesis", Sudhakar. A & Shyammohan S Palli, 4th Edition, Tata McGraw Hill, 2010
3. Engineering basics: Electrical, Electronics and computer Engineering" T.Thyagarajan, New Age International, 2007
4. Electronic Devices and Circuits, G K.Mithal

Reference Text Books:
1. "Electronic Devices and Circuits" J. Millman and Halkias, 1991 edition, 2008, TMH
2. "Electronic Devices and Circuit Theory" Robert L.Boylestad and Louis Nashelsky, 9th edition, PHI
3. "Electronic Principles" Albert Malvino, David J Bates, MGH, SIE 2007
4. "Micro Electronic Circuits" Sedra and Smith, Oxford University Press

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the circuit components voltage, current, power and energy relations and their types.	L2

2. Apply the circuit simplification techniques L3
3. Have the knowledge of semiconductor diodes. L2
4. Understand the operation and usage of Rectifiers and filters. L2
5. Understand the basic concepts of Bipolar Junction Transistor L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19A411T.1	2	2										2
19A411T.2	3	3	3	3	3							3
19A411T.3	2	2										2
19A411T.4	2	2	2									2
19A411T.5	2		2									2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Engineering Graphics & Design
Category	ES
Course Code	19A312T
Year	I B.Tech.
Semester	I Semester (Common to EEE & ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
1	0	3	2.5

Course Objectives:

- To learn engineering drawing sketches and dimensioning.
- To learn basic engineering drawing formats.
- To increase ability for communicating with engineers around the world.
- To prepare the student for future Engineering positions.

PART – A : Manual Drawing

Unit 1 Introduction Theory Hours: 05 Practice sessions: 04

Principles of Engineering Graphics and their significance - Lettering – Geometrical constructions - Curves used in Engineering Practice: Conic Sections– General method only. Special methods: Ellipse – Oblong method, Arcs of circle method, concentric circles method – Parabola - Rectangle method and Tangent method – Rectangular Hyperbola.

Unit 2 Cycloidal Curves Theory Hours: 03 Practice Sessions: 06

Cycloid, Epicycloid and Hypocycloid (treatment of simple problems only)
Involutes – Square, Pentagon, Hexagon and Circle.

Unit 3 Projections of Points and Lines Theory Hours: 05 Practice Sessions: 04

Projections of Points and Projections of Lines-inclined to one reference plane - inclined to both reference planes, finding the True lengths.

Unit 4 Projections of Planes Theory Hours: 04 Practice Sessions: 05

PROJECTIONS OF PLANES: Projections of regular Plane surfaces inclined to one reference plane and both reference planes.

Unit 5 Projections of Solids & Conversion of Views

Projections of Solids: Projections of Regular Solids – Cylinder, Cone, Prism and Pyramid - inclined to one reference and both reference planes.
Conversion of Views: Conversion of Isometric views to Orthographic Views and Conversion of Orthographic views to Isometric views.

PART – B : Computer Aided Drafting (For Internal Evaluation Weightage only)
Theory Hours: 03 Practice Sessions: 03

Introduction to AutoCAD: Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, templates, polylines, trimming, extending, stretching, fillets, arrays, dimensions. Dimensioning principles and conventional representations. Free hand sketches on isometric views to orthographic views.

Prescribed Text Books:

1. Engineering Drawing, N.D. Bhatt, Charotar Publishers, Edition 2016
2. Engineering Drawing, K.L. Narayana, P. Kanniah, Scitech Pub, Edi 2016

Reference Books:

1. Engineering Drawing and Graphics, Venugopal/ New age, Ed 2015.
2. Engineering Drawing, Johle, Tata McGraw-Hill. Ed 2014
3. Engineering Drawing, Shah and Rana, 2/e, Pearson Education Ed 2015

Course Outcomes:

Student will be able to,	Blooms Level of Learning
1. Understand the concepts of Conic Sections.	L1, L2
2. Understand the concept of Cycloidal Curves, Involutes and the application of industry standards.	L2, L3
3. Understand the Orthographic Projections of Points and Lines and are capable to improve their visualization skills, so that they can apply these skills in developing the new products.	L2, L3
4. Understand and apply Orthographic Projections of Planes.	L1, L2, L3
5. Understand and analyze the Orthographic Projections of Solids and conversion of isometric views to orthographic views vice versa.	L3, L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19A312T.1	3	-	-	-	-	3	2	-	1	2	-	-
19A312T.2	3	-	-	-	-	3	2	-	1	2	-	-
19A312T.3	3	2	-	-	-	3	2	-	1	2	-	-
19A312T.4	3	2	-	-	-	3	2	-	1	2	-	-
19A312T.5	3	-	2	-	2	2	-	3	3	-	-	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)
Department of Electronics and Communication Engineering

Title of the Course	Applied Physics Lab
Category	BS
Couse Code	19AC12L
Year	I B.Tech.
Semester	I Semester (Common to ECE & EEE)

Lecture Hours	Tutorial Hours	Practical	Credits
-	-	3	1.5

Course Objectives:

- Understand the concepts of interference, diffraction and their applications and the role of optical fiber parameters in communication.
- Recognize the importance of energy gap in the study of conductivity and Hall Effect in a semiconductor.
- Illustrates the magnetic and dielectric materials applications.
- Apply the principles of semiconductors in various electronic devices.

Note: In the following list, out of 15 experiments, any 10 experiments must be performed in a semester

List of Experiments

1. Determination of the thickness of the wire using wedge method
2. Determination of the radius of curvature of the lens by Newton's ring method
3. Determination of wavelength by plane diffraction grating method
4. Dispersive power of a diffraction grating
5. Resolving power of a grating
6. Determination of dielectric constant by charging and discharging method.
7. Magnetic field along the axis of a circular coil carrying current.
8. Determination of the self-inductance of the coil (L) using Anderson's bridge.
9. Study of variation of B versus H by magnetizing the magnetic material (B-H curve)
10. Determination of the numerical aperture of a given optical fiber and hence to find its acceptance angle
11. Measurement of magnetic susceptibility by Gouy's method
12. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect.
13. Determination of the resistivity of semiconductor by Four probe method
14. Determination of the energy gap of a semiconductor
15. Measurement of resistance with varying temperature.

Reference Text Book:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Operate various optical instruments and estimate various optical parameters.	L2
2. Estimate the Various magnetic parameters	L2
3. Measure properties of a semiconductors	L3
4. Determine the properties dielectric materials and optical fiber materials	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC12L.1	3											
19AC12L.2	3	1			2							
19AC12L.3	2				2							
19AC12L.4	3	2			2							

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Engineering & IT Workshop
Category	ES
Course Code	19A313L
Year	I B.Tech.
Semester	I Semester (Common to EEE & ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
-	-	3	1.5

Engineering Workshop

Course Objectives:
- To read and interpret job drawing, plan various operations and make assembly.
- To identify and select the hand tools and instruments used in various trades.
- To gain practical skills by performing the experiments in different trades of workshop.

Trades for exercises — Practice hours: 24

Carpentry shop– Two joints (exercises) from: Mortise and tenon T joint, Dove tail joint, Bridle T joint, middle lap T joint, Half Lap joint, cross lap joint, Corner Dovetail joint or Bridle Joint from soft wood stock.
Sheet metal shop– Two jobs (exercises) from: Tapered Tray, cylinder, conical funnel from out of 22 or 20 gauge G.I. sheet
Fitting shop– Two jobs (exercises) from: square Fit, V-Fit, Semi-circular fit, dove tail fit from M.S. stock
House-wiring– Two jobs (exercises) from: Parallel and Series, Two-way switch, Tube –Light connection, Stair case connection

Trades for demonstration:
- Plumbing
- Machine Shop
- Metal Cutting
- Soldering and Brazing

Reference Text Books:
1. Kannaiah P. and Narayana K.L., Workshop Manual, 3rd Edn, Scitech publishers.
2. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
3. Jeyapoovan T and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

Course Outcomes:

Student will be able to,	Blooms Level of Learning
1. Apply wood working skills in real world applications.	L3
2. Build different parts with metal sheets used in various appliances.	L3
3. Apply fitting operations in various assemblies.	L3
4. Apply basic electrical engineering knowledge for house wiring practice.	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A313L.1	3	-	1	-	1	-	-	-	-	-	-	1	-	-	-
19A313L.2	3	-	1	-	1	-	-	-	-	-	-	1	-	-	-
19A313L.3	3	-	1	-	1	-	-	-	-	-	-	1	-	-	-
19A313L.4	2	-	1	-	1	-	-	-	-	-	-	1	-	-	-

IT Workshop

Course Objectives: This course will

- Demonstrate the disassembling and assembling of a personal computer system.
- Demonstrate the Installation the operating system and other software required in a personal computer system.
- Introduce connecting the PC on to the internet from home and work place and effectively usage of the internet, Usage of web browsers, email, news groups and discussion forums.
- Introduce the usage of Productivity tools in crafting professional word documents; excel spreadsheets and power point presentations.
- Demonstrate the disassembling and assembling of a personal computer system.

Preparing your Computer 9

Task 1: Learn about Computer: Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

Task 2: Assembling a Computer: Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and troubleshooting a computer.

Task 3: Install Operating System: Student should install MS Windows on the computer. Students should record the entire installation process.

Internet 3

Task 4: Browsing Internet: Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc. If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating e-mail account.

Productivity tools 9

Task 5: Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered.

Task 6: Spreadsheet: Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.

Task 7: Presentations: creating, opening, saving and running the presentations, selecting the style for slides, formatting the slides with different fonts, colours, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

Prescribed Text Books:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. Upgrading and Repairing PC's, 22nd Edition, Scott Muller QUE, Pearson Education.
3. Comdex Information Technology Course Kit, Vikas Gupta, WILEY Dreamtech.
4. MOS 2010 Study Guide for Microsoft Word, Excel, PowerPoint, and Outlook Exams, 1st Edition, Joan Lambert, Joyce Cox, Microsoft Press

Reference Text Books:

1. IT Essentials PC Hardware and Software Companion Guide, CICSO Networking Academy

2. Network Your Computer & Devices Step by Step 1st Edition, Ciprian Rusen, Microsoft Press
3. Troubleshooting, Maintaining & Repairing PCs, 5th Edition, Bigelow, TMH
4. Introduction to computers, Peter Norton, 6/e, Mc Graw Hill

Course Outcomes:

Student will be able to	Blooms Level of Learning
5. Recognize the peripherals of a computer, perform assembling and disassembling of various components of a computer.	L1, L3
6. Describe and perform installation and un-installation of Windows operating systems and also perform troubleshooting of various hardware and software components.	L2, L3
7. Use Web browsers to access Internet, Search Engines.	L3
8. Use word processor, spread sheet, presentation and data storage tools.	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19A313L.5	3	3	1	-	3	-	-	-	-	-	-	3
19A313L.6	3	3	1	-	3	-	-	-	-	-	-	3
19A313L.7	3	3	1	-	3	-	-	-	-	-	-	3
19A313L.8	3	3	1	-	3	-	-	-	-	-	-	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	C Programming Lab
Category	ES
Course Code	19A511L
Year	I B.Tech.
Semester	I Semester (Common to ECE, CE, EEE, ME, CSE)

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives: This course will

- Setting up programming environment
- Develop Programming skills to solve problems
- Use of appropriate C programming constructs to implement algorithms.
- Identification and rectification of coding errors in program
- Develop applications in a modular fashion
- Manage data using files

Minimum number of FOUR programmes from the list of experiments are to be done students.

Exercise I (week-1): Data types, Variables, Constants and Input and Output.
Exercise 2:(week-2): Operators, Expressions and Type Conversions.
Exercise 3:(week-3): Conditional Statements [two way and multipath].
Exercise 4:(week-4): Loop Control Statements. [for, while and do-While]
Exercise 5:(week-5): Unconditioned JUMP Statements- break, continue, goto.
Exercise 6:(week-6): Declaring Arrays, Referencing Arrays, Array Subscripts. Using for loop for sequential Access.
Exercise 7:(week-7): Multidimensional Arrays
Exercise 8:(week-8): String Basics, String Library Functions and Array of Strings.
Exercise 9:(week-9): Simple user defined functions, Parameter passing methods- pass by value, pass by reference.
Exercise 10:(week-10): Storage classes- Auto, Register, Static and Extern
Exercise 11:(week-11): Recursive Functions, Preprocessor commands.
Exercise 12:(week-12): Array Elements as Function Arguments.
Exercise 13:(week-13): Pointers and structures.
Exercise 14:(week-14): Dynamic memory allocation and error handling.
Exercise 15:(week-15): File handling
Recommended Systems/Software Requirements: Intel based desktop PC with ANSI C/ TURBO C Compiler and Supporting Editors

Prescribed Text Books:

1. C and Data Structures, E. Balaguruswamy, Tata McGraw Hill
2. Let Us C, Yeswanth Kanitkar, Ninth Edition, BPB Publication

References:

1. https://www.cprogramming.com/
2. https://www.mycplus.com/tutorials/c-programming-tutorials

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Identify and setup program development environment	L2
2. Implement the algorithms using C programming language constructs	L3
3. Identify and rectify the syntax errors and debug program for semantic errors	L3
4. Solve problems in a modular approach using functions	L4
5. Implement file operations with simple text data	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A511L.1	3	2	-	2	2	-	-	-	2	2	1	-	3		
19A511L.2	2	2	-	-	-	-	-	-	1	-	-	-	3		
19A511L.3	3	3	3	3	-	-	-	-	1	-	-	3	3		
19A511L.4	3	3	3	3	-	-	-	-	-	-	-	3	3		
19A511L.5	3	3	3	3	-	-	-	-	-	-	-	3	3		

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	Essentials of Electrical & Electronics Engineering Lab
Category	ES
Course Code	19A411L
Year	I B.Tech.
Semester	I Semester (Common to ECE & EEE)

Lecture Hours	Tutorial Hours	Practical	Credits
-	-	2	1

Course Objectives:

1. To determine the characteristics of semiconductor diode
2. To perform various rectifier circuits in practical approach
3. To perform input and output characteristics of BJT for various configurations

List of Experiments

1. Identification, Specifications, Testing of R, L, C Components (Color Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCBs, Diodes, BJTs.
2. Study and operation of
   - Multi-meters (Analog and Digital)
   - Function Generator
   - Regulated Power Supplies
   - CRO
3. Verification of Kirchhoff's Voltage and Current Law.
4. Forward and Reverse Bias Characteristics of PN junction Diode.
5. V-I Characteristics of Zener Diode
6. Half Wave Rectifier with and without filter.
7. Full Wave (Center trapped) Rectifier with and without filter.
8. Full Wave (Bridge) Rectifier with and without filter.
9. Zener Diode as a Voltage Regulator.
10. Input and Output Characteristics of Transistor CB Characteristics.
11. Input and Output Characteristics of Transistor CE Characteristics.
12. Input and Output Characteristics of Transistor CC Characteristics.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Determine the parameters like cut-in voltage, resistances and breakdown voltage of semiconductor diode	L5
2. Design DC power supply circuits using rectifiers and filters	L6
3. Choose the desired configuration for specified applications	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19A411L.1	2	2	-	-	-	-	-	-	-	-	-	-
19A411L.2	-	2	-	-	-	-	-	-	-	-	2	-
19A411L.3	-	-	2	-	-	-	-	2	-	-	-	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	Functional English and Life Skills
Category	HS
Course Code	19AC25T
Year	I B.Tech.
Semester	II Semester (Common to ECE & EEE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives:

1. To focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
2. To impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays
3. To provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing
4. To build self-confidence, encourage critical thinking, foster independence and help people to communicate more effectively.

Unit 1 9

Reading: *On the Conduct of Life* by William Hazlitt
Life Skills: 'Values and Ethics' with reference to Rudyard Kipling's poem '*If*'
Grammar and Vocabulary: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.
Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph

.

Unit 2 9

Reading: *The Brook* by Alfred Tennyson
Life Skills: 'Self-Improvement' with reference to George Bernard Shaw's speech '*How I Became a Public Speaker'*
Grammar and Vocabulary: Cohesive devices - linkers, sign posts and transition signals; use of articles and zero article; prepositions.
Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.

Unit 3 9

Reading: *The Death Trap* by Saki
Life Skills: 'Time Management' with reference to an extract from Seneca's letter to his friend '*On Saving Time'*
Grammar and Vocabulary: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.
Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Unit 4 9

Reading: *ChinduYellamma*
Life Skills: 'Innovation' with reference to the life of 'Muhammad Yunus'
Grammar and Vocabulary: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms
Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables

Unit 5 9

Reading: *Politics and the English Language b*y George Orwell

Life Skills: 'Motivation with reference to RanjanaDeve's article 'The Dancer with a White Parasol'

Grammar and Vocabulary: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Writing: Writing structured essays on specific topics using suitable claims and evidences

Prescribed Text Books

1. Language and Life published by Orient Black Swan (with CD).

Reference Books

1. English Grammar in Use: A Self Study Reference and Practice Book, Raymond Murphy, Fourth Edition, Cambridge Publications
2. English Grammar and Composition, David Grene, Mc Millan India Ltd

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. read, scan and skim texts such as literary forms, journalistic articles and scientific readings for comprehension and retention	L2
2. exhibit self-confidence and innovative thinking and communicate more effectively	L3
3. understand the factors that influence use of grammar and vocabulary in speech and writing and formulate sentences with grammatical accuracy	L2
4. produce coherent and unified paragraphs with adequate support and detail	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC25T.1	-	-	-	-	-	-	-	-	-	3	-	2
19AC25T.2	-	-	-	-	-	-	-	-	-	3	-	2
19AC25T.3	-	-	-	-	-	-	-	-	-	3	-	2
19AC25T.4	-	-	-	-	-	-	-	-	-	3	-	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the course	Programming through Python
Category	ES
Course Code	19A521T
Year	I B.Tech.
Semester	II Semester (Common to EEE & ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will

- To learn basics of computational problem solving, python programming and basic control structures.
- To understand python programming basic constructs like lists, dictionaries, sets and functions
- To learn module design and usage of text files in python programming
- To understand basics of object-oriented programming.
- To understand elementary data structures like linked list, stacks and queues.

Unit 1 9

Computational problem solving, Introduction to python programming language, literals, variables and identifiers, operators, expressions and data types.
Control Structures: Control structure importance, Boolean expressions, selection control, and iterative control.

Unit 2 9

Lists: List structures, lists in python, iterating over lists in python, more on python lists
Dictionaries and sets: Dictionary type in python, Set data type
Functions: Program routines, more on functions

Unit 3 9

Module Design: Modules, Top-Down design, python modules
Text Files: Text File, Using Text files, string processing, exception handling

Unit 4 9

Objects and their usage: software objects
Introduction to Object oriented programming: class, three fundamental features of object oriented programming, encapsulation-what is encapsulation, defining classes in python.

Unit 5 9

Data structures: Introduction to abstract data types, Single Linked List-traversing, searching, prepending, and removing nodes, Stacks-implementing using python list& linked list, Queues-implementing using python list& linked list.

Prescribed Text Books:

1. Introduction to Computer Science Using Python: A Computational Problem-Solving Focus, Charles Dierbach.
2. Data Structures and Algorithms using Python , RanceD.Necaise, Wiley Publications.

Reference Books:

1. Python Programming using problem solving approach, ReemaThareja, Oxford University press
2. Python Programming: An Introduction to Computer Science, John Zelle, Franklin,Beedle&Associates Inc., 3rd Edition
3. Think Python: How to think like a computer Scientist, Allen Downey 2nd Edition O'Reilly Publications.
4. Problem solving with algorithms and data structures using python, Bradley Miller, David L.Ranum, Franklin, Beedle& Associates incorporated, independent publishers.
5. Learning Python, Mark Lutz, O'Reilly Publications 5th Edition
6. Learn Python the Hard Way: A Very Simple Introduction to the Terrifyingly Beautiful World of Computers and Code Zed Shaw,Zed Shaw's Hard Way Series, Third Edition
7. Automate the Boring Stuff with Python: Practical Programming for Total Beginners, Al Sweigart, 1st Edition.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand computational problem solving and basic elements of python programming.	L1
2. Understand and apply python programming basic constructs like lists, dictionaries, sets and functions.	L1, L3
3. Illustrate module design and usage of text files in python programming	L3
4. Understand apply basics of object-oriented programming in python.	L1, L3
5. Understand and demonstrate elementary data structures.	L1, L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19A521T.1	3	-	3	-	-	-	-	-	-	-	-	3
19A521T.2	3	-	3	3	-	-	-	-	-	-	-	3
19A521T.3	3	-	3	3	-	-	-	-	-	-	-	3
19A521T.4	3	-	3	3	-	-	-	-	-	-	-	3
19A521T.5	3	-	3	3	-	-	-	-	-	-	-	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	Engineering Chemistry
Category	BS
Couse Code	19AC24T
Year	I B.Tech.
Semester	II (Common to EEE & ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	-	3

Course Objectives:

6. To instruct electrode potential and differentiation of different electrodes and their applications.
7. To impart knowledge on the basic concepts of battery technology.
8. To familiarize various sources of renewable energy and explain the construction of photovoltaic cells.
9. To explain how to synthesize different polymers and differentiate polymers based on properties.
10. To introduce different types of nano-materials, its instrumental techniques and compare molecular machines and molecular switches.

Unit 1 Electrochemical Energy Systems - I 9

Introduction-Origin of electrode potential, Electrode Potentials, Measurement of Electrode Potentials, Nernst Equation for a single electrode, EMF of a cell, Types of Electrodes or Half Cells-Hydrogen and Calomel electrode, Electrochemical Cell, Galvanic Cell vs. Electrolytic Cell, Electrochemical conventions, Types of Ion Selective Electrodes- glass membrane electrode, polymer membrane electrodes, solid state electrodes, gas sensing electrodes (classification only), Concentration Cells.

Unit 2 Electrochemical Energy Systems - Ii 9

Basic concepts, battery characteristics, classification of batteries, Important applications of batteries, Classical batteries-dry/Leclanche cell, Modern batteries-zinc air, lithium cells-Li MnO_2 cell- challenges of battery technology. Fuel cells-Introduction - classification of fuel cells – hydrogen and oxygen fuel cell, propane and oxygen fuel cell- Merits of fuel cell

Unit 3 Energy Sources And Applications 9

Solar energy – Introduction - Physical and Chemical properties of Silicon- Production of Solar Grade Silicon from Quartz - Doping of Silicon- p and n type semi conductors- PV cell / solar cell- Manufacturing of Photovoltaic Cells using Chemical Vapor Deposition Technique-applications of solar energy.

Unit 4 Polymer Chemistry 9

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation.

Plastics - Thermoplastics and Thermosettings, Preparation, properties and applications of – Bakelite, urea-formaldehyde, Nylon-6,6 Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline – mechanism of conduction and applications.

Unit 5 Nanomaterials And Molecular Machines & Switches 9

Nanomaterials: Introduction to nanomaterial: nanoparticles, nanocluster, carbon nanotube (CNT) and nanowires. Chemical synthesis of nanomaterials: sol-gel method. Characterization: Principle and applications of scanning electron microscope (SEM) and transmission electron microscope (TEM).

Molecular machines & Molecular switches: Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, autonomous light-powered molecular motor, systems based on catenanes, molecular switches – introduction, cyclodextrin-based switches, in and out switching, back and forth switching.

Prescribed Text Books

1. P.C. Jain and M. Jain, Engineering Chemistry, 15/e, Dhanapat Rai & Sons, Delhi (2014).
2. B.K. Sharma, Engineering Chemistry, Krishna Prakashan, Meerut.

References Text Books:

1. O G Palanna, Engineering Chemistry, Tata McGraw Hill Education Private Limited, (2009)
2. Sashi Chawla, A Textbook of Engineering Chemistry, Dhanapath Rai and sons, (2003)
3. B.S Murthy and P. Shankar, A Text Book of NanoScience and NanoTechnology, University Press (2013).
4. S.S. Dara, A Textbook of Engineering Chemistry, S.Chand& Co, (2010)
5. N. Krishna Murthy and Anuradha, A text book of Engineering Chemistry, Murthy Publications (2014).
6. K. SeshaMaheshwaramma and MridulaChugh, Engineering Chemistry, Pearson India Edn services, (2016)

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Enumerate different types of electrodes, electrochemical cells and their working	L1
2. Describe the constructing and working of different types of batteries and fuel cells	L2
3. Understand p and n type semiconductors and construction of PV cell	L2
4. explain the preparation, properties, mechanism of conduction and applications of different types of polymers	L4
5. explain the synthesis & analysis of different types of nanomaterials and compare molecular switches with molecular machines	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC24T.1	3	2	-	-	-	-	-	-	-	-	-	2
19AC24T.2	3	2	-	2	-	-	-	-	-	-	-	2
19AC24T.3	2	2	-	2	-	-	-	-	-	-	-	2
19AC24T.4	3	2	-		-	-	-	-	-	-	-	-
19AC24T.5	3	2	-	2	-	-	-	-	-	-	-	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	Differential Equations and Vector Calculus
Category	BS
Couse Code	19AC21T
Year	I B.Tech.
Semester	II Semester (Common to CE, EEE, ME, ECE & CSE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	1		4

Course Objectives:

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

Unit 1 Linear Differential Equations of Higher Order 9

Definitions-complete solution-operator D-rules for finding complimentary function-inverse operator-rules for finding particular integral for RHS term of the type e^{ax}, $\sin ax / \cos ax$, polynomials in x, $e^{ax}\sin ax / e^{ax}\cos ax / e^{ax}x^n$, $x\sin ax / x\cos ax$ -method of variation of parameters.

Unit 2 Equations Reducible to Linear Differential Equations and Applications 9

Cauchy's and Legendre's linear equations-simultaneous linear equations with constant coefficients.
Applications: Electrical Circuits – L-C and L-C-R Circuit problems.

Unit 3 Partial Differential Equations 9

Formation of PDEs by eliminating arbitrary constants and arbitrary functions-solutions of first order linear and non-linear PDEs using Charpits method-solutions of boundary value problems by using method of separation of variables.

Unit 4 Vector differentiation and integration 9

Scalar and vector point functions-vector operator del, del applies to scalar point functions-Gradient-del applied to vector point functions-Divergence and Curl-del applied twice to scalar point function-Line integral-circulation-work done-surface integral-flux-volume integral

Unit 5 Vector integral theorems 9

Green's theorem in the plane (without proof) - Stoke's theorem (without proof) - Divergence theorem (without proof)-Applications.

Prescribed Text Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

Reference Books

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd.,2002
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Solve the differential equations related to various engineering fields.	L3
2. Formulate and solve the higher order differential equation by analyzing physical situations.	L3

3. Identify solution methods for partial differential equations that model physical processes. L3
4. Interpret the physical meaning of different operators such as gradient, curl and divergence and estimate the work done against a field, circulation and flux using vector calculus. L2
5. Evaluate double and triple integrals using Green's, Stoke's and Divergence theorem. L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC21T.1	3	3	-	-	-	-	-	-	-	-	-	2
19AC21T.2	3	3	-	-	-	-	-	-	-	-	-	2
19AC21T.3	3	3	-	-	-	-	-	-	-	-	-	3
19AC21T.4	3	3	-	-	-	-	-	-	-	-	-	2
19AC21T.5	3	3	-	-	-	-	-	-	-	-	-	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	Electronic Devices and Circuits
Category	PC
Course Code	19A421T
Year	I B.Tech.
Semester	II Semester (Common to EEE & ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
2	0	0	2

Course Objectives:
- To understand the concepts of biasing and stabilization in BJT
- To understand the concepts of FET, MOSFET and their biasing techniques.
- To analyze the parameters like gain and impedances for single stage amplifier circuits.
- To understand the small signal analysis of FET Amplifiers.
- To understand the working principles of special purpose electronic devices.

Unit 1 Biasing & Stability 9

Overview of BJT Configurations, Transistor Amplifying Action – Load Line Analysis of AC & DC – Operating Point. Types of Biasing: Fixed Bias – Emitter Bias – Emitter Feedback Bias - Collector to Base bias – Voltage Divider Bias. Bias Stability: Need for Stabilization – Stabilization Factors (s,S',S'') – Stability Factors for Voltage Divider Bias - Thermal Stability and Thermal Runaway – Heat Sinks.

Unit 2 Field Effect Transistors & Its Biasing 9

Construction of JFETs – Transfer Characteristics – FET Biasing: Fixed Bias Configuration – Self Bias Configuration – Voltage Divider Biasing – Construction and Characteristics of MOSFETs – Depletion type MOSFETs – Enhancement type MOSFETs – Biasing in MOSFETs.

Unit 3 Single Stage Amplifiers 9

Single Stage Transistor Amplifier-How Transistor Amplifies- Graphical Demonstration of Transistor Amplifier- Practical Circuit of Transistor Amplifier-Phase Reversal- D.C. and A.C. Equivalent Circuits- Load line Analysis- A.C. emitter resistance-Formula for A.C. emitter resistance-Voltage gain in terms of A.C. emitter Resistance-Voltage gain-Classification of Amplifiers-Amplifier equivalent circuit-Equivalent circuit with signal source-Input impedance of an amplifier.

Unit 4 FET Amplifiers 9

Small signal model of JFET and MOSFET – Common source and common Drain amplifiers using FET.

Unit 5 Special Purpose Electronic Devices 10

Varactor Diode, Tunnel Diode, LED, PIN Diode, Schottky Diode, SCR, UJT, Photodiode, Phototransistor.

Prescribed Text Books:
1. Electronic Devices and Circuits, David A Bell, Fifth Edition, 2008, Oxford University Press.
2. Electronic Devices and Circuits, J. Millman and Halkias, 1991 edition, 2008, TMH.

Reference Text Books:
1. Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky, 9th edition, PHI.
2. Principles of Electronics, V. K. Mehta, S. Chand Publications 2004
3. Integrated Electronics, Analog and Digital Circuits and Systems, J. Millman and Halkias, TMH.
4. Micro Electronic Circuits, Sedra and Smith, Oxford University Press

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. understand Biasing and Stabilization conditions of BJT.	L2

2. understand Biasing and Stabilization conditions of FET. L2
3. design the amplifiers circuits under given requirements. L5
4. understand the Small signal model of FET. L2
5. have the knowledge and usage of special purpose electronic devices in various applications. L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A421T.1	-	3	2	-	-	-	-	1	-	-	1	-	3	-	-
19A421T.2	-	3	3	-	1	-	-	2	-	-	1	-	3	-	-
19A421T.3	-	3	2	-	1	-	-	1	-	-	2	-	2	3	-
19A421T.4	-	3	2	-	1	-	-	1	-	-	2	-	2	-	-
19A421T.5	-	3	2	-	1	-	-	1	-	-	1	-	-	-	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Environmental Science
Category	MC
Course Code	19AC26T
Year	I B.Tech.
Semester	II (Common to EEE & ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	0

Course Objectives:

- To make the student to get awareness on environment and understand the importance of protecting natural resources.
- To enable the student to know the importance of ecosystems and biodiversity for future generations.
- To make the student to know pollution problems due to the day to day activities of human life to save earth from the inventions by the engineers.
- To enable the student to acquire skills for identifying and solving the social issues related to environment.
- To enable the student to understand the impact of human population on the environment.

Unit 1 Multidisciplinary Nature of Environmental Studies 9

Definition, Scope and Importance – Need for Public Awareness. NATURAL RESOURCES: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources: Use and over – exploitation, deforestation, dams and their effects on forest and tribal people – Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources – Food resources: Changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity – Land Resources: Land degradation, soil erosion - Energy resources: Renewable and non-renewable energy resources, use of alternate energy resources.

Unit 2 Ecosystems, Biodiversity, and its Conservation 9

ECOSYSTEMS: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers –Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

BIODIVERSITY AND ITS CONSERVATION : Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit 3 Environmental Pollution and Solid Waste Management 9

ENVIRONMENTAL POLLUTION: Definition, Causes, effects and control measures of: Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards.

SOLID WASTE MANAGEMENT: Causes, effects and control measures of urban waste – Role of an individual in prevention of pollution – Pollution case studies.

Unit 4 Social Issues and the Environment 9

SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development – Water conservation, rain water harvesting, Environmental ethics: Issues and possible solutions –global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust – Wasteland reclamation – Consumerism and waste products – Environment Protection Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act.

Unit 5 Human Population and the Environment 9

HUMAN POPULATION AND THE ENVIRONMENT: Population explosion – Family Welfare Programmes – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

FIELD WORK: Visit to a local area to document environmental assets River/forest/ grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.,

Prescribed Text Books:

1. Text book of Environmental Studies for undergraduate courses, Erach Bharucha for University Grant Commission, University press, New Delhi, 2004.
2. Environmental Studies, Palaniswamy, Second edition, Pearson education, New Delhi, 2014.

Reference Text Books:

1. Environmental Studies, Benny Joseph, Second edition, McGraw Hill Education (India) Private Limited, New Delhi, 2013
2. Environmental Studies from crisis to cure, R. Rajagopalan, Oxford University Press, New Delhi, 2015
3. Environmental Studies: A Text Book for Undergraduates, Dr. K. Mukkanti, S. Chand and Company Ltd, New Delhi, 2010
4. Ecology, Environmental Science and Conservation, J.S. Singh, S.P. Singh and S.R. Gupta, S. Chand and Company Ltd, New Delhi, 2014
5. A Text book of Environmental Studies, Shashi Chawla, Tata McGraw Hill Education, India, 2012

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Explain how natural resources should be used.	L2
2. Identify the importance of protection of different ecosystems and biodiversity for future generations.	L3
3. List out the causes, effects and control measures of environmental pollution.	L1
4. Demonstrate knowledge to the society in the proper utilization of goods and services.	L2
5. Outline the interconnectedness of human dependence on the earth's ecosystems.	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC26T.1	1	1	-	-	-	3	3	1	-	-	-	3
19AC26T.2	1	2	-	-	-	3	3	1	-	-	-	3
19AC26T.3	-	1	-	-	-	3	3	1	-	-	-	3
19AC26T.4	2	-	-	-	-	3	3	1	-	-	-	3
19AC26T.5	1	-	-	-	-	3	3	1	-	-	-	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Communicative English Lab
Category	HS
Couse Code	19AC25L
Year	I B.Tech.
Semester	II Semester (Common to ECE & EEE)

Lecture Hours	Tutorial Hours	Practical	Credits
-	-	3	1.5

Course Objectives:
- Students will learn better English pronunciation
- Students will be trained to use language effectively in every day conversations
- Students will be trained to make formal oral presentations using effective strategies in professional life
- Students will be exposed to a variety of self-instructional, learner friendly modes of language learning

Pronunciation 6
Introduction to English speech sounds
Listening Comprehension: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. Answering a series of questions about main idea and supporting ideas after listening to audio texts.Listening for global comprehension and summarizing what is listened to.

Speaking 24
Situational Dialogues (Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions - Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.)
Oral Presentations: Formal oral presentations on topics from academic contexts - Formal presentations using PPT slides with graphic elements, deliver an enthusiastic and well-practiced presentation
Describing people and situations (learn new adjectives, practice describing themselves and others, describe objects using proper adjectives, use details in pictures to make predictions orally, describing situations, Integrate and evaluate information presented in diverse media visually and orally

Reading 6
Information Transfer (Studying the use of graphic elements in texts to convey information, reveal trends/ patterns/ relationships, communicate processes or display complicated data.

Minimum Requirement:
1. Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.
2. Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a T. V. an LCD projector, a digital stereo –audio & video system and camcorder etc.

Prescribed Text Book: Lab Manual developed by Faculty Members of AITS Rajampet
Suggested Software:
1. Loose Your Accent in 28 days, CD Rom, Judy Ravin
2. Sky Pronunciation Suite
3. Clarity Pronunciation Power – Part I
4. Learning to Speak English - 4 CDs

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Neutralize their pronunciation of English sounds, and their accent	L3
2. Adopt effective listening skills for better comprehension of English, spoken by native speakers	L2
3. Illustrate themselves in social and professional context effectively	L3
4. Improve their public speaking skills and make technical presentations confidently	L4
5. Describe people and situations using adjectives effectively	L3
6. Assess and Deduct data from graphs/pie charts/tables	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC25L.1	-	-	-	-	-	-	-	-	-	2	-	1
19AC25L.2	-	-	-	-	-	-	-	-	-	1	-	2
19AC25L.3	-	-	-	-	-	-	-	-	3	3	-	3
19AC25L.4	-	-	-	-	-	-	-	-	3	2	-	1
19AC25L.5	-	-	-	-	-	-	-	-	1	3	-	3
19AC25L.6	-	-	-	-	-	-	-	-	-	2	-	1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Programming through Python Lab
Category	ES
Course Code	19A522L
Year	I B.Tech.
Semester	II Semester (Common to EEE & ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	2	1

Course Objectives: This course will

- To practice basics of computational problem solving, python programming and basic control structures.
- To practice python programming basic constructs like lists, dictionaries, sets and functions
- To practice module design and usage of text files in python programming
- To practice basics of object oriented programming and elementary data structures.

List of Experiments

1. Install Python ecosystem and execute “Hello World” program.
2. Practice
   a. Python literals, variables, identifiers and data types
   b. Python operators
   c. Input and output statements.
   d. Control statements
3. Practice Python Programs on Numbers
   a. Prime Numbers
   b. Armstrong Numbers
   c. Fibonacci Numbers and Series
   d. Sum of squares for the first n natural numbers.
   e. Reverse of a number
4. Implement python program on temperature conversion
5. Implement the python program to convert age in seconds.
6. Practice python programs on various types of triangle patterns
7. Implement python programs to find factorial and Fibonacci number using recursion
8. Practice python programs on lists
9. Practice python programs on sets and dictionaries
10. Practice python programs on functions and their implementation
11. Practice any one python program on module design
12. Practice python programs on text files, string processing
13. Practice python program on exception handling
14. Implement python programs on
    i) Stacks ii) Queues
15. Implement Single linked list data structure.

Prescribed Text Books:

1. Introduction to Computer Science Using Python: A Computational Problem-Solving Focus, Charles Dierbach
2. Data Structures and Algorithms using Python , RanceD.Necaise, Wiley Publications

Reference Books:

1. Python Programming using problem solving approach, ReemaThareja, Oxford University press
2. Python Programming: An Introduction to Computer Science, John Zelle, Franklin,Beedle&Associates Inc., 3rd Edition
3. Think Python: How to think like a computer Scientist, Allen Downey 2nd Edition O’Reilly Publications.

4. Problem solving with algorithms and data structures using python, Bradley Miller, David L.Ranum, Franklin, Beedle& Associates incorporated, independent publishers.
5. Learning Python, Mark Lutz, O'Reilly Publications 5th Edition
6. Learn Python the Hard Way: A Very Simple Introduction to the Terrifyingly Beautiful World of Computers and Code Zed Shaw,Zed Shaw's Hard Way Series, Third Edition
7. Automate the Boring Stuff with Python: Practical Programming for Total Beginners, Al Sweigart, 1st Edition.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Use python basic concepts to develop problems to solve computational problems.	L3
2. Apply lists, dictionaries, sets and functions in python programming.	L3
3. Experiment module design and text files in python programming	L3
4. Solve problems using object-oriented concepts, elementary data structures in python programming	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19A522L.1	-	-	3	3	3	-	-	-	-	-	-	-
19A522L.2	-	-	3	3	3	-	-	-	-	-	-	-
19A522L.3	-	-	3	3	3	-	-	-	-	-	-	-
19A522L.4	-	-	3	3	3	-	-	-	-	-	-	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Engineering Chemistry Lab
Category	BS
Course Code	19AC24L
Year	I B.Tech.
Semester	II (Common to EEE & ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives:

- To familiarize the students with the basic concepts of Engineering Chemistry lab
- To train the students on how to handle the instruments.
- To demonstrate the digital and instrumental methods of analysis.
- To expose the students in practical aspects of the theoretical concepts.

LIST OF EXPERIMENTS

Any TEN of the following experiments must be performed

1. Determination of Zinc by EDTA method.
2. Estimation of active chlorine content in Bleaching powder
3. Determination of copper by Iodometry
4. Estimation of ferrous iron by Dichrometry
5. Preparation of Phenol-Formaldehyde resin
6. Determination of Fe (II) in Mohr's salt by potentiometric method
7. Determination of chromium (VI) in potassium dichromate
8. Conduct metric titration of Acid mixture against Strong base
9. Determination of strength of an acid by pH metric method
10. Determination of viscosity of a liquid
11. Determination of sulphuric acid in lead-acid storage cell
12. Preparation of TiO_2/ZnOnano particles
13. Determination of surface tension of a liquid
14. Preparation of Urea-Formaldehyde resin
15. SEM/TEM analysis of nano materials

Prescribed Text Books

1. Mendham J, Denney RC, Barnes JD, Thomas M and Sivasankar B Vogel's Quantitative Chemical Analysis 6/e, Pearson publishers (2000).
2. N.K Bhasin and Sudha Rani Laboratory Manual on Engineering Chemistry 3/e, Dhanpat Rai Publishing Company (2007).

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Explain the functioning of instruments such as pH meter, conductivity meter and potentiometer.	L2
2. Estimate Zn, Cr, Fe & Cu and other metals in various compounds	L2
3. Determine physical properties of liquids	L4
4. Synthesize and characterize polymers and nano materials using SEM	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC24L.1	3	2	2	-	-	-	-	-	-	-	-	-
19AC24L.2	3	2	2	2	-	-	-	-	-	-	-	-
19AC24L.3	3	2	2	2	-	-	-	-	-	-	-	-
19AC24L.4	3	2	2	2	-	-	-	-	-	-	-	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Electronic Devices and Circuits Lab
Category	PC
Course Code	19A421L
Year	I Year
Semester	II Semester (Common to EEE & ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	2	1

Course Objectives:

- To determine characteristics of JFET, MOSFET, SCR and UJT.
- To determine parameters like gain, impedances and band width of BJT and FET amplifier circuits.

List of the Experiments

1. Identification, Specifications and Testing of Active Devices, Low power JFETs, MOSFETs, Photodiode, Phototransistor, LEDs, SCR and UJT.
2. JFET Characteristics.
3. MOSFET Characteristics
4. Frequency response of CE Amplifier.
5. Frequency response of CB Amplifier.
6. Frequency response of CC Amplifier.
7. Frequency response of Common Source FET Amplifier.
8. V-I Characteristics of LED.
9. SCR Characteristics.
10. UJT Characteristics.
11. Photodiode and Phototransistor Characteristics
12. Soldering Practice.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. gain the practical knowledge of JFET, MOSFET and some special electronic devices.	L1
2. design the amplifier circuits under given requirements.	L5

CO-PO Mapping**:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A421L.1	2	2	1	-	-	-	-	-	-	-	-	1	-	-	3
19A421L.2	2	2	1	-	-	-	-	1	-	-	-	1	2	3	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Partial Differential Equations and Complex Variables
Category	BS
Course Code	19AC31T
Year	II B. Tech
Semester	I Semester (Common to CE, ME, EEE & ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	0		3

Course Objectives:

- To familiarize the transform techniques and complex variables.
- To equip the students to solve application problems in their disciplines

Unit 1: Laplace transforms 9

Laplace transforms of standard functions- First shifting theorem- change of scale property- multiplication by t^n- division by t- transforms of derivatives and integrals- Laplace transform of Periodic functions. (Without proofs)

Unit 2: Inverse Laplace transforms 9

Inverse Laplace transforms – Convolution theorem. (Without proof).
Applications of Laplace transforms to ordinary differential equations of first and second order with constant coefficients.

Unit 3: Fourier series 9

Fourier series- Dirichlet conditions- functions of any period-odd and even functions - half range series.

Unit 4: Applications of Partial Differential Equations 9

Method of separation of variables- second order partial differential equations- solutions of 1D-wave- 1D-heat and 2D-Laplace equations in Cartesian coordinates

Unit 5: Complex Variables 9

Differentiability-Analyticity -C-R equations (without proof) - harmonic functions- finding harmonic conjugate. Contour integrals- Cauchy's theorem (without proof) - Cauchy's integral formula-Generalized Cauchy's integral formula (without proof).

Prescribed Text Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43/e, 2015.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.

Reference Books

1. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
2. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India,1995.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7/e, Mc-Graw Hill, 2004.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Apply the Laplace transformations for different types of functions.	L3
2. Apply the inverse Laplace transformations for different types of functions and solve ordinary differential equations by using Laplace transformation technique.	L3
3. Understand the nature of the Fourier series that represent even and odd functions	L2
4. Solve the boundary value problems (related to heat, one dimensional wave equation)	L3
5. Apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic and evaluate contour integrals.	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC31T.1	3	2	-	-	-	-	-	-	-	-	-	2
19AC31T.2	3	2	-	-	-	-	-	-	-	-	-	2
19AC31T.3	3	2	-	-	-	-	-	-	-	-	-	2
19AC31T.4	3	2	-	-	-	-	-	-	-	-	-	2
19AC31T.5	3	3	-	-	-	-	-	-	-	-	-	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Electronic Circuits
Category	PC
Course Code	19A431T
Year	II B.Tech.
Semester	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives:
This course will provide the student with the ability

- To analyze and design the transistor and feedback amplifiers.
- To understand and analyze the concepts of oscillators, linear and nonlinear wave shaping circuits.

Unit 1 Small Signal Analysis of Amplifiers 9
Introduction to h-parameter model, Small Signal model of BJT, Analysis of CB, CE and CC configurations using h-parameters – simplified hybrid model – miller's theorem – dual of miller's theorem. Analysis ofCascaded Transistor Amplifiers- RC Coupled amplifier, Frequency response of RC Coupled, Direct coupled and Transformer coupled amplifiers.

Unit 2 Feedback Amplifiers 9
Concept of Feedback, Classification of feedback amplifiers, Transfer Gain with feedback, General characteristics of negative feedback amplifiers. Voltage series, voltage shunt, current series, and current shunt feedback amplifiers with discrete components (Topologies).

Unit 3 Oscillators 9
Condition for oscillations. Oscillator Types, Frequency and amplitude stability of oscillators, LC oscillators-Hartley and Colpitts oscillators, RC-phase shift and Wien bridge oscillators, Crystal Oscillators.

Unit 4 Large Signal Amplifiers 9
Classifications, Class A power Amplifiers- Direct coupledand Transformer Coupled, Class B power Amplifiers- Push-pull and Complementary Symmetry-Transistor power dissipation, Power and Efficiency calculations.

Unit 5 Linear Wave Shaping & Non-Linear Wave Shaping 9
LINEAR WAVE SHAPING: High pass & low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and Exponential inputs. NON LINEAR WAVE SHAPING: Diode and Transistor clippers and clampers, clamping circuit theorem.

Prescribed Text Books:

1. J. Millman and Christos C. Halkias- "Integrated Electronics", Mc Graw-Hill, 1972.
2. Robert T. Paynter- "Introductory Electronic Devices and Circuits", Pearson Education, 7th Edition.
3. J. Millman and H. Taub, "Pulse, Digital and Switching Waveforms", McGraw-Hill, second edition, 2007.

Reference Books:

1. Robert L. Boylestad and Louis Nashelsky - "Electronic Devices and Circuits Theory", Pearson/Prentice Hall, 9th Edition, 2006.
2. Donald A. Neumann- "Electronic Circuit Analysis and Design", Mc Graw Hill.
3. Anand Kumar, "Pulse and Digital Circuits", PHI, 2005.Second Edition.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Analyze the single stage amplifiers using h-parameter model at low frequencies.	L4
2. Understand the feedback amplifiers and oscillators	L2
3. Analyze the concepts of large signal amplifiers.	L4
4. Design and analyze linear and nonlinear wave shaping circuits.	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A431T.1	3	3	2	3	3	1	-	-	2	-	-	-	2	3	-
19A431T.2	1	3	3	2	2	-	-	-	2	-	-	-	3	-	-
19A431T.3	3	3	3	2	2	1	-	-	2	-	-	-	2	3	-
19A431T.4	2	2	2	-	-	-	-	-	2	-	-	-	2	3	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Electrical Circuits and Technology
Category	ECE
Course Code	19A237T
Year	II B.Tech.
Semester	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives:

- To impart the knowledge about the basic concepts of circuit analysis and Transient Response.
- To inculcate the understanding about AC circuits and resonance.
- To understand the concepts of two port networks.
- To understand the working of various Electrical Machines.

Unit 1 Basic Electrical Circuits & Transient Analysis 9

BASIC ELECTRICAL CIRCUITS: Network Reduction Techniques, Star &Delta transformations, Source Transformation, Nodal & Mesh Analysis, Super Node & Super Mesh Concepts - Problems.

TRANSIENT ANALYSIS: Transient Response of RL, RC & RLC Series Circuits for DC Excitation using differential equation approach.

Unit 2 Fundamentals of Ac Circuits& Resonance 9

FUNDAMENTALS OF AC CIRCUITS: Advantages of AC Supply, Types of Wave Forms, Importance of Sinusoidal Wave Forms, Cycle, Time Period, Frequency & Amplitude, Determination of Average & RMS Value, Form Factor & Peak Factor for different Alternating Wave Form.

RESONANCE: Resonant frequency, Band Width & Q-Factor for Series and Parallel RLC Network only.

Unit 3 Two Port Networks 9

TWO PORT NETWORKS: Impedance, Admittance, Hybrid, Transmission (ABCD) Parameters, Conversion of one Parameter to another Parameter, Conditions for Reciprocity & Symmetry, Inter connection of Two Port Networks in Series, Parallel and Cascaded Configurations, Problems.

Unit 4 D.C Machines 9

DC Generator: Constructional Features, Principle of operation, EMF Equation, Types, Magnetization Characteristics, Applications.

DC Motor: Principle of operation, Back EMF, Torque Equation, Characteristics of DC Shunt Motor, Losses & Efficiency, Testing - Brake Test & Swinburne's Test - Speed control of DC shunt Motor, Applications.

Unit 5 AC Machines 9

Single Phase Transformer: Principle of operation, Types, Constructional Features, EMF equation, Losses, Efficiency & Regulation, OC & SC Tests and Pre-Determination of Efficiency & Regulation.

Three Phase Induction Motor: Principle of operation, Torque equation, Torque-slip characteristics, Brake test on three phase induction motor.

Prescribed Text Books:

1. Network Analysis by A. Sudhakar&Shyam Mohan S.Pillai, Tata McGraw Hill, 3rd Edition, New Delhi, 2009.
2. A. Chakrabarti. Circuit Theory. 6th edition, DhanpatRai& Co, New Delhi, 2014.
3. A Text book of Electrical Technology by B.L.Theraja&A.K.Theraja, Vol-II, S.Chand& Company, New Delhi, 2010.

Reference Books:

1. Introduction to Electrical Engineering by M.S. Naidu & S. Kamakshaiah, Tata McGraw Hill, New Delhi, 2008.
2. Basic Electrical Engineering by T.K. Nagasarkar& M.S. Sukhija, Oxford University Press, New Delhi, 2005.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Analyze the Basic concepts of Electrical Circuits and Transient Phenomenon.	L1,L2,L3
2. Analyze the concepts of 1-Φ AC circuits and Resonance.	L1,L2
3. Analyze the phenomenon of two port networks.	L1,L2
4. Understand the construction, working and testing of DC-Machines and their applications	L1,L2
5. Know principle of operation and calculate the Efficiency and Regulation of transformer.	L1,L2
6. Understand the principle and characteristics of three phase induction motor.	L1,L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A237T.1	3	3	-	-	-	-	-	-	-	-	2	3	3	2	-
19A237T.2	3	2	3	-	-	-	-	-	-	-	2	2	3	2	1
19A237T.3	3	2	2	2	1	-	-	-	-	-	-	-	2	1	1
19A237T.4	3		3	2	-	-	2	-	2	-	2	-	-	1	2
19A237T.5	2	2	-	-	-	-	-	-	-	-	-	-	-	1	1
19A237T.6	2	2	-	-	-	-	-	-	-	-	-	-	-	1	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Random Variables Theory
Category	ES
Course Code	19A432T
Year	II B.Tech.
Semester	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
2	0	0	2

Course Objectives:
The course aims to provide the student with the ability

- To understand the basics of Probability and its Theorems
- To gain the knowledge on random variables and related operations
- To understand random process concepts related to probability estimations

Unit 1 Probability Concepts 9
Introduction to set theory, Probability introduced through sets: Experiments and sample space, Events, Probability definitions and axioms, Mathematical model of experiments, Joint and Conditional Probability, Total Probability, Bayes Theorem, Independent Events.

Unit 2 Random Variable Concepts 9
Random Variable Concept: Definition, Conditions to be a random variable, Types of Random variables, Distribution and Density functions, Bernouli Trials, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh functions, Conditional Distribution & Conditional Density Functions, Methods of defining a conditioning events.

Unit 3 Operations on One Random Variable 9
Expectation: Expected value of a random variable, expected value of a function of a random variable, Moments: moments about the origin, Central Moments, Variance and Skew, Chebyshev's Inequality, Functions that give moments: Characteristic function and Moment generating function.

Unit 4 Multiple Random Variables 9
Vector Random Variables, Joint Distribution Function: Properties-Marginal Distribution, Joint Density: Properties-Marginal Density, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, Expected Value of a Function of Random Variables, Joint Characteristic Functions, Jointly Gaussian Random Variables.

Unit 5 Random Processes 9
The Random Process Concept, Distribution and Density Functions, Stationarity: First-Order Stationary Processes, Second-Order and Wide-Sense Stationarity, N-Order and Strict-Sense Stationarity, Statistical Independence, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes. Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions.

Prescribed Text Books:
1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4th Edition, 2001
2. Probability, Random Variables and Stochastic Processes – Athanasius Papoulis and S. Unnikrishna Pillai, PHI, 4th Edition, 2002.
Reference Text Books:
1. Probability and Random Processes with Application to Signal Processing – Henry Stark and John W. Woods, Pearson Education, 3rd Edition.
2. Probability Methods of Signal and System Analysis. George R. Cooper, Clave D. MC Gillem, Oxford, 3rd Edition, 1999.

3. Probability Theory and Stochastic Process. Y Mallikarjuna Reddy, University Press, 4th Edition, 2013.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the concept of Probability	L2
2. Understand the concept of random variables.	L2
3. Apply the possible operations on random variables.	L3
4. Understand the concept of random processes	L2
5. Analyze the random processes based on their temporal characteristics	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A432T.1	-	3	3	3	1	1	1	1	-	-	-	-	3	1	-
19A432T.2	-	3	3	3	1	1	1	1	-	-	-	-	3	2	-
19A432T.3	-	3	-	3	3	2	2	1	-	-	-	-	-	3	2
19A432T.4	3	2	1	1	1	-	-	-	-	-	-	-	3	1	-
19A432T.5	1	1	2	3	3	3	-	-	-	-	-	-	-	3	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Digital Design
Category	PC
Course Code	19A433T
Year	II B.Tech.
Semester	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives:

- To get the knowledge on Number Systems and codes.
- To gain the knowledge on Boolean algebra.
- To acquire the knowledge of various circuits in Digital design.

Unit 1 Numbersystems, Codes & Boolean Algebra 9

Philosophy ofnumber systems – r, (r-1)"s complement, representation of negative numbers, binary arithmetic, binary codes, error detecting & error correcting codes, hamming codes.
Boolean algebra: Fundamental postulates of Boolean algebra, Basic theorems and properties, digital logic gates, properties of XOR gate, universal gates.

Unit 2 Switching Functions and Their Minimization 9

Switching Functions-Canonical and Standard forms, algebraic simplification using Boolean theorems, two level & Multilevel Realization of Boolean Functions using Universal Gates.
Minimization: K-Map methods, Prime implicants, don"t care combinations, Minimal SOP and POS forms, Tabular Method, Prime-Implicants chart, simplification rules

Unit 3 Combinational Logic Design & Programmable Logic Devices 9

Design using conventional logic gates-Binary Adders, Subtractors, Ripple Adder, carry Look Ahead adder, Magnitude comparator, Encoder, Decoder, Multiplexer, De-Multiplexer, Code converters.
PLD's: ROM, PROM, PLA, PAL, and Realization of Switching functions using PLD"s. Comparison between PLA, PAL, ROM

Unit 4 Sequential Circuits 9

Classification of sequential circuits (Synchronous, Asynchronous, Pulse mode, Level mode with examples),Basic flip-flops, Triggering and excitation tables, flip flop conversions, Steps in synchronous sequential circuit design, Design of modulo-N Synchronous counters – up/down counter, ring counter, Johnson counter

Unit 5 FSM Minimization and ASM Charts 9

Finite state machine- capabilities and limitations, Mealy and Moore models and their conversions- Sequence detector, Serial binary adder. Minimization of completely specified sequential machines-Partition techniques. Salient features of the ASM chart, Simple examples

Text Books:

1. Morris Mano, Digital Design. Prentice Hall India, 3rdEd.
2. ZVI Kohavi and Niraj K. Jha Switching & Finite Automata theory. Tata McGraw Hill, 3 rdEd.

Reference Text Books:

1. Charles H. Roth, Fundamentals of Logic Design. Thomson Publications, 2004, 5thEd.
2. Fletcher, an Engineering Approach to Digital Design. Prentice Hall India. Anand Kumar, Switching Theory and Logic Design. Prentice Hall India, 2008.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand different number systems conversions & Binary codes	L2
2. Simplify Boolean functions& realize them using digital logic gates.	L5
3. Design various combinational & sequential circuits	L6
4. Understand the Minimization techniques of Finite State Machine & the elements of ASM chart.	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A433T.1	2	-	2	-	2		-	1	-	-	2	-	3	-	-
19A433T.2	2	2	2	-	-	1	-	1	-	-	2	-	2	2	-
19A433T.3	2	2	2	-	-	1	-	1	-	-	2	-	-	3	-
19A433T.4	2	2	2	-	-	1	-	1	-	-	2	-	-	3	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Signals and Systems
Category	PC
Course Code	19A434T
Year	II B.Tech.
Semester	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	1	0	4

Course Objectives:
To do analysis of signals & systems (continuous and discrete) using time domain & frequency domain methods.
To acquire practical knowledge on various transform techniques in the analysis of signals and systems.
To acquire the knowledge of LTI Systems and Sampling Concepts.
To study the various convolution in communication systems

Unit 1 Introduction To Signals And Systems 9
Continuous time Signal and Discrete time Signals, Elementary Continuous and Discrete time signals, Basic Operations on Signals, Classification of Signals, Concept of Systems, Representation of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Fourier spectrum, Gibbs Phenomenon, properties of Fourier series.

Unit 2 Fourier Transforms 9
Deriving Fourier transform from Fourier series, Fourier transform of standard signals, properties of Fourier transforms, Fourier transform of periodic signals, Introduction to Hilbert Transform.

Unit 3 LTI Systems And Sampling 9
LTI systems, Properties & Transfer function, Filter Characteristics, Distortion less Transmission through a system, signal and system bandwidth, Ideal filter characteristics, Causality and Paley-Wiener Criterion, Relationship between Bandwidth and Rise Time.
Sampling theorem – Graphical and analytical proof for Band Limited Signals, effect of under sampling – Aliasing Sampling Techniques, data Reconstruction, Sampling of Band pass signals.

Unit 4 Convolution and Correlation 9
Convolution: Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution property of Fourier transforms.
Correlation: Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function. Relation between convolution and correlation.

Unit 5 Laplace Transforms and Z–Transforms 9
Laplace Transforms- Introduction, Region of Convergence, L. T's of some commonly used signals, Properties, Inverse Laplace Transforms.Z-Transforms- Relation between DTFT and Z-Transform, Region of Convergence, Z-transforms of common sequences, Properties, Inverse Z-Transform.

Prescribed Text Books:
1. B.P. Lathi- Signals, Systems & Communications – BS Publications, 2003
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawab- Signals and Systems – PHI, 2nd Edn
Reference Books:
1. Simon Haykin and Van Veen,Wiley- Signals & Systems – 2nd Edition.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand signal representation methods and operation on signals.	L1
2. Have the knowledge to obtain Fourier series and Fourier Transforms	L1&L2
3. Learn LTI Systems and Sampling Concepts.	L2
4. Understand the convolution and correlation of signals.	L3
5. Understand different transforms (Laplace & Z) and their responses with different types of signals.	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
19A434T.1	3	1	1	1	-	-	-	1	-	-	-	1	3	-
19A434T.2	1	3	-	2	-	1	-	-	-	-	-	1	-	3
19A434T.3	1	-	2	3	1	-	1	-	-	1	-	3	-	1
19A434T.4	3	1	-	-	2	-	-	1	1	-	-	3	-	1
19A434T.5	1	1	-	2	-	3	-	1	-	1	-	3	1	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Electrical Circuits and Technology Lab
Category	ES
Course Code	19A237L
Year	II B.Tech.
Semester	I semester

Lecture Hours	Tutorial Hours	Practical	Credits
-	-	3	1.5

Course Objectives:
To impart knowledge and practical exposure on various theorems of electrical circuits, Different operational aspects of various electrical machines and electronic circuits.

List of Experiments

Perform any ten experiments out of the following
1. Verification of Super Position and Reciprocity Theorems.
2. Verification of Thevenin's and Norton's Theorems.
3. Verification of Maximum Power Transfer theorem for DC Excitation.
4. Determination of Resonant Frequency, Bandwidth and Quality Factor for Series and Parallel Resonant Circuits.
5. Determination of Z and Y parameters for a Two port network.
6. Determination of Time Constant and Steady state error for first order RL and RC Series Circuit with non-sinusoidal inputs
7. Determination of Critical Field Resistance and Critical Speed of DC Shunt Generator from the Magnetization Characteristics.
8. Determination of Performance Characteristics of DC Shunt motor(Brake Test)
9. Pre-determination of Efficiency of DC shunt Machine working as Generator and Motor(Swinburne's Test)
10. Pre-determination of Efficiency & Regulation of 1-phase transformer at different factors and Equivalent Circuit(OC and SC test)
11. Speed Control of DC Shunt Motor by Armature Control Method and Field Control Method.
12. Determination of Performance Characteristics of Three Phase Induction Motor (Brake Test)

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Apply the conceptual knowledge of various electrical machines to understand their operation and control aspects through practical investigations.	L3
2. Apply the conceptual knowledge of Theorems to analyze the electrical circuits through practical investigations.	L3
3. Apply ethics and norms of the engineering practices while exercising experimental investigations.	L3
4. Function effectively as an individual and as a member in a team	L1
5. Communicate effectively in verbal and written forms	L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
19A237L.1	3	-	-	3	-	-	-	-	-	-	-	-	3	-
19A237L.2	3	-	-	3	-	-	-	-	-	-	-	-	3	-
19A237L.3	-	-	-	-	-	-	-	3	-	-	-	-	-	-
19A237L.4	-	-	-	-	-	-	-	-	-	-	1	-	-	-
19A237L.5	-	-	-	-	-	-	-	-	-	-	1	-	-	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Electronic Circuits Lab
Category	PC
Course Code	19A431L
Year	II B.Tech.
Semester	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives:

- Aims to make the students be able to design electronic circuits
- To understand the analysis of transistor based amplifiers

List of Experiments

1. Common Emitter Amplifier
2. Common Collector Amplifier
3. Two stage RC-Coupled amplifier
4. Feedback amplifier (Current Series & Voltage Series)
5. RC Phase shift oscillator
6. Hartley oscillator
7. Colpitts oscillator
8. Class A power amplifier
9. Class B power amplifier
10. Linear wave shaping
11. Non-linear wave shaping –Clippers
12. Non-linear wave shaping- Clampers

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Analyze and design single and multistage amplifiers and feedback amplifiers	L6
2. Design different oscillators with different frequencies	L6
3. Determine the efficiencies of power amplifiers	L4
4. Design wave shaping circuits	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A431L.1	2	3	2	2	2	-	-	2	-	1	-	-	2	3	-
19A431L.2	2	3	2	-	-	-	-	2	-	1	-	-	2	3	-
19A431L.3	2	1	1	-	2	-	-	-	-	1	-	-	2	3	-
19A431L.4	2	3	3	2	2	-	-	-	2		-	-	2	3	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

(An Autonomous Institution)

Title of the Course	Basic Simulation lab
Category	ECE
Course Code	19A434L
Year	II B.Tech.
Semester	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives:

- To analyse the characteristics of various signals and systems using simulation software
- To enable the students to know about different transforms with respective waveform generations.
- To acquire the knowledge of systems and sampling through simulations.
- To study the convolution and correlation concepts with the help of experimentation.

List of Experiments

1. Basic Operations on Matrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit impulse, unit step, square, saw tooth, triangular, sinusoidal, ramp, sinc.
3. Observations on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power.
4. Finding the even and odd parts of signal/ sequence and real and imaginary parts of signal.
5. Gibbs phenomenon.
6. Finding the Fourier transform Phase spectrum.
7. Sampling theorem verification.
8. Verification of linearity and time invariance properties of a discrete system.
9. Computation of unit sample, unit step and sinusoidal responses of the given LTI system and verifying its physical reliability and stability properties.
10. Convolution between signals and sequences.
11. Autocorrelation and cross correlation between signals and sequences.
12. Verification of winer-khinchine relations
13. Waveform synthesis using Laplace Transform
14. Locating the zeros and poles and plotting the pole Z-plane for the given transfer function.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. understand fundamentals of Signals and systems and operations through simulation.	L1
2. understand the transforms on various signals practically.	L2
3. acquire knowledge on the Systems and sampling concepts.	L2&L3
4. have the knowledge of Convolution and Correlation theories with the help of Laboratory simulations.	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A434L.1	3	1	-	2	-	-	3	-	-	-	-	3	3	3	-
19A434L.2	2	-	3	-	1	-	2	-	-	-	-	2	3	1	-
19A434L.3	1	2	-	3	-	3	-	-	-	-	-	2	2	-	-
19A434L.4	2	3	1	-	1	-	2	-	2	-	2	1	1	1	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Essence of Indian Traditional Knowledge
Category	MC
Course Code	19AC35T
Year	II B.Tech.
Semester	I Semester (Common to ECE& EEE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	0

Course Objectives:

- To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system
- To understand the legal framework and traditional knowledge and biological diversity act 2002 and geographical indication act 2003.
- To focus on traditional knowledge and intellectual property mechanism of traditional knowledge and protection

Unit 1 9

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems.

Unit 2 9

Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

Unit 3 9

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK, Protection, value of TK in global economy, Role of Government to harness TK.

Unit 4 9

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

Unit 5 9

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

Prescribed Text Books

1. Traditional Knowledge System in India, by Amit Jha, 2009.

Reference Books

1. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012
2. Knowledge Traditions and Practices of India, Kapil Kapoor, Michel Danino

e-resources: https://www.youtube.com/watch?v=LZP1StpYEPM

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the concept of Traditional knowledge and its importance	L2

2. Understand the need and importance of protecting traditional knowledge and apply it in daily lives L2
3. Apply various enactments related to the protection of traditional knowledge. L1
4. Understand the concepts of Intellectual property to protect the traditional knowledge L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC35T.1	-	-	-	-	-	-	-	-	-	-	-	3
19AC35T.2	-	-	-	-	-	-	-	-	-	-	-	3
19AC35T.3	-	-	-	-	-	-	-	-	-	-	-	3
19AC35T.4	-	-	-	-	-	-	-	-	-	-	-	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Analog IC Applications
Category	PC
Course Code	19A441T
Year	II B.Tech.
Semester	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives:
This course will provide the student with the ability
- Understand the Concepts of differential amplifier and OP-Amp
- To analyze Timers, PLL and converters

Unit 1 Introduction to ICs 9
IC Classifications, IC chip size and Circuit complexity, Operational amplifiers: Basic Information of Op-amp, Ideal op-amp, Internal Circuit, DC& AC Characteristics.

Unit 2 Linear Applications of OPAMP 9
Inverting and non-inverting summing amplifier, subtractor, adder - subtractor, integrator, differentiator, instrumentation amplifier, V-I & I-V converters

Unit 3 Non-Linear Applications of OPAMP 9
Comparators and its applications, Multivibrators- a stable and monostable, Schmitt trigger, Triangular and saw tooth wave generators, Log and antilog amplifiers, precision rectifiers, RC active filters.

Unit 4 Timers and Phase Locked Loops 9
Introduction to 555 Timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger, PLL-Introduction, Block schematic, principles and description of individual blocks, 565 PLL,applications of PLL-Frequency multiplication, frequency translation, AM, FM and FSK demodulators.

Unit 5 D-A and A-D Converters 9
Introduction, Basic DAC techniques, weighted resistor DAC, R-2R Ladder DAC, Inverted R-2R DAC, monolithic DAC, ADCs-parallel comparator type ADC, counter type ADC, servo tracking ADC, successive approximation ADC, Dual slope ADC, DAC and ADC specifications

Prescribed Text Books:
1. Ramakanth A. Gayakwad - Op-Amps & Linear ICs, 3rd edition, PHI, 2001.
2. D. Roy Chowdhury - Linear Integrated Circuits, New Age International (p) Ltd, 4th Edition, 2010.

Reference Text Books:
1. David A. Bell - Operational Amplifiers & Linear ICs, 2nd edition, Oxford University Press, 2010.
2. Sergio Franco - Design with Operational Amplifiers & Analog Integrated Circuits, McGraw Hill, 1988.
3. C.G. Clayton Operational Amplifiers, Butterworth & Company Publ. Ltd./ Elsevier, 1971.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the analysis of differential amplifier and characteristics of OP-Amp.	L2
2. Design Op-Amp circuits for liner & non-linear applications.	L6
3. Design different analog filters	L6
4. Understand the applications of 555 timer and PLL.	L2
5. Gain knowledge on data converters.	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A441T.1	3	3	3	3	2	-	-	-	1	-	-	-	3	2	-
19A441T.2	3	3	2	3	2	-	-	-	1	-	-	-	2	2	-
19A441T.3	2	3	2	3	2	-	-	-	1	-	-	-	-	3	-
19A441T.4	1	2	2	3	1	2	-	2	-	-	-	-	2	-	1
19A441T.5	1	2	2	2	3	-	-	-	1	-	-	-	3	-	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Numerical Methods and Transform Techniques
Category	BS
Course Code	19AC42T
Year	II B.Tech.
Semester	II Semester (Common to ECE & EEE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives:

- To familiarize the students with numerical methods of solving.
- To familiarize the complex variables and transform techniques.

Unit 1 Solutions of algebraic, transcendental equations and Interpolation 9

Solutions of algebraic and transcendental equations: Bisection method – Regular Falsi method and Newton-Raphson method. Interpolation: Finite differences - forward differences and backward differences - Newton's forward interpolation formula and Newton's backward interpolation formula - Lagrange's interpolation formula.

Unit 2 Numerical Differentiation and Numerical Solutions of ordinary differential equations of first order 9

Numerical Differentiation: Numerical integration- Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.
Numerical Solutions of ordinary differential equations of first order: Taylor's series, Modified Euler's method - Runge-Kutta method of fourth order.

Unit 3 Complex Power Series and Residues 9

Complex variables-Taylor's series - zeros of analytic functions – singularities - Laurent's series - Residues- Cauchy residue theorem (without proofs).

Unit 4 Fourier Transforms 9

Fourier integrals - Fourier cosine and sine integrals - Fourier transform - sine and cosine transform – properties.

Unit 5 Z-Transforms 9

Definition of Z-transform - elementary properties - linearity property - damping rule - shifting u_n to the right and left - multiplication by n - initial value theorem - final value theorem - inverse Z-transform - convolution

Prescribed Text Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43/e, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.

Reference Books

1. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley
2. India, 2009.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7/e, McGraw Hill, 2004.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Apply the knowledge of numerical methods to solve algebraic and transcendental equations and acquire the knowledge of interpretation.	L3
2. Understand the technics of numerical differentiation, Integration and numerical solution of ordinary differential equations.	L2

3. Evaluate the Taylor and Laurent expansions of simple functions, determining the nature of the singularities and calculating residues. L3
4. Apply the knowledge of Fourier Integrals and Fourier transformation to solve differential equations. L3
5. Develop Z-transforms Techniques for discrete time systems. L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC42T.1	3	3	-	-	-	-	-	-	-	-	-	3
19AC42T.2	3	3	-	-	-	-	-	-	-	-	-	2
19AC42T.3	3	3	-	-	-	-	-	-	-	-	-	2
19AC42T.4	3	3	-	-	-	-	-	-	-	-	-	3
19AC42T.5	3	3	-	-	-	-	-	-	-	-	-	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Control Systems
Category	ES
Course Code	19A442T
Year	II B.Tech.
Semester	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
2	--	0	2

Course Objectives:
The Course aims to provide the students with the ability
- To understand the basic concepts of systems and their stability
- To apply the knowledge to design an efficient compensator to meet desired specifications

Unit 1 Introduction &Transfer Function Representation 9
Concepts of Control Systems-Classification- Open Loop and closed loop control systems and their differences-Examples-Feed-Back Characteristics, Effects of feedback-Mathematical models. Transfer function, Block Diagram representation - Block diagram algebra, Signal Flow graph and Mason's gain formula.

Unit 2 Time Response Analysis & Stability Analysis In S-Domain 9
Types of test signals, Type and Order of systems, Time Response of first and second order system, Time domain specifications- and– steady state error – static error constants. Concepts of stability: Routh-Hurwitz stability criterion, Root Locus Technique-Root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.

Unit 3 Stability Analysis in Frequency Domain 9
Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots. Polar Plots, Nyquist stability criterion– simple problems.

Unit 4 Design and Compensation of Control Systems 9
Introduction to Compensation networks – Lag, Lead, Lead-Lag, controllers Design in Frequency Domain–Effects of PI, PD & PID controllers.

Unit 5 State Space Analysis of Continuous Systems 9
Concepts of state, state variables and state model-derivation of state model for physical systems Diagonalization- State transition Matrix and its properties – Solution of linear state equation – Concepts of controllability and observability.

Prescribed Text Books:
1. I. J. Nagrath and M. Gopal, Control Systems Engineering, 2nd edition, New Age International (P) Limited, Publishers.
2. Xavier .S.P.Eugene, Joseph Cyril Babu, Principles of control systems, S.Chand&Company
Reference Books:
1. Katsuhiko Ogata, Modern Control Engineering, 3rd edition, Prentice Hall of India Pvt. Ltd., 1998.
2. NISE, Control Systems Engg, 3rd Edition, John wiley.
3. A. Anand Kumar, control systems, Eastern Economy edition, PHI Learning private Ltd, 2011.
4. A. NagoorKani, Control Systems, 3rd Edition,RBA Publications-2015.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the basic principles of systems and their mathematical representations	L2
2. Know the type and order of the systems and their time domain specifications.	L1
3. Gain the knowledge on stability and analyze it using different techniques	L1
4. Design compensators and controllers for various systems	L6
5. Know the mathematical approach for determining the stability of the control system, controllability and observability.	L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A442T.1	3	2	1	-	-	-	-	2	-	2	-	2	2	2	2
19A442T.2	3	2	-	-	-	-	-	-	2	2	-	-	1	2	2
19A442T.3	3	3	-	-	-	-	-	1	2	-	-	2	2	1	1
19A442T.4	-	3	3	-	-	-	-	-	-	-	-	2	2	2	-
19A442T.5	3	3	-	-	-	-	-	-	3	-	-	3	2	-	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(**An Autonomous Institution)**

Title of the Course	Analog Communication Systems
Category	PC
Course Code	19A443T
Year	II B.Tech.
Semester	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will

- To learn the fundamental concept of analog communication systems
- To study different analog modulation and demodulation techniques
- To understand the working of transmitters and receivers
- To know the effect of noise on analog communication systems

Unit 1 Amplitude Modulation 9

Introduction to communication system, Elements of communication system, Need for modulation, Types of Modulation, Amplitude Modulation-single tone modulation, power relations in AM waves, Generation and Detection of AM Waves, Double side band suppressed carrier modulation, Generation and Detection of DSB-SC Modulated waves, SSB Modulation, Generation and Detection of AM-SSB Modulated waves, vestigial side band modulation, Generation and Detection of VSB waves.

Unit 2 Angle Modulation 9

Basic concepts, Frequency Modulation, Single tone frequency modulation, Narrow band FM, Wide band FM, Transmission bandwidth of FM Wave, Generation of FM Waves, and Detection of FM Waves: Comparison of FM & AM.

Unit 3 Noise 9

Noise in Analog communication System, Noise in DSB & SSB System Noise in AM System, Noise in Angle Modulation System, Threshold effect in Angle Modulation System, SNR Calculation, Pre-emphasis & de-emphasis.

Unit 4 Transmitters & Receivers 9

Introduction, Classification of Transmitter, AM Transmitter, FM Transmitter-Variable reactance type, Receiver Types, Characteristics of Receiver, TRF receiver, Super-heterodyne receiver.

Unit 5 Pulse Analog Modulation 9

Multiplexing-TDM, FDM, Types of Pulse modulation, PAM-Single polarity PAM, double polarity PAM, PWM-Generation & demodulation of PWM, PPM-Generation and demodulation of PPM.

Prescribed Text Books:

1. Simon Haykin, John Wiley - Principles of Communication Systems, 2nd Ed.,
2. George Kennedy and Bernard Davis - Electronics & Communication System, TMH 2004

Reference Books:

H Taub & D. Schilling, Gautam Sahe - Principles of Communication Systems, TMH, 2007 3rd Edition.
John G. Proakis, Masood Salehi - Fundamentals of Communication Systems PEA, 2006.
A. Bruce Carlson, & Paul B. Crilly, “Communication Systems – An Introduction to Signals & Noise in Electrical Communication”, McGraw-Hill International Edition, 5th Edition, 2010.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the basic concepts of the analog communication systems	L2
2. Analyze various analog modulation and demodulation techniques	L4

3. Evaluate the performance of the communication system in the presence of noise L5
4. Gain the knowledge about working of radio transmitters and receivers L1
5. Analyze various pulse analog modulation and demodulation techniques L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A443T.1	3	1	-	-	-	1	-	-	-	3	-	2	3	2	-
19A443T.2	3	3	1	-	-	1	-	-	-	2	-	2	3	2	-
19A443T.3	2	3	-	1	-	2	-	-	-	2	-	2	3	2	-
19A443T.4	2	1	3	-	-	2	-	-	-	2	-	2	3	2	1
19A443T.5	3	3	1	-	-	1	-	-	-	2	-	2	3	2	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Field Theory and Transmission lines
Category	PC
Course Code	19A444T
Year	II B.Tech.
Semester	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	1	0	4

Course Objectives:

- To understand the Concepts of Vectors and Co-ordinate Systems
- To learn the concepts of Electric and Magnetic Fields with their corresponding equations.
- To know the importance of Maxwell's equations in differential and integral forms.
- To acquire a knowledge of wave propagation with its different characteristics
- To acquire a knowledge on transmission lines & their characteristics

Unit 1 Vector Analysis and Introduction To Electrostatics: 9

Introduction to Vector Algebra, Coordinate systems and Transformation, Vector Calculus. Introduction to Electrostatic Fields, Coulomb's Law, Electric Field Intensity, Fields due to continuous Charge Distributions, Electric Flux Density, Gauss's Law and Applications, Electric Potential, Relations Between E and V-Maxwell's Equations, Energy Density.

Unit 2 Electrostatic Fields 9

Introduction to electrical fields in material space- Convection and Conduction Currents, Conductors, Polarization in Dielectrics, Dielectric Constant and strength, Linear, Isotropic and Homogeneous Dielectrics, Continuity Equation and Relaxation Time, Resistance and Capacitance.

Unit 3 Magnetostatic Fields And Maxwell's Equations. 9

Introduction to magnetic fields, Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Equations for Static EM Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic fields, Magnetic Energy. Introduction to Maxwell's equations, Faraday's Law, Transformer and Motional EMFs, Maxwell's Equations in Final Forms.

Unit 4 EM Wave Propagation And Characteristics 9

Introduction, Waves in general, Wave propagation in Lossy Dielectrics, Plane waves in Lossless Dielectrics, Plane Waves in Free space, Plane waves in Good conductors. Poynting Vector and Poynting Theorem, Reflection of a Plane Wave at Normal incidence.

Unit 5 Transmission Lines 9

Types, Primary & Secondary Constants, Transmission Line Equations, Expressions for Characteristic Impedance &Propagation Constant, wavelength, Phase and Group Velocities, Infinite Line Concepts, Input Impedance Relations , , Reflection Coefficient, Standing waves in OC&SC Lines Line Distortion, Condition for Distortion less &lossless lines, Condition for minimum attenuation, Smith Chart – Properties and Applications.

Prescribed Text Books:

1. Elements of Electromagnetics – Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition,2000.
3. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan (Tech.India Publications), New Delhi.

Reference Books:

1. Engineering Electromagnetics – Nathan Ida, Springer (India) Pvt. Ltd., New Delhi, 2nd ed. 2005.
2. Networks, Lines and Fields – John D. Ryder, PHI, 2nd ed., 1999. Engineering Electromagnetic – William H. Hayt Jr. and John A. Buck, TMH, 7th ed., 2006.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the vector analysis-vector algebra and vector calculus, co-ordinate systems, transformation	L3
2. Understand the Magneto static fields in free space & also in material space.	L2
3. Learned the usage of Maxwell's equations in differential and integral final forms in electromagnetic fields.	L2
4. Analyze and apply EM wave propagation characteristics on different mediums.	L4
5. Identify different transmission lines and their relations.	L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A444T.1	3	3	3	-	2	-		-	-	-	-	-	-	-	-
19A444T.2	3	3	1	-	2	-	2	-	-	-	-	-	-	-	-
19A444T.3	2	2	-	-	3	-	2	-	-	2	-	-	-	-	-
19A444T.4	3	3	3	2	1	-	1	-	-	2	2	2	1	1	-
19A444T.5	2	2	3	2	2	-	1	2	1	2	-	-	-	-	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Life Sciences for Engineers
Category	BS
Course Code	19AC44T
Year	II B.Tech.
Semester	II Semester (Common to ECE & EEE)

Lecture Hours	Tutorial Hours	Practical	Credits
2	-	-	2

Course Objectives:

- Introduce the molecular basis of life.
- Provide the basis for classification of living organisms.
- Describe the transfer of genetic information.
- Introduce the techniques used for modification of living organisms.
- Describe the applications of biomaterials

Unit 1 Living Organisms 9

Comparison of biological organisms with manmade systems, Classification of living organisms, Cellular basis of life, differences between prokaryotes and eukaryotes, classification on the basis of carbon and energy sources, molecular taxonomy.

Unit 2 Proteins and Enzymes 9

Water, Biomolecules, structure and functions of proteins and nucleic acids, hemoglobin, antibodies and enzymes, Industrial applications of enzymes, Fermentation and its industrial applications

Unit 3 Human Physiology 9

Bioenergetics, Respiration: Glycolysis and TCA cycle, Electron transport chain and oxidative phosphorylation, Mechanism of photosynthesis, Human physiology, neurons, synaptic and neuromuscular junctions

Unit 4 Genes and DNA 9

Mendel's laws, gene mapping, Mitosis and Meiosis, single gene disorders in humans, Genetic code, DNA replication, Transcription, Translation

Unit 5 RNA 9

Recombinant DNA Technology: recombinant vaccines, transgenic microbes, plants and animals, animal cloning, biosensors, biochips.

Prescribed Text Books

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2018.
2. Arthur T Johnson, Biology for Engineers, CRC press, 2011

Reference Books

1. Alberts Et.Al. The molecular biology of the cell, 6/e, Garland Science, 2014
2. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry", John Wiley and Sons, 2009.
3. John Enderle and Joseph Bronzino Introduction to Biomedical Engineering, 3/e, 2012

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Explain catalytic properties of enzymes.	L2
2. Summarize application of enzymes and fermentation in industry.	L2
3. Identify DNA as a genetic material in the molecular basis of information transfer.	L2

4. Apply thermodynamic principles to biological systems. L2
5. Analyze biological processes at the reductionistic level. L4
6. Identify the potential of recombinant DNA technology. L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC44T .1												
19AC44T .2												
19AC44T .3												
19AC44T.4												
19AC44T .5												
19AC44T .6												

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	Analog IC Applications Lab
Category	PC
Course Code	19A441L
Year	II B.Tech.
Semester	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives:

- To generate different types of non-sinusoidal signals
- To verify the applications of Op-Amp

List of Experiments

1. Op-Amp applications- adder and subtractor circuits
2. Active filter applications- LPF, HPF(first order)
3. Function generator using Op-Amps
4. Comparator using IC741
5. Monostable Operation using IC-555 timer
6. Astable Operation using IC-555 timer
7. Schmitt Trigger
8. 4-Bit DAC using Op-Amp
9. PLL applications (AM & FM)
10. Voltage Regulator using IC 723

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Verify linear applications of Op-Amp	L2
2. Verify the operating modes of IC555 timer.	L2
3. Design of active filters	L6
4. Verify the PLL applications	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A441L.1	2	3	2	2	-	-	-	2	-	-	-	-	3	-	1
19A441L.2	3	3	2	2	-	-	-	2	-	-	-	-	3	-	-
19A441L.3	2	2	3	3	-	-	-	2	-	-	-	-	3	2	-
19A441L.4	2	3	2	2	-	-	-	2	-	-	-	-	3	-	1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	Analog Communication Systems Lab
Category	PC
Course Code	19A443L
Year	II B.Tech.
Semester	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
-	-	3	1.5

Course Objectives: This course will
- To provide a real time environment about different analog modulation and demodulation methods.
- To analyse the available circuits behaviour in analog communication through hardware as well as software environment.

List of Experiments
Design and Simulation* of following experiments and also verify in Hardware Laboratory (minimum 6 of the following)
1. Amplitude Modulation& Demodulation
2. SSB Modulation and Demodulation
3. DSB-SC Modulation and Demodulation
4. Frequency Modulation & Demodulation
5. Characteristics of Mixer
6. Pre-Emphasis and De- Emphasis
7. Pulse Amplitude Modulation& Demodulation
8. Pulse Width Modulation& Demodulation
9. Pulse Position Modulation& Demodulation

* Multisim OR Pspice OR Equivalent Simulation Software.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Experience real time behaviour of different analog modulation schemes.	L2
2. Understand the working mechanism of modulation methods.	L2
3. Analyze practical behaviour of different elements available in analog communication system such as filters and mixers.	L4
4. Analyze the working of communication methods using both hardware and software.	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A443L.1	2	-	1	3	3	-	-	-	2	-	-	2	3	2	-
19A443L.2	2	1	2	2	3	-	-	-	2	-	-	2	3	2	-
19A443L.3	2	1	3	3	3	-	-	-	2	-	-	2	3	2	-
19A443L.4	2	1	2	2	3	-	-	-	1	-	-	2	3	2	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Digital Design Lab
Category	PC
Course Code	19A445L
Year	II B.Tech.
Semester	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives:

- Design different types of Combinational Logic Circuits
- To learn about Flip-Flops and their Conversions.
- To Design Mod-N Synchronous and Shift Register Counters.

List of Experiments (Perform any 10 Experiments):

1. Logic gates
2. Realization of AND, OR,NOT,EX-OR,EXNOR functions using universal Gates
3. Applications of logic gates –ADDER,SUBTRACTORS
4. 2-bit Magnitude comparator
5. Decoders
6. Multiplexes
7. Boolean function realization using Decoder andMux
8. Code converters (Binary to Gray & Gray to Binary)
9. Flip-Flops
10. Flip –Flop Conversions
11. Design of MOD-N synchronous counter
12. Shift register counters (Ring & Twisted Ring Counters)

Course Outcomes:

Upon completion of the course, students will	Blooms Level of Learning
1. Design different types of Combinational Logic Circuits	L6
2. Learn about Various Flip- Flops and their Conversion	L1
3. Design various Mod-N Synchronous and Shift Register Counters	L6

CO-PO Mapping**:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A445L .1	2	2	2	-	-	1	-	1	-	-	2	-	-	3	-
19A445L .2	2	2	2	-	-	1	-	1	-	-	2	-	-	3	-
19A445L .3	2	2	2	-	-	1	-	1	-	-	2	-	-	3	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Constitution of India
Category	MC
Course Code	19AC47T
Year	II B.Tech.
Semester	II Semester (Common to ECE & EEE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	0

Course Objectives:

- To enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of india and election commission of india.
- To understand the central and state relation financial and administrative

Unit 1 9

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Unit 2 9

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions

Unit 3 9

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

Unit 4 9

Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Unit 5 9

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

Prescribed Text Books

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
2. Subash Kashyap, Indian Constitution, National Book Trust

Reference Books

1. J.A. Siwach, Dynamics of Indian Government & Politics
2. D.C. Gupta, Indian Government and Politics
3. M.V. Pylee, India's Constitution

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand historical background of the constitution making and its importance for building a democratic India.	L2
2. Understand the functioning of three wings of the government i.e., executive, legislative and Judiciary.	L2
3. Understand the value of the fundamental rights and duties for becoming good citizen of India.	L2
4. Analyze the decentralization of power between central, state and local self-government.	L3
5. Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC47T.1	-	-	-	-	-	-	-	-	-	-	-	3
19AC47T.2	-	-	-	-	-	-	-	-	-	-	-	3
19AC47T.3	-	-	-	-	-	-	-	-	-	-	-	3
19AC47T.4	-	-	-	-	-	-	-	-	-	-	-	3
19AC47T.5	-	-	-	-	-	-	-	-	-	-	-	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, RAJAMPET
(An Autonomous Institution)

Title of the Course	:	MICROPROCESSORS & INTERFACING
Category	:	PC
Course Code	:	19A451T
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able

- To know the basic concepts of first 16 bit general purpose Microprocessor
- To learn the Programming and Interfacing Concepts of Microprocessors

Unit 1 : **8086 ARCHITECTURE & PROGRAMMING** 13

Overview of 8085 processor architecture**,** Architecture of 8086 microprocessor, Register organization, Memory organization, Machine language instruction formats of 8086. Addressing modes of 8086, Instruction set of 8086, Assembler directives, Assembly language programs involving logical, branch and call instructions, sorting, evaluation of arithmetic expressions, string manipulation. Procedure and Macros.

Unit 2 : **MEMORY INTERFACING** 13

Pin diagram of 8086 - Minimum mode and maximum mode of operation, Timing diagrams. I/O Interfacing methods – I/O mapped I/O, Memory mapped I/O. Basic structure of SRAM and DRAM cell, Memory interfacing to 8086 (static RAM and EPROM). Need for DMA, Architecture of 8257 and interfacing with 8086.

Unit 3 : **I/O INTERFACING & PROGRAMMABLE INTERRUPT CONTROLLER (8259)** 9

Interfacing I/O ports – latches and buffers. 8255 PPI - Architecture, various modes of operation and interfacing to 8086. Seven segment Displays, Stepper motor, D/A, A/D converter interfacing.
Data transfer methods-Programmed I/O, interrupt driven I/O. Interrupt structure of 8086, Vector interrupt table. Interrupt service routines. 8259 PIC architecture and interfacing, cascading of interrupt controller. Simple programs.

Unit 4 : **PROGRAMMABLE INTERVAL TIMER/COUNTER (8253) & COMMUNICATION INTERFACE** 07

Architecture of 8253 programmable interval timer/counter, mode of operations, interfacing with 8086.
Asynchronous and synchronous data transfer schemes. Necessity of communication interfaces, 8251 USART architecture and interfacing, RS-232C. TTL to RS232C and RS232C to TTL conversion. Sample program of serial data transfer.

Unit 5 : **ADVANCED MICROPROCESSORS** 05

Introduction to 80286, salient features of 80386, Real and Protected mode Segmentation and Paging, salient features of Pentium and Pentium pro processors.

PrescribedText Books:

1. Advanced microprocessor and peripherals- A.K. Ray and K.M.Bhurchandi, 2nd edition, TMH, 2000
2. Microprocessors and Interfacing- Douglas V.Hall, 2nd edition, 2007

Reference Text books:

1. The 8086 and 8088 Microprocessors- Walter A. Triebel, Avtar Singh, PHI, 4th Edition, 2003
2. Micro computer system 8066/8088 family Architecture, programming and Design-By Liu and GA Gibson, PHI, 2nd Ed
3. Intel 8086/8088 microprocessor architecture, programming, design and interfacing, Bhupendra singh chabra, Dhanpat Rai publications

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Know the Architectural features and programming of 8086..	L1,L3
2. Be able to Interface various Intel devices with 8086.	L3
3. Understand the Interrupt structure of 8086 and servicing the interrupts using interrupt controller	L2
4. Know the Salient features of advanced microprocessors	L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A451T.1	3	-	-	-	2	2	-	-	1	-	-	-	3	2	-
19A451T.2	2	3	-	-	3	-	-	-	-	-	-	-	2	3	-
19A451T.3	3	-	-	-	-	-	-	-	-	-	-	-	1	1	-
19A451T.4	3	-	-	-	2	-	-	-	-	-	-	-	2	2	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	ANTENNAS AND WAVE PROPAGATION
Category	:	PC
Course Code	:	19A452T
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	1	0	4

Course Objectives: This course will able to

- To understand the concepts of Antennas and their family
- To analyze and design different antennas for various applications.
- To understand Concepts of Various Wave Propagation methods.

Unit 1 : **INTRODUCTION** 14

Introduction, Basic Antenna Parameters ,Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity and Gain, Directivity and Resolution, Antenna Apertures, Effective Height, Fields from Oscillating dipole, Antenna Field Zones. Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Antenna Theorems – Reciprocity Theorem.

Unit 2 : **ANTENNA ARRAYS** 14

Point Source , Arrays of two isotropic point sources-Different cases, Non-isotropic point Sources, Principle of Pattern Multiplication , N element Uniform Linear, Arrays Broadside, End fire Arrays, EFA with Increased Directivity, Arrays with Parasitic Elements, Folded Dipoles & their characteristics, Yagi - Uda Arrays.

Unit 3 : **ANTENNAS AND THEIR CHARACTERISTICS** 10

Helical Antennas: Helical Geometry, Helix modes, Horn Antennas – Introduction, Optimum Horns, Rectangular Horn antenna, Reflector Antennas: Flat Sheet and Corner Reflectors. Paraboloidal Reflectors – Geometry, characteristics, Spill Over, Back Lobes, Aperture Blocking..

Unit 4 : **GROUND WAVE PROPAGATION** 9

Introduction to wave propagation-Definition and Broad Categorization, Classification of Electromagnetic waves based on Modes of propagation, Different modes of Wave Propagation. Ground Wave Propagation– Introduction, Plane earth reflection, Space wave and surface wave, Transition between surface and space wave, Reduction factor and, numerical Distance, Earth"s Behavior at different frequencies, Electrical Properties of earth, Curved earth reflection.

Unit 5 : **SPACE WAVE PROPAGATION and SKY WAVE PROPAGATION** 12

Introduction, Effect of imperfection of Earth, Effects due to - curvature of earth, Shadowing of hills and buildings, Variation of field strength with Height, Super refraction, Scattering Phenomena, Tropospheric propagation, .Structural details of Ionosphere, Wave propagation mechanism, Refraction and reflection of Sky waves by Ionosphere, Ray path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip distance, Multi hop propagation, Take-off angle.

Prescribed Text Books:

1. John D. Kraus, Ronald J. Marhefka and Ahmad S Khan – "Antennas and Wave Propagation" TMH, 4e, Special Indian Edition 2010.

2. E.C. Jordan and K.G. Balmain - Electromagnetic Waves and Radiating Systems, PHI, 2nd ed., 2000.

Reference Text books:

1. K.D.Prasad - Antenna and wave propagation, Khanna Publications
2. Balanis- Antenna Theory.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Knowledge on different basic concepts related to antennas and different antenna parameters mathematically.	L1
2. An ability to design BSA, EFA etc., Antenna arrays. Parasitic arrays and Yagi- Uda antenna	L5
3. Ability to design and implement the utilization of Helical and VHF and UHF antennas	L5
4. An Ability to analyze the propagation of wave and different parameters and Knowledge on all the layers of atmosphere and the nature of different Propagation mechanisms	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A452T.1	3	3	3	2	-	-	-	-	-	2	-	-	3	2	1
19A452T.2	2	2	3	2	-	-	-	-	-	2	-	2	3	2	1
19A452T.3	1	1	3	3	-	1	1	-	-	-	-	1	3	2	1
19A452T.4	2	2	2	2	-	2	2	-	-	2	-	2	3	2	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	DIGITAL SIGNAL PROCESSING
Category	:	PC
Course Code	:	19A453T
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- To understand application of Discrete Fourier series and Transforms
- To learn design techniques and applications of Digital signal processing

Unit 1 : **INTRODUCTION AND DISCRETE FOURIER SERIES** 20

Discrete time signals, LTI systems, stability and causality, Solution of linear constant coefficient difference equations. Properties of discrete Fourier series, DFS representation of periodic sequences, discrete Fourier transforms: properties of DFT, linear convolution of sequences using DFT, computation of DFT.

Unit 2 : **FAST FOURIER TRANSFORMS** 10

Fast Fourier transforms (FFT)-Radix2 decimation in time and decimation in frequency FFT algorithms, inverse FFT, FFT for composite N.

Unit 3 : **IIR AND FIR DIGITAL FILTERS** 20

Analog filter approximations-Butterworth and chebyshev, design of digital filters from analog filters, design examples: analog-digital transformations, Basics of Z-Transforms, IIR Structures- Direct form–I, Direct form-II, Transposed Structure, and Cascade form. Design of FIR digital filters using window techniques, frequency sampling technique, comparison of IIR and FIR filters.

Unit 4 : **MULTIRATE DIGITAL SIGNAL PROCESSING FUNDAMENTALS** 10

Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Filter Design and Implementation for Sampling rate conversion, Multistage implementation of Sampling rate conversion.

Unit 5 : **APPLICATIONS OF DIGITAL SIGNAL PROCESSING** 5

Spectral analysis of non-stationary Signals, Musical Sound processing, signal Compression, Oversampling A/D Converter, Oversampling D/A Converter.

Prescribed Text Books:

1. Digital signal processing, principles, Algorithms and applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI, 4th ed., 2007
2. Digital signal processing , A computer base approach- Sanjit K Mitra, Tata McGraw Hill, 3rd edition, 2009.

Reference Text books:

1. Digital signal processing: Andreas Antoniou, TATA McGraw Hill, 2006.
2. Discrete Time Signal Processing-A.V. Oppenheim and R.W. Schaffer, 2nd ed., PHI.
3. Digital Signal Processing- P.Ramesh Babu, 4th Ed. SciTech Publications.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the types of discrete time signals & systems and analyze using Fourier series and Fourier transforms.	L2
2. Know the basics of digital filters and design using different techniques.	L1
3. Understand the concepts of decimation and interpolation..	L2
4. know the applications in Real life	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A453T.1	2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
19A453T.2	2	3	3	3	-	-	-	-	-	-	3	2	3	3	-
19A453T.3		3	3	3	2	-	-	-	-	-	3	-	3	3	-
19A453T.4			3	3	2	1	-	-	-	-	3	2	3	3	1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	DIGITAL COMMUNICATION
Category	:	PC
Course Code	:	19A454T
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- Acquire basics involved in digital communication.
- Impart knowledge of digital pulse modulation techniques
- Understand and apply different digital modulation Techniques
- Design different source coding methods

Unit 1 : **PULSE DIGITAL MODULATION** 10

Elements of digital communication system, advantages of digital communication systems, Elements of PCM, Bandwidth requirements of PCM, Noise in PCM Systems, Differential PCM systems (DPCM), Delta modulation systems, Adaptive delta modulation

Unit 2 : **DIGITAL CARRIER MODULATION SCHEMES** 8

Introduction, Binary ASK Signaling Scheme-Generation and detection methods, Binary FSK Signaling Scheme-Generation and detection methods, Binary PSK Signaling Scheme-Generation and detection methods, DPSK, Introduction to M-ary Signaling.

Unit 3 : **Information Theory And Source Coding** 12

UnitofInformation, Entropy, Rate of information, Joint and conditional entropy, Mutual information, Channel capacity using Shannon –Hartley theorem, Comparison between fixed length and variable length coding, Shanon-Fano coding, Huffman coding, Lempel-Ziv Code.

Unit 4 : **ERROR CONTROL CODING-I** 14

Linear block codes: Introduction, Matrix description of Linear Block codes, encoder design for LBC, Error detection and error correction capabilities of linear block codes, Syndrome Calculation, Decoder for LBC

Unit 5 : **ERRORCONTROL CODING-II** 12

Binary cyclic codes: Algebraic structure, encoding of cyclic codes, syndrome calculation

Convolution Codes: Introduction, Encoder for convolution codes, State diagram, Tree diagram and Trellis diagram, Viterbi algorithm

PrescribedText Books:

1. K.Sam shanmugam - Digital and Analog communication Systems, Wiley, 2010
2. R.P.Singh & S.D.Sapre - Communication Systems Analog & Digital, TMH, 2008

Reference Text books:

1. Simon Haykin - Digital Communications, Wiley, 2006
2. John Proakis - Digital Communications, TMH, 1983

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Recall fundamentals of Digital communication system and Demonstrate digital pulse modulation techniques	L1
2. Analyze digital modulation schemes and discriminate them	L3
3. Design source coding techniques in communications systems	L4
4. Apply channel coding techniques for data transmission and Design Different error control Codes	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A454.1	3	3	2	2	2	-	-	-	-	3	2	2	3	3	3
19A454.2	3	3	2	2	2	-	-	-	-	3	2	2	3	3	3
19A454.3	3	3	2	2	2	-	-	1	-	3	2	2	3	3	3
19A454.4	3	3	2	2	2	-	-	1	-	3	2	2	3	3	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
Category	:	PE
Course Code	:	19A45AT
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will be able to

- Give the knowledge on instrument usage for a particular application.
- Explain the internal structure of all instruments that are used in measuring parameters related to electronic based systems.

Unit 1 : **MEASURING INSTRUMENTS AND MEASUREMENT ERRORS** 12

Generalized measurement system, Accuracy, Precision, Resolution. Errors in Measurement. Basics of statistical analysis, D'Arsonval galvanometer, PMMC mechanism. DC Ammeter. DC voltmeter. Series Ohmmeter, shunt Ohmmeter. Volt-Ohm-Milliammeter. Digital voltmeters (DVMs): Ramp type & dual slope integrator, Digital Multimeter.

Unit 2 : **SIGNAL GENERATORS & ANALYZERS** 11

Audio frequency signal generation, Sine-wave generator, frequency-Synthesized signal generator, frequency divider generator, signal generator modulation, Sweep frequency generator, pulse and square wave generators. Function generator. Wave analyzers, Harmonic distortion analyzers, Spectrum Analyzers. Simple Frequency counter.

Unit 3 : **OSCILLOSCOPES** 15

Oscilloscope block diagram, Cathode Ray Tube, deflection amplifiers, waveform display, oscilloscope time base, dual trace oscilloscope, and oscilloscope controls. Measurement of voltage, frequency and phase. Pulse measurements, oscilloscope probes, display of device characteristics, X-Y and Z displays, oscilloscope specifications and performance. Delayed-Time-Base oscilloscopes, Analog storage oscilloscope, Sampling oscilloscopes, digital storage oscilloscopes, DSO applications.

Unit 4 : **BRIDGES** 11

Wheatstone bridge, guarded Wheatstone bridge, Kelvin Bridge, AC bridges and their application, Maxwell's bridge, Hays Bridge. Schering Bridge. Wein Bridge. Q-meter.

Unit 5 : **TRANSDUCERS** 10

Classification of transducers, selecting a transducer, strain gauges, displacement transducers. Temperature Measurements. Data Acquisition System, strip chart recorders and X-Y recorder.

Prescribed Text Books:

1. Electronic Instrumentation and Measurements, second edition – David A. Bell, Eastern Economy Edition, PHI.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PEARSON Education.

Reference Text books:

1. Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
2. A course in electrical and electronic measurements and instrumentation. A.K.Sawhney., DhanpatRai & Co publishers.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. State the principles of measurements with different basic meters and calculate all the parameters related to measurements.	L1
2. Describe different types of signal generators and Signal analyzers.	L2
3. Explain the basic features of oscilloscope, its internal architecture and different types	L4
4. Design different types of bridges for signal conditioning purpose.	L4
5. Understand about different types of transducers and advancements in Instrumentation	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A45AT.1	3	3	3	-	3	-	-	-	-	-	-	3	3	3	-
19A45AT.2	3	-	-	-	3	-	-	-	-	-	-	3	3	-	-
19A45AT.3	3	3	3	-	3	-	-	-	-	-	-	3	3	3	-
19A45AT.4	3	3	3	-	3	-	-	-	-	-	-	3	3	3	-
19A45AT.5	3	--	-	-	3	-	-	-	-	-	-	3	3	--	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	ADVANCED DIGITAL DESIGN CONCEPTS
Category	:	PE
Course Code	:	19A45BT
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: The course aims to provide the student with the ability

- To Understand Concept of logic families & the basics of VHDL
- To design circuits and implement their functionality using VHDL
- To have a knowledge on synchronous design methodology.

Unit 1 : **CMOS & BIPOLAR LOGIC** 12

Introduction to logic families, CMOS logic, CMOS steady state electrical behavior, CMOS dynamic electrical behavior, CMOS logic families. Bipolar logic, Transistor-Transistor logic, TTL families, CMOS/TTL interfacing, Low voltage CMOS logic and interfacing, Emitter coupled logic, Comparison of logic families.

Unit 2 : **VHDL ELEMENTS & STRUCTURAL MODELING** 8

Introduction to HDL, Design flow, Program structure, Basic language elements- Data Objects, Data types, Operators, Functions and procedures, Packages and Libraries. Structural design elements: Introduction, Component declaration, Component instantiation, Examples.

Unit 3 : **DATAFLOW & BEHAVIORAL MODELING** 15

Data flow design elements: Introduction, Concurrent signal assignment statement, Concurrent versus Sequential signal assignment statement, Conditional signal assignment statement and Selected signal assignment statement, Behavioral design elements: Introduction, Entity declaration, Architecture body, Process statement, Variable assignment statement, Signal assignment statement, Wait statement, If statement, Case statement, Null statement, Loop statement, Exit statement, Next statement, Assertion statement, Report statement, Delay models- Inertial delay model, Transport delay model.

Unit 4 : **COMBINATIONAL LOGIC DESIGN** 12

Decoders, Encoders, Three state devices, Multiplexers and Demultiplexers, Code Converters, EX-OR gates and Parity circuits, Comparators, Adders & subtractors, ALUs, Combinational multipliers and their VHDL models. Design examples: Barrel shifter, Comparators, Ones counter.

Unit 5 : **SEQUENTIAL LOGIC DESIGN** 12

Latches and flip-flops, Counters, Shift register and their VHDL models, Synchronous design methodology, Impediments to synchronous design.

PrescribedText Books:

1. John F. Wakerly- Digital Design Principles & Practices, PHI/ Pearson Education Asia, 3rd Ed., 2005.
2. J.Bhaskar-VHDL primer, PHI/ Pearson Education Asia, 3rd Ed., 2003.

Reference Text books:

3. Charles H. Roth Jr- Digital System Design Using VHDL, PWS Publications, 2nd edition, 2008.
1. Kenneth L Short – VHDL for Engineers, Pearson Education 2009.
2. Stephen Brown and Zvonko Vranesic- Fundamentals of Digital Logic with VHDL Design, McGraw Hill, 2nd Edition. 2005.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the theory of logic families & interfacing.	L1,L2
2. Understand the basics of VHDL & programming.	L2
3. Be able to know the concepts of VHDL design modeling	L3
4. Be able to design combinational circuits and implementation using VHDL programming.	L6
5. Be able to design Sequential circuits and implementation using VHDL programming.	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A45BT.1	3	3	3	1									3	2	2
19A45BT.2			2		3						3		3		1
19A45BT.3			2		3						3		3		1
19A45BT.4	1	3	3	2	3						3		3	3	3
19A45BT.5	1	3	3	2	3						3		3	3	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	Data Communication Systems
Category	:	PE
Course Code	:	19A45CT
Year	:	III B. Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	1	0	4

Course Objectives: The course aims to provide the student with the ability

- To have a detailed study of various analog and digital modulation and demodulation techniques
- To have a thorough knowledge of various multiplexing schemes
- To know about the standards and mechanisms of telephone systems.

Unit 1 : 10

INTRODUCTION TO DATA COMMUNICATIONS AND NETWORKING: Standards Organizations for Data Communications, Layered Network Architecture, Open Systems Interconnection, Data Communications Circuits, Serial and parallel Data Transmission, Data communications Networks, Alternate Protocol Suites.

SIGNALS, NOISE, MODULATION, AND DEMODULATION: Signal Analysis, Electrical Noise and Signal-to-Noise Ratio, Analog Modulation Systems, Information Capacity, Bits, Bit Rate, Baud, and M-ary Encoding, Digital Modulation..

Unit 2 : 11

METALLIC CABLE TRANSMISSION MEDIA: Metallic Transmission Lines, Transverse Electromagnetic Waves, Characteristics of Electromagnetic Waves.

OPTICAL FIBER TRANSMISSION MEDIA: Advantages of Optical Fiber cables, Disadvantages of Optical Fiber Cables, Electromagnetic spectrum, Optical Fiber Communications System Block Diagram, Optical Fiber construction, Propagation of Light Through an Optical fiber Cable, Optical Fiber Modes and Classifications, Optical Fiber Comparison, Losses in Optical Fiber Cables, Light sources, Light Detectors, Lasers.

Unit 3 : 10

DIGITAL TRANSMISSION: Pulse Modulation, Pulse code Modulation, Dynamic Range, and Signal Voltage to-Quantization Noise Voltage Ratio, Linear Versus Nonlinear PCM Codes, Companding, PCM Line Speed, Delta Modulation PCM and Differential PCM.

MULTIPLEXING AND T CARRIERS: Time- Division Multiplexing, T1Digital Carrier System, Digital Line Encoding, T Carrier systems, Frequency- Division Multiplexing, Wavelength- Division Multiplexing, Synchronous Optical Network.

Unit 4 : 9

WIRELESS COMMUNICATIONS SYSTEMS: Electromagnetic Polarization, Electromagnetic Radiation, Optical Properties of Radio Waves, Terrestrial Propagation of Electromagnetic Waves, Skip Distance, Free-Space Path Loss, Microwave Communications Systems, Satellite Communications Systems.

Unit 5 : 10

TELEPHONE INSTRUMENTS AND SIGNALS: The Subscriber Loop, Standard Telephone Set, Basic Telephone Call Procedures, Call Progress Tones and Signals, Cordless Telephones, Caller ID, Electronic Telephones, Paging systems.

CELLULAR TELEPHONE SYSTEMS: First- Generation Analog Cellular Telephone, Personal Communications system, Second-Generation Cellular Telephone Systems, N-AMPS, Digital Cellular Telephone, Interim Standard, Global system for Mobile Communications.

Prescribed Text Books:

1. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education.
2. Data Communications and Networking, Behrouz A Forouzan, Fourth Edition.TMH.

Reference Text books:

1. Data and Computer communications, 8/e, William Stallings, PHI.
2. Computer Communications and Networking Technologies, Gallow, Second Edition Thomson
3. Computer Networking and Internet, Fred Halsll, Lingana Gouda Kulkarni, Fifth Edition, Pearson Education.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the concepts of data communications and networking.	L2
2. Identify suitable transmission media for different types of communications	L2
3. Differentiate the different digital transmission techniques and multiplexing schemes	L3
4. Understand the different types of wireless communications systems	L2
5. Explain basic blocks of Telephone System and the generations of cellular telephone systems	L2

CO-PO Mapping:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A45CT.1	3	3	2	3	1	2	1			3		1	3	2	
19A45CT.2	3	3	2	3	2	2	1			3		1	3	2	
19A45CT.3	3	3	2	3	2	2	2			3		1	3	2	
19A45CT.4	3	3	2	3	2					3		1	3	2	
19A45CT.5	1	1	2		2	2	2			3		1	3	2	

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	VLSI TESTING & TESTABILITY
Category	:	OE
Course Code	:	19A45DT
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: The course aims to provide the student with the ability

- To have knowledge about testing of various faults and modeling of faults
- To learn about testing algorithms and test vector generation
- To acquire knowledge on testable designs

Unit 1 : **FUNDAMENTALS OF TESTING DIGITAL SYSTEMS** 10

Modeling: Modeling Digital Circuits at Logic Level, Register Level and Structural Models. Levels of Modeling. Logic Simulation: Types of Simulation, Delay Models, Element Evaluation, Hazard Detection, Gate Level Event Driven Simulation.

Unit 2 : **FAULT MODELING** 10

Logic Fault Models, Fault Detection and Redundancy, Fault Equivalence and Fault Location. Single Stuck and Multiple Stuck – Fault Models. Fault Simulation Applications, General Techniques for Combinational Circuits

Unit 3 : **TESTING FOR SINGLE STUCK FAULTS (SSF)** 12

Automated Test Pattern Generation (ATPG/ATG) For SSFs in Combinational and Sequential Circuits, Functional Testing With Specific Fault Models, Test Pattern Generation.

Unit 4 : **DESIGN FOR TESTABILITY** 10

Testability Trade-Offs, Techniques. Scan Architectures and Testing – Controllability and Absorbability, Generic Boundary Scan, Full Integrated Scan, Storage Cells for Scan Design. Board Level and System Level DFT Approaches. Boundary Scans Standards

Unit 5 : **BUILT-IN SELF-TEST (BIST)** 08

BIST Concepts, Specific BIST Architectures – CSBL, BEST, RTS, LOCST, STUMPS, CBIST, CEBS, RTD, SST, CATS, CSTP, BILBO. Brief Ideas on Some Advanced BIST Concepts and Design for Self-Test at Board Level, ICT, JTAG Testing Features.

PrescribedText Books:

1. Miron Abramovici, Melvin A. Breur, Arthur D.Friedman, Digital Systems Testing and Testable Design, Jaico Publishing House, 2001.

2. P.K. Lala – Digital Circuit Testing and Testability – Academic press 2002

Reference Text books:
1. Alfred Crouch, Design for Test for Digital ICs & Embedded Core Systems, Prentice Hall.

2. Robert J.Feugate, Jr., Steven M.Mentyn, Introduction to VLSI Testing, Prentice Hall, Englehood Cliffs, 1998.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Detect faults in digital systems	L3
2. Model faults to simplify fault detection	L3
3. Generate test vectors to detect and diagnose the faults using various algorithms	L4
4. Design testable architecture for digital circuits	L4
5. Implement Built-In Self-Test architectures for digital circuits	L4

CO-PO Mapping:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A45DT.1	3	3	1	2									2	2	
19A45DT.2	3	3	3	2									2	2	
19A45DT.3	3	3	3	3									2	2	
19A45DT.4	2	2	3	2			1						2	2	
19A45DT.5	2	2	3	2			1						2	2	

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	DIGITAL SYSTEM DESIGN
Category	:	OE
Course Code	:	19A45ET
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: The course aims to provide the student with the ability

- To Understand Concept of digital system designs.
- To analyze the fault modeling concepts & diagnosis and different test generation algorithms.
- To design and test the digital circuits using PLAs.
- To have a knowledge on asynchronous sequential machines.

Unit 1 : **DESIGN OF DIGITAL SYSTEMS AND SEQUENTIAL CIRCUIT** 12

ASM charts, Hardware description language and control sequence method, Reduction of state tables, state assignments, design of Iterative circuits, design of sequential circuits using ROMs and PLAs.

Unit 2 : **FAULT MODELING AND TEST GENERATION ALGORITHMS** 15

Fault classes and models – Stuck at faults, bridging faults, transition and intermittent faults. Fault diagnosis of Combinational circuits by conventional methods – Path Sensitization technique, Boolean difference method, Kohavi algorithm. D – Algorithm, PODEM, Random testing, transition count testing, Signature analysis and testing for bridging faults.

Unit 3 : **FAULT DIAGNOSIS IN SEQUENTIAL CIRCUITS** 12

State identification and fault detection experiment. Machine identification, Design of fault detection experiment.

Unit 4 : **PROGRAMMING LOGIC ARRAYS & TESTING** 12

Design using PLA's, PLA minimization and PLA folding. Fault models, Test generation and Testable PLA design.

Unit 5 : **ASYNCHRONOUS SEQUENTIAL MACHINE** 9

Fundamental mode model, flow table, state reduction, minimal closed covers, races, cycles and hazards.

Prescribed Text Books:

1. Z. Kohavi – "Switching & finite Automata Theory" (TMH)
2. N. N. Biswas – "Logic Design Theory" (PHI)
3. Nolman Balabanian, Bradley Calson – "Digital Logic Design Principles" – Wiley Student Edition 2004.

Reference Text books:

1. M. Abramovici, M. A. Breues, A. D. Friedman – "Digital System Testing and Testable Design", Jaico Publications
2. Charles H. Roth Jr. – "Fundamentals of Logic Design".
3. Frederick. J. Hill & Peterson – "Computer Aided Logic Design" – Wiley 4th Edition.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the concepts of digital design and able to design sequential circuit.	L1, L2 & L4
2. Understand the concepts of fault modeling and able to do diagnosis them with different algorithms.	L1, L4 & L5
3. Be able to do fault diagnosis of sequential circuits.	L4
4. Be able to design and test the circuits using PLAs	L3 & L6
5. Be able to design Asynchronous Sequential machines.	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A45ET.1	1	3	3	3	2						2		3	2	2
19A45ET.2	3	3	3	3	3	1					3		3		1
19A45ET.3	3	3	3	3	3	1					2		3		1
19A45ET.4	3	3	3	3	3						3		3	3	3
19A45ET.5	3	3	3	3	2						1		3	3	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	INDUSTRIAL ELECTRONICS
Category	:	OE
Course Code	:	19A45FT
Year	:	III B.Tech.
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- Power quality terminology, power quality issues, classification
- Different sources of power quality disturbances
- Harmonic distortion; Principles for controlling harmonics
- Power quality measuring equipment; Power quality monitoring standards
- Impact of distributed generation on power quality

Unit 1 : **INTRODUCTION TO POWER QUALITY** 8

Power Quality- definition, terminology, issues, evaluation procedure, responsibilities of the suppliers and users of electric power, power quality standards, CBEMA and ITI curves.

Unit 2 : **POWER QUALITY DISTURBANCES** 10

General classes of power quality problems- Impulsive and oscillatory transients. Long duration voltage variations - over voltage, under voltage, sustained interruption. Short duration voltage variations-interruption, sag, swell and outage. Sources of sags and interruptions, estimating voltage sag performance overview of mitigation methods.

Unit 3 : **FUNDAMENTALS OF HARMONICS** 10

Harmonic distortion, voltage versus current distortion, harmonics versus transients, power system quantities under non-sinusoidal conditions, harmonic indices. Harmonic sources from commercial and industrial loads. Effects of harmonic distortion. Applied harmonics - harmonic distortion evaluation, principles of controlling harmonics, and devices for controlling harmonic distortion. Harmonic filter design and standards on harmonics.

Unit 4 : **POWER QUALITY MONITORING** 9

Power quality benchmarking, monitoring considerations, choosing monitoring locations, permanent power quality monitoring equipment, historical perspective of power quality measuring instruments. Power quality measurement equipment-types of instruments, assessment of power quality measurement data, power quality monitoring standards.

Unit 5 : **DISTRIBUTED GENERATION AND GRID INTERCONNECTION** 8

Distributed generation -connection requirements and impacts on the network. Interaction and optimal location of DG-Eigen analysis and voltage interaction. Power quality in DG-Mitigation of voltage dip during motor start, harmonic effects with DG, voltage flicker and fluctuation. Islanding issues, distribution line compensation-heavy Load and Light load condition, real generation, protection issues for distributed generation, technologies for distributed generation, power quality impact from different DG types.

PrescribedText Books:

4. Roger C. Dugan, Mark F. Mc Granaghan, Surya Santoso, H. Wayne Beaty, Electrical Power Systems Quality, 3rd edition, TMH Education Pvt. Ltd., 2012.
5. ArindamGhosh, Gerard Ledwich, Power quality enhancement using custom power devices, Kluwer academic publishers, 2002

Reference Text books:

4. G.T. Heydt, Electric Power Quality, Stars in a circle Publications, 1991. USA.
5. Surajit Chattopadhyaya, Madhuchhanda Mitra, Samarjit Senugupta, Electrical Power Quality, Springer Dordrecht Heidelberg London New York.
6. Math H. J. Bollen, Understanding Power quality problems, IEEE Press, 2007.

Course Outcomes:

Student will be able to	Blooms Level of Learning
6. Demonstrate knowledge on sources of power quality disturbances and issues, power quality monitoring and measuring instruments, power quality standards, effect of distributed generation on power quality.	L1
7. Analyze various power quality issues.	L3
8. Design a suitable harmonic filter for commercial and industrial loads.	L4
9. Investigate various power quality issues and provide feasible solutions for improvement of power quality.	L5
10. Select and use an appropriate equipment for monitoring and measurement of power quality.	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A27CT.1	3	-	-	-	-	-	-	-	-	-	-	-	-3	-	-
19A27CT.2	2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
19A27CT.3	1	2	3	-	-	-	-	-	-	-	-	-	3	-	-
19A27CT.4	3	3	-	-	3	-	-	-	-	-	-	-	-	3	-
19A27CT.5	2	2	-	-	3	-	-	-	-	-	-	-	-	3	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	MICROPROCESSORS AND INTERFACING LAB
Category	:	PC
Course Code	:	19A451L
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives: This course will able

- To learn Assembly Language programming.
- To understand programmable peripheral devices and their Interfacing.

Experiment No. 1 :- Arithmetic operations.
Experiment No. 2 :- Signed Arithmetic operations.
Experiment No. 3 :- ASCII – Arithmetic operations.
Experiment No. 4 :- Addition of two BCD numbers(4-digits each).
Experiment No. 5 :- Logical Operations

a. Code conversion.
b. Identify the parity (even/Odd) of a given byte/word.

Experiment No. 6 :- String Operations

a. Relocate a string of N words/bytes.
b. Reverse String.
c. Length of the String
d. String Insertion
e. String Deletion
f. Scanning a byte/ word.

Experiment No. 7 :- Sorting using near procedure.

Experiment No. 8 :- Interfacing with 8255 PPI

a. DAC Interfacing:
   i. PWM generation in BSR mode
   ii. Triangular, sinusoidal and square wave generation in I/O mode.
b. Stepper Motor Interfacing: Rotation in Clock wise and Anti-clock wise direction.

Experiment No. 9 :- 8259 – Interrupt Controller.

Experiment No. 10:- 8251 - USART Interfacing.

Course Outcomes:

Student will be	Blooms Level of Learning
1. Able to write Assembly Language programs.	L6
2. Able to understand the operations and applications of microprocessors	L2

3. Able to understand programmable peripheral devices and their Interfacing L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A451L.1	3	-	-	-	2	2	-	-	1	-	-	-	3	2	-
19A451L.2	2	3	-	-	3	-	-	-	-	-	-	-	2	3	-
19A451L.3	3	-	-	-	-	-	-	-	-	-	-	1	1	1	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	DIGITAL COMMUNICATION LAB
Category	:	PC
Course Code	:	19A454L
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	2	1

Course Objectives: This course will able

- The course aims to provide a real time experience for different digital modulation and demodulation schemes,
- To simulate and analyse the digital modulation schemes.

Design and Simulation* of following experiments and also verify in Hardware Laboratory (minimum 6 of the following)

*** Multisim OR Matlab OR Equivalent Simulation Software.**

Experiment No. 1 :- Sampling Theorem
Experiment No. 2 :- Pulse Code Modulation and Demodulation
Experiment No. 3 :- DPCM Modulation and Demodulation
Experiment No. 4 :- Delta Modulation
Experiment No. 5 :- Time Division Multiplexing
Experiment No. 6 :- FSK Modulation and Demodulation
Experiment No. 7 :- PSK Modulation and Demodulation
Experiment No. 8 :- DPSK Modulation & Demodulation

Course Outcomes:

Student will be able	Blooms Level of Learning
1. To experience real time behaviour of different digital modulation schemes	L6
2. To understand the working principles of Modulation and demodulation.	L2
3. To simulate and analyse the digital modulation schemes	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A451L.1	2	3	3		2	2				3		3	3	2	-
19A451L.2					2	2				3		3	2	3	-
19A451L.3	2	3	3	1	2	2				3		3	1	1	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	Professional Communication Skills Lab
Category	BS
Couse Code	19AC52L/62L
Year	III Year
Semester	I/II Semester
Branch	ECE, EEE /CE, ME, CSE

Lecture Hours	Tutorial Hours	Practical	Credits
-	-	3	1.5

Résumé Preparation – structure, formats and styles – planning - defining career objective - projecting one's strengths and skills - creative self-marketing–sample resumes - cover letter

Interview Skills- concept and process - pre-interview planning – preparation - body language - answering strategies – frequently asked questions

Group Discussion –communicating views and opinions – discussing – intervening – agreeing and disagreeing –asking for and giving clarification - substantiating - providing solution on any given topic across a cross-section of individuals - modulation of voice and clarity - body language – case study

Oral Presentations (Individual& Team) – collection of data from various sources –planning, preparation and practice – attention-gathering strategies - transitions – handling questions from audience

Listening Comprehension – listening for understanding - responding relevantly

Learning Resources: AECS Lab Manual prepared by Dept of HS, AITS Rajampet

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. express himself/herself fluently in social and professional contexts	L4
2. demonstrate effective presentation skills	L4
3. face interviews confidently	L3
4. participate in meetings effectively	L4
5. listen actively for better understanding	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19AC52L.1										3		3			
19AC52L.2										3		3			
19AC52L.3										3		3			
19AC52L.4										3		3			
19AC52L.5										3		3			

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	VLSI DESIGN
Category	:	PC
Course Code	:	19A462T
Year	:	III B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: The course aims to provide the student with the ability

- To acquire knowledge of fabrication process involved in MOS Devices
- To understand the basic electrical properties of MOS devices and VLSI Circuit Design Processes
- To get the knowledge on design methods and testing techniques.

Unit 1 : **INTRODUCTION TO IC TECHNOLOGY** 15

VLSI design flow, MOS, PMOS, NMOS, CMOS and BI-CMOS fabrication processing technologies - oxidation, Photolithography, diffusion, Ion implantation, metallization, Encapsulation, probe testing, integrated resistors and capacitors. Introduction to Fin FET technology BASIC ELECTRICAL PROPERTIES OF MOS AND BICMOS CIRCUITS: Basic electrical properties of MOS and BI-CMOS circuits: Ids-Vds relationships, MOS transistor threshold voltage, gm, gds, figure of merit (ωo), pass transistor, NMOS inverter, various pull-ups, CMOS inverter analysis and design, BICMOS inverters.

Unit 2 : **VLSI CIRCUIT DESIGN PROCESSES** 12

MOS layers, stick diagrams, design rules and lay out, 2µm CMOS design rules for wires, contacts and transistors layout diagrams for NMOS and CMOS inverters, Logic gates and Other Complex Gates, scaling of MOS circuits, limitations of scaling.

Unit 3 : **GATE LEVEL DESIGN** 8

Switch logic, alternate gate circuits, basic circuit concepts, sheet resistance RS and its concept applied to MOS Transistors, area capacitance and its calculations, Inverter delays, driving large capacitive loads, wiring capacitances.

Unit 4 : **SUBSYSTEM AND SEMICONDUCTOR IC DESIGN** 14

Shifters, adders, multipliers, parity generators, comparators, zero/one detectors, counters, high density memory elements, Field Programmable Gate Arrays, Complex Programmable Logic Devices, standard cell based Designs.

Unit 5 : **DESIGN METHODS AND TESTING** 8

Design methods, design capture tools, design verification tools, Test principles, Need for testing, design strategies for test, chip level test techniques, system-level test techniques, Layout Design for Improved Testability.

PrescribedText Books:

1. Kamran Eshraghian, Eshraghian Douglas and A. pucknell - Essentials of VLSI circuits and systems, PHI, 2005 Edition.

2. Weste and Eshraghian - Principles of CMOS VLSI design, Pearson Education, 1999.

Reference Text books:

1. John P.Uyemura, John Wiley - Introduction to VLSI circuits and systems, 2003.
2. John M. Rabaey - Digital Integrated circuits, PHI, ECE, 1997. 3. Jerry G. Fossum, Vishal P. Trivedi - Fundamentals of Ultra-Thin-Body MOSFETs and FinFETs, Cambridge University Press, 2013.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand different IC technologies and their fabrication process.	L1
2. Analyze the basic electrical properties of MOS transistor and design of CMOS and Bi-CMOS inverters.	L3
3. Be able to understand the VLSI design process.	L1
4. Be able to design the gate level and sub system modules.	L5
5. Be able to knowledge on design methods and testing techniques.	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A462T.1	3	3	3		3	3	2		2		2	2	2	2	3
19A462T.2	3	3	3	1	2	2	2	1	2	2	1	2	2	2	2
19A462T.3	3	3	3	2	3			2			3	2	2	2	2
19A462T..4	2	3	3	1	2			1	2	2	2		2	2	3
19A462T.5	2	3	3					1	3				3	2	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	MICROWAVE ENGINEERING
Category	:	PC
Course Code	:	19A463T
Year	:	III B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: The course aims to provide the student with the ability

1. To understand EM Wave theory at microwave frequencies.
2. To learn about various microwave components: microwave tubes, microwave devices along with measurements.

Unit 1 : **INTRODUCTION TO MICROWAVE ENGINEERING & WAVE GUIDES:** 9

Introduction to Microwave engineering, Microwave Spectrum and Bands, Advantages & Applications of Microwaves. Wave guides- Types, Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes. Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations, Impossibility of TEM mode, Power Transmission and Power Losses in Rectangular Guide.

Unit 2 : **CIRCULAR WAVEGUIDES:** 9

Propagation of TE & TM waves, Nature of Fields, Characteristic Equation, TM modes, Dominant and Degenerate Modes, Attenuation, Advantages and Applications. Cavity Resonators– Introduction, Rectangular and Cylindrical Cavities, Dominant Modes and Resonant Frequencies, Q factor and Coupling Coefficients.

Unit 3 : **MICROWAVE COMPONENTS** 12

Waveguide Microwave Junctions Formulation and Properties of S-Matrix, Microwave T-Junctions-H-Plane, E-Plane, Magic Tee and its Applications. Directional Couplers-Two Hole, Wave guide Irises- Posts & Tuning screws, Coupling Probes and loops, Waveguide Terminations, Phase Shifters and Microwave attenuators, Ferrite Devices-Faraday Rotation Microwave devices-Gyrator, Isolator, Circulator.

Unit 4 : **MICROWAVE SOURCES-KLYSTRONS, TWT's, MAGNETRONS** 12

Limitations and Losses of conventional tubes, Microwave tubes– classifications, Two Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process, Expressions for output Power and Efficiency. Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Electronic Admittance. TWT"s- Construction, Principle and working Operation, Mathematical Analysis, Performance and Applications. Magnetron-Introduction, Cavity Magnetron, Mathematical Analysis, Sustained oscillations, Mode jumping, Frequency Pushing and pulling, Performance Characteristics and Applications.

Unit 5 : **MICROWAVE SOLID STATE DEVICES & MEASUREMENTS** 9

Introduction, TED"s, Gunn Effect Diodes (GaAs), RWH Theory-
Differential Negative Resistance, Two Valley Model Theory, Modes of Operation. Avalanche Transit Time devices-Introduction, IMPATT and TRAPATT Diodes -Structure, Principle of Operation, Power output and Efficiency. Microwave Measurements-Description of Microwave Bench–Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, VSWR, Cavity Q, Impedance Measurements.

PrescribedText Books:

1. Samuel Y. Liao, PHI- Microwave Devices and Circuits, 3rd Edition, 2003.
2. Microwave and Radar Engineering, M Kulkarni– Umesh Publications, 1998.

Reference Text books:

1. R.E. Collin - Foundations for Microwave Engineering, IECE Press, John Wiley, 2nd Edition, 2002.
2. Herbert J. Reich, J.G. Skolnik, P.F. Ordung and H.L. Krauss - Microwave Principles, CBS Publishers and Distributors, New Delhi, 2004.

Course Outcomes:

Upon completion of the course, students will	Blooms Level of Learning
1. Ability to solve the wave equations.	L3
2. Learn the construction and operation of microwave devices, components, sources and detectors.	L4
3. Study about the various measurements of microwave parameters	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A463T.1	1	3	3	1	--	--	--	--	--	2	--	--	--	3	--
19A463T.2	--	3	3	--	--	--	--	--	--	2	1	--	--	3	--
19A463T.3	--	3	3	--	1	--	--	--	--	--	--	--	--	3	1

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	DIGITAL DESIGN THROUGH VERILOG HDL
Category	:	PE
Course Code	:	19A46AT
Year	:	III B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- To understand the basics of Verilog
- To make the students renown to basics, syntax and semantics of new programming language

Unit 1 : **INTRODUCTION TO VERILOG** 10

Verilog as HDL, Levels of design description, concurrency, simulation and synthesis, functional verification, test benches.

LANGUAGE CONSTRUCTS AND CONVENTIONS: Introduction, keywords, identifiers, whitespace characters, comments, numbers, strings, logic values, strengths, data types, scalars and vectors, parameters, memory, operators, system tasks.

Unit 2 : **GATE LEVEL MODELLING&SWITCH LEVEL MODELLING** 10

Introduction, AND gate primitive, module structure, other gate primitives, illustrative examples, tristate gates, array of instances of primitives, design of Flip flops with gate primitives, delays, strengths and contention resolution, net types, design of basic circuits

Switch Level Modelling :Introduction, basic transistor switches, CMOS switch, Bidirectional gates, time delays wit switch primitives, instantiations with strengths and delays, strength contention with trireg nets

Unit 3 : **MODELLING AT DATAFLOW LEVEL&BEHAVIORAL MODELLING** 10

Introduction, continuous assignment structures, delays and continuous assignments, assignment to vectors, operators.

Data Flow Modelling: Introduction, operations and assignments, functional Bifurcation, initial construct, always construct, examples, assignments with delays, wait construct, multiple always blocks, designs at behavioral level, blocking and non-blocking assignments, the case statement, simulation flow, if and if else constructs, assign-De assign construct, repeat construct, FOR loop, the disable construct, While loop, Forever loop, parallel blocks, force-release construct, event.

Unit 4 : **FUNCTIONS, TASKS, AND USER-DEFINED PRIMITIVESSYSTEM TASKS, FUNCTIONS AND COMPILER DIRECTIVES:** 9

Introduction, Function, Tasks, User- Defined Primitives (UDP)

System Tasks, Functions And Compiler Directives: Introduction, parameters, path delays, module parameters, system tasks and

functions, file –based tasks and Functions, Compiler Directives, FSM Design (Moore and Mealy Machines).

Unit 5 : **DIGITAL DESIGN WITH SM CHARTS&DESIGNING WITH PROGRAMMABLE GATE ARRAYS AND COMPLEX PROGRAMMABLE LOGIC DEVICES** 8

State Machine Charts, Derivation of SM Charts, Realization of SM Charts, Implementation of the Dice Game, Alternative realizations for SM Charts using Microprogramming, Linked State Machines, Static RAM Memory,

UART Design

DESIGNING WITH PROGRAMMABLE GATE ARRAYS AND COMPLEX PROGRAMMABLE LOGIC DEVICES: Xilinx 3000 Series FPGAs, Designing with FPGAs, Using a One-Hot State Assignment, Altera Complex Programmable Logic Devices (CPLDs), Altera FLEX 10K Series CPLDs.

PrescribedText Books:

3. Design through Verilog HDL – T.R. Padmanabhan and B. Bala Tripura Sundari, WSE, IECE Press, 2004
4. A Verilog Primier – J. Bhasker, BSP, 2003
5. Digital System Design Using VHDL – Charles.H.Roth.Jr

Reference Text books:

3. Fundamentals of Logic Design with Verilog – Stephen. Brown and ZvonkoVranesic, TMH, 2005.
4. Advanced Digital Design with Verilog HDL – Michael D. Ciletti, PHI, 2005.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand, design, simulate and synthesize computer hardware using Verilog HDL	L6
2. Be able to rapidly design combinational and sequential logic	L6
3. Be able to use different Verilog programming constructs in digital system design	L4
4. gain knowledge in implementing state machines	L3
5. Gain ability to Design CPLDs & PGAs.	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A46AT.1	-	3	3	-	-	2	-	3	2	-	3	2	3	3	2
19A46AT.2	2	3	3	-	-	3	-	3	2	-	3	2	3	3	2
19A46AT.3	-	-	3	-	-	1	-	2	-	-	2	1	3	2	-
19A46AT.4	2	3	3	-	-	1	-	2	2	-	2	2	3	3	-
19A46AT.5	1	3	3	-	-	1	-	3	3	-	3	2	3	3	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	RADAR ENGINEERING
Category	:	PE
Course Code	:	19A46BT
Year	:	III B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- To learn the fundamental operation and working principles of modern radar systems
- To understand basic concepts of modern radar systems for both civilian and defense applications
- To learn various signal detection techniques, displays and duplexers used in radar systems

Unit 1 : **RADAR PRINCIPLES** 10

Introduction, The simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies, Applications of radar, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Signal-to-noise Ratio, Integration of Radar Pulses, Radar Cross Section of Targets (sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System losses

Unit 2 : **CW AND FREQUENCY MODULATED RADAR** 9

Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Intermediate-frequency Receiver, Receiver Bandwidth , Applications of CW radar, FM-CW Radar-Range and Doppler Measurement, Block Diagram, FM-CW altimeter, Multiple Frequency CW Radar.

Unit 3 : **MTI AND PULSE DOPPLER RADAR** 10

Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, and Transversal filters, Staggered PRFs, Range Gated Doppler Filters, Limitations to MTI Performance.

Unit 4 : **TRACKING RADAR** 10

Tracking with Radar, Sequential lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one and two coordinates), Phase Comparison Monopulse, Tracking in Range, Acquisition, Comparison of Trackers

Unit 5 : **DETECTION OF RADAR SIGNALS IN NOISE** 11

Introduction, Matched-Filter Receiver, Derivation of the matched-filter characteristic, The matched filter and the Correlation Function, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise, Correlation Detection.

Radar Displays & Duplexers: Noise Figure, Noise figure of networks in cascade, Noise Temperature, Radar Displays – types, Duplexers – Branch type and Balanced type, Circulators as Duplexers.

Prescribed Text Books:

1.Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd Edition, 2007

Reference Text books:

1. Radar Principles – Peebles, Jr., P.Z.Wiley, New York, 1998.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the essential principles of operation and fundamentals of radar systems	L2
2. Gain in-depth knowledge about the different types of RADARS	L1
3. Identify the various RADAR systems in existence, their applications and limitations	L3
4. Understand the need for various signal detection techniques in RADAR systems	L2
5. know the various technologies used in the design of RADAR systems such as duplexers, displays etc	L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A46BT. 1	1	3	3	-	-	-	-	2	-	1	2	3	2	-	-
19A46BT .2	1	3	3	-	-	2	-	2	-	-	2	3	2	2	-
19A46BT .3	1	3	3	-	-	2	-	2	-	-	3	3	1	-	1
19A46BT .4	1	3	3	-	-	2	-	2	-	-	2	3	-	1	-
19A46BT .5	1	3	3	-	1	-	1	2	-	-	2	3	1	-	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	Ad-hoc Wireless Networks
Category	:	PE
Course Code	:	19A46CT
Year	:	III B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: The students will be able to

- Understand the basics and applications of Ad -hoc Networks
- Learn various fundamental and emerging protocols of all layers in ad-hoc network.
- Study the issues pertaining to major obstacles in establishment and efficient
- Understand various security practices and protocols of Ad-hoc Networks

Unit 1 : **ADHOC NETWORKS AND MAC PROTOCOLS** 8

Ad hoc wireless networks : Introduction, Issues in Ad hoc wireless networks, Adhoc wireless internet . MAC protocols for ad hoc wireless networks: Introduction, Issues in designing a MAC protocol for ad hoc wireless networks, Design goals of a MAC protocol for Ad hoc wireless networks, Classifications of MAC protocols, Contention based protocols, Contention-based protocols with reservation mechanisms, Contention-based MAC protocols with scheduling mechanisms.

Unit 2 : **ROUTING PROTOCOLS FOR AD HOC WIRELESS NETWORKS** 12

Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks , Classifications of Routing Protocols ,Table Driven Routing Protocols ,Destination Sequenced Distance Vector (DSDV),Wireless Routing Protocol (WRP) , Cluster – Head Gateway Switch Routing Protocol , Source Initiated On Demand Approaches :Ad hoc On Demand Distance Vector Routing (AODV) , Dynamic Source Routing (DSR) , Temporally Ordered Routing Algorithm (TORA) , Signal Stability Routing (SSR) , Location Aided Routing (LAR) , Zone Routing Protocol (ZRP), Zone-Based Hierarchical Link State Routing Protocol.

Unit 3 : **MULTICAST ROUTING IN AD HOC WIRELESS NETWORKS** 8

Issues in Designing a Multicast Routing Protocol ,Operation of Multicast Routing Protocols , An Architecture Reference Model for Multicast Routing Protocols, Classifications of Multicast Routing Protocols , Tree Based Multicast Routing Protocols, Mesh Based Multicast Routing Protocols, Summary of Tree and Mesh based Protocols , Energy Efficient Multicasting , Multicasting with Quality of Service Guarantees, Application Dependent Multicast Routing.

Unit 4 : **TRANSPORT LAYER AND SECURITY** 9

Issues in Designing a Transport Layer Protocol for Adhoc Wireless Networks , Design Goals of a Transport Layer Protocol for Adhoc Wireless Networks, Classification of Transport Layer Solutions , TCP over Ad hoc Wireless Networks, Security in Ad Hoc Wireless Networks ,Network Security Requirements , Issues and Challenges in Security Provisioning , Network Security Attacks , Key Management , Secure Routing in Ad hoc Wireless Networks.

Unit 5 : **QoS and Energy Management** 8

Issues and Challenges in Providing QoS in Ad hoc Wireless Networks,
Classifications of QoS Solutions, MAC Layer Solutions, Network Layer Solutions, QoS Frameworks for Ad hoc Wireless Networks.
Energy Management In Ad Hoc Wireless Networks : Introduction , Need for Energy Management in Ad hoc Wireless

Networks ,Classification of Energy Management Schemes , Battery Management Schemes , Transmission Power Management Schemes ,System Power Management Schemes.

PrescribedText Books:

1. C. Siva Ram Murthy and B. S. Manoj, “Ad Hoc Wireless Networks Architectures and Protocols”, Prentice Hall, PTR, 2004. ISBN, 013147023X.
2. K. Toh, “Ad Hoc Mobile Wireless Networks Protocols and Systems”, Prentice Hall, PTR,2001. ISBN, 0130078174.

Reference Text books:

5. Charles E. Perkins, “Ad Hoc Networking”, Addison Wesley, 2000. ISBN-13: 978-0321579072

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Explain the concepts and applications of ad-hoc networks	L2
2. Analyze the technology trends for the implementation and deployment of wireless Adhoc networks	L3
3. Analyze the challenges in designing protocol stacks for ad-hoc networks.	L3
4. Evaluate solutions to manage QoS and Energy efficiency	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A46CT.1	1	2	----	2	----	----	----	----	----	----	----	----	1	1	---
19A46CT.2	3	3	----	3	----	2	----	----	1	----	----	2	2	2	---
19A46CT.3	2	3	----	2	----	2	----	----	1	----	----	2	2	2	---
19A46CT.4	2	3	----	3	----	2	----	----	1	----	----	2	2	2	---

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	OPTICAL FIBER COMMUNICATION
Category	:	PE
Course Code	:	19A46DT
Year	:	III B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- To understand different Optical fibers with its structures and materials.
- Understand and analyze different Optical sources, detectors and their operating mechanisms.
- To understand the losses and to design different power link mechanisms of optical fibers

Unit 1 : **Optical waveguides and materials** 8

Introduction to fiber optic cables, Historical Development, The General System, Advantages of Optical Fiber Communications, Ray Theory transmission, Electromagnetic mode theory for Optical Propagation, Cylindrical Fiber. Single mode fibers, fiber materials.

Unit 2 : **Optical sources:** 10

Light Emitting Diodes (LEDs): LED Structures, Light Source Materials, Quantum efficiency and LED Power, Modulation of LED. LASER Diodes- Laser Diode Modes and Threshold Conditions, Laser Diode Rate Equations, External Quantum Efficiencies.

Unit 3 : **Optical detectors** 10

Physical principles of photo diodes, photo detector noise, detector response time, avalanche multiplication noise, structures for In GaAs APDs, temperature effect on avalanche gain, comparisons of photo detectors.

Unit 4 : **Fiber Losses and Power Coupling** 9

Attenuation, Fiber Bend Loss, Dispersion, Chromatic dispersion, Intermodal dispersion, Overall fiber dispersion, Polarization, Fiber alignment and joint loss. Source to Fiber Power Launching, Lensing schemes for Coupling Improvement, fiber-to-fiber Joints, semiconductor optical amplifiers.

Unit 5 : **Optical links** 8

Point to point links, Over-view of analog links, carrier to noise ratio, multichannel transmission techniques, RF over fiber, radio over fiber links.

WDM Concepts and components: Over-view, WDM, Necessity , Principles, Types of WDM.

Prescribed Text Books:

1. Optical fiber communications- Gerdkeiser, McGraw Hill International Edition, 3 rd Edition, 2010.
2. Optical fiber communications-John M. Senior, PHI, 3rd Edition, 2010.

Reference Text books:

6. Fiber-optic communication systems, Third edition,Govind P.Agrawal,The Institute of optics university of Rochester, Rochester, NY, WILEY Inter science, A John Wiley & sons, INC., Publication

Course Outcomes:

Student will be able to Blooms Level of Learning

1. Understand historical developments of OFC and different types of OFC L1
2. Analyze the transmission of optical signal in fibers L3
3. To design the constructional features of OFC and optical sources L4
4. To design the optical links and analyze different applications. L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A46DT.1	3	--	2	--	--	--	--	--	--	1	--	--	1	--	--
19A46DT.2	3	2	1	--	--	--	--	--	--	--	--	--	2	3	--
19A46DT.3	3	2	3	--	1	--	--	--	--	--	--	--	2	3	--
19A46DT.4	3	--	3	3	3	--	--	--	--	1	--	--	3	2	--

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course : DIGITAL IMAGE PROCESSING
Category : PE
Course Code : 19A46ET
Year : III B.Tech
Semester : II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

1. To understand the Digital Image Processing fundamentals
2. To acquire the knowledge of Image enhancement and restoration techniques
3. To identify the types of Image formats and their importance in Image Processing
4. To analyze various Image Segmentation and Compression methods

Unit 1 : **DIGITAL IMAGE FUNDAMENTALS** 8

Image Sensing and acquisition, Image Sampling and Quantization, Some basic Relationship between pixels. An Introduction to mathematical tools used in Image Processing, 2-D DFT, Properties. Walsh transforms, Hadamard Transform.

Unit 2 : **IMAGE ENHANCEMENT** 10

Some basic Intensity Transformation functions, Histogram Processing, Smoothing and Sharpening spatial filters, Image Smoothing and sharpening using Frequency domain filters

Unit 3 : **IMAGE RESTORATION** 10

A model of the Image degradation, Noise models, Restoration in the presence of Noise only, Estimating the degradation function, Inverse filtering, Wiener filtering.

Unit 4 : **COLOUR IMAGE PROCESSING** 9

Color Models, Pseudo Color Image Processing, Basics of Full Color Image Processing.

Unit 5 : **IMAGE SEGMENTATION & COMPRESSION** 8

Point, Line and Edge Detection, Thresholding – Global and Optimum Global, Region based segmentation, Coding Redundancy, Spatial and temporal Redundancy, Image Compression Models

PrescribedText Books:

1. Digital Image processing – R.C. Gonzalez & R.E. Woods, Addison Wesley/ Pearson education, 3rd Edition.
2. Digital Image processing – R.C. Gonzalez & R.E. Woods, Addison Wesley/ Pearson education, 2nd Edition, 2002.

Reference Text books:

1. Fundamentals of Digital Image processing – A.K.Jain , PHI.
2. Digital Image processing using MAT LAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Edition, PEA, 2004.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand how images are acquired, sampled, quantized and	L2

represented in digital form and analyze images in the frequency domain using various transforms.

2. Apply various enhancement techniques to improve the Image perception L3
3. Analyze the restoration/degradation models for different applications L4
4. Describe the images in different formats such as binary, grey shade and Color with respect to different areas L1
5. Differentiate the methods related to image segmentation and compression with respect to the required applications L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A46ET.1	3	3	3	2	1	1	-	-	-	3	-	3	3	3	3
19A46ET.2	3	3	3	3	2	2	-	-	-	3	-	3	3	3	3
19A46ET.3	3	3	3	3	2	2	-	-	-	2	-	3	3	3	3
19A46ET.4	3	3	3	3	2	2	-	-	-	2	-	3	3	3	3
19A46ET.5	3	3	3	3	3	3	-	-	-	2	-	3	3	3	3

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	CELLULAR AND MOBILE COMMUNICATIONS
Category	:	PE
Course Code	:	19A46FT
Year	:	III B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able

- To understand the basics of Cellular Mobile systems
- To describe interference and its classification
- To study the concepts of Cell Coverage and Mobile antennas
- To manage the frequencies of different channels and their assignments
- To differentiate handoffs &dropped calls and digital cellular systems

Unit 1 : **CELLULAR MOBILE SYSTEMS** 8

Introduction to Cellular Mobile system, *Basic Cellular System*, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital Cellular systems.

Elements of Cellular *Mobile* Radio System Design: General description of the problem, concept of frequency Reuse channels, Co-channel Interference Reduction Factor, Desired C/I from a normal case in an Omni directional Antenna system, *Handoff Mechanism*, Cell splitting, Consideration of the components of cellular system.

Unit 2 : **INTERFERENCE** 10

Introduction to Co-channel interference, Real time cochannel interference *measurement at mobile radio Transceivers*, Design of an omnidirectional and directional Antenna systems, Diversity receiver, Types of non-cochannel interference-*Measurement of* SINAD, adjacent channel interference, cross talk.

Unit 3 : **CELL COVERAGE FOR SIGNAL AND TRAFFIC** 10

Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and ground reflected path, straight line path loss slope, General formula for mobile *radio* propagation, propagation over water *or* flat open area, near-in and long distance propagation, Form of a point-to-point model.

Cell site and mobile antennas: Sum and difference patterns and their synthesis, *Antennas at cell site*-Omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site *receiving* antennas, *Mobile* high-gain antennas.

Unit 4 : **FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT** 9

Numbering and grouping, set-up *channels*-access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment *Algorithms*

Unit 5 : **HANDOFFS & DROPPED CALLS** 8

Types of handoff, *Initiation of a handoff*, delaying a handoff, forced handoffs, mobile assisted handoff. Intersystem handoff, dropped call rate *and their formula*

Digital cellular *Systems:* GSM-Architecture, channels, multiplex access scheme, TDMA, CDMA

Prescribed Text Books:

1. Mobile cellular telecommunications-W .C. Y. Lee, Tata Mc-Graw Hill, 2nd Edition, 2006.
2. Wireless communications-Theodore. S. Rappaport, Pearson Education, 2nd Edn. 2002.

Reference Text books:

1. Principles of Mobile communications-Gordon L. Stuber, Springer International 2nd Edition, 2007.
2. Wireless and Mobile Communications-Lee Mc Graw Hills, 3rd Edition, 2006.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand fundamentals of cellular system design, coverage and interference	L2
2. Identify different types of non-co channel interference	L1
3. Analyze cell coverage in different traffic and their effects over different terrains	L4
4. Organize the concepts related to numbering, grouping, channels, channel sharing and borrowing	L3
5. Distinguish the concept of handoffs &dropped calls and digital cellular systems	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A46FT.1	3	3	2	2	1	2	-	-	-	3	2	3	3	3	3
19A46FT.2	3	3	3	3	2		-	-	-	3	3	3	3	3	1
19A46FT.3	3	3	3	3	2	2	-	-	-	2	2	3	3	3	2
19A46FT.4	3	2	3	2	1	2	-	3	-	3	3	3	3	3	3
19A46FT.5	3	2	3	1	3	1	-	3	-	3	3	3	3	2	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	General Aptitude
Category	HS
Couse Code	19AC61L
Year	III B. Tech
Semester	II Semester
Branch	EEE & ECE

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	2	1

Course Objectives:

- To equip students with aptitude and reasoning skills in order to help them succeed in competitive exams.
- To help students improve their knowledge of quantitative and reasoning skills, which in turn helps them comprehend and solve various mathematical problems in professional life.
- To equip students with English verbal and reasoning skills in order to help them succeed in exams like GRE, TOEFL and help them to do well in placement drives.
- To help students improve their knowledge of grammar, vocabulary and reasoning skills pertain to English.

Quantitative Aptitude:

Number Systems - HCF and LCM - Averages - Problems on ages– Percentages - Profit and loss - Simplification - Ratio and Proportion - Time and Work - Time and Distance - Simple interest and Compound interest –Calendar - Clocks – Mensuration: Area, Volume and Surface Areas - Data Interpretation: Tabulation, Line Graphs, Bar Graphs, Pie charts.

Reasoning:

Directions - Blood Relations - Series and Sequences - Odd man out - Coding and Decoding - Data Sufficiency-Logical deductions.

English for Competitive Examinations

Synonyms – Antonyms – Analogy – Words often confused, One-word substitutions – Idioms and Phrases – Homonyms – Spellings, Reading comprehension – Cloze tests

Articles – Prepositions – Tenses – Voice – Error spotting and correcting – Sentence improvement.

Rearrangement of jumbled words and jumbled sentences – word pairs – sentence completion

Prescribed Textbooks:

1. R.S. Agarwal, Quantitative Aptitude, S. Chand Publishers, New Delhi, 2005.
2. R. S. Agarwal, Verbal and Non-Verbal Reasoning, S. Chand Publishers, New Delhi, 1998.
3. Hari Prasad, "Objective English for Competitive Exams", TMH
4. R. S. Agarwal, "Objective English", S. Chand Publishers

Reference Books

1. Shakuntala Devi, Puzzles to Puzzle you, Orient Paper Backs Publishers (OPB), New Delhi, 2005.
2. Arun Sharma, How to Prepare for Quantitative Aptitude, TMH Publishers, New Delhi, 2003.
3. Sharon Weiner-Green, IrnK.Wolf, Barron's GRE, Galgotia Publications, New Delhi, 2006.
4. Shakuntala Devi, More Puzzles, OPB, New Delhi, 2006.
5. Ravi Narula, Brain Teasers, Jaico Publishing House, New Delhi, 2005.
6. George J Summers, Puzzles and Teasers, Jaico Publishing House, Mumbai, 2005

Course Outcomes:

Student will be able to — Blooms Level of Learning

- demonstrate various principles involved in solving mathematical problems pertain to Quantitative functions.
- decode information from charts and interpret their logical thinking in the aspects.
- interrelate English vocabulary with the knowledge of synonyms, antonyms, idiomatic expressions and, accuracy in English spelling
- apply knowledge of articles, prepositions, tenses and voice to correct errors or to improve sentences

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC61L.1	3											3
19AC51L.2	3											3
19AC61L.3										3		3
19AC61L.4										3		3

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	Universal Human Values - II
Category	HS
Couse Code	19AC63T
Year	III B. Tech
Semester	II Semester
Branch	ECE, EEE

Lecture Hours	Tutorial Hours	Practical	Credits
1	1	-	2

Course Objectives:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection
- Development of commitment and courage to act

Unit 1 Course Introduction - Need, Basic Guidelines, Content and Process for Value Education 6

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and
- Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for
- fulfilment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

Unit 2 Understanding Harmony in the Human Being - Harmony in Myself! 6

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct
- appraisal of Physical needs, meaning of Prosperity in detail

- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

Unit 3	Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship	6

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Unit 4	Understanding Harmony in the Nature and Existence -Whole existence as Coexistence	6

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature recyclability
- and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all pervasive space
- Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Unit 5	Implications of the above Holistic Understanding of Harmony on Professional Ethics	6

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual:

as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

- Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Prescribed Text Books

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5. E. FSchumacher. "Small is Beautiful"
6. Slow is Beautiful –Cecile Andrews
7. J C Kumarappa "Economy of Permanence"
8. Pandit Sunderlal "Bharat Mein Angreji Raj"
9. Dharampal, "Rediscovering India"
10. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland(English)
13. Gandhi - Romain Rolland (English)

Course Outcomes:

	Blooms Level of Learning
• Students are expected to become more aware of themselves, and their surroundings (family, society, nature)	L2
• They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.	L2
• They would have better critical ability.	L2
• They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).	L2
• It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC53T.1/63T.1												3
19AC53T.2/63T.2												3
19AC53T.3/63T.3												3
19AC53T.4/63T.4												3
19AC53T.5/63T.5												3

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Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course : VLSI DESIGN LAB
Category : PC
Course Code : 19A462L
Year : III B.Tech
Semester : II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives: This course will able to

- To Understand and develop the test bench code for combinational circuits and sequential circuits
- To make the students Design combinational and sequential circuits
- To Learn the simulation with truth table through EDA tool

Experiment No. 1:- Design of Logic gates using VHDL\Verilog.

Experiment No. 2:- Design Full Adder,Ripple Carry Adder using VHDL\Verilog.

Experiment No. 3:- Design Encoders and Decoders using VHDL\Verilog.

Experiment No. 4:- Design Multiplexer using VHDL\Verilog.

Experiment No. 5:- Design of ALU using Verilog.

Experiment No. 6:- Design of Flip-Flops using VHDL\Verilog.

Experiment No. 7:- Design of a decade counter using VHDL\Verilog.

Experiment No. 8:-Design of a CMOS NAND, NOR & XNOR using Verilog.

Implementation of Expt. 2, Expt. 3 and Expt.4 using FPGA kit.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Develop the test bench code for combinational circuits and sequential circuits	L6
2. Be able to use different Verilog/VHDL programming constructs in the design combinational and sequential circuits	L3
3. Simulate various combinational and sequential logic circuits and verify the simulation with truth table through EDA tool	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A462L.1	2	2	-	2	-	2	-	-	2	-	-	2	2	3	-
19A462L.2	1	2	-	2	-	2	-	-	1	-	-	2	-	2	-
19A462L.3	2	2	-	2	-	-	1	-	1	-	-	2	2	2	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course : DIGITAL SIGNAL PROCESSING LAB
Category : PC
Course Code : 19A464L
Year : III B.Tech
Semester : II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives: This course will able to

- The course aims to enable the students to learn and design the concepts of MATLAB in signal processing applications.

1. To verify the stability and causality of LTI Systems.
2. To Identify Fourier series & Fourier transform of Continuous and Discrete signals.
3. To verify linear convolution.
4. To verify the circular convolution.
5. N-point FFT algorithm
6. MATLAB program to find frequency response of analog LP/HP filters.
7. To Design Butterworth (LP/HP)
8. To Design IIR filter by Impulse Invariant/Bi-Linear Transformation
9. To design FIR filter (LP/HP) using windowing technique a) Using rectangular window b) Using triangular window c) Using Kaiser window
10. To compute power density spectrum of a sequence.
11. Decimation by a factor D
12. Interpolation by a Factor L

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Able to write MATLAB programs.	L1
2. Able to understand the operations on signals.	L2
3. Able to understand and design different filters	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A464L.1	-	-	-	1	3	-	2	-	-	-	-	3	-	3	-
19A464L.2	2	2	-	-	3	-	2	-	-	-	-	3	2	3	-
19A464L.3	2	2	-	-	3	-	-	-	-	-	-	3	2	3	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	EMBEDDED SYSTEMS
Category	:	PC
Course Code	:	19A471T
Year	:	IV B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
2	0	0	2

Course Objectives: This course will able to

- To understand concepts of embedded systems.
- To apply the knowledge acquired on the design considerations

Unit 1 : **MICROCONTROLLER & INTERFACING 8051** 25

Introduction, Architecture, Register Organization, Internal and External Memory, Pin diagram, I/O port structure, Addressing modes, Instruction Set, simple programs. On-Chip Peripherals-8051 Interrupt Structure, Timer/Counter features, modes and programming. MSP 430 Low power Micro Controller (A Quantitative study only).Applications- Interfacing with switches, display – LED, seven segment display, LCD. Keyboard interfacing, D/A and A/D interfacing, Stepper motor interfacing, Handling External Interrupts, serial communications.

Unit 2 : **INTRODUCTION TO EMBEDDED SYSTEMS** 8

Embedded System – Definition, Application Areas, and Categories. Overview of embedded system architecture, specialities: reliability, performance, power consumption cost, size, user interface, software upgradation capability, recent trends: processor, power, memory, operating system, communication interface, programming languages, development tools, programmable hardware.

Unit 3 : **ARCHITECTURE OF EMBEDDED SYSTEMS** 14

Hardware Architecture – CPU, Memory, Clock Circuitry, Watch dog Timer/Reset Circuitry, chip select, I/O devices, Debug Port, Communication Interfaces, Power supply Unit. Software Architecture – Services provided by an operating System, Architecture and categories of Embedded Operating Systems, Application Software, Communication software, Process of generating Executable image, Development/Testing tools.

Unit 4 : **COMMUNICATION INTERFACES** 11

Need for Communication interface, RS232/UART, RS 422/RS 485, USB, Infrared, IECE 1394 fire wire, IECE 802.11, Blue tooth, I2C and CAN Bus.

Unit 5 : **REAL TIME OPERATING SYSTEM** 17

Architecture of Kernel, Tasks and Task Scheduler, Interrupt Service Routines, Inter process Communication– Semaphores, mutex, message queues, mailboxes, pipes, signals, event registers and timers. Priority Inversion Problem. Off the Shelf Operating Systems, Embedded Operating Systems, Real Time Operating Systems, And Handheld Operating Systems.

Prescribed Text Books:

1. Embedded/ Real Time Systems, K.V.K.K. Prasad, Dream tech press

2. The 8051 Microcontroller, Kenneth J Ayala, 3rd edition, Thomson Press.

Reference Text books:

1. Computers and Components, Wayne Wolf, Elsevier.
2. Embedded Systems, Raj Kamal, TMH. 2nd edition.2008.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand basic concepts to design embedded applications.	L2
2. Understand different programming models and their suitable application areas	L2
3. Analyze the operation of I/O ports and different communication protocols.	L4
4. Design different embedded applications.	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
19A471T.1	3	2	1	2			1		2		1	2	3		
19A471T.2	3						2		1			2	2		
19A471T.3	2	3	2	1		2	1		2		2	1		2	
19A471T.4	2	3	3	2	2	1		1	2			1			3

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	DSP PROCESSORS AND ARCHITECTURES
Category	:	PE
Course Code	:	19A47AT
Year	:	IV B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able

- To get sufficient exposure to the architecture and Computational implementations of Programmable DSP devices.
- To study the basic DSP algorithms and implementation on filters.
- To obtain knowledge on interfacing memory and I/O devices with programmable DSP devices.

Unit 1 : **DSP FUNDAMENTALS** 10

Introduction to Digital Signal Processing: Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation,

Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors.

Unit 2 : **ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES** 10

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

Unit 3 : **PROGRAMMABLE DIGITAL SIGNAL PROCESSORS** 10

Architecture of TMS320C54XX DSP- Bus structure, CPU, Memory, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors. .

Unit 4 : **IMPLEMENTATIONS OF DSP ALGORITHMS**: 12

The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

Unit 5 : **INTERFACING WITH PROGRAMMABLE DSP DEVICES** 10

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). Synchronous Serial Interface, a Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

PrescribedText Books:

1. Avtar Singh and S. Srinivasan, Digital Signal Processing, Thomson Publications, 2004
2. B. Venkata Ramani and M. Bhaskar, Digital Signal Processors, Architecture, Programming and Applications, TMH, 2004.

Reference Text books:

1. Jonathan Stein, Digital Signal Processing, John Wiley, 2005.
2. Lapsley et al. S. Chand & Co, DSP Processor Fundamentals, Architectures & Features, 2000.
3. Math H. J. Bollen, Understanding Power quality problems, IEEE Press, 2007.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand concepts of DSP systems and implementation methods	L1
2. Have the knowledge of programmable DSP architectures.	L1
3. Design and formulate the implementations of algorithms on TMS320C54XX processor.	L6
4. Obtain knowledge on architecture of TMS320C54XX processor and its interfacing.	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A47AT.2	3	2	2	-	-	-	-	-	-	-	-	-	2	2	-
19A47AT.1	3	-	-	-	-	-	-	-	-	-	-	-	2	2	-
19A47AT.3	3	3	3	-	-	-	-	-	-	-	-	-	2	2	-
19A47AT.4	3	2	2	-	-	-	-	-	-	-	-	-	2	2	

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course : ASIC DESIGN
Category : PE
Course Code : 19A47BT
Year : IV B.Tech
Semester : I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: The course aims to provide the student with the ability

- To understand ASIC Design flow, ASICs Design styles and Issues, ASICs Design Techniques and ASIC Construction.
- To analyze the Performance of ASICs.
- To apply appropriate techniques, resources and tools to engineering activities for appropriate Solution to develop ASICs

Unit 1 : **ASIC DESIGN STYLES** 15
Introduction – categories-Gate arrays-Standard cells-Cell based ASICs-Mixed mode and analogue ASICs – PLDs.

Unit 2 : **ASICS – PROGRAMMABLE LOGIC DEVICES** 12
Overview – PAL –based PLDs: Structures; PAL Characteristics – FPGAs: Introduction, selected families – design outline.
ASICS –DESIGN ISSUES: Design methodologies and design tools – design for testability – economies

Unit 3 : **ASICS- CHARACTERISTICS AND PERFORMANCE** 8
design styles, gate arrays, standard cell -based ASICs, Mixed mode and analogue ASICs.

Unit 4 : **ASICS-DESIGN TECHNIQUES** 14
Overview- Design flow and methodology-Hardware description languages-simulation and checking-commercial design tools- FPGA Design tools: XILINX, ALTERA
LOGIC SYNTHESIS, SIMULATION AND TESTING: Verilog and logic synthesis -VHDL and logic synthesis - types of simulation -boundary scan test - fault simulation- automatic test pattern generation.

Unit 5 : **ASIC CONSTRUCTION** 8
Floor planning, placement and routing system partition.
FPGA PARTITIONING: Partitioning Methods-Floor Planning- Placement-Physical Design Flow-Global Routing-Detailed Routing –Special Routing-Circuit Extraction-DRC.

PrescribedText Books:

3. L.J.Herbst,"Integrated circuit engineering", OXFORD SCIENCE Publications, 1996.

Reference Text books:

1. M.J.S.Smith,"Application - Specific integrated circuits", Addison-Wesley Longman Inc 1997.

Course Outcomes:
Student will be able to Blooms Level of Learning

1. Demonstrate in-depth knowledge in ASIC Design flow, ASICs Design styles and Issues, ASICs Design Techniques. ASIC Construction L1
2. Analyze the characteristics and Performance of ASICs and judge independently the best suited device for conducting research in ASIC design. L3
3. Solve problems of Design issues, simulation and Testing of ASICs. L1
4. Apply appropriate techniques, resources and tools to engineering activities for appropriate Solution to develop ASICs. L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A462T.1	2		2							1		1	2	2	
19A462T.2	3	3	3							2		1	2	2	
19A462T.3	2		2							2		1	2	2	
19A462T.4	3	3	3							2		1	2	2	

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	WIRELESS COMMUNICATION & NETWORKS
Category	:	PE
Course Code	:	19A47CT
Year	:	IV B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: The course aims to provide the student with the ability

- To Gain knowledge and experience with regard to wireless communication engineering including multiple access techniques.
- To Identify and understand wireless communication network and their evaluation.

Unit 1 : **Introduction To Wireless Communications And Multiple Access Techniques** 8

Evolution of mobile radio communications, examples of Wireless Communication systems, comparison of common Wireless Communication systems, Multiple access techniques: Introduction, FDMA, TDMA, Spread Spectrum, Multiple Access, SDMA, Packet radio, Packet radio protocols, CSMA protocols, Reservation protocols.

Unit 2 : **Wireless Networking And Data Services:** 10

Wireless Networking: Difference between wireless and fixed telephone networks, Development of wireless networks, Traffic routing in wireless networks. Data Services: Data services, CCS, BISDN and ATM, SiganalingSystemNo7

Unit 3 : **Mobile IP and Wireless Access Protocol** 11

Mobile IP: Mobile IP Operation of mobile IP, Co-located address, Registration, Tunneling. WAP: WAP Architecture, overview, WML scripts, WAP service, WAP session protocol.

Unit 4 : **Wireless LAN Technology And Bluetooth** 9

Wireless LAN: Infrared LANs, Spread spectrum LANs, Narrow bank microwave LANs, IEEE802.11 Protocol architecture and services. Bluetooth: Overview, Radio specification, Base band specification, Links manager specification, Logical link control and adaptation protocol.

Unit 5 : **Mobile Data Networks And HIPER LAN** 8

Mobile Data Networks: GPRS and higher data rates, Short messaging service in GSM, HIPER LAN: HIPERLAN-1

Prescribed Text Books:

1. Wireless Communications, Principles, Practice – Theodore S. Rappaport, PHI, 2 nd Ed., 2002.
2. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, Pearson Education, 2002.
3. Wireless Communication and Networking – William Stallings, PHI, 2003.

Reference Text books:

1. Wireless Digital Communications – Kamilo Feher, PHI, 1999.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the effective bandwidth utilization to accommodate large number	L2

of mobile users by using various accessing techniques

2. Analyze networking considerations, practical networking approaches with mobile data services. L3
3. Analyze the protocols used in wireless LAN technologies. L3
4. be able to identify mobile data and advanced wireless networks and their applications in real time. L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A47CT.1	1	--	--	--	--	--	--	--	--	--	--	2	--	--	--
19A47CT.2	1	2	2	2	--	1	--	--	--	1	--	2	1	2	--
19A47CT.3	1	2	2	2	--	1	--	--	--	1	--	2	1	2	--
19A47CT.4	1	2	--	--	--	--	--	--	--	1	--	2	--	--	--

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course : DIGITAL IC DESIGN
Category : PE
Course Code : 19A47DT
Year : IV B.Tech
Semester : I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able

- To study about different CMOS characteristics and it's design.
- Verify different methods to reduce the size and power consumption of CMOS IC.
- To understand the design of subsystems and layout of CMOS chip

Unit 1 : **CMOS Characteristics** 8

CMOS inverters -static and dynamic characteristics.

Unit 2 : **CMOS Circuits Design** 10

Static and Dynamic CMOS design- Domino and NORA logic – Alternative gate circuits of CMOS.

Unit 3 : **CMOS Gates Behavior** 10

Method of Logical Effort for transistor sizing -power consumption in CMOS gates- Low power CMOS design

Unit 4 : **LAYOUT DESIGN RULES** 9

Need for Design Rules, NMOS and CMOS Based Design Rules, Simple Layout Examples, Sheet Resistance, Area Capacitance, Wiring Capacitances, Drive Large Capacitive Load**.**

Unit 5 : **SUBSYSTEM DESIGN PROCESS** 8

Arithmetic circuits in CMOS VLSI - Adders- multipliers- shifter -CMOS memory design - SRAM and DRAM, modified Booth's algorithm for multipliers, Design of ALU subsystem, and Implementing ALU functions with an adder

PrescribedText Books:

1. Sung-Mo Kang & Yusuf Leblebici, "CMOS Digital Integrated Circuits - Analysis & Design", MGH, Second Ed., 1999 .
2. Jan M Rabaey, "Digital Integrated Circuits - A Design Perspective", Prentice Hall, 1997
3. Eugene D Fabricus, "Introduction to VLSI Design,"McGraw Hill International Edition.1990.

Reference Text books:

1. Ken Martin, "Digital Integrated Circuit Design", Oxford University Press, 2000
2. Neil H E West and Kamran Eshranghian, "Principles of CMOS VLSI Design: A System Perspective", Addision-Wesley 2nd Edition, 2002.

Course Outcomes:

Student will be able to — Blooms Level of Learning

1. Illustrate the different characteristics of CMOS ICs. — L2

2. Understand the design aspects of CMOS. L2
3. Formulate the logical size and power efficiency of CMOS design. L4
4. Acquire the knowledge about to design the subsystems of CMOS. L4
5. Analyze the design of CMOS layout. L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A47DT.1	2	1	2	-	-	2	-	3	2	-	3	2	3	3	2
19A47DT.2	2	2	3	-	-	3	-	3	2	-	3	2	3	3	2
19A47DT.3	2		2	-	-	1	-	2	-	-	2	1	3	2	-
19A47DT.4	1	1	3	-	-	1	-	2	2	-	2	2	3	3	-
19A47DT.5	2	2	2	-	-	1	-	3	3	-	3	2	3	3	2

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	FPGA ARCHITECTURES AND APPLICATIONS
Category	:	PE
Course Code	:	19A47ET
Year	:	IV B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- Introduction to ROM, PLA, PAL, PLD, PGA, FPGA
- To understand the complexities of commercial grade FPGAs, programming and implementing complex applications
- Usage of tools for state machine design and implementation on FPGA.

Unit 1 : **PROGRAMMABLE LOGIC** 9

ROM, PLA, PAL, PLD, PGA – Features, Programming and Applications using Complex Programmable Logic Devices Altera Series – Max 5000/7000 Series and Altera FLEX Logic – 10000 Series CPLD, AMD's – CPLD (Mach 1 To 5); Cypres FLASH 370 Device Technology, Lattice Plsi's Architectures – 3000 Series – Speed Performance and in System Programmability

Unit 2 : **FPGAs** 5

Field Programmable Gate Arrays – Programming technologies, Logic Blocks, Routing Architecture, Design Flow, Technology Mapping for Fpgas.

Unit 3 : **COMMERCIAL FPGA'S** 9

Xilinx XC4000 & ALTERA's FLEX 8000/10000 FPGAs: AT & T – ORCA's (Optimized Reconfigurable Cell Array): ACTEL's – ACT-1,2,3 and Their Speed Performance

Unit 4 : **REALIZATION OF STATE MACHINE** 9

Top Down Design – State Transition Table, State Assignments for FPGAs. Problem of Initial State Assignment for One Hot Encoding. Charts with a PAL. Alternative Realization for State Machine Chart using Microprogramming. Linked State Machines. One – Hot State Machine, Petrinets for State Machines – Basic Concepts, Properties. Extended Petrinets for Parallel Controllers. Finite State Machine – Ex: Traffic Light Controller, Implementation of Petrinet Description.

Unit 5 : **FSM ARCHITECTURES AND SYSTEM LEVEL DESIGN** 9

Architectures Centered Around Non-Registered PLDs. State Machine Designs Centered Around Shift Registers. One – Hot Design Method. Use of ASMs in One – Hot Design. Application of One – Hot Method. System Level Design – Controller, Data Path and Functional Partition.

PrescribedText Books:

1. P.K.Chan & S. Mourad, Digital Design Using Field Programmable Gate Array, jPrentice Hall (Pte), 1994.
2. S.Trimberger, Edr., Field Programmable Gate Array Technology, Kluwer Academic Publicatgions,1994.
3. J. Old Field, R.Dorf, Field Programmable Gate Arrays, John Wiley & Sons, Newyork, 1995..

Reference Text books:

1. S.Brown, R.Francis, J.Rose, Z.Vransic, Field Programmable Gate Array, Kluwer Pubin, 1992.
2. Richard F. Tinder, Engineering Digital Design, Second Edition, Academic Press.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Analyse the problems and find the suitable digital device like PLA,PAL,PLD, PGA or LSI, MSI,VLSI devices	L4
2. Map the applications to the FPGA architectures using tools.	L4
3. Use of microprogramming, bottom up, top down design and other techniques for digital circuit implementation	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A47ET.1	2	1	2	-	-	2	-	3	2	-	3	2	3	3	2
19A47ET.2	2	2	3	-	-	3	-	3	2	-	3	2	3	3	2
19A47ET.3	2	-	2	-	-	1	-	2	-	-	2	1	3	2	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
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Title of the Course	:	CODING THEORY AND TECHNIQUES
Category	:	PE
Course Code	:	19A47FT
Year	:	IV B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	1	0	3

Course Objectives: This course will able to

- Focus on transferring data without error from source to destination by means of coding.
- Emphasize the generation of various coding Techniques.

Unit 1 : **Digital Transmission Coding's** **12**

Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system.

Unit 2 : **Cyclic Codes** **10**

Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

Unit 3 : **Convolutional Codes** **10**

Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority -logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

Unit 4 : **Galois Fields** **8**

Groups, fields and Vector spaces –Elementary properties of Galois fields –Primitive polynomials and Galois fields of order p^m - Zech's algorithms.

Unit 5 : **Polynomials over Galois Fields** **8**

Euclidean domains and Euclid's algorithm –Minimal polynomials and Conjugate elements –Factoring $x^n - 1$ - Ideals in the Ring $\frac{GF(q)[x]}{X^n-1}$

Prescribed Text Books:

1. Error Control Coding- Fundamentals and Applications – Shu Lin, Daniel J.Costello,Jr, Prentice Hall, Inc.
2. Error Correcting Coding Theory - Man Young Rhee- 1989, McGraw-Hill.
3. Error control systems for Digital communication and storage - Stephen B. Wicker, Prentice Hall, Upper Saddle River, NJ, 1995.

Reference Text books:

1. Error Correcting Coding Theory-Man Young Rhee-1989,McGraw Hill Publishing.
2. Digital Communications-Fundamental and Application - Bernard Sklar, Pearson Education.
3. Digital Communications- John G. Proakis, 5th ed., 2008, Mcgrawhill education.
4. Introduction to Error Control Codes-Salvatore Gravano-oxford
5. Error Correction Coding – Mathematical Methods and Algorithms – Todd K. Moon, 2006, Wiley India.
6. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Edition, 2009, Mcgrawhill education
7. Digital Communication - Simon Haykin, John Wiley and Sons, 1988.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Knowledge about measuring information and errors occurred	L3
2. Familiar in designing various coding techniques like block codes, cyclic codes, convolution codes, turbo codes and space codes.	L6
3. Understand Galois field arithmetic and its implementation in coding theory.	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A47FT.1	3	3	2	2	2	-	-	-	-	3	2	2	3	3	3
19A47FT.2	3	3	2	2	2	-	-	-	-	3	2	2	3	3	3
19A47FT.3	3	3	2	2	2	-	-	-	-	3	2	2	3	3	3

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course:		Basic Civil Engineering
Category	:	OE
Course Code	:	19A17GT
Year	:	IV B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives:

- To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Civil Engineering.
- To motivate the student to pursue a career in one of the many areas of Civil Engineering with deep interest and keenness.
- To expose the students to the various avenues available for doing creative and innovative work in this field by showcasing the many monuments and inspiring projects of public utility.

Unit 1 : **(**8hrs)

Basic Understanding: What is Civil Engineering/ Infrastructure? Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career.
History of Civil engineering: Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers

Unit 2 : **(**10hrs)

Overview of National Planning for Construction and Infrastructure Development; Position of construction industry vis-à-vis other industries, five year plan outlays for construction; current budgets for infrastructure works;
Fundamentals of Building Materials: Stones, bricks, mortars, Plain, Reinforced & Prestressed Concrete, Construction Chemicals; Structural Steel, High Tensile Steel, Carbon Composites; Plastics in Construction; 3D printing; Recycling of Construction & Demolition wastes.

Unit 3 : **(**10hrs)

Environmental Engineering & Sustainability: Water treatment systems; Effluent treatment systems; Solid waste management; Sustainability in Construction;
Geotechnical Engineering: Basics of soil mechanics, rock mechanics and geology; various types of foundations; basics of rock mechanics & tunnelling.

Unit 4 : **(**8hrs)

Hydraulics &Water Resources Engineering: Fundamentals of fluid flow, basics of water supply systems; Underground Structures; Underground Structures Multi-purpose reservoir projects.
Surveying & Geomatics: Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS, LIDAR;

Unit 5 : **(**8hrs)

Computational Methods, IT, IoT in Civil Engineering: Typical software used in Civil Engineering- Finite Element Method, Computational Fluid Dynamics; Computational Geotechnical Methods; highway design (MX), Building Information Modelling; Highlighting typical available software systems (STAAD, ETAB & AUTOCAD)

PrescribedText Books:

1. Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth-Heinemann
2. Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
4. Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering (Civil and Environmental Engineering) by V.N.S. Murthy
5. Building Planning & Drawing by Dr N. Kumaraswamy and A.Kameswara Rao, Charitor Publications
6. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011.

Reference Text books:

1. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc.corresponding to materialsused for Civil Engineering applications
2. An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall, NJ
3. K Subramanya, Water Resources Engineering through Objective Questions, Tata Mc-Graw Hill.
4. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.

Course Outcomes:

Student will be able to	Blooms Level of Learning
CO1: Identifying the various areas available to pursue and specialize within the overall field of Civil Engineering.	L3
CO2: Showcasing the many monuments, heritage structures, nationally important infrastructure, and impressive projects to serve as sources of inspiration.	L1
CO3: Highlighting the depth of engagement possible within each of these areas.	L3
CO4: Providing a foundation for the student to launch off upon an inspired academic pursuit into this branch of engineering.	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A16GT.1						3			2			1	1	2	
19A16GT.2						3			2			1	1	2	
19A16GT.3						3			2			1	1	2	
19A16GT.4						3			2			1	1	2	

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course: Water Resources and Conservation
Category : OE
Course Code : 19A17HT
Year : IV B.Tech
Semester : I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives:

- To impart knowledge about the planning and management of water resources.
- To introduce the concepts of watershed management, integrated water resources management, environmental interaction of water resources and policies/framework related to water resources.
- To enable the students to understand the different components of water resources and water conservation techniques.

Unit 1 : (8hrs)

Historical profile on world water resources development; Global water resources, Hydrologic cycle, Watershed zoning, Interrelation of water resources with other natural resources and the environment, Water quantity and water budget, Water allocation and water scheduling; Water resources availability and demand.

Unit 2 : (10hrs)

Hydrologic Processes – evaporation, transpiration and precipitation; Water quality parameters, Water pollution – causes, effects and measures; Rainfall-Runoff analysis, Floods measurement, frequency analysis, design of peak flood and routing, Reservoir operation and design.

Unit 3 : (10hrs)

Water resource planning – concept, preliminary study, feasibility study, detailed planning, Design of water distribution system, Irrigation scheduling and techniques;
Water use sectors – Domestic, Industries and Agriculture, Sustainable water resources development, Integrated Water Resources Management (IWRM), Socio-economic aspects of water resources management, Rainwater Harvesting Watershed management.

Unit 4 : (9hrs)

Global Efforts on Water conservation, Think Globally Act Locally on water resources, Local water organizations, National Water Policy, World water organizations - WUGs, WUAs, UN, WWP, WWC, etc. Environmental discourse on dam Construction.

Unit 5 : (8hrs)

Water conservation Techniques: Protection of Water from Pollution, Redistribution of Water, Rational Use of Groundwater, Renovation of Traditional Water Sources, Use of Modern Irrigation Methods, Increasing Forest Cover, Change in Crop Pattern, Flood Management, Conserving Water in Industries, Conservation of water by Municipal authorities, Use rainwater effectively, Make effective use of soil water reserves, Take measures to avoid run off, Avoid wasting water through evaporation, Reduce water losses through drainage, Plan your irrigation, Contour Farming& Contour Ploughing

PrescribedText Books:

1. Global Water Partnership (GWP), Integrated Water Resources Management, Background Papers No. 4, Technical Advisory Committee (TAC)..
2. Water Resources Systems Planning and Management, Vol. 51 by Jain, S.K. and V.P. Singh, Elsevier Science
3. Hierarchical Analyses of Water Resources Systems: Modeling and Optimization of Largescale systems by Haimes, McGraw-Hill, New York.
4. Water Resources Systems Planning and Management by Loucks D.P. and van Beek E., UNESCO Publishing, The Netherlands.

Reference Text books:

1. Water Resources Systems Planning and Analysis by Loucks, D.P., J.R. Stedinger, and D.A. Haith, Prentice-Hall, N.J.
2. Hydrosystems Engineering and Management by Mays, L.W. and K. Tung, McGraw-Hill Inc., New York.

Course Outcomes:

Student will be able to	Blooms Level of Learning
CO1: Identify different problems related to water resources planning, management and development.	L3
CO2: Describe problems like water balance, rainfall-runoff analysis, water distribution networks, flood routing, irrigation scheduling, water pollution and other water related concerns	L2
CO3: Apply principles and guidelines to solve above mentioned problems.	L4
CO4: Understand different water conservation techniques, in order to save water for future	L2

CO-PO Mapping:

OE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A16HT.1						2	3		2				1		3
19A16HT.2						2	3		2				1		3
19A16HT.3						2	3		2				1		3
19A16HT.4						2	3		2						3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

(An Autonomous Institution)

Title of the Course	Energy Management and Conservation
Category	OE
Course Code	19A27GT
Year	IV B.Tech
Semester	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	-	3

Course objective:

1. To impart basic knowledge to the students about current energy scenario, energy conservation and management.
2. To inculcate among the students systematic knowledge and skill about assessing the energy efficiency and energy management**.**

UNIT-I Principles of energy management 8

Organizing an energy management program – Initiating and managing an energy management program - Planning - Leading – Controlling – Promoting – Monitoring and reporting.

UNIT-II Electrical energy management 9

Energy efficient motors – Power factor improvement – Lighting and lighting system control – Energy saving opportunities.

Qualities and functions of energy managers – Qualities and functions of an energy manager – questionnaire - Check list for top management.

UNIT-III 10

Energy Scenario Commercial and Non-commercial energy, primary energy resources, commercial energy Production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, energy efficiency and its need ,restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change.

UNIT-IV Energy Conservation 10

Definition, Principles of Energy Conservation. energy conservation opportunities Assessments of technical merits of energy conservation methods and techniques in specific applications, energy saving methods, energy strategy, industrial energy applications Energy Conservation Act 2001 and its feature, Electricity Act -2003 and features, The Energy Conservation (Amendment) Act,2010 and its importance. Prominent organizations at Centre and state level responsible for its implementation.

UNIT-V 9

Basics of Energy, pricing and its uses in buildings Electricity tariff, load management and maximum demand control, power factor Improvement, selection & location of capacitors. Estimation of Energy use in buildings: Estimation of Energy use in a building, Heat gain and Thermal Performance of building envelope- steady and Non-Steady heat transfer through the glazed window and the wall-standard for thermal performance of building envelope, Evaluation of the overall Thermal Transfer.

Text Books :

1. "Energy Management" - W.R.Murphy&G.MckeyButterworths.
2. "Energy Management Hand Book" - W.C.Turner, John Wiley and Sons.
3. "Energy Management Principles" – Craig B Smith – Pergamon press
4. "Energy Conservation" - Pa ulO'Callagan - Pergamon press.
5. S.C. Tripathy, "Utilization of Electrical Energy and Conservation", McGraw Hill, 1991.
6. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

Course Outcomes:

Student will be able to

	Blooms Level of Learning
1. To understand the Principles and organization of energy management.	L2 &L4
2. To acquaintance with electrical energy management like energy saving opportunities and Power factor improvement.	L3
3. .Analyze the current energy scenario and its importance in energy conservation	L4
4. Understand the concepts of Energy conservation and its features.	L2
5. Understand the estimation of Energy use in buildings.	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19A27GT.1	3	3	-	-	-	2	3	-	-	-	-	3
19A27GT.2	3	3	-	-	-	3	3	-	-	-	-	3
19A27GT.3	3	3	-	-	-	2	2	2	-	-	-	3
19A27GT.4	3	3	-	-	-	2	2	2	-	-	-	2
19A27GT.5	3	3	-	-	-	2	2	2	-	-	-	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES RAJAMPET
(AN AUTONOMOUS INSTITUTION)

Title of the course : Fuzzy Logic and Neural Networks
Category : OE
Course code : 19A27HT
Year : IV B. Tech
Semester : I Semester

Lecture Hours	Tutorial Hours	Practical Hours	Credits
3	-	-	3

Course Objectives

- To understand the fundamental concepts of Artificial Neural network
- To Understand the concepts of different types Neural network architectures and training algorithms
- To understand the concepts of classical sets Fuzzy sets
- To understand the concepts Fuzzy logic controllers
- To gain knowledge in neuro- fuzzy control and its applications in power systems

Unit1 Introduction to Artificial Neural Networks 12

Introduction, Biological Neuron, Biological Artificial Neuron model , Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of neural networks , Historical developments, Neural network architectures, McCulloch-Pitts Model, Types of neuron activation functions, Learning methods(supervised, unsupervised, Reinforcement), Applications of Neural Networks.

Unit-2 Single layer and multi layer feed forward neural networks 12

Perceptron Models: Discrete, Continuous (concepts only), Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications, ADALINE, MADALINE, Back Propagation Network, BP Learning Rule, Input Layer, Hidden Layer and output Layer computations, Radial Basis function network, Hetero associative memory neural and Auto associative memory net, applications.

Unit-3 Classical and Fuzzy sets 08

Introduction to classical sets, Fuzzy sets – Properties, Operations and Relations, Membership, Uncertainty, Fuzzy Relations, Cardinalities and Membership Functions.

Unit-4 Fuzzy Logic system and components 10

Fuzzification, Membership Value assignment, Development of Rule Base, Defuzzification to crisp sets, Defuzzification methods

Unit 5 Neural network and fuzzy logic applications to Power system 10

ANN Based Short Term Load Forecasting, Load Flow Studies, Fault diagnosis and Fuzzy Logic based Unit Commitment and load frequency control.

Text Books:

1. S.N.Sivanadam, S.N.Deepa *Principles of Soft Computing Techniques* , Wiley India publication.
2. JacekM.Zurada *Introduction to Artificial Neural Systems*, Jaico Publishing House, 1997.

Reference Books:

1. N. Yadaiah and S. BapiRaju, *Neural and Fuzzy Systems*: *Foundation, Architectures and Applications*, Pearson Education

2. James A Freeman and Davis S kapura, *Neural Networks* ,Pearson, 2002
3. Brok Kosko, *Neural Networks and Fuzzy Logic System* , , PHI Publications
4. Rajasekharan and Rai, *Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications* - PHI Publication.

Course Outcomes: By the end of this course, students will be able to

1. Able to analyze and form Neural Networks For Different Problems
2. Able to Get the knowledge of Different Types of Neural Networks
3. Understand fuzzy concepts and fuzzy logic components
4. Able to apply Neural Networks for Electrical Systems.
5. Able to apply Fuzzy Logic for Electrical Systems

CO-PO Mapping

Course Outcomes	Program Outcomes														PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	1	2
19A27HT .1	1	1	1	1	1	-	-	-	1	1	1	1	1	1	1	1
19A27HT .2	2	3	2	2	3	-	-	-	2	2	2	2	2	2	2	2
19A27HT .3	-	2	-	-	-	-	-	-	-	-	2	-	-	-	-	2
19A27HT .4	-	-	-	3	-	-	-	-	-	-	-	3	-	-	2	-
19A27HT .5	2	3	2	2	2	-	-	-	2	2	2	2	2	2	2	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	Introduction to Mechatronics
Category	:	OEC
Course Code	:	19A37JT
Year	:	IV Year
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	0	3

Course Objectives: This course will

- Familiarize the technologies behind modern mechatronic systems.
- Explain fundamentals for the development of fully automated system.
- Develop a robotic or automated systems focusing on the hardware and software integration.
- Demonstrate the development of mechatronic system and MEMS.

Unit 1 Introduction 09

Definition of Mechatronics, Need for Mechatronics in Industry, Objectives of mechatronics, mechatronics design process, Mechatronics key elements, mechatronics applications–Computer numerical control(CNC) machines, Tool monitoring systems, Flexible manufacturing system(FMS), Industrial Robots, Automatic packaging systems, Automatic inspection systems.

Unit 2 : Signal Conditioning 09

Introduction, hardware digital I/O, analog input – ADC resolution, speed channels filtering noise using passive components – resistors, capacitors – amplifying signals using OP amps – software – digital signal processing – low pass, high pass, notch filtering.

Unit 3 Sensors & Actuators 09

Sensors: Static characteristics & sensors, displacement, position and proximity sensors. Force and torque sensors, pressure sensors, flow sensors, temperature sensors, acceleration sensors, level sensors, selection criteria for sensors.

Actuators: Mechanical, electrical, hydraulic & pneumatic actuation systems characteristics and their limitations. Design of hydraulic & pneumatic circuits.

Unit 4 Microprocessors, Micro controllers and Programmable Logic Controllers 09

Architecture of of Microprocessor, Micro controller and Programmable Logic Controller, PLC Programming using ladder diagrams, logics, latching, sequencing, timers relays and counters, data handling, Analog input/output, selection of controllers.

Unit 5 Micro Electro Mechanical Systems(MEMS) 09

History, Effect of scaling, Fabrication Techniques: Oxidation, Physical Vapor disposition, Chemical Vapor Deposition, Lithography, Etching, Wafer bonding, LIGA, DRIE, and Applications: Labon chip.

Prescribed Text Books:

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering, WBolton, 3/e Pearson Education Press, 2018. ISBN: 9781292250977
2. Devadas Shetty and Richard A Kolk, Mechatronic System Design, 2/e, Cengage learning, 2010. ISBN: ISBN-13 : 978-1439061985
3. Clarence W. de Silva, Mechatronics an Integrated Approach, CRC Press, 2005. ISBN: 0203611640, 9780203611647

Reference Books:

1. James J Allen, Micro Electro Mechanical Systems Design, CRC Press, Taylor & Francis group, 2005. ISBN-10 : 9780824758240
2. Ganesh S Hedge, Mechatronics, Jones & Bartlett Learning, 2010. ISBN, 1934015296, 978193401529

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Explain to role of mechatronics in industry and applications of mechatronics in automation industry.	L3
2. Understand signal conditioning and its application.	L4
3. Know the different types of sensors and actuators in industry.	L4
4. Understand the architecture of microprocessors, microcontrollers and PLC	L1
5. Illustrate the application of MEMS in industry.	L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A37DT.1	3	3	-	-	-	-	-	-	3	-	3	-	-	-	-
19A37DT.2	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
19A37DT.3	-	-	-	-	2	-	-	-	2	-	-	-	-	-	-
19A37DT.4	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
19A37DT.5	-	2	-	-	2	-	-	-	-	-	-	-	-	-	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course : Fundamentals of Robotics
Category : OE
Course Code : 19A37KT
Year : IV Year
Semester : I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	-	3

Course Objectives:

- To acquire the knowledge on Robotics and its performance
- To develop the ability of kinematics and dynamics of Robots
- To acquire the knowledge on trajectory planning and manipulator
- To develop the ability on various sensor integration on robot
- To develop the ability to use the programming and tools for operation of robot

Unit 1 Introduction to Robotics 11

Types and components of a robot, Classification of robots - Robotics, Robots-Anatomy, Structure and classification, Robot performance parameters – resolution, accuracy and repeatability, Arm and wrist configuration - Social issues and safety

Unit 2 Robot Kinematics and Dynamics 11

Description of links and joints, Kinematic modeling of manipulator, Translation and Rotation Representation, Coordinate transformation, Denavit - Hartenberg (DH) notation, Examples of DH notation, Jacobian, Singularity, and Statics.

Unit 3 Trajectory Planning and Manipulator 08

Control Terminology, Steps in trajectory planning, Joint space techniques, path description, Use of polynomials as interpolating function, various trajectories, Introduction to Cartesian space techniques.

Unit 4 End effectors, sensors and vision system 08

Tools as end effectors, Robot Grippers - Types of Grippers, Design aspect for gripper, Force analysis for various basic gripper system. Sensors for Robots - Characteristics of sensing devices, Classification, applications and selection of sensors. Robotic vision system, image acquisition, spatial and amplitude digitization, image processing and analysis.

Unit 5 Robot programming and applications 10

Robot applications in material handling, machine loading/unloading, assembly, inspection and processing. Robot Programming – Methods, Lead through methods, Robot Programming-Language overview, commands for elementary operations

Prescribed Text Books:

1. Saha, S.K., “Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014. , ISBN - 0070140014
2. Ghosal, A., “Robotics”, Oxford, New Delhi, 2006. ISBN - 9780195673913
3. Niku Saeed B., “Introduction to Robotics: Analysis, Systems, Applications”, PHI, New Delhi. 2001. ISBN - 0130613096

Reference Books:

1. Tsuneo Yoshikawa, Foundations of Robotics, MIT Press. Roy. 2010. ISBN - 0262514583
2. Mittal R.K. and Nagrath I.J., "Robotics and Control", Tata McGraw Hill. 2017, ISBN - 9780070482937
3. Mukherjee S., "Robotics and Automation", Khanna Publishing House, Delhi. 2017. 2017, ISBN - 9386173751

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the concept of Robots, Structure and its specifications.	L2
2. Solve robot forward and inverse kinematic problems.	L5
3. Carry out trajectory planning and joint modeling for the simple robotic system.	L4
4. Identify appropriate end effectors and sensors for particular application	L4
5. Execute various steps robot programming and Knowledge will be gained on application of Robotics used in various sectors.	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A36FT.1	3	3	3	-	-	3	3	3	-	-	-	-	-	-	-
19A36FT.2	2	2	2	-	-	2	-	2	-	-	-	-	-	-	-
19A36FT.3	1	1	1	-	-	-	-	1	-	-	-	-	-	-	-
19A36FT.4	1	1	1	-	-	-	-	1	-	-	-	-	-	-	-
19A36FT.5	2	-	2	-	-	2	-	2	-	2	-	-	-	-	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	Non-conventional sources of energy
Category	:	OE
Course Code	:	19A37LT
Year	:	IV Year
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	0	3

Course Objectives:

- To grasp the role and potential of new and renewable source
- To recognize the principle, storage and applications of solar energy
- To understand the sources and potentials of wind energy and also to comprehend the Principles of Bio-Conversion of bio-mass and bio-gas uses.
- To explain the principle, working procedure and types of geothermal energy, ocean energy and tidal & wave energy.
- To know the knowledge on direct energy conversion.

Unit 1 Principles Of Solar Radiation 09

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation , potential in India

Unit 2 Solar Energy Collectors 09

Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors. Solar Energy Storage And Applications: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion, potential in India.

Unit 3 Wind Energy 08

Sources and potential in India, horizontal and vertical axis wind mills, performance characteristics, Betz criteria. Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, and economic aspects, potential in India

Unit 4 Geothermal Energy 08

Resources, types of wells, methods of harnessing the energy, potential in India.
Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics, potential in India.

Unit 5 Direct Energy Conversion 09

Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thomson effects, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions

Prescribed Text Books:

4. Tiwari and MK.Ghosal, Renewable energy resources: Basic principles and applications, Narosa publications 2005, ISBN 10: 1842651250 ISBN 13: 9781842651254
5. G.D. Rai, Non-Conventional Energy Sources, khanna publications, 2011, ISBN 10: 8174090738, ISBN 13: 9788174090737

Reference Books:

4. Twidell & Weir, Renewable Energy Sources, Routledge , 3rd Ed.2015,ISBN 9780367200756
5. Non Conventional Energy Resources, B.H.Khan, McGrawHIll, 2015, ISBN 1259081397, 9781259081392

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Create awareness on role and potential of new and renewable source and basics of solar energy.	L2
2. acquire the knowledge on different types of collectors and storage systems of solar energy and their applications.	L2
3. Able to achieve sufficient knowledge on Wind energy and Bio-mass energy.	L2
4. Familiarize the student with the Geothermal and Ocean energy concepts and their potentiality	L2
5. Gain the knowledge on direct energy conversion	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A37ET.1	3	2	-	-	-	3	3	-	-	-	-	3	-	-	-
19A37ET.2	3	3	-	1	3	3	-	-	-	-	-	3	-	-	-
19A37ET.3	3	2	3	-	-	3	3	-	-	-	-	3	-	-	-
19A37ET.4	3	3	-	-	3	3	-	-	-	-	-	3	-	-	-
19A37ET.5	3	3	-	-	3	3	-	-	-	-	-	3	-	-	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

(An Autonomous Institution)

Title of the Course	:	Artificial Intelligence
Category	:	OE
Course Code	:	19A57ET
Year	:	IV Year
Semester	:	I Semester (Offered to EEE & ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will

- To comprehend the building blocks of AI in terms of intelligent agents.
- To understand the main approaches of artificial intelligence such as heuristic search, game search and logical inference.
- To know how decision theory and planning is processed on the agents.
- To verify the different types of objects in uncertain world for an agent
- To identify the solution in uncertain knowledge with reasoning.

Unit 1 : *Introduction to Artificial Intelligence* 9

Introduction to AI, History of AI, Emergence of Intelligent Agents, Intelligent Agents: PEAS- Representation for an Agent, Types of Agents, Types of Agent Environments, Concept of Rational Agent, Structure of Intelligent agents, Defining the Problem as a State Space Search, Problem Characteristics.

Unit 2 : *Problem Solving* 12

Solving problems by searching, Problem Formulation, Uninformed Search Techniques- DFS, BFS, Iterative Deepening, Comparing Different Techniques, Informed search methods – heuristic Functions, Hill Climbing, Simulated Annealing, A*, Performance Evaluation. Constrained Satisfaction Problems: Constraint Satisfaction Problems like – map Coloring, Crypt Arithmetic, Backtracking for CSP, Local Search.

Unit 3 : *Knowledge and Reasoning* 9

A knowledge Based Agent, Introduction To Logic, Propositional Logic, Reasoning in Propositional logic, First Order Logic: Syntax and Semantics, Extensions and Notational Variation, Inference in First Order Logic, Unification, Forward and Backward chaining, Resolution.

Unit 4 : *Knowledge Engineering and Planning* 11

Knowledge Engineering: Ontology, Categories and Objects, Mental Events and Objects.
Planning: Planning problem, Planning with State Space Search, Partial Order Planning, Hierarchical Planning, Conditional Planning.

Unit 5 : *Uncertain Knowledge and Reasoning* 10

Uncertain Knowledge and Reasoning: Uncertainty, Acting Under Uncertainty, Basic Probability Notation, The Axioms of Probability, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use, Belief Networks, Simple Inference in Belief Networks,Fuzzy Logic.

Prescribed Text Books:

6. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 2nd Edition, Pearson Publication.
7. Rich, E. and Knight, K., "Artificial Intelligence", Tata McGraw-Hill.

Reference Books:

6. George Lugar, "AI-Structures and Strategies for Complex Problem Solving", 4/e, 2002, Pearson Education.
7. Robert J. Schalkolf, Artificial Intelligence: an Engineering approach, McGraw Hill, 1990.

8. Patrick H. Winston, Artificial Intelligence, 3rd edition, Pearson.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the importance of artificial Intelligence in real world environment	L2
2. Apply the artificial intelligence algorithms for problem solving	L3
3. Analyze the various reasoning and knowledge representation techniques	L4
4. Solve the problems using classification and planning techniques	L3
5. Apply knowledge and reasoning techniques in uncertain environment for obtaining solution	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19A57ET.1	3	3				3			3	2		2
19A57ET.2	3	3	3	3		3	2		3			2
19A57ET.3	3	3	3	3		3			3	2		
19A57ET.4	3	3	3	3	1	3	2		3			
19A57ET.5	3	3	3	3		3			3			

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	Cyber Security
Category	:	OE
Course Code	:	19A57FT
Year	:	IV B.Tech (EEE, ECE)
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- Remember Cyber Security architecture principles
- Compare different classes of attacks
- Understand about cybercrime with mobile and wireless devices
- Apply tools and methods used in cybercrime
- Understand about cyber security and social media marketing.

Unit 1 : INTRODUCTION: 10

Cybercrime:

Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes, The Legal Perspectives, Indian Perspectives, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens

Cyber offenses:

Introduction of Criminal Planning and Criminal Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

Unit 2 : CYBERCRIME MOBILE AND WIRELESS DEVICES: 10

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

Unit 3 : TOOLS AND METHODS USED IN CYBERCRIME: 9

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Phishing and Identity Theft: Introduction, Phishing, Identity Theft(ID Theft)

Unit 4 : CYBERCRIMES AND CYBER SECURITY: 9

Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program, Continuing Strategies.

Unit 5 : UNDERSTANDING COMPUTER FORENSICS: 10

Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Antiforensics

Prescribed Text Books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, Sunit Belapure, Wiley.
2. Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, Cengage Learning.

Reference Text Books:

1. Information Security, Mark Rhodes, Ousley, MGH.
2. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press

Web References:

1.https://www.tutorialspoint.com/fundamentals_of_science_and_technology/cyber_crime_and_cyber_security.htm

Course Outcomes

Student will be able to	Blooms Level of Learning
1. Remember Cyber Security architecture principles	L1
2. Compare different classes of attacks	L2
3. Understand about cybercrime with mobile and wireless devices	L2
4. Apply tools and methods used in cybercrime	L3
5. Understand about cyber security and social media marketing	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19A57FT.1	3	3	3	-	3	-	-	3	-	-	3	-
19A57FT.2	-	3	-	3	-	3	-	-	3	-	-	3
19A57FT.3	3	-	-	3	-	-	3	3	-	3	-	3
19A57FT.4	3	3	3	-	3	-	-	-	-	-	3	3
19A57FT.5	-	-	3	3	3	-	-	-	3	-	3	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	Management Science
Category	:	HS
Course Code	:	19A373T
Year	:	IV B.Tech
Semester	:	I Semester (Common to CSE & ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	0	3

Course Objectives:

- To understand the basic concepts of management and organization structures, types, merits and demerits.
- To give a clear idea about the plant layout and methods of production and understand the basic concepts of marketing and product life cycle.
- To understand the function of HR manager & industrial relations.
- To understand the concepts of Financial Management. Understand the concepts of PERT, CPM and how to draw the network diagram.
- To understand the concepts of MIS, TQM, JIT etc. Understand the importance of ethics in an organization.

Unit 1 Management and Organization Structure 10

Meaning, Nature, Importance Elements Of Management; Planning, Organizing, Staffing, Directing, Coordinating, Reporting, Budgeting- Systems Approach To Management Evolution Of Scientific Management, Modern Management. Principles Need Of Organization Structure- Types Of Organization Structure Line, Line And Staff, Functional And Matrix Organizations.

Unit 2 Operations Management & Marketing Management 10

Plant Location And Layout Methods Of Production (Job, Batch And Mass Production) Objectives Of Inventory Management- Need For Inventory Control- Method Of Inventory Management: EOQ, ABC Analysis **-** Core Concepts Of Marketing. Need, Want, Demand, Product, Value, Satisfaction, Marketing Mix- Product, Price, Place, Promotion, Product Levels – Product Life Cycle, – Channels Of Distribution.

Unit 3 Human Resources Management (Hrm) 10

Significance Of HRM, Basic Functions Of HR manager, HR planning Job evaluation and Recruitment Selection and Placement, Induction and Training. Performance Appraisal. Compensation. Industrial Relations.

Unit 4 Financial Management, Project Management (PERT/CPM): 10

Objectives, Scope, Techniques Of Investment Analysis, Pay Back Period, Accounting Rate Of Return, And Working Capital Cost Of Capital. Sources Of Financing**.** Network Drawing - Program me Evaluation And Review Technique (PERT) – Critical Path Method (CPM) – Probability Of Completing the project within given time Project Crashing (Simple Problems).

Unit 5 Advances in Management Practices 10

Basic Concepts And Overview Of Management Information System (MIS), Enterprise Resource Planning (ERP), Value Analysis, Just –In-Time (JIT), Total Quality Management (TQM) And Supply Chain Management. Overview Of Ethics-Nature And Objectives Of Ethics - Relationship Between Ethics And An Organization.

Prescribed Text Books:

1. Industrial Management by O.P.Khanna, 17 Edition, ISBN: 9788189928353, 9788189928353
2. Management Science by Aryasri, McGraw Hill Education India, ISBN: 9780070090279, 9780070090279
3. Manufacturing Organization and Management, 6th Edition, Pearson Education India, ISBN: 9788177582758, 9788177582758

Reference Books:

1. Stoner, Freeman, Gilbert, Management, Pearson Edu., 2005, 6th Ed. ISBN: 9788131707043, 8131707040
2. Panneer Selvam, Production and Operations Management. PHI, 2004. ISBN, 8120324528, 9788120324527

Course Outcomes:

Student will be able to	Blooms Level of Learning
6. Understand the basic concepts of management and organization. structures, types, merits and demerits	L1
7. Give a clear idea about the plant layout and methods of production. Understand the basic concepts of marketing and product life cycle.	L1
8. Understand the function of HR manager & industrial relations.	L1
9. Understand the concepts of Financial Management. Understand the concepts of PERT, CPM and how to draw the network diagram.	L3
10. Understand the concepts of MIS, TQM, JIT etc. and the importance of ethics in an organization	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A373T.1	3	3	3	-	3	-	-	-	3	-	3	-	2	-	-
19A373T.2	3	3	3	-	3	-	-	-	3	-	3	-	2	-	-
19A373T.3	3	3	3	-	-	-	-	-	3	-	3	-	2	-	-
19A373T.4	3	3	3	1	3	-	-	-	3	-	3	-	2	2	-
19A373T.5	-	3	3	-	3	1	1	-	3	1	3	-	2	2	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course : MICROWAVE ENGINEERING LAB
Category : PC
Course Code : 19A472L
Year : IV B.Tech
Semester : I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	2	1

Course Objectives: This course will able

- To analyze the characteristics of various microwave components using microwave test bench.
- To enable the students to know about optical fiber communication and its applications.

Experiment No. 1:- Reflex Klystron Characteristics.

Experiment No. 2:- Gunn Diode Characteristics.

Experiment No. 3:- Attenuation Measurement.

Experiment No. 4:-Directional Coupler Characteristics

Experiment No. 5:- VSWR Measurement.

Experiment No. 6:- Impedance Measurement.

Experiment No. 7:- Waveguide parameters measurement.

Experiment No. 8:-Scattering parameters of Directional Coupler.

Experiment No. 9 :-.Scattering parameters of Magic Tee.

Experiment No. 10:-Characterization of LED.

Experiment No. 11:-Characterization of Laser Diode.

Experiment No. 12:-Measurement of NA.

Course Outcomes:

Student will be	Blooms Level of Learning
1. To understand applications and testing of microwave components	L1
2. To understand the connections regarding various microwave components	L3
3. To acquire knowledge on the various applications of optical Fiber communications	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A472L.1	2	2	3	-	1	-	3	-	-	2	-		2	3	-
19A472L.2	2	2	3			-	3	-	-	-	-	-	2	3	-
19A472L.3			3			-	3	-	-	2	-	-		3	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	EMBEDDED SYSTEMS LAB
Category	:	PC
Course Code	:	19A471L
Year	:	IV B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	2	1

Course Objectives:

- To learn the interfacing concepts of embedded systems.
- To develop Embedded Applications.

Minimum Eight Experiments to be conducted

1. Switch and LED Interfacing
2. LCD Interfacing
3. Serial Transmission
4. Serial Reception
5. Key Pad Interfacing
6. Analog Interfacing
7. Sorting RTOS
8. Elevator Interfacing
9. Seven segment Display
10. Door Sensor Buzzer
11. GSM Interfacing.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. To design real time Embedded systems	L5
2. To understand the applications of embedded Systems through experimentations.	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
19A471L.1		1	3	2	2				2		1	2		2	
19A471L.2	3	2	2	3	2		2	1	2		2	2	3		2

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course: DISASTER MANAGEMENT
Category : OPEN ELECTIVE (OE)
Course Code : 19A18DT
Year : IV Year
Semester : II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	-	3

Course Objectives:

- The course is intended to provide a general concept in the dimensions of disasters caused by nature beyond the human control as well as the disasters and environmental hazards induced by human activities with emphasis on disaster preparedness, response and recovery.

Unit 1 : (9hrs)
INTRODUCTION - Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, prevention, mitigation).

Unit 2 : (9hrs)
DISASTERS - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, arthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

Unit 3 : (9hrs)
DISASTER IMPACTS - Disaster impacts (environmental, physical, social, ecological, economical, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and National disaster trends; climate-change and urban disasters.

Unit 4 : (9hrs)
DISASTER RISK REDUCTION (DRR) - Disaster management cycle–its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Unit 5 : (9hrs)
Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Prescribed Text Books:

1. Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012)
2. Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heineman.
3. Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.
4. Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.
5. Modh S. (2010) Managing Natural Disasters, Mac Millan publishers India LTD.

Reference Books:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority).
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: techniques & Guidelines, Rajat Publication.
5. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

Course Outcomes:

Student will be able to	Blooms Level of Learning
• The students increase the knowledge and understanding of the disaster phenomenon and, its factors.	L1
• The students must learn various classification of disasters hazard and vulnerability profile of India.	L4
• The students will learn impacts, global and national disaster trends	L2
• The students will learn disaster management cycle and its phases and DRR programmes in India and activities of national disaster management academy.	L3
• The students should be able to analyze factors affecting vulnerability of developmental projects and environmental modifications for sustainable development.	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A18DT.1	-	-	-	-	2	1	-	2	2	2	-	-	-	-	-
19A18DT.2	1	-	-	-	-	-	-	2	3	3	-	2	-	-	-
19A18DT.3	1	-	-	-	-	3	-	3	2	2	-	-	-	-	-
19A18DT.4	-	-	-	-	-	-	-	3	3	3	-	2	-	-	-
19A18DT.5	1	-	-	-	-	-	2	3	-	-	-	3	-	-	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course: Building Planning and Construction
Category : OE
Course Code : 19A18ET
Year : IV B.Tech
Semester : I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives:

- Teach to supervision of different types of masonry
- Illustrate the methodology in selection of materials, design and supervision of suitable type of floor and roof
- To ensure the student to be aware of building byelaws.
- To make the student to understand about principles of planning, standards and requirements of Residential building and Public building

Unit 1 : Building Byelaws and Regulations (8hrs)

Introduction –Terminology –Objectives of building byelaws –Floor area ratio (FAR) –Floor space Index (FSI) –Principles underlying building byelaws –classification of buildings –Open space requirements –built up area limitations –Height of Buildings –Wall thickness –lighting and ventilation requirement.

Unit 2 : *Planning of Residential buildings* (10hrs)

Minimum standards for various parts of buildings –requirements of different rooms and their grouping –characteristics of various types of residential buildings. Principles of planning- architectural principle, Aspects of planning within and with respect to surroundings, Modular planning concept.

Unit 3 : *Planning of* Public buildings (10hrs)

Planning of Educational institutions, hospitals, dispensaries, Office buildings, banks, industrial buildings, hotels and motels, buildings for recreation. Elements of Perspective Drawing: Definition, concept and single and two point perspective

Unit 4 : Building components *& foundations* (9hrs)

Building components: Lintels, Arches, and stair cases – Types. Different types of floors-Concrete, Mosaic, Terrazo floors, Pitched, flat and curved Roofs. Lean-to-Roof, Coupled Roofs, Trussed roofs- King and Queen Post Trusses. RCC Roofs.
Foundations: Shallow foundations – Spread, combined, strap and mat foundations.

Unit 5 : (8hrs)

Masonry: Types of masonry, English and Flemish bonds, Rubble and Ashlar masonry, cavity and partition walls.
Finishings: Damp proofing- materials used. Plastering, pointing, white washing and distempering – Painting – Constituents of a paint – Types of paints – Painting of new/old Wood – Varnish – Form work and scaffolding.

PrescribedText Books:

1. Building Planning & Drawing by Dr N. Kumaraswamy and A.Kameswara Rao, Charitor Publications.
2. Planning and Designing and Scheduling- Gurucharan Singh and Jagadish Singh – Standard Publishers.
3. Planning and Designing of Buildings – Y.S.Sane.
4. Building Construction by P.C. Varghese, Prentice-Hall of India private Ltd, New Delhi.
5. Building Construction by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.
6. National Building Code of India.

Reference Text books:

1. Sikka, V.B. (2013), A Course in Civil Engineering Drawing, S. K. Kataria & Sons
2. R.Chudly "Construction Technology "– Volumes I and II" 2nd Edition, Longman, UK, 1987.

Course Outcomes:

Student will be able to	Blooms Level of Learning
CO1: Understand Building Byelaws & regulations.	L2
CO2: Understand principles of planning, standards and requirements for residential building.	L2
CO3: Understand principles of planning, standards and requirements for public building.	L2
CO4: Summarize different types of masonry and foundations	L3
CO5: Understand different types of building components and finishing works	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A18ET.1	-	-	-	-	-	3	1	-	2	-	-	-	-	2	3
19A18ET.2	-	-	-	-	-	3	1	-	2	-	-	-	-	2	3
19A18ET.3	-	-	-	-	-	3	1	-	2	-	-	-	-	2	3
19A18ET.4	-	-	-	-	-	3	1	-	2	-	-	-	-	2	3
19A18ET.5	-	-	-	-	-	3	1	-	2	-	-	-	-	2	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES RAJAMPET
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Title of the Course	Battery Energy Storage Systems
Category	OE
Course Code	19A28DT
Year	IV B. Tech
Semester	II Semester

Lecture Hours	Tutorial Hours	Practical
3	1	-

Course Objectives:

1. To enable the student to understand the need for Energy Storage.
2. To learn sufficient knowledge about various Energy Storage Technologies.
3. To deal with grid connected Battery Energy Storage System.
4. To study the Challenges, Risk and Policy of Battery Energy Storage System.

Unit I Introduction to Energy Storage for Power Systems

Emerging needs for Electrical Energy Storage -Role of Energy Storage Systems-Applications. Overview of energy storage technologies: Thermal, Mechanical, Chemical, Electrochemical, Electrical-Efficiency of Energy Storage Systems.

Unit II Energy Storage Technologies

Storage Types - Components of a Battery Energy Storage System (BESS) - Energy Storage System Components -Grid Connection for Utility-Scale BESS Projects -Battery Chemistry Types -Lead–Acid (PBA) Battery - Nickel–Cadmium (Ni–Cd) Battery-Lithium-Ion (Li-Ion) Battery.

Unit III Grid Applications of Battery Energy Storage Systems

Scoping of BESS Use Cases - General Grid Applications of BESS -Technical Requirements -Round-Trip Efficiency - Response Time - Lifetime and Cycling - Sizing - Operation and Maintenance.

Unit IV Challenges and Risks

Grid Tariff Applications and Licensing Issues -Battery Safety - Challenges of Reducing Carbon Emissions - Battery Recycling and Reuse Risks -Examples of Battery Reuse and Recycling - Reuse of Electric Vehicle Batteries for Energy Storage - Recycling Process.

UNIT V Policy Recommendations

Frequency Regulation - Renewable Integration -Distribution Grids -Transmission Grids - Peak Shaving and Load Leveling - Microgrids

Text Books:

1. YongpingZhai. *Handbook on Battery Energy Storage System*Asian Development Bank.2018.
2. James M. Eyer, Joseph J.Iannucci and Garth P. Corey .*Energy Storage Benefits and Market Analysis*, Sandia National Laboratories, 2004.
3. Jim Eyer, Garth Corey", *Energy Storage for the Electricity Grid*: Benefits and Market Potential Assessment Guide, Report, Sandia National Laboratories, Feb 2010.

Reference Books:

1. Doughty, D. H., and E. Peter Roth. 2012. A General Discussion of Li Ion Battery Safety. Electrochemical Society Interface 21 (2): 37–44. DOI: 10.1149/2.F03122if.
2. Electric Power Research Institute (EPRI). 2010. Electricity Energy Storage Technology Options: A White Paper Primer on Applications, Costs, and Benefits. Palo Alto, California, US. http://large. stanford.edu/courses/2012/ph240/doshay1/docs/EPRI.pdf
3. Enel Green Power. 2016. Integrating Renewable Power Plants with Energy Storage. 7 June. http://www.iefe.unibocconi.it/wps/wcm/connect/29b685e1-8c34-4942-8da3-6ab5e701792b/ Slides+Lanuzza+7+giugno+2016.pdf?MOD=AJPERES&CVID=lle7w78.
4. Initial Operating Experience of the La Ola 1.2-MW Photovoltaic System. Sandia National Laboratories Report SAND2011-8848. Kane, Mark. 2015.
5. Bosch Cooperates With BMW And Vattenfall In Second Life Battery Project. Inside EVs 9 February. https://insideevs.com/bosch-cooperates-with-bmw-and-vattenfall-in-second-lifebattery-project/

Course outcomes: At the end of the course the student will be able to

1. Understanding the needof the Energy Storage Systems.
2. Study and Analyse the function of each storage Technology, its Types.
3. Explore the Battery Energy Storage applications in Renewable energy systems and in Smart grid.
4. Study the Challenges, Risk and Policy recommendation of Battery Energy Storage Systems.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	2	1
19A28DT .1	2	-	-	1	-	-	1	-	1	-	-	-	1	-
19A28DT .2	2	2	1	1	-	-	1	-	-	-	-	-	1	-
19A28DT .3	2	1	1	1	-	-	1	-	2	-	-	-	1	1
19A28DT .4	2	1	1	1	-	-	2	-	1	-	-	-	2	1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES RAJAMPET

(AN AUTONOMOUS INSTITUTION)

Title of the course: System modeling and Simulation
Category : OE
Course code : 19A28ET
Year : IV B.Tech
Semester : II Semester

Lecture Hours	Tutorial Hours	Practical Hours	Credits
3	-	-	3

Course Objectives

- To understand the basic system concepts and definitions of system.
- Techniques to model and to simulate various systems.
- To analyze a system and to make use of the information to improve the performance

Unit 1: Introduction to simulation models 10

Basic Simulation Modeling, Systems, Advantages and disadvantages of simulation, Models and Simulation, Discrete Event Simulation, Simulation of Single Server Queuing System, Simulation of Inventory System, Alternative approach to Modeling and Simulation

Unit-2: Simulation software 10

Comparison of Simulation Packages with Programming Languages, Classification of Software, Desirable Software Features, General Purpose Simulation Packages – Arena, Extend and Others, Object Oriented Simulation, Examples of Application Oriented Simulation Packages.

Unit-3 Building simulation models and time driven simulation models 08

Guidelines for Determining Levels of Model Detail, Techniques for Increasing Model Validity and Credibility, Modeling Time Driven Systems: Modeling Input Signals, Delays, System Integration, Linear Systems, Motion Control Models, Numerical Experimentation.

Unit-4 Exogenous signals and events and markov Process 12

Disturbance Signals, State Machines, Petri Nets & Analysis, System Encapsulation, MARKOV Process: Probabilistic Systems, Discrete Time Markov Processes, Random Walks, Poisson Processes, the Exponential Distribution, Simulating a Poison Process, Continuous-Time Markov Processes.

Unit 5 Event driven models and system optimization 10

Simulation Diagrams, Queuing Theory, characteristics of queuing system, Simulating Queuing Systems, Types of Queues, Multiple Servers, System Identification, Searches, Multidimensional Optimization, Modeling and Simulation Mythology.

Text Books:

1. System Modeling & Simulation, an Introduction – Frank L. Severance, John Wiley & Sons, 2001.
2. Simulation Modeling and Analysis – Averill M. Law, W. David Kelton, TMH, 3rdEdition, 2003.

Reference Book:

1. Systems Simulation – Geoffrey Gordon, PHI, 1978.

Course Outcomes:

1. Define basic concepts in Modeling and Simulation.
2. Understand the fundamental logic, structure, components and management of simulation modeling& demonstrate knowledge of how to use arena
3. Classify various simulation models and give practical examples for each category
4. Generate and test random number varieties and apply them to develop simulation models

5. Analyze output data produced by a model and test validity of the model.
6. Perform statistical analysis of output from terminating simulation.

CO-PO Mapping

Course Outcomes	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
19A28ET .1	3	3	3	3	3	3	3	3	3	3	3	-
19A28ET .2	3	3	3	3	3	3	3	3	3	3	1	-
19A28ET .3	3	3	3	3	3	3	3	3	3	3	3	-
19A28ET .4	3	3	3	3	3	3	3	3	3	3	3	-
19A28ET .5	3	3	3	3	3	3	3	3	3	3	3	-
19A28ET .6	3	3	3	3	3	2	-	2	2	2	2	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	Entrepreneurship Development
Category	:	OEC
Course Code	:	19A38ET
Year	:	IV Year
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	-	3

Course Objectives:

- To develop and strengthen entrepreneurial quality and motivation in students
- To impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

Unit 1 **Entrepreneurship** 09

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.

Unit 2 Motivation 09

Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self-Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

Unit 3 **Business** 10

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

Unit 4 **Financing And Accounting** 09

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.

Unit 5 **Support To Entrepreneurs** 09

Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures

- Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting

Prescribed Text Books:

1. Khanka. S.S., "Entrepreneurial Development" S.Chand& Co. Ltd., Ram Nagar, New Delhi, 2013. ISBN : 81-219-1801-4
2. Donald F Kuratko, "Entreprenuership – Theory, Process and Practice", 9th Edition, Cengage Learning, 2014. ISBN-10: 1285051750

Reference Books:

1. Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013. ISBN 1843769964
2. Mathew J Manimala, "Enterprenuership theory at cross roads: paradigms and praxis" 2nd Edition Dream tech, 2005. ISBN 81-297-0260-6
3. Rajeev Roy, "Entrepreneurship" 2nd Edition, Oxford University Press, 2011. ISBN 10: 0198072635
4. EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development", Institute of India, Ahmadabad, 1986. ISBN 0-07-026694-8

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the basic concepts of entrepreneurship	L2
2. Understand the importance of motivation for entrepreneur	L2 & L3
3. Gain knowledge and skills needed to run a business successfully.	L3, L4 & L5
4. Learn the concepts of financing and accounting	L3
5. Understand the basic concepts of various supporting process	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A35KT.1	3	-	-	-	-	-	-	-	3	3	-	2	-	-	-
19A35KT.2	3	-	-	-	-	-	-	-	-	3	-	-	-	-	-
19A35KT.3	3	-	-	-	-	2	-	2	2	3	-	3	-	-	-
19A35KT.4	3	3	-	-	-	-	-	-	3	3	-	-	-	-	-
19A35KT.5	3	-	-	-	-	-	-	-	3	3	-	-	-	-	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	Optimization in Engineering
Category	:	OEC
Course Code	:	19A38FT
Year	:	IV Year
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	0	3

Course Objectives:

- To enable the students to the nature and scope of various decision making situations within business contexts, understand and apply operations research techniques to industrial applications.
- To learn the fundamental techniques of Operations Research and to choose a suitable OR technique to solve problem

Unit 1 12

Linear Programming: Problem Formulation, Graphical solution, Simplex method, Artificial variables techniques - Two–phase method, Big-M method – Duality Principle

Unit 2 12

Transportation Mode: Formulation, Optimal solution, unbalanced transportation problem, Degeneracy.

Assignment Model: Formulation, Optimal solution, Variants of Assignment Problem, Travelling Salesman problem.

Unit 3 09

Theory of Games: Introduction – minimax - maximin – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – 2 X 2 games – m X 2, 2 X n & m x n games - Graphical method, Dominance principle

Unit 4 : 07

Waiting Lines: Introduction – single channel – Poisson arrivals – exponential service times – with infinite queue length models.

Simulation: Definition – Types of simulation models – phases of simulation– applications of simulation – Queuing problems – advantages and disadvantages – Simulation languages.

Unit 5 : 08

Inventory: Introduction – Single item – Deterministic models – Purchase inventory models with one price break and multiple price breaks

Dynamic Programming: Introduction – Bellman's Principle of optimality – Applications of dynamic programming- shortest path problem – linear programming problem

Prescribed Text Books:

1. PS Gupta, DS Hira, Operations Research, S Chand Publications, 10th Edition, 2016, ISBN-13978-8121902816
2. S.D. Sharma, Operations Research, Kedarnath and Ramnath Publications, 2012, ISBN-135551234001596

Reference Books:

1. Taha, *Introduction to Operations Research*. PHI, 10 th edition, 2016, ISBN-13978-0134444017
2. R. Panneerselvam, *Operations Research.* PHI Publ, 2nd edition, 2004, ISBN: 9788120319233

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Develop mathematical models of the real life situations and capable of solving them for obtaining best solutions	L3
2. Solve the special cases of LPP like Transportation problems, Assignment and Travelling salesmen problems	L3
3. Choose the best strategy out of the available strategies in the competition or game	L3
4. Apply the fundamentals of waiting lines in real life situations and can Simulate queuing models	L3
5. Understand and will apply the fundamentals of inventory in real life situations and can apply Dynamic Programming technique to solve the complex problems by breaking them into a series of sub-problems	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A38FT.1	3	2	-	2	-	-	-	-	-	-	-	-	-	-	-
19A38FT.2	3	2	2	-	-	-	2	-	-	-	-	-	-	-	-
19A38FT.3	3	2	2	-	-	-	2	-	-	-	-	-	-	-	-
19A38FT.4	3	2	2	-	-	2	2	-	-	-	-	-	-	-	-
19A38FT.5	3	2	-	-	-	2	2	-	-	-	-	-	-	-	-

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Title of the Course	:	Total Quality Management
Category	:	OEC
Course Code	:	19A38GT
Year	:	IV Year
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	0	3

Course Objectives:

- To introduce the students, the basic concepts of Total Quality Management.
- To expose with various quality issues in Inspection.
- To gain Knowledge on quality control and its applications to real time.
- To know the extent of customer satisfaction by the application of various quality concepts.
- To understand the importance of Quality standards in Production.

Unit 1 Introduction 10

Definition of Quality, Dimensions of Quality, Definition of Total quality management, Quality Planning, Quality costs – Analysis, Techniques for Quality costs, Basic concepts of Total Quality Management.

Unit 2 Historical Review 09

Quality council, Quality statements, Strategic Planning, Deming Philosophy, Barriers of TQM Implementation, Benefits of TQM, Characteristics of successful quality leader, Contributions of Gurus of TQM, Case studies.

Unit 3 TQM Principles 08

Customer Satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment teams, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure Case studies

Unit 4 TQM Tools 09

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA, The seven tools of quality, Process capability, Concept of Six Sigma, New Seven management tools, Case studies.

Unit 5 Quality Systems 08

Need for ISO 9000 and Other Quality Systems, ISO 9000: 2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits, Case Studies.

Prescribed Text Books:

4. Dale H Besterfield, Total Quality Management, Fourth Edition, Pearson Education, 2018, ISBN: 9789332534452
5. Subburaj Ramaswamy, Total Quality Management, Tata Mcgraw Hill Education., 2012, ISBN: 1259001415, 9781259001413
6. Joel E.Ross , Total Quality Management, Third Eition, CRC Press, 2017, ISBN: 9781351407786

Reference Books:

3. Narayana V and Sreenivasan N.S, Quality Management – Concepts and Tasks, NewAge International, 1996,

ISBN-10: 8122416802.
4. Robert L.Flood, Beyond TQM, First Edition, John Wiley & Sons Ltd, 1993, ISBN: 9780471939672.
5. Richard S. Leavenworth & Eugene Lodewick Grant, Statistical Quality Control, Seventh Edition, Tata Mcgraw Hill, 2015, ISBN, 0070241147, 9780070241145.
6. Samuel Ho , TQM – An Integrated Approach, Kogan Page Ltd, USA, 1995, ISBN: 9780749415617.

Course Outcomes:

Student will be able to	Blooms Level of Learning
11. Develop an understanding on quality Management philosophies and frameworks.	L2
12. Adopt TQM methodologies for continuous improvement of quality.	L3
13. Measure the cost of poor quality, process effectiveness and efficiency to identify areas for improvement.	L4
14. Apply benchmarking and business process reengineering to improve management processes.	L3
15. Determine the set of indications to evaluate performance excellence of an organization.	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A37GT.1	2	-	-	-	-	2	2	-	-	-	2	1	-	-	-
19A37GT 2	2	2	-	2	-	2	-	-	-	1	2	1	-	-	-
19A37GT 3	1	2	-	2	-	-	-	1	1	1	2	1	-	-	-
19A37GT 4	1	-	-	-	-	1	-	-	-	-	2	1	-	-	-
19A37GT 5	1	-	-	-	-	-	-	-	-	-	2	2	-	-	-

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Title of the Course	:	Internet of Things
Category	:	OE
Course Code	:	19A58ET
Year	:	IV B.Tech
Semester	:	II Semester (Offered to CE, EEE, ME & ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- To understand the terminology, technology and its applications of IoT.
- To know the concept of M2M (machine to machine) with necessary protocols.
- To memorize the software platforms which are used for developing the applications.
- To learn the concepts of python programming language which is used to develop the IoT projects.
- To know the hardware platforms which is necessary to develop the IoT applications.

Unit 1 : Introduction to Internet of Things 8

Introduction to Internet of Things, History of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Templates, Applications of IoT.

Unit 2 : IoT and M2M & IoT Platforms Design Methodology 7

IoT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT.
IoT Platforms Design Methodology: Introduction, IoT Design Methodology.

Unit 3 : The Wireless Embedded Internet 8

Introduction to 6LoWPAN,The 6LoWPAN Architecture ,The Basic 6LoWPAN Format, Addressing MQ telemetry transport for sensor networks (MQTT-S), ZigBee compact application protocol, Contiki and uIPv6, Wireless RFID Infrastructure.

Unit 4 : IoT Systems-Logical Design Using Python 8

Introduction, Installing Python, Python Data Types and Data Structures, Control Flow, Functions, Modules, Packages and File Handling.

Unit 5 : IoT Physical Devices and Endpoints 8

What is an IoT Device, Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry Pi with Python, Other IoT Devices.

Prescribed Text Books:

4. Internet of Things, A Hands-On Approach, Arshdeep Bahga, Vijay Madisetti, University Press,2015.
5. 6LoWPAN: The WirelessEmbedded Internet, Zach Shelby and Carsten Bormann,Wiley publications, first edition,2009.(Unit III).

Reference Text books:

1. The Internet of Things Connecting Objects to the Web, Hakima Chaouchi,Wiley publications,2010.
2. Designing the Internet of Things, Adrian McEwen, Hakim Cassimally, Wiley 2014.
3. Enterprise IoT, A Definitive Handbook by Naveen Balani.

Course Outcomes:

Student will be able to	Blooms Level of Learning
• Understand the vision of IoT from a global context.	L1
• Identify the difference between IoT and M2M communication.	L3
• Determine the usage of 6LoWPAN and select the appropriate network protocols for IoT project.	L4
• Create the IoT experiments with the help of Python programs.	L5
• Design the IoT applications using Raspberry Pi kit.	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19A58ET .1	-	-	-	3	3	3	1	1	-	-	-	1
19A58ET .2	-	-			3	-	-	-	-	1	-	-
19A58ET 3	-	-	3	3	3	-	-	-	-	-	-	-
19A58ET 4	-	-	3	3	-	-	-	-	-	-	-	-
19A58ET 5	1	1	3	3	3	3	-	-	-	-	-	-

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Title of the Course	Web Programming
Category	OE
Course Code	19A58FT
Year	IV B. Tech
Semester	II Semester (Common to CE, EEE, ME, ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will make the students

- Interpret and use HTML concepts in developing the web pages
- Use the CSS to design web pages.
- Interpret the JavaScript programming language
- Interpret the JavaScript framework using JQuery

Unit 1 : 9

Structuring Documents for the Web-A Web of Structured Documents, Introducing HTML5, Tags and Elements, Attribute Groups Core Attributes, Internationalization, Core Elements ,Basic Text Formatting, Understanding Block and Inline Elements, Grouping Content, Working with Lists, Text Processing tags, Links and Navigation :Basic Links, Understanding Directories and Directory Structures, Understanding URLs, Creating In-Page Links with the <a> Element.

Unit 2 : Images, Audio, and Video, Tables, Forms 9

Images, Audio, and Video -Adding Images Using the <img> Element, Using Images as Links Adding Flash, Video, and Audio to Your Web Pages Tables: Introducing Tables, Basic Table Elements and Attributes, adding a Caption to a Table, Grouping Sections of a Table, Nested Tables, Accessible Tables. Forms: Introducing Forms, creating a Form with the <form> Element, Form Controls, Creating Labels for Controls and the <label> Element, Structuring Your Forms with <fieldset> and <legend> Elements, Focus, Disabled and Read-Only Controls, Sending Form Data to the Server, Creating More Usable Form Fields.

Unit 3 : Cascading Style Sheets, Introduction to XML 9

Cascading Style Sheets: Introducing CSS, Where You Can Add CSS Rules, CSS Properties Controlling Text, Text Formatting, Text Pseudo-Classes, Styling Text, Selectors Lengths, Introducing the Box Model, An Example Illustrating the Box Model, Links, Backgrounds, Lists, Tables, And Miscellaneous Properties.
Introduction to XML: Difference between HTML and XML, Basic structure and Syntax of XML Document, DTD, sample examples.

Unit 4 : Learning JavaScript 9

Learning JavaScript-Introduction to JavaScript, How to Add a Script to Your Pages, comments in JavaScript, Create an External JavaScript ,The Document Object Model, JavaScript Programming console, General Programming Concepts, Variables, Operators, String Operators (Using + with Strings), Functions, Conditional Statements, Looping, Events, Built-in Objects.

Unit 5 : Working with jQuery 9

Working with jQuery: introduction to jQuery, adding jQuery to Your Page, jQuery Basics, jQuery and the DOM, Managing Events with jQuery, Ajax with jQuery, jQuery UI.

Prescribed Text Books:

1. Beginning HTML and CSS Rob Larsen, Wrox Programmer to Programmer.

Reference Books:

1. JavaScript and JQuery: Interactive Front-End Web Development, Jon Duckett, Wiley Publications
2. Web Design with HTML, CSS, JavaScript and jQuery Set, Jon Duckett, Wiley Publications
3. jQuery in Action, Bear Bibeault, Yehuda Katz, and Aurelio De Rosa, Third Edition, Manning Publications
4. https://www.w3schools.com/

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Interpret and Use the fundamental HTML markups when designing web pages.	L2, L3, L5
2. Use and design the web pages with images, audio, videos, tables and form controls.	L3, L5
3. Use cascading style sheets and XML concepts to design web pages	L3, L5
4. Interpret and use JavaScript concepts in designing web pages	L2, L3, L5
5. Interpret and use JQuery concepts in designing web pages.	L2, L3, L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A534T.1	3	-	3	3	3	-	-	-	-	-	-	3	-	-	-
19A534T.2	-	-	3	3	3	-	-	-	-	-	-	3	-	-	-
19A534T.3	-	-	3	3	3	-	-	-	-	-	-	3	-	-	-
19A534T.4	3	-	3	3	3	-	-	-	-	-	-	3	-	-	-
19A534T.5	3	-	3	3	3	-	-	-	-	-	-	3	-	-	-

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Title of the Course	:	MIXED SIGNAL IC APPLICATIONS
Category	:	PE
Course Code	:	19A48AT
Year	:	IV B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- Understand the concepts of Switched capacitors Circuits.
- Know the concepts of PLLS & it's applications.
- Learn the concepts of A/D & D/A Converters.
- Understand concepts of the Oversampling Converters and Continuous-Time Filters.

Unit 1 : **Switched Capacitor Circuits** 8

Introduction to Switched Capacitor circuits basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing.

Unit 2 : **Phased Lock Loop (PLL)** 10

DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters.

Unit 3 : **D/A Converters** 10

Harmonic distortion, voltage versus current distortion, harmonics versus transients, power system quantities under non-sinusoidal conditions, harmonic indices. Harmonic sources from commercial and industrial loads. Effects of harmonic distortion. Applied harmonics - harmonic distortion evaluation, principles of controlling harmonics, and devices for controlling harmonic distortion. Harmonic filter design and standards on harmonics.

Unit 4 : **A/D Converters** 9

Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time-interleaved converters.

Unit 5 : **Oversampling Converters & Continuous Time Filters** 8

Noise shaping modulators, Decimating filters and Interpolating filters, Higher order modulators, Delta sigma modulators with multi-bit quantizers, Delta sigma D/A, Introduction to Gm-C Filters, Bipolar Trans conductors , CMOS trans conductors Using Triode and Active Transistors.

Prescribed Text Books:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, 2002
2. Analog Integrated Circuit Design- David A. Johns,Ken Martin, Wiley Student Edition, 2013

Reference Text books:

1. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009.

2. CMOS Analog Circuit Design –Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the concepts of Switched capacitors Circuits.	L2
2. Remember the concepts of PLLS & it's applications	L1
3. Design and analysis of A/D & D/A Converters.	L4
4. Understand concepts of the Oversampling Converters and Continuous-Time Filters	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A48AT.1	3	-	2	-	-	2	-	-	-	-	-	2	3	3	3
19A48AT 2	3	-	3	-	-	3	-	-	-	-	-	3	3	3	2
19A48AT.3	3	2	3	-	-	3	-	-	-	-	-	3	3	3	2
19A48AT.4	3	3	1	-	-	2	-	-	-	-	-	1	3	3	3

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Title of the Course	:	SATELLITE COMMUNICATIONS
Category	:	PE
Course Code	:	19A48BT
Year	:	IV B. Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- To understand concepts of Satellite Engineering and applications
- To design basic Satellite links and solve the problems of budgeting, speed, modulation and multiple access schemes.

Unit 1 : **INTRODUCTION & ORBITAL MECHANICS** 10

Origin of satellite communications, Historical background, basic concepts of satellite communications, frequency allocations for satellite services, applications, future trends of satellite communications. Orbital Mechanics look angle determination, orbital perturbations, orbit determination, launches and launch vehicles, orbital effects in communication systems performance.

Unit 2 : **SATELLITE SUBSYSTEMS** 8

Attitude and orbital control system, Telemetry, Tracking, command and monitoring, power systems, communication subsystems, satellite antenna equipment reliability and space qualification.

Unit 3 : **SATELLITE LINK DESIGN** 10

Basic transmission theory, system noise temperature and G/T ratio, design of down links, uplink design, design of satellite links for specified C/N, system design example. Basic concepts of Multiple access, Time Division multiple access (TDMA) frame structure, examples. Satellite switched TDMA onboard processing,

Unit 4 : **EARTH STATION TECHNOLOGY, LEO AND GEOSTATIONARY SATELLITE SYSTEMS** 9

Introduction, transmitters, receivers, Antennas, tracking systems, terrestrial interface, primary power test methods. Orbit consideration, coverage and frequency considerations, delay and throughput considerations, system considerations, operational NGSO constellation designs.

Unit 5 : **SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM INTERCONNECTION** 9

Radio and satellite navigation, GPS position location principles, GPS receivers and codes, satellite signal acquisition, GPS navigation message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS.

Prescribed Text Books:

1. Satellite communications-Timothi Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley publications, 2nd Edition, 2003.
2. Satellite communications Engineering-Wilbur L.Prichard, Robert A.Nelson & Henry G.Suyderhoud, 2nd Edition, Pearson Publications,2003.

Reference Text books:

1. Satellite communications: Design principles-M. Richharia, BS publications, 2ndEdition, 2003.

2. Satellite communications-D.C.Agarwal, Khanna publications, 5 Ed
3. Fundamentals of Satellite communications-K.N.Rajarao, PHI, 2004.
4. Satellite communications-Dennis Roddy, McGraw Hill, 2nd Edition,1996.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand basics of Satellite Communications	L1
2. Understand and Analyze the satellite subsystems	L3
3. Design the basic satellite links by means of .multiple access	L4
4. Investigate various Earth station techniques for different satellite systems	L5
5. Able to learn the satellite Navigation & Global Positioning system	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A48BT.1	3	2	2	-	-	-	-	-	-	-	-	-	3	2	1
19A48BT.2	3	2	3	2	-	2	-	-	-	-	-	-	3	2	1
19A48BT.3	3	3	3	3	-	-	-	-	-	-	-	-	3	2	1
19A48BT.4	3	2	2	2	3	2	-	-	-	-	-	-	3	1	1
19A48BT.5	3	1	1	2	3	-	-	-	-	-	-	-	3	1	1

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Title of the Course	:	NANO ELECTRONICS
Category	:	PE
Course Code	:	19A48CT
Year	:	IV B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- To learn the fundamentals of Nano electronics.
- To understand the applications and limitation of ICs.

Unit 1 : **INTRODUCTION** 8

Nano- The beginning – Electron Microscopies –Scanning probe Microscopies – Optical Microscopies for Nano science and technology – Other kinds of microscopies. Synthesis and purification of nanotubes - transport, mechanical properties and applications.

Unit 2 : **MODELS OF SEMICONDUCTOR QUANTUMWELLS,QUANTUMWIRES, AND QUANTUM DOTS** 9

Semiconductor Hetero structures and quantum wells – Quantum wires and nano wires – Quantum dots and Nano particles – Fabrication Techniques for Nanostructures: Lithography, Nano imprint lithography – split-gate technology, self-assembly

Unit 3 : **QUANTUM ELECTRONICS** 10

Quantum Electronic Devices – Short channel MOS Transistor, split-gate transistor, Electron-wave transistor, Electron-spin transistor, quantum cellular automata, quantum dot array..

Unit 4 : **TUNNELING DEVICES** 9

Tunneling effect and Tunneling diode, three terminal RTDs Technology of RTD. Digital circuit design based on RTDS, basic logic circuits, Principle of SET – Coulomb blockade, performance of Single Electron Transistor(SET),SET circuit design – wiring and drivers, logic and memory circuits, SET Adder. Comparison between FET and SET circuit design.

Unit 5 : **LIMITS OF INTEGRATED ELECTRONICS** 8

Energy supply and heat dissipation – Parameter spread as limiting effect – Limits due to thermal particle motion – The Debye length – Reliability as limiting factor – Physical limits. Nano systems as information processing machines – system design and its interfaces – Evolutionary Hardware – Requirements of Nano systems..

PrescribedText Books:

1. T. Pradeep, „Nano: The Essentials”, TMH Edition (2008)
2. K. Goser, P. Glosekotter, J. Dienstuhl, „Nano electronics and Nano systems", Springer Edition (2004).

Reference Text books:

1. George W. Hanson, Fundamentals of Nano electronics", Pearson Education(2009).

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Learn the basics of microscopy's and applications	L1,L2
2. Knows the fundamentals of Quantum electronics	L2
3. Understands the basics of Tunneling devices and SETs	L2
4. Acquire the knowledge on limitations of ICs.	L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A48CT.1	1	1	2	2	3	1	1	2	2	1	3	2	3	3	-
19A48CT.2	2	2	2	1	3	2	2	3	3	3	3	2	3	3	
19A48CT.3	2	2	3	3	3	2	2	2	2	1	3	1	3	-	3
19A48CT.4	2	3	3	3	3	3	2	3	3	3	3	3	3		3