ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

(An Autonomous Institution)

ACADEMIC REGULATIONS (R20), COURSE STRUCTURE AND SYLLABI

For the students admitted to

B. Tech., Regular Four Year Electronics and Communication Engineering Degree Programme from the Academic Year 2020-21, B.Tech Honors and Minors

and

B. Tech., Lateral Entry Scheme from the Academic Year 2021-22

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 ELECTRONICS AND COMMUNICATION ENGINEERING REGULAR DEGREE PROGRAMME

APPLICABLE FOR THE STUDENT BATCHES ADMITTED FROM THE ACADEMIC YEAR 2020-21

APPLICABLE FOR THE STUDENTS (Lateral Entry) ADMITTED FROM THE ACADEMIC YEAR 2021-22

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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 2020-21.

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 2020-21 and Lateral Entry students admitted from the academic year 2021-22
- 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 R20 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 and APSCHE 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 including 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 2020-2021.

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
6	Artificial Intelligence and Data Science	30
7	Computer Sciences and Engineering (Artificial Intelligence)	31
8	Computer Sciences and Engineering (Data Science)	32
9	Artificial Intelligence and Machine Learning	33

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
Project Work / Internship	-	16.5

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 and Social Science Courses including Management Courses	
Civil Engineering	1
Electrical and Electronics Engineering	2
Mechanical Engineering	3
Electronics & Communication Engineering	4
Computer Science & Engineering	5
Artificial Intelligence and Data Science	30
Computer Sciences and Engineering (Artificial Intelligence)	31
Computer Sciences and Engineering (Data Science)	32
Artificial Intelligence and Machine Learning	33

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	CODE	DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
Foundation	Engineering Sciences	ESC	24
	Basic Sciences	BSC	21
	Humanities & Social Sciences and Management	HSMC	10.5
Core	Professional Core	PCC	51
Project	Project (12)	PROJ	16.5
	Internship (4.5)		
Elective courses	Professional Elective	PEC	15
	Open Elective (including two MOOCs)	OEC	12
Mandatory Courses	Mandatory	MC	-
Skill Oriented Courses		SC	10
Total Credits			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. All the Professional and Open elective courses shall be offered for 3 credits.

Students have to register for a total of 5 professional core electives courses (PEC-1 to PEC-5) 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 (OEC1) offered by their concerned department. However, one Open Electives (OEC2) is inter-disciplinary and shall be offered by other branches.

Two Open electives (OEC3 & OEC4) are 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 be permitted to pursue up to a maximum of two electives courses under MOOCs during programme. Each of courses must be of minimum 12 weeks in duration.
- 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 Skill Oriented Courses

- There shall be 5 skill oriented course offered during 3rd to 7th semester. Among the 5 skill oriented courses, 4 courses shall focus on the basic advanced skills related to the domain courses and remaining 1 shall be a soft skills course.
- Skill oriented / skill advanced courses carry 2 credits
- For skill oriented/skill advanced course, 1 theory and 2 practical hours may be allotted as per the

decision of concerned BOS.

- Out of the 5 skill courses 2 shall be skill-oriented courses from the same domain and shall be completed in 2nd year. Of the remaining 3 skills course, 1 shall be necessarily be a soft skill course and the remaining 2 shall be skill advanced courses either from the same domain or job oriented skill course, which can be of inter-disciplinary nature.
- A pool of interdisciplinary job-oriented skill course shall be designed by a common Board of studies by the participating departments and the syllabus along with the pre-requisites shall be prepared for each of the laboratory infrastructure requirements,
- The student shall be given an option to choose either the skill courses being offered by the institute or to choose a certificate course being offered by Industries/Professional Bodies/ APSSDC or any other accredited bodies as approved by the concerned BOS.
- If a student chooses to take a certificate course offered by Industries/Professional Bodies/ APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the department, the credits shall be awarded to the student upon producing the course completion certificate from Industries/Professional Bodies/ APSSDC as approved by the concerned BOS.
- If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill oriented course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the concerned BOS, the student is deemed to have fulfilled the attendance requirements of the course and acquire the credits assigned to the course.
- A committee shall be formed at the level of the institute to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades. The recommended conversions and appropriate grades/marks are to be approved by the Academic Council

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.

7.1.8 Universal Human Values (UHV) Courses

- Universal Human Values-I shall be offered during the Student Induction Programme with no credits.
- Universal Human Values-II course carries 3 credits. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self-assessment, peer assessment etc. will be used in evaluation.
- A student has to secure 40% marks out of 100 in the CIE and SEE together to qualify for the award of the degree. The distribution shall be 50 marks for continuous internal assessment and 50 marks for semester end examination.
- Internal evaluation shall be conducted for the course during semester and shall be evaluated for 50 marks and distributions of marks as follows:
    - Assessment by faculty mentor: 10 marks
    - Self-assessment: 10 marks
    - Assessment by peers: 10 marks
    - Socially relevant project/Group Activities/Assignments: 20 marks

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 8.1.3
- Project Work shall be evaluated for 200 marks. Mandatory courses with no credits shall be evaluated for 100 marks.

8.1 Internal Evaluation

For a Theory Course, 30 marks are allotted for Internal Evaluation. Two Internal examinations (Theory Internal Examinations) shall be conducted for a Theory Course during a semester and they shall be evaluated for 30 marks of which 25 marks are given for Internal Examination and 5 marks for assignment. For Lab Course, there shall be a continuous internal evaluation during the semester for 30 marks.

8.1.1 Theory Internal Examinations

Theory internal examination shall have Part A & Part B. In Part A, which is compulsory, five short answer questions each of which carries one mark. There shall be no sub-questions or bits or fill-up the blanks. The examination shall be conducted for 2 hours.

Part B shall contain three either type questions (Total six questions from 1 to 6). Each question shall carry 10 marks. 30 marks allotted for Part B shall finally be scaled down to 20 marks. The questions shall be set/ moderated such that the student can comfortably answer each question within the stipulated time.

Question paper pattern for Internal Examination (25 Marks) shall be as follows:

PART A: Five short answer questions - 5 x 1 = 5 Marks

PART B: 30 Marks (will be scaled to 20 marks)

(i) There shall be three questions with internal Choice i.e., 'either' or 'choice'

(ii) The student shall answer three questions

First Theory Internal examination shall be conducted as per the syllabus of I & II units. The second internal examination shall be conducted as per the syllabus of III, IV and V units. 80 % weightage for the best performance and 20 % the other shall be considered.

For Example:

Marks obtained in I Internal examination: 19

Marks obtained in II Internal examination: 10

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

If the student is absent for any one Internal 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 Internal: 0 (Absent); Marks obtained in second Internal: 18

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

Note: For some courses namely, Engineering Graphics 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 internal examination carries 10 marks. Day-to-day work shall be evaluated by the teacher concerned based on the exercises/submissions/assignments prepared in the class. Two internal examinations shall be conducted in a semester for 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 work and the internal examination marks will be the final internal evaluation for 30 marks for the subject. End examination shall be for 70 marks and is of 3 hours

duration. The question paper shall be with 5 questions, one question from each unit with internal choice. All questions carry 14 marks each.

8.1.2 Assignment (Theory)

The assignment shall contain essay type questions/numerical problems etc.., the assignments is given by the concerned class teacher for five marks from first two units. The second assignments shall give from rest of the syllabus. The first assignment should be submitted before the conduct of the first internal examination, and the second assignment should be submitted before the conduct of the second internal examination. There shall be at least two assignments in a semester and performance of one best out of two assignments to be considered.

8.1.3 Lab Internal Evaluation

Out of the 30 marks allotted for Lab Internal Evaluation, day-to-day performance of the student in the laboratory shall be evaluated for 20 marks by the concerned laboratory teacher based on experimental evaluation/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.

8.1.4 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.

8.1.5 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 Internal 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 Internal examinations with valid reasons he/ she should produce a supporting document to the department within a week after completion of last internal examination. And the same student absent for same subject in II Internal 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.

8.1.6 Evaluation of Skill oriented / Skill advanced / Soft Skills course

Course type: Laboratory

Distribution of marks: 30:70

Evaluation Type: Internal Evaluation

A student is evaluated for a maximum of 100 marks with respect to skill oriented course / Skill advanced courses / Soft skill course. The distribution of marks shall be 30 for internal evaluation and 70 for external evaluation. For Internal Evaluation, day-to-day performance of the student in the laboratory shall be evaluated for 30 marks by the concerned skill oriented course / Skill advanced courses / Soft skill course class teacher based on experimental evaluation / discussions / results / reports. External evaluation is done for 70 marks in a laboratory end semester examination conducted for 3 hours.

Note: Each skill oriented course / Skill advanced courses / Soft skill course will have its own evaluation procedure and weightage.

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.

Theory end examination shall have Part A & Part B. In Part A, which is compulsory, five short answer questions each unit of which carries two marks shall be given. There shall be no sub-questions or bits or fill-up the blanks.

Part B shall contain five either type questions (Total 10 questions with internal choice). 60 marks allotted for Part B and each question shall carry 12 marks. There will be one question from each unit. The examination shall be conducted for 3 hours.

Question paper pattern for Semester End Examination (70 Marks) shall be as follows:

PART A: 5 x 2 = 10 Marks

(i) There shall be one question from each unit

(ii) Part A is compulsory.

PART B: 5 x 12 = 60 Marks

(i) Five questions with internal choice will be given

(ii) There shall be one question from each unit with Internal Choice i.e., ‘either’ or ‘choice’

(iii) Sub questions may also be given.

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 Summer Internship / Research Internship (Industry / Govt. / NGO / MSME / Online)

- A student shall carry a mandatory Internship for 2 months for 1.5 credits in 2nd year 2nd semester during summer vacation and it is evaluated during 3rd year 1st semester. A student shall carry a mandatory Industrial / Research Internship for 2 months for 3 credits in 3rd year 2nd semester during summer vacation and it is evaluated during 4th year 1st semester.
- Two summer internships each with a minimum of 6 weeks duration. Done at the end of 2nd and 3rd year, respectively are mandatory. The internship can be done by the students at local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs
- Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned departments and appear for an oral presentation before the departmental committee. The report and the oral presentation shall carry 40% and 60% weightages respectively.

- In the final semester, the student should mandatorily undergo internships and parallelly he/she should work on a project with well-defined objectives. At the end of the semester the candidates shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner.
- The institute shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.
- There shall also be mandatory full internship in the final semester of the programme along with the project work.
- For other details, please refer to Appendix I.

9.2 Project Work

Project work consists of a presentation of **Abstract of the main project** in the beginning of 8th 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. 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 12 credits assigned, if her/his report is declared Satisfactory by the committee based on Rubrics set by the Department for evaluation.

Out of a total of 200 marks for the **Project work,** 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 150 marks shall be awarded by a committee consisting of HOD, project Supervisor and an External Examiner nominated by the Principal or Dean Academics. 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 viva voce examination. Further such students shall re-appear as and when next year 8th semester supplementary examinations are conducted.

10. Curricular Framework for Honors Programme

- Students of a Department/ Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline
- A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired a minimum of 8.0 SGPA up to the end of 2nd

semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.

- Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/ she will be awarded B.Tech (honors) in Mechanical Engineering.
- In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B.Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).
- Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies.
- It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.
- The concerned BoS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.
- Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component. (Model pool list is enclosed in the end of the syllabus)
- MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC Courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the Academies Council.

- The concerned BoS shall also consider courses listed under professional electives of the respective B. Tech Programmes for the requirement of B.Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.
- If a student drops or is terminated from the Honors programme, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.
- In case student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with honors and they will receive regular B.Tech degree only, however, such students will receive a separate grade sheet mentioning the additional courses completed by them.
- Honors must be completed simultaneously with a major degree Programme. A student cannot earn Honors after he/she has already earned bachelor's degree.

11. Curricular Framework for Minor Programme

- a) Students who are desirous of pursuing their special interest areas other than the choses discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, if Mechanical Engineering student select subjects from Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering.

  b) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine Learning track etc.
- The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance/demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE, CE, ME etc., or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric Vehicles, and VLSI etc.,
- The list of disciplines / branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BoS.

- There shall be no limit on the number of programs offered under Minor. The Institute can offer minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the Programme.
- The concerned BoS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.
- A student shall be permitted to register for Minors Programme at the beginning of 4th semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA up to the end of 2nd semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4th semester. If a student fails to acquire 8 SGPA up to 3rd semester or failed in any of the courses, his/her registration for Minors program shall stand cancelled. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.
- A student shall earn additional 20 credits in the specified area to be eligible for the award of B.Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).
- Out of the 20 credits, 16 credits shall be earned by undergoing specified course listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.
- In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is pass/fail course without any grades, the grade to be assigned as decided by the Academic Council.
- Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BoS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

- A committee should be formed at the level of Institute / Department to evaluate the grades/marks given by external agencies to a student which are approved by concerned BoS. Upon completion of courses the departmental committees should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.
- If a student drops (or terminated) from the Minor Programme, they cannot convert the earned credits into free or core electives, they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following:
    - All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Miner will be shown in the transcript.
- In case a student fails to meet the CGPA requirement for B.Tech degree with Minor at any point after registration, he/ she will be dropped from the list of students eligible for degree with Minors and they will receive B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
- Minor must be completed simultaneously with a major degree Programme. A student cannot earn the Minor after he/she has already earned bachelor's degree.

12. Attendance Requirements and Detention Policy

- A student shall maintain a minimum required attendance of 40 % in each subject and 75 % in AGGREGATE of all the subjects in a semester.
- 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.

13. 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.

13.1 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.

13.2 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.

13.3. 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.

13.4 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

13.5 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.

14. 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	A+	Outstanding	10
≥80 and ≤89.99	A	Excellent	9
≥70 and ≤79.99	B	Very Good	8
≥60 and ≤69.99	C	Good	7
≥50 and ≤59.99	D	Average	6
≥40 and ≤49.99	E	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

14.1 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.

14.2 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.

14.3 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	A+	10	3*10=30
Course 3	2.5	A+	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.

14.4 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 = (CGPA - 0.50) * 10

14. 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.

16. 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.

17. 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.

18. Minimum Instruction Days for a Semester

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

19. 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.

20. 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.

21. 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	Expulsion from the examination hall and cancellation of the

	examination hall.	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. Life Sciences for Engineers (mandatory non-credit course prescribed at 3/4 semester)
3. Constitution of India (mandatory non-credit course prescribed at 5/6 semester)
4. Essence of Indian Traditional Knowledge (mandatory non-credit course prescribed at 5/6 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.

STUDENT 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	20A501	Proficiency classes: Familiarity with a computer	2	2
Regular Phase	20AC01	Proficiency classes: English Communication Skills	2	2
Regular Phase	20A502	Basics of Programming and Lab	3	2
Regular Phase	20AC02	Foundation classes in Mathematics	3	0
Regular Phase	20AC03	Foundation classes in Physics	3	2
Regular Phase	20AC04	Foundation classes in Chemistry	3	2
Regular Phase	20AC05	Universal Human Values I	2	0
Regular Phase	20A301	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		

Department of Electronics and Communication Engineering

BASIC STRUCTURE FOR ELECTRONICS & COMMUNICATION ENGINEERING (R20 regulations)

Semester I (First year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	BSC	20AC11T	Algebra and Calculus	3	0	0	3
2	BSC	20AC12T	Applied Physics	3	0	0	3
3	ESC	20A511T	Problem Solving through C Programming	3	0	0	3
4	ESC	20A411T	Basic Electrical and Electronics Engineering	3	0	0	3
5	ESC	20A312T	Engineering Drawing	1	0	4	3
Lab Courses							
6	BSC	20AC12L	Applied Physics Lab	0	0	3	1.5
7	ESC	20A511L	Problem Solving through C Programming Lab	0	0	3	1.5
8	ESC	20A411L	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5
			Total credits				19.5

Category	**Credits**
Basic Science Courses	7.5
Engineering Science Courses	12
Total Credits	**19.5**

Semester II (First year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	BSC	20AC21T	Differential Equations and Vector Calculus	3	0	0	3
2	BSC	20AC23T	Chemistry	3	0	0	3
3	ESC	20A421T	Electronic Devices and Circuits	3	0	0	3
4	HSMC	20AC25T	Communicative English	3	0	0	3
5	ESC	20A224T	Electrical Circuits & Technology	3	0	0	3
6	MC	20AC26T	Environmental Science	2	0	0	0
Lab Courses							
7	ESC	20A325L	Engineering & IT Workshop	0	0	3	1.5
8	BSC	20AC23L	Chemistry lab	0	0	3	1.5
9	HSMC	20AC25L	Communicative English lab	0	0	3	1.5
			Total credits				19.5

Category	**Credits**
Basic Science Courses	7.5
Engineering Science Courses	7.5
Humanities and Social Sciences and management course	4.5
Mandatory Courses	0
Total Credits	**19.5**

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Semester III (Second year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	BSC	20AC32T	Transform techniques & Complex Variables	3	0	0	3
2	PCC	20A431T	Signals and systems	3	0	0	3
3	PCC	20A432T	Digital Logic Design	3	0	0	3
4	HSMC	20AC36T	Managerial Economics & Financial Analysis	3	0	0	3
5	PCC	20A433T	Analog Circuits	3	0	0	3
Lab Courses							
6	PCC	20A431L	Signals and Systems lab	0	0	3	1.5
7	PCC	20A432L	Digital Logic Design Lab	0	0	3	1.5
8	PCC	20A433L	Analog Circuits lab	0	0	3	1.5
9	SC	20A434L	HDL Programming(Verilog)	1	0	2	2
						Total credits	21.5

Category	**Credits**
Basic Science Courses	3
Humanities and Social Sciences	3
Program Core Courses	13.5
Skill oriented course	2
Total Credits	**21.5**

Semester IV (Second year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	ESC	20A441T	Linear IC applications	3	0	0	3
2	BSC	20AC42T	Numerical Methods and Random Variables	3	0	0	3
3	PCC	20A442T	Communication Systems	3	0	0	3
4	PCC	20A443T	Electromagnetic Theory	3	0	0	3
5	PCC	20A444T	Advanced Digital design concepts	3	0	0	3
6	MC	20AC44T	Life Sciences for Engineers	2	0	0	0
Lab Courses							
7	PCC	20A441L	Linear IC applications lab	0	0	3	1.5
8	ESC	20A442L	Communication systems lab	0	0	3	1.5
9	PCC	20A444L	Advanced Digital Design Concepts Lab	0	0	3	1.5
10	SC	20A545L	Python Programming	1	0	2	2
						Total credits	21.5
Internship 2 Months (Mandatory) during summer vacation							

Category	**Credits**
Engineering Science Courses	4.5
Program Core Courses	12
Skill oriented course	2
Total Credits	**21.5**

Semester V (Third year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	PCC	20A451T	VLSI Design	3	0	0	3
2	PCC	20A452T	Control Systems	3	0	0	3
3	PCC	20A453T	Microprocessors and Interfacing	3	0	0	3
4	PEC-I	20A45AT	Computer System Architecture	3	0	0	3
		20A45BT	Nano Electronics				
		20A45CT	Data Communication Systems				
		20A45DT	Pulse & Digital circuits				
5	OEC-I	20A15ET	Water Resources and Harvesting	3	0	0	3
		20A15FT	Disaster Management				
		20A25ET	Energy Auditing Conservation and Management				
		20A25FT	Electric Vehicles				
		20A35ET	Non-Conventional Sources of Energy				
		20A35FT	Industrial Management & Entrepreneurship				
		20A55FT	Data Structures using Python				
		20A55GT	Database Management Systems				
		20A305GT	Foundations of Artificial Intelligence and Data Science				
		20A305HT	Machine Learning				
		20AE5AT	Human Resource Management				
		20AE5BT	Intellectual property Rights				
		20AC5AT	Literature and Life				
		20AC5BT	Linear Algebra and Numerical Analysis				
6	MC	20AC52T	Constitution of India	3	0	0	0
Lab Courses							
7	PCC	20A451L	VLSI Design Lab	0	0	3	1.5
8	PCC	20A453L	Microprocessors and Interfacing Lab	0	0	3	1.5
9	SC	20AC51L	Professional Communication	0	1	2	2
10	PROJ	20A454I	Summer Internship 2 Months (Mandatory)-Social relevance after second year (to be evaluated during V semester	0	0	0	1.5
						Total credits	21.5

Category	Credits
Program core Courses	12
Program Elective Courses	3
Job Oriented/Open Elective Course	3
Skill advanced course/ soft skill course	2
Summer Internship	1.5
Total Credits	**21.5**

Semester VI (Third year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	PCC	20A461T	Embedded Systems	3	0	0	3
2	PCC	20A462T	Microwave Engineering	3	0	0	3
3	PCC	20A463T	Digital Signal Processing	3	0	0	3
4	PEC-II	20A46AT	Electronic Measurements & Instrumentation	3	0	0	3
		20A46BT	Digital System Design				
		20A46CT	Radar Engineering				
		20A46DT	Antennas & wave propagation				
5	OEC-II	20A46ET	MOOCS	3	0	0	3
6	MC	20AC63T	Essence of Indian Tradition Knowledge	3	0	0	0
Lab Courses							
7	PCC	20A461L	Embedded Systems Lab	0	0	3	1.5
8	PCC	20A462L	Microwave Engineering Lab	0	0	3	1.5
9	PCC	20A463L	Digital signal Processing Lab	0	0	3	1.5
10	SC	20A564L	JAVA Programming	1	0	2	2
						Total credits	21.5
Industrial/Research Internship (Mandatory) 2 Months during summer vacation							

Category	Credits
Program Core Courses	13.5
Program Elective Courses	3
Open Elective Courses	3
Skill advanced course/ soft skill course	2
Mandatory Course	
Total Credits	21.5

Department of Electronics and Communication Engineering

Semester VII (Fourth year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	PEC-III	20A47AT	Digital Image Processing	3	0	0	3
		20A47BT	DSP Processors and Architectures				
		20A47CT	Coding theory & Techniques				
		20A47DT	Testing & Testability				
2	PEC-IV	20A47ET	Satellite Communication	3	0	0	3
		20A47FT	FPGA Architectures & Applications				
		20A47GT	Computer Networks				
		20A47HT	Advanced Digital signal processing				
3	PEC-V	20A47IT	Digital IC Design	3	0	0	3
		20A47JT	Optical Fiber Communication				
		20A47KT	Wireless Communication & Networks				
		20A47LT	Image & Video processing				
4	OEC-III	20A47MT	Cellular & Mobile Communications	3	0	0	3
		20A47NT	Ad-hoc Wireless networks				
		20A47OT	Embedded Real time Systems				
		20A47PT	ASIC Design				
5	OEC-IV	20A47QT	MOOCS-Interdisciplinary	3	0	0	3
6	HSMC	20AC71T	Universal Human Values-II	3	0	0	3
7	SC	20A471L	IOT based Embedded System design	1	0	2	2
8	PROJ	20A472I	Industrial/Research Internship (2 Months) to be evaluated during VII semester	0	0	0	3
			Total credits				23

Category	**Credits**
Program Elective Courses	9
Open Elective Courses	6
Humanities, Social Sciences and Management Course	3
Skill advanced course/ soft skill course	2
Industrial/Research Internship	3
Total Credits	**23**

Semester VIII (Fourth year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	PROJ	20A481P	Project work	0	0	0	12
						Total credits	12

Courses Offered to Other Departments

SNo.	Course Code	Regular Courses	Semester	Branches
1.	20A445T	Microprocessors & Interfacing	IV	CSE/AIDS
2.	20A445L	Microprocessors & Interfacing Lab	IV	CSE/AIDS

SNo.	Course Code	Open Elective Courses	Semester	Branches
1.	20A45ET	Electronic Circuits & its Applications	V	EEE/CE/MECH
2.	20A45FT	Introduction to Communication Systems	V	EEE/CE/MECH

SNo.	Course Code	Open Elective Courses	Semester	Branches
1	20A47RT	Electronic Circuits & its Applications	VII	CSE/AIDS
2	20A47ST	Introduction to Communication Systems	VII	CSE/AIDS

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Algebra and Calculus
Category BSC
Course Code 20AC11T

Year I B. Tech.
Semester I Semester
Branch CE, EEE, ME, ECE, CSE & AI&DS

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- This course will illuminate the students in the concepts of calculus and linear algebra
- To 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 Matrices **10**

Rank of a matrix by echelon form, Normal form, Solving system of homogeneous and non-homogeneous linear equations, Eigen values and Eigen vectors and their properties.

Learning Outcomes: At the end of the unit, the student will be able to:

- Find the rank, Eigen values and Eigenvectors of a matrix (L1)
- Solve systems of linear equations (L3)

Unit 2 Quadratic forms of matrices **8**

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 form by orthogonal transformation.

Learning Outcomes: At the end of the unit, the student will be able to:

- Apply Cayley-Hamilton theorem to find inverse and power of a matrix (L3)
- Identify special properties of a matrix, such as positive definite, etc., and use this information to facilitate the calculation of matrix characteristics(L3)

Unit 3 Mean Value Theorems & Multivariable calculus **10**

Taylor's theorem and Maclaurin's theorem (without proofs) – Simple problems.
Partial derivatives, total derivatives, chain rule, change of variables, Jacobian, maxima and minima of functions of two variables, method of Lagrange multipliers for three variables.

Learning Outcomes: At the end of the unit, the student will be able to:

- Translate the given function as series of Taylor's and Maclaurin's (L2)
- Find partial derivatives numerically and symbolically and use them to analyze and interpret the way a function varies, and utilize Jacobian of a coordinate transformation to deal with the problems in change of variables (L3)
- Acquire the Knowledge of maxima and minima of functions of several variables (L1)

Unit 4 Multiple Integrals **8**

Double integrals, change of order of integration, change of variables (Cartesian to polar), areas enclosed by plane curves, evaluation of triple integrals.

Learning Outcomes: At the end of the unit, the student will be able to:

- Extend the definite integral to double and triple integrals in cartesian and polar coordinates(L2)
- Apply double integration techniques in evaluating areas bounded by region(L3)

Unit 5 Special Functions **8**

Beta and Gamma functions and their properties, relation between beta and gamma functions, evaluation of definite integrals using beta and gamma functions.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the properties of beta and gamma functions and its relations(L2)
- Utilize the special functions in evaluating definite integrals(L3)

Prescribed Text Books:

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

Reference Books:

1. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers,2013.
3. R.L. Garg Nishu Gupta, Engineering Mathematics Volumes-I &II, Pearson Education
4. H. K. Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand.

Course Outcomes:

At the end of the course, the 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. Solve important tools of calculus in higher dimensions and be familiar with 2-dimensional, 3- dimensional coordinate systems	L3
5. Understand the properties of beta and gamma functions and its relations	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20AC11T.1	3	3	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC11T.2	3	2	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC11T.3	3	3	-	-	-	-	-	-	-	-	-	2	-	-	-
20AC11T.4	3	3	-	-	-	-	-	-	-	-	-	2	-	-	-
20AC11T.5	3	3	-	-	-	-	-	-	-	-	-	2	-	-	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Applied Physics
Category BSC
Couse Code 20AC12T

Year I B. Tech.
Semester I Semester
Branch EEE, ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	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.

Learning Outcomes: At the end of the unit, the student will be able to:

- explain the need of coherent sources and conditions for sustained interference and illustrate the concept of polarization of light and its applications. (L2)
- identify engineering applications of interference including homodyne and heterodyne detection. (L3)
- analyze the differences between interference and diffraction and classify ordinary and extraordinary polarized light. (L4)

Unit 2 Dielectric and Magnetic materials 11

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 domain theory of ferromagnetism (qualitative)-Hysteresis-soft and hard magnetic materials-Magnetic device applications (Magnetic bubble memory).

Learning Outcomes: At the end of the unit, the student will be able to:

- explain the concept of dielectric constant and polarization in dielectric materials. (L2)
- classify the magnetic materials based on susceptibility and their temperature dependence. (L2)
- apply the concept of magnetism and magnetic devices. (L3)

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.
Introduction to Optical Fibers-Total Internal Reflection-Critical angle of propagation-Acceptance angle - Numerical Aperture-Classification of fibers based on Refractive index profile, modes (step index, Graded index optical fibers) – attenuation and losses in optical fibers-Block diagram of fiber optic communication- Medical Applications-Fiber optic Sensors.

Learning Outcomes: At the end of the unit, the student will be able to:

- apply the Gauss' theorem for divergence and Stoke's theorem for curl. (L3)
- apply electromagnetic wave propagation in different guided media. (L3)
- classify optical fibers based on refractive index profile and mode of propagation and identify the applications of optical fibers in medical, communication and other fields. (L2)

Unit 4 Semiconductors 8

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 - Density of charge carriers - 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.

Learning Outcomes: At the end of the unit, the student will be able to:

- outline the properties of n-type and p-type semiconductors and charge carriers. (l2)
- interpret the direct and indirect band gap in semiconductors. (L2)
- identify the type of semiconductor using Hall effect. (L2)

Unit 5 Superconductors and Nano materials 8

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

Nano materials – significance of nanoscale - properties of nanomaterials: physical, mechanical, magnetic, Optical, 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.

Learning Outcomes: At the end of the unit, the student will be able to:

- explain how electrical resistivity of solids changes with temperature. (L2)
- classify superconductors based on Meissner's effect. (L2)
- Apply the basic properties of nanomaterials in various engineering branches. (L3)

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. K Thyagarajan "Applied Physics"-McGraw Hill Education (India) Private Ltd,2019

Reference Books:

1. David J. Griffiths, Introduction to Electrodynamics, 4/e, Pearson Education,2014
2. T Pradeep, A textbook of Nano Science and Nano Technology, Tata McGraw Hill 2013
3. Charles Kittel, Introduction to Solid State Physics, Wiley Publications,2011
4. Gerd Keiser, Optical Fiber Communications, 4/e, Tata McGraw Hill ,2008

Course Outcomes:

At the end of the course, the 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 Explain fiber optics concepts in various fields with working principle.	L2 & L3
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	PSO1	PSO2	PSO3
20AC12T.1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
20AC12T.2	3	2	2	-	-	-	-	-	-	-	-	2	-	-	-
20AC12T.3	3	2	2	-	-	-	-	-	-	-	-	2	-	-	-
20AC12T.4	3	1		-	-	-	-	-	-	-	-	-	-	-	-
20AC12T.5	3	2	2	-	-	-	-	-	-	-	-	2	-	-	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Problem Solving through C programming
Category ESC
Couse Code 20A511T

Year I B. Tech
Semester I Semester
Branch CE, EEE, ME, ECE, CSE, AI&DS

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	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 Problem Solving and Introduction to C (9)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Identify situations where computational methods and computers would be useful.
- Approach the programming tasks using techniques learned and write pseudo-code.
- Choose the right data representation formats based on the requirements of the problem.
- Write the program on a computer, edit, compile, debug, correct, recompile and run it.

Unit 2 Introduction to decision control statements and Arrays (9)

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.

Learning Outcomes: At the end of the unit, the student will be able to

- Use the comparisons and limitations of the various programming constructs and choose the right one for the task in hand.
- Identify tasks in arrays with different techniques that are applicable and apply them to write programs.
- Design and implement operations on both single and Multidimensional arrays.

Unit 3 Strings and Functions (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.

Learning Outcomes: At the end of the unit, the student will be able to

- Implement and test the programs on strings using string manipulation functions.
- Analyze programming problems to choose when regular loops should be used and when recursion will produce a better program

Unit 4 Pointers (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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Identify tasks in which the dynamic memory allocation techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.
- Design and develop Computer programs, analyzes, and interprets the concept of pointers and their usage.

Unit 5 Structures and Files (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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Define derived data types and use them in simple data processing applications.
- Develop and test C programs for simple applications using files.

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 Books:

1. LET US C, YeswanthKanitkar, 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, the student 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	PSO1	PSO2	PSO3
20A511T.1	1	2	2	3		1	-	-	-	-	-	-	-	-	-
20A511T.2	3	3	3	3	3	-	-	-	1	-	-	-	-	-	-
20A511T.3	3	2	1	2	1	-	-	-	1	-	-	2	-	-	-
20A511T.4	2	3	2	2	3	-	-	-	1	-	1	2	-	-	-
20A511T.5	3	2	2	2	2	-	-	-	1	-	-	2	-	-	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Basic Electrical and Electronics Engineering
Category ESC
Couse Code 20A411T

Year I B.Tech.
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

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 concepts of Bipolar Junction transistor

Unit 1 Circuit Elements & Devices 9

Active and Passive elements – R,L,C Components – types- resistance color coding, Voltage and Current sources, Devices – Multimeter, CRO, DSO and Function generator.

Learning Outcomes: At the end of the unit, the student will be able to:
- Understand the circuit components, types and their relation.
- Able to analyze different voltage and current sources
- Understand the basic operation of different devices.

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's Theorem- Norton's Theorem- Superposition Theorem-maximum power transfer theorem.

Learning Outcomes: At the end of the unit, the student will be able to:
- Apply Thevenin's and Norton theorems to analyze and design for maximum power transfer
- Use network techniques, like node analysis and loop analysis, to write equations for large linear circuits.
- Apply the concept of linearity and the technique of superposition to circuits and networks.

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), Diode equation and it's mathematical derivation, Static and Dynamic Resistance, Temperature Dependency, Transition and Diffusion Capacitances, Breakdown Mechanisms in semiconductor diodes, Zener diode characteristics & Zener diode acts as a regulator.

Learning Outcomes: At the end of the unit, the student will be able to :
- Analyze concepts of semiconductor devices and solve problems.
- Study the characteristics and operation of p-n junction diode
- Explain the energy band diagram & effect of temperature on the characteristics of diode.

Unit 4 Diode Applications 9

Half Wave and Full Wave Rectifiers – General Filter Considerations – Capacitor Filter – RC Filter, Choke Filter, LC Filter, π-Filter.

Learning Outcomes: At the end of the unit, the student will be able to:
- Analyze the performance of rectifiers with and without filters
- Understand the operation and usage of Rectifiers and Filters.

Unit 5 Introduction of BJT 9

Transistor constructions – types. Transistor operation in CB, CE and CC configurations and their Characteristics.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the construction, operation and types of BJT
- Analyze the different configurations (CB,CE,CC)

Prescribed Text Books:

1. "Electronic Devices and Circuits" David A Bell, Fifth Edition, 2008, Oxford University Press
2. "Circuits&NetworkAnalysis&Synthesis",Sudhakar.A&ShyammohanSPalli,4thEdition,TataMcGrawHill,2010
3. Engineering basics: Electrical, Electronics and computer Engineering" T.Thyagarajan, New Age International,2007

Reference 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, SIE2007
4. "Micro Electronic Circuits" Sedra and Smith, Oxford UniversityPress

Course Outcomes:

At the end of the course, the student will be able to — Blooms Level of Learning

1. Understand the circuit components voltage, current, 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	PSO1	PSO2	PSO3
20A411T.1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2
20A411T.2	3	3	3	3	3	-	-	-	-	-	-	-	-	-	3
20A411T.3	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2
20A411T.4	2	2	2	-	-	-	-	-	-	-	-	-	-	-	2
20A411T.5	2	-	2	-	-	-	-	-	-	-	-	-	-	-	2

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

Title of the Course Engineering Drawing
Category ESC
Couse Code 20A312T

Year I B.Tech
Semester I Semester
Branch CE, EEE & ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
1	0	4	3

Course Objectives:
- To bring awareness that Engineering Drawing is the Language of Engineers.
- To familiarize how industry communicates technical information.
- To teach the practices for accuracy and clarity in presenting the technical information.
- To develop the engineering imagination essential for successful design.
- To provide the basic geometrical information to ignite the innovative design ideas.

Unit 1 Introduction to Drawing and Engineering Curves. **Theory Hours: 05**
Practice sessions: 04

Introduction: Lettering–Geometrical Constructions- Construction of polygons by General method. Conics: Ellipse, Parabola and Hyperbola (General method only). Special Methods: Ellipse - Concentric Circles method, Oblong method & Arcs of Circles method - Drawing tangent & normal to the conics. Cycloidal Curves: Cycloid, Epi-cycloid, Hypo-cycloid (simple problems) - Drawing tangent & normal to the Cycloidal curves.

Learning Outcomes: At the end of the unit, the student will be able to
- Understand the significance of engineering drawing and understand the geometrical constructions, conventions used in the engineering drawing.
- Identify the curves obtained in different conic sections and able to draw different conic curves.
- Know and draw the different Cycloidal curves, also its practical application in engineering.

Unit 2 Projections of Points and Lines **Theory Hours: 03**
Practice sessions: 06

Projections of points - Projections of lines inclined to one reference plane, Projections of lines inclined to both reference planes. True lengths and Traces of lines.

Learning Outcomes: At the end of the unit, the student will be able to:
- Understand the principles and elements of projection.
- Know how to draw the projections of points, lines.
- Differentiate between projected length and true length and also find the true length of the lines.

Unit 3 Projections of Planes. **Theory Hours: 05**
Practice sessions: 04

Projection of planes inclined to one reference plane - and inclined to both the reference planes.

Learning Outcomes: At the end of the unit, the student will be able to:
- Understand the projections of different geometrical regular plane surfaces.
- Identify and Construct the true shapes of the plane surfaces.
- Analyze the projections of plane surface inclined to both the planes.

Unit 4 Projections of Solids. **Theory Hours: 04**
Practice sessions: 05

Projections Of simple Solids such as Cylinder, Cone, Prism and Pyramid - Axis Inclined to one reference plane, Axis inclined to both the reference planes.

Learning Outcomes: At the end of the unit, the student will be able to:
- Understand different types of solids.

- Draw projection of simple solids.
- Draw the Projections of solids inclined to both the reference planes.

Unit 5 Isometric Projections & Conversion of Views. Theory Hours: 04
Practice sessions: 05

Isometric Projections: Projections of Lines, Planes and Simple Solids – Prism, Pyramid, Cylinder and Cone in simple positions only.

Conversion of Views: Conversions of Orthographic views in to Isometric views and Conversion of Isometric views to Orthographic views.

Learning Outcomes :At the end of the unit, the student will be able to:

- Understand the pictorial views such as isometric views, orthographic views and also differentiate between Isometric Projection and View.
- Draw the Isometric views of simple plane surfaces and simple solids.
- Draw the conversions of Isometric Views in to Orthographic Views and Vice-versa.

Prescribed Text Books:

1. Engineering Drawing, N.D. Bhatt, Charotar Publishers, Edition2016
2. Engineering Drawing, K.L. Narayana, P. Kanniah, Scitech Pub, Edi2016

Reference Books:

1. Engineering Drawing and Graphics, Venugopal/ New age, Ed2015.
2. Engineering Drawing, Johle, Tata McGraw-Hill. Ed2014
3. Engineering Drawing, Shah and Rana, 2/e, Pearson Education Ed2015

Course Outcomes:

At the end of the course, the 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 ofPlanes.	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	PSO1	PSO2	PSO3
20A312T.1	3	-	-	-	-	3	2	-	1	2	-	-	-	-	-
20A312T.2	3	-	-	-	-	3	2	-	1	2	-	-	-	-	-
20A312T.3	3	2	-	-	-	3	2	-	1	2	-	-	-	-	-
20A312T.4	3	2	-	-	-	3	2	-	1	2	-	-	-	-	-
20A312T.5	3	-	2	-	2	2	-	3	3	-	-	3	-	-	-

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

Title of the Course Applied Physics Lab
Category BSC
Couse Code 20AC12L

Year I B.Tech.
Semester I Semester
Branch EEE, ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
0	0	3	1.5

Course Objectives:

- Learn 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.
- Know about the magnetic and dielectric materials applications.
- Apply the principles of semiconductors in various electronic devices.

List of Experiments

1. Determine the thickness of the wire using wedge shape 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 the 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
11. Measurement of magnetic susceptibility by Gouy's method
12. Determination of Hall voltage and Hall coefficient of a given semiconductor usingHall 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.

References:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.
2. http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

Course Outcomes:	Blooms Level of Learning
At the end of the course, student will be able to	
1. operate various optical instruments and estimate various optical parameters.	L2
2. estimate the various magnetic properties.	L4
3. measure properties of semiconductors.	L4 & L5
4. determine the properties of dielectric materials and optical fiber materials.	L5

CO-PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20AC12L.1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20AC12L.2	3	1	-	-	2	-	-	-	-	-	-	-	-	-	-
20AC12L.3	2	-	-	-	2	-	-	-	-	-	-	-	-	-	-
20AC12L.4	3	2	-	-	2	-	-	-	-	-	-	-	-	-	-

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

Title of the Course Problem Solving through C Programming Lab
Category ESC
Couse Code 20A511L
Year I B. Tech
Semester I Semester
Branch CE, EEE, ME, ECE, CSE& AI&DS

Lecture Hours	Tutorial Hours	Practice Hours	Credits
0	0	3	1.5

Course Objectives:
- 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 using a modular programming and Manage data using files.

Minimum FOUR programs from each exercise is to be done by students

Data Types, constants, Input and Output and expressions

Exercise I: (week-1): Data types, Variables, Constants and Input and Output.
Exercise 2 :(week-2): Operators, Expressions and Type Conversions.
Learning Outcomes: At the end of the unit, the student will be able to:
- Identify situations where computational methods and computers would be useful.
- Approach the programming tasks using techniques learned and write pseudo-code.
- Write the program on a computer, edit, compile, debug, correct, recompile and run it.

Decision control statements and Arrays

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
Learning Outcomes: At the end of the unit, the student will be able to:
- Choose the right data representation formats based on the requirements of the problem.
- Use the comparisons and limitations of the various programming constructs and choose the right one for the task in hand.
- Identify tasks in arrays with different techniques that are applicable and apply them to write programs.
- Design and implement operations on both single and Multidimensional arrays.

Strings and Functions

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.
Learning Outcomes: At the end of the unit, the student will be able to:
- Implement and test the programs on strings using string manipulation functions.
- Analyze programming problems to choose when regular loops should be used and when recursion will produce a better program

Pointers

Exercise 13:(week-13): Pointers, Dynamic memory allocation and error handling
Learning Outcomes: At the end of the unit, the student will be able to:

- Design and develop Computer programs, analyzes, and interprets the concept of pointers and their usage.
- Identify tasks in which the dynamic memory allocation techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.

Structures and Files

Exercise 14:(week-14): Structures
Exercise 15:(week-15): File handling

Learning Outcomes: At the end of the unit, the student will be able to:

- Define structure data types and use them in simple data processing applications.
- Develop and test C programs for simple applications using files.

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 Books:

1. Let Us C, Yeswanth Kanitkar, Ninth Edition, BPB Publication
2. A K Sharma "Computer Fundamentals and Programming", 2nd Edition, University Press, 2018.
3. Pradeep Dey and Manas Ghosh, "Programming in C", Oxford Press, 2nd Edition, 2017
4. ReemaTharaja "Introduction to C Programming", Second Edition, OXFORD Press, 2015
5. https://www.cprogramming.com/
6. https://www.mycplus.com/tutorials/c-programming-tutorials

Course Outcomes:

At the end of the course, the 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
20A511L.1	3	2	-	2	2	-	-	-	2	2	1	-	-	-	-
20A511L.2	2	2	-	-	-	-	-	-	1	-	-	-	-	-	-
20A511L.3	3	3	3	3	-	-	-	-	1	-	-	3	-	-	-
20A511L.4	3	3	3	3	-	-	-	-	-	-	-	3	-	-	-
20A511L.5	3	3	3	3	-	-	-	-	-	-	-	3	-	-	-

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

Title of the Course Basic Electrical and Electronics Engineering Lab
Category ESC
Couse Code 20A411L
Year I B. Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives:

1. To identify the various electrical and electronic components and devices.
2. To analyze the performance of rectifier circuits in practical approach
3. To observe the characteristics of semiconductor devices.

List of the 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, BJT)
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. Verification of Thevenins theorem.
5. Verification of Norton's theorem.
6. Forward and Reverse Bias Characteristics of PN junction Diode.
7. Zener Diode acts as Voltage Regulator.
8. Half Wave Rectifier with and without filter.
9. Full Wave (Center trapped) Rectifier with and without filter.
10. Bridge Rectifier with and without filter
11. Input and Output Characteristics of Transistor in CB Configuration.
12. Input and Output Characteristics of Transistor in CE Configuration.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the analysis of basic electrical laws and theorems.	L1
2. Gain the practical knowledge of Diode, BJTs.	L1

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20A411L.1	2	2	2	2	2	-	2	-	2	-	-	2	2	2
20A411L.2	2	2	2	2	2	-	2	-	2	-	-	2	2	2

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

Title of the Course Differential Equations and Vector Calculus
Category BSC
Course Code 20AC21T

Year I B. Tech
Semester II Semester
Branch CE, EEE, ME, ECE, CSE & AI&DS

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

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 with constant coefficients **10**

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.

Learning Outcomes: At the end of the unit, the student will be able to
- Identify the essential characteristics of linear differential equations with constant coefficients(L3)
- Solve the linear differential equations with constant coefficients by appropriate method (L3)

Unit 2 Equations reducible to Linear Differential Equations **8**

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

Learning Outcomes: At the end of the unit, the student will be able to
- Classify and interpret the solutions of linear differential equations(L4)
- Generalize and solve the higher order differential equation by analyzing physical situations(L3)

Unit 3 Partial Differential Equations **8**

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

Learning Outcomes : At the end of the unit, the student will be able to
- Apply the techniques to find solutions of standard PDEs (L3)
- Solve the boundary value problems (L3)

Unit 4 Vector Differentiation **8**

Scalar and vector point functions, vector operator Del, Del applied to scalar point functions- Gradient, del applied to vector point functions-Divergence and Curl- del applied twice to scalar point function, vector identities.

Learning Outcomes: At the end of the unit, the student will be able to
- Apply del to Scalar and vector point functions(L3)
- Illustrate the physical interpretation of Gradient, Divergence and Curl(L2)

Unit 5 Vector integration **10**

Line integral-circulation-work done, surface integral, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

Learning Outcomes: At the end of the unit, the student will be able to
- Find the work done in moving a particle along the path over a force field(L1)

- Apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals(L3)

Prescribed Text Books:

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

Reference Books:

1. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
3. R.L. Garg NishuGupta, Engineering Mathematics Volumes-I &II, PearsonEducation
4. H. K. Das, Er. RajnishVerma, Higher Engineering Mathematics, S.Chand.

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Solve the differential equations related to various engineering fields	L3
2. Generalize 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. Understand the physical meaning of different operators such as gradient, curl and divergence	L2
5. Find the work done against a field, circulation and flux using vector calculus	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20AC21T.1	3	3	-	-	-	-	-	-	-	-	-	2	-	-	-
20AC21T.2	3	3	-	-	-	-	-	-	-	-	-	2	-	-	-
20AC21T. 3	3	3	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC21T.4	3	3	-	-	-	-	-	-	-	-	-	2	-	-	-
20AC21T.5	3	3	-	-	-	-	-	-	-	-	-	3	-	-	-

Title of the Course Chemistry
Category BSC
Couse Code 20AC23T

Year I Year
Semester II Semester
Branch EEE, ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:
- To instruct electrode potential and differentiation of different electrodes and their applications.
- To impart knowledge on the basic concepts of battery technology.
- To explain how to synthesize different polymers and differentiate polymers based on properties.
- To introduce different types of instrumental techniques and molecular machines and molecular switches.

Unit 1 Electrochemical Energy Systems - I 10

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)

Learning Outcomes: At the end of the unit, the student will be able to:
- explain the construction of different Ion selective electrodes (L4)
- solve problems based on cell potential and EMF(L3)
- apply Nernst equation for calculating electrode and cell potentials (L3)

Unit 2 Electrochemical Energy Systems - II 10

Basic concepts of batteries, 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 cells.

Learning Outcomes: At the end of the unit, the student will be able to:
- explain the theory of construction of battery and fuel cells (L4)
- describe the working principle of Fuel cells (L2)
- summarize the applications of batteries (L4)

Unit 3 Polymer Chemistry 10

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 Preparation, properties, and applications of Buna-S, Buna-N. Conducting polymers – polyacetylene, polyaniline – mechanism of conduction and applications

Learning Outcomes: At the end of the unit, the student will be able to:
- explain the preparation, properties and applications of Bakelite, and Nylon-6,6 (L4)
- illustrate the mechanism of conduction in polyacetylene and polyaniline (L3)
- discuss Buna-S and Buna-N elastomers and their applications (L2)

Unit 4 Instrumental Methods and their Applications 9

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law.

Principle and applications of pH metry, Potentiometry, Conductometry, UV-Visible, IR Spectroscopy, Gas Chromatography (GC) Thin layer chromatography (TLC)

Learning Outcomes: At the end of the unit, the student will be able to:

- distinguish the ranges of different types of spectral series in electromagnetic spectrum (L4)
- understand the principles of different analytical instruments (L2)
- differentiate between pH metry, potentiometry and conductometry (L4)

Unit 5 Molecular Machines & Switches 10

Molecular machines: Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor, systems based on Catenanes.

Molecular switches – Introduction to molecular switches, Cyclodextrin-based switches, in and out switching, back and forth switching, displacement switching

Learning Outcomes: At the end of the unit, the student will be able to:

- describe the mechanism involved in linear motion of Rotaxanes (L2)
- explain different types of switching in Cyclodextrins (L4)
- demonstrate the applications of Rotaxanes and Catenanes as artificial molecular machines (L2)

Prescribed Text Books:

1. O.G. Palanna, Engineering Chemistry, 2/e, Tata McGraw Hill Education Private Limited, 2017.
2. P.C. Jain and M. Jain, Engineering Chemistry, 17/e, DhanapatRai& Sons, 2018

Reference Books:

1. ShashiChawla, A textbook of Engineering chemistry, 3/e, DhanapatRai& Co, 2015.
2. Skoog, Holler, Crouch, Principles of Instrumental Analysis, 7/e, Cengage learning, 2018.
3. T. Ross Kelly, Molecular Machines, 1/e, Springer Berlin Heidelberg, 2005
4. Ben L. Feringa, Wesley R. Browne, Molecular Switches, 2/e, Wiley, 2011

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. explain the significance of electrode potentials, classify ion selective electrodes, and list different types of electrodes	L4
2. compare various batteries, explain the concepts involved in the construction of lithium cells, different fuel cells and apply redox principles for construction of batteries and fuel cells.	L4
3. illustrate the mechanism of conduction in conducting polymers, and explain the preparation, properties, and applications of various polymers	L3
4. differentiate various analytical techniques	L4
5. compare molecular switches and molecular machines, and distinguish between molecular machines	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20AC23T.1	3	2	-	-	-	-	-	-	-	-	-	2	-	-	-
20AC23T.2	3	2	-	-	-	-	-	-	-	-	-	2	-	-	-
20AC23T.3	3	2	-	-	-	-	-	-	-	-	-	2	-	-	-
20AC23T.4	3	2	-	-	-	-	-	-	-	-	-	2	-	-	-
20AC23T.5	3	2	-	-	-	-	-	-	-	-	-	2	-	-	-

Title of the Course Electronic Devices and Circuits
Category ESC
Couse Code 20A421T

Year I B.Tech.
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

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 BJT and 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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Able to understand the concepts of stability and biasing of BJT(L2)
- Able to find the stability factor of different biasing techniques of BJT(L2)
- Understand the concepts of thermal stability, Run away and heat sinks (L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the construction and operation of JFET and MOSFET (L2)
- Able to design different biasing for JFET and MOSFET (L6)

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-Classification of Amplifiers- Amplifier equivalent circuit – Concepts of h-parameters – Analysis of CE, CB and CC Amplifiers – Comparisons of CE,CB and CC.

Learning Outcomes: At the end of the unit, the student will be able to:

- Able to understand single stage transistor amplifier and it's operation (L2)
- Able to understand the concepts of h-parameters (L2)

Unit 4 FET Amplifiers 9

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

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the concepts of small signal model of JFET and MOSFET (L2
- Able to identify different parameters of JFET and MOSFET (L3)

Unit 5 Special Purpose Electronic Devices 9

LED, Tunnel Diode, PIN Diode ,SCR, UJT, Photodiode, Phototransistor, Varactor diode

Learning Outcomes: At the end of the unit, the student will be able to

- Able to understand the construction and operation of different special purpose devices
- Able to identify different symbols of special purpose electronic devices.

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 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 Publications2004
3. Integrated Electronics, Analog and Digital Circuits and Systems, J. Millman and Halkias,TMH.
4. Micro Electronic Circuits, Sedra and Smith, Oxford UniversityPress

Course Outcomes:

At the end of the course, the 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 BJT and 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
20A421T.1	-	3	2	-	-	-	-	1	-	-	1	-	3	-	-
20A421T.2	-	3	3	-	1	-	-	2	-	-	1	-	3	-	-
20A421T.3	-	3	2	-	1	-	-	1	-	-	2	-	2	3	-
20A421T.4	-	3	2	-	1	-	-	1	-	-	2	-	2	-	-
20A421T.5	-	3	2	-	1	-	-	1	-	-	1	-	-	-	3

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

Title of the Course Communicative English
Category HSMC
Course Code 20AC25T

Year I Year
Semester II Semester
Branch EEE, ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- To focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- To Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- To impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays
- To provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Unit 1 **9**

Listening: Identifying the topic, the context, and specific pieces of information by listening to short audio texts and answering a series of questions.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies, and interests; introducing oneself and others.
Reading: *On the Conduct of Life* by William Hazlitt; Skimming to get the main idea of a text; scanning to look for specific pieces of information.
Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.
Grammar and Vocabulary: Parts of Speech, Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.
Learning Outcomes: At the end of this unit, the student will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

Unit 2 **9**

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.
Speaking: Discussion in pairs/small groups on specific topics followed by short, structured talks.
Reading: *The Brook* by Alfred Tennyson; Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.
Grammar and Vocabulary: Cohesive devices - linkers, signposts and transition signals; use of articles and zero article; prepositions.
Learning Outcomes: At the end of this unit, the student will be able to

- comprehend short talks on general topics

- participate in informal discussions and speak clearly on a specific topic using suitable discourse markers
- understand the use of cohesive devices for better reading comprehension
- write well-structured paragraphs on specific topics
- identify basic errors of grammar/ usage and make necessary corrections in short texts

Unit 3 **9**

Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed
Reading: *The Death Trap* by Saki; Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing: Summarizing, Paragraph Writing, identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions
Grammar and Vocabulary: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.
Learning Outcomes: At the end of the unit, the student will be able to

- comprehend short talks and summarize the content with clarity and precision
- participate in informal discussions and report what is discussed
- infer meanings of unfamiliar words using contextual clues
- write summaries based on global comprehension of reading/listening texts
- use correct tense forms, appropriate structures and a range of reporting verbs in speech and writing

Unit 4 **9**

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading: *Muhammad Yunus;* Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.
Writing: Writing structured essays on specific topics using suitable claims and evidence.
Grammar and Vocabulary: Quantifying expressions - adjectives and adverbs; comparing and contrasting; Voice - Active & Passive Voice
Learning Outcomes: At the end of the unit, the student will be able to

- infer and predict about content of spoken discourse
- understand verbal and non-verbal features of communication and hold formal/informal conversations
- interpret graphic elements used in academic texts
- produce a coherent paragraph interpreting a figure/graph/chart/table
- use language appropriate for description and interpretation of graphical elements

Unit 5 **9**

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides.
Reading: The Dancer with a White Parasol by Ranjana Deve; Reading for comprehension.
Writing: Letter Writing: Official Letters/Report Writing
Grammar and Vocabulary: Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Learning Outcomes: At the end of the unit, the student will be able to

- take notes while listening to a talk/lecture and make use of them to answer questions
- make formal oral presentations using effective strategies
- comprehend, discuss and respond to academic texts orally and in writing
- produce a well-organized essay with adequate support and detail
- edit short texts by correcting common errors

Prescribed Text Book:

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, McMillan India Ltd
3. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
4. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
5. Raymond Murphy's English Grammar in Use Fourth Edition (2012) E-book
6. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
7. Oxford Learners Dictionary, 12th Edition, 2011
8. Norman Lewis Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary (2014)
9. Speed Reading with the Right Brain: Learn to Read Ideas Instead of Just Words by David Butler

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English	L3
2. read, scan and skim texts such as literary forms, journalistic articles and scientific readings for comprehension and retention	L2
3. exhibit self-confidence and speak in formal and informal contexts	L3
4. apply grammatical knowledge in speech and writing and formulate sentences with accuracy	L2
5. 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	PSO1	PSO2	PSO3
20AC25T.1	-	-	-	-	-	-	-	-	-	3	-	2	-	-	-
20AC25T.2	-	-	-	-	-	-	-	-	-	3	-	2	-	-	-
20AC25T.3	-	-	-	-	-	-	-	-	-	3	-	2	-	-	-
20AC25T.4	-	-	-	-	-	-	-	-	-	3	-	2	-	-	-
20AC25T.5	-	-	-	-	-	-	-	-	-	3	-	2	-	-	-

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

Title of the Course Electrical Circuits and Technology
Category ESC
Couse Code 20A224T

Year I B.Tech.
Semester II Semester
Branch ECE

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.

Learning Outcomes: At the end of the unit, the student will be able to

- understand the fundamental laws of Electrical Engineering.
- understand the Kirchhoff's laws
- use network techniques like node analysis and loop analysis to write equations for large linear circuits

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.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand and use the concepts of reactance and impedance to analyse simple a.c. circuits
- Calculate the power dissipation of an a.c. circuit, and understand the concept of power factor.
- Explain the effect of resonance, and its implications for practical circuits
- Design resonant circuits which are used in wireless transmission and communication networks

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.

Learning Outcomes: At the end of the unit, the student will be able to

- Analyze two port networks
- Know about reciprocity and symmetry of two port network
- Analyze interconnection of Two port network

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..

Learning Outcomes: At the end of the unit, the student will be able to:

- understand construction and operation of DC machines
- analyze the performance of DC machines

- know the speed control methods of DC motor

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- understand construction and operation of various AC machines
- analyze the performance of various AC machines

Prescribed Text Books:

1. Network Analysis by A. Sudhakar&Shyam Mohan S.Pillai, Tata McGraw Hill, 3 rd Edition, New Delhi, 2009.
2. T.Thyagarajan,Fundamentals of Electrical and Electronics Engineering. SciTech publications, 2011, 5th edition.
3. D. C. Kulshreshta, "Basic Electrical Engineering", McGraw Hill, 2009.
4. P.S.Dhogal "Basic Electrical Engineering with Numerical Problems" McGraw Hill, 2006.
5. A. Chakrabarti. Circuit Theory. 6 th edition, DhanpatRai& Co, New Delhi, 2014.
6. A.Sudhakar and Shyammohan S Palli, "Circuits and Networks" McGraw Hill, 2018.

Reference Books:

1. M.S Naidu and S.Kamakshaiah, Introduction to Electrical Engineering. TMH Publications.
2. D.P Kothari and I.J Nagrath, Basic Electrical Engineering, TMH, 3rdEd.2010
3. Millman and Halkias, Electriconics devices and circuits
4. S.Salivahanan, N,Suresh Kumar, "Electronic Devices and Circuits" McGraw Hill, 2011.

Course Outcomes:

Student will be able to	Blooms Level of Learning
• Impart the basic knowledge about the Electric circuits.	L1
• Understand the working of various DC Machines and analyze their performance.	L1,L4
• Understand the working of various AC Machines and analyze their performance.	L1,L4
• Know about various electronic devices.	L1
• Understand the various electrical installations and measuring instruments	L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A224T.1	2	2	-	2	-	-	-	-	2	-	2	-	2	2	-
20A224T.2	2	3	2	2	-	-	-	-	2	-	2	-	2	3	-
20A224T.3	2	3	2	2	-	-	-	-	2	-	2	-	2	3	-
20A224T.4	2	2	-	3	-	-	-	-	2	-	2	-	2	2	-
20A224T.5	2	2	1	3	-	-	-	-	2	-	2	-	2	2	-

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

Title of the Course Environmental Science
Category MC
Couse Code 20AC26T

Year I B.Tech.
Semester II Semester
Branch EEE, ECE

Lecture Hours	Tutorial Hours	Practice Hours	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 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 10

Definition, Scope and Importance – Need for Public Awareness. NATURAL RESOURCES: Renewable and non-renewable resources – Forest resources: Uses, deforestation– Water resources: Uses, floods, drought – Mineral resources: Uses, environmental effects of extracting mineral resources – Food resources: Impacts of overgrazing, problems with traditional agriculture, effects of modern agriculture – Land Resources: Land degradation, soil erosion - Energy resources: Renewable and non-renewable energy resources.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the importance of public awareness.
- Know about the various natural resources.

Unit 2 Ecosystems, Biodiversity and its Conservation 10

Ecosystems: Producers, consumers and decomposers – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, lake ecosystem.

Biodiversity and Its Conservation: Definition – Value of biodiversity - Hot-spots of biodiversity – Threats to biodiversity – Conservation of biodiversity.

Learning Outcomes: At the end of the unit, the student will be able to:

- Know about the concept of ecosystem.
- Know about the importance of biodiversity.

Unit 3 Environmental Pollution 8

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

Learning Outcomes: At the end of the unit, the student will be able to:

- Know about the different types of pollution.
- Know about various sources, effects and control measures of pollution.

Unit 4 Social Issues and the Environment 10

Rain water harvesting, Environmental ethics: Issues and possible solutions – global warming, acid rain, ozone layer depletion – Environment Protection Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act.

Learning Outcomes: At the end of the unit, the student will be able to:

- Know about social issues related to environment.
- Know about importance of environmental acts.

Unit 5 Human Population and the Environment 7

Population explosion – Family Welfare Programmes – Environment and human health – Value Education – HIV/AIDS – Role of information Technology in Environment and human health, Field work – Visit to a local area to document environmental assets.

Learning Outcomes: At the end of the unit, the student will be able to:

- Know about the effects of population explosion.
- Identify the natural assets and their relationship.

Prescribed Text Books:

1. Perspectives in environmental Studies, AnubhaKaushik and C P Kaushik, New Age International Publishers, New Delhi, 2018.
2. A Textbook of Environmental Studies, Shashi Chawla, McGraw Hill Education, New Delhi, 2017.

Reference Books:

1. Environmental Studies by Benny Joseph, McGraw Hill Education, New Delhi, 2017.
2. A textbook of environmental studies, A Dhinakaran and B Sankaran, Himalaya Publishing House, Mumbai, 2017.
3. Fundamentals of environmental studies, Mahua Basu and S Xavier, Cambridge University Press, New Delhi, 2017.
4. Textbook of Environmental Studies for undergraduate courses, Erach Bharucha for University Grant Commission, University press, New Delhi, 2013.
5. A textbook of environmental studies, Vijay kumar Tiwari, Himalaya Publishing House, Mumbai, 2017.

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Explain how natural resources should be used.	L2
2. Identify the need to protect 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	PSO1	PSO2	PSO3
20AC26T.1	1	1	-	-	-	3	3	1	-	-	-	3	-	-	-
20AC26T.2	1	2	-	-	-	3	3	1	-	-	-	3	-	-	-
20AC26T.3	-	1	-	-	-	3	3	1	-	-	-	3	-	-	-
20AC26T.4	2	-	-	-	-	3	3	1	-	-	-	3	-	-	-
20AC26T.5	1	-	-	-	-	3	3	1	-	-	-	3	-	-	-

Department of Electronics and Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

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Title of the Course Engineering & IT Workshop
Category ESC
Couse Code 20A325L

Year I B.Tech
Semester II Semester
Branch CE, ME & ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
0	0	3	1.5

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.

Trade 1 Carpentry Shop 02

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.

Learning Outcomes: At the end of the unit, the student will be able to apply wood working skills in real world applications.

Trade 2 Sheet metal shop 02

Two jobs (exercises) from: Tapered Tray, cylinder, conical funnel from out of 22 or 20 guage G.I. sheet

Learning Outcomes:At the end of the unit, the student will be able to build different parts with metal sheets used in various appliances

Trade 3 Fitting shop 02

Two jobs (exercises) from: square Fit, V-Fit, Semi-circular fit, dove tail fit from M.S. stock

Learning Outcomes: At the end of the unit, the student will be able to apply fitting operations in various assemblies.

Trade 4 House-wiring 02

Two jobs (exercises) from: Parallel and Series, Two way switch, Tube –Light connection, Stair case connection.

Learning Outcomes: At the end of the unit, the student will be able to apply basic electrical engineering knowledge for house wiring practice.

Trade 5 Demonstration 01

Any one trade of Plumbing • Machine Shop • Metal Cutting • Soldering and Brazing

Learning Outcomes: At the end of the unit, the student will be able to get the basic awareness of any of trade demonstrated.

Prescribed 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.

Reference Books:

1. JeyapoovanT. And Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

Course Outcomes:

At the end of the course, the 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. Employ fitting operations in various assemblies.	L3
4. Execute basic electrical engineering knowledge for house wiring practice.	L3
5. Identify various operations and its applications from the demonstration.	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A325L.1	3	-	1	-	1	-	-	-	-	-	-	1	-	-	-
20A325L.2	3	-	1	-	1	-	-	-	-	-	-	1	-	-	-
20A325L.3	3	-	1	-	1	-	-	-	-	-	-	1	-	-	-
20A325L.4	2	-	1	-	1	-	-	-	-	-	-	1	-	-	-
20A325L.5	3	-	1	-	1	-	-	-	-	-	-	1	-	-	-

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

Title of the Course Chemistry Lab
Category BSC
Couse Code 20AC23L

Year I Year
Semester II Semester
Branch EEE, ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
0	0	3	1.5

Course Objectives:
- To familiarize the students with the basic concepts of chemistry
- To train the students on how to handle the instruments.
- To familiarize the students with digital and instrumental methods of analysis.
- To expose the students in practical aspects of the theoretical concepts.

List of experiments
From the following list, any 10 experiments must be performed in a semester
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. Conductometric 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 functional groups in the given organic compound
12. Thin layer chromatography

Prescribed Text Books:
1. J. Mendham, R.C Denney, J.D Barnes, M. Thomas, B. Sivasankar Vogel's Quantitative Chemical Analysis 6/e, Pearson publishers, 2009.
2. N.K Bhasin and Sudha Rani Laboratory Manual on Engineering Chemistry 3/e, Dhanpat Rai Publishing Company 2009.

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. explain the functioning of instruments such as pH meter, conductivity meter and potentiometer.	L4
2. estimate Zn, Cr, Fe, Cu and other functional groups in various samples	L2
3. determine physical properties of liquids and synthesize polymers and nanomaterials	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20AC23L 1	3	2	-	-	-	-	-	-	-	-	-	2	-	-	-
20AC23L 2	3	2	-	-	-	-	-	-	-	-	-	2	-	-	-
20AC23L 3	3	2	-	-	-	-	-	-	-	-	-	2	-	-	-

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

Title of the Course Communicative English Lab
Category HSMC
Couse Code 20AC25L

Year I B. Tech.
Semester II Semester
Branch EEE, ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
0	0	3	1.5

Course Objectives:
1. To learn better English pronunciation
2. To use language effectively in everyday conversations
3. To make formal oral presentations using effective strategies in professional life
4. To be exposed to a variety of self-instructional, learner friendly modes of language learning

Detailed Syllabus:
Pronunciation: 6
Introduction to English speech sounds
Learning Outcome:
At the end of the module, the learners will be able to
- understand different accents spoken by native speakers of English and speak in intelligible way

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.
Learning Outcome:
At the end of the module, the learners will be able to
- Adopt better strategies to listen attentively and comprehend attentively

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
Learning Outcomes:
At the end of the module, the learners will be able to
- speak confidently in formal and informal contexts
- comprehend and produce short talks on general topics
- use specific vocabulary to describe different persons, places and objects

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.
Learning Outcome:
At the end of the unit, the student will be able to
- Analyze data given in an infographic and write/speak about it

Minimum Requirements:
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. Lose 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	PSO1	PSO2	PSO3
20AC25L.1	-	-	-	-	-	-	-	-	-	2	-	1	-	-	-
20AC25L.2	-	-	-	-	-	-	-	-	-	1	-	2	-	-	-
20AC25L.3	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
20AC25L.4	-	-	-	-	-	-	-	-	3	2	-	1	-	-	-
20AC25L.5	-	-	-	-	-	-	-	-	1	3	-	3	-	-	-
20AC25L.6	-	-	-	-	-	-	-	-	-	2	-	1	-	-	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Transform Techniques & Complex Variables
Category BSC
Couse Code 20AC32T

Year II B.Tech.
Semester I Semester
Branch EEE & ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:
- To introduce Laplace transforms
- To elucidate the Laplace transforms and their inverses.
- To introduce Fourier Series and Fourier Transform to solve real life problems.
- To describe continuity/differentiability/analyticity of a function and find the derivative of a function;
- To classify and explain complex power series, singularities, calculus of residues and its applications in the evaluation of integrals.

Unit 1 Laplace transforms 10

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).

Learning Outcomes: At the end of the unit, the student will be able to:
- Examine the properties Laplace transform (L4)
- Apply the Laplace transform for elementary functions (L3)

Unit 2 Inverse Laplace transforms 8

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

Learning Outcomes: At the end of the unit, the student will be able to:
- Apply inverse Laplace transform for elementary functions (L3)
- Solve Ordinary differential equations by using Laplace transformation techniques (L3)

Unit 3 Fourier series and Fourier Transforms 11

Fourier series: Dirichlet conditions - functions of any period - odd and even functions - half range series.
Fourier Transforms: Fourier integrals - Fourier cosine and sine integrals - Fourier transform - sine and cosine transform – properties.

Learning Outcomes: At the end of the unit, the student will be able to:
- Determine the Fourier Series expansion for different periodic functions (L3)
- Understand the nature of Fourier series that represent even and odd functions how deviation of a Fourier series can be simplified (L2)
- Examine the properties of Fourier transform (L4)
- Apply the Fourier transform for different functions (L3)

Unit 4 Functions of Complex Variables 10

Continuity - 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).

Learning Outcomes: At the end of the unit, the student will be able to:

- Define continuity and differentiability of complex functions (L1)
- Apply Cauchy-Riemann equations to complex functions in order to determine whether a given function is analytic (L3)
- Make use of Cauchy integral theorem to evaluate certain integrals(L3)

Unit 5 Complex Power series and Residues 9

Complex power series: Taylor's series - zeros of analytic functions – singularities - Laurent's series. Residues: Evaluation of residues - Cauchy residue theorem (without proof).

Learning Outcomes: At the end of the unit, the student will be able to:

- Determine the Taylor and Laurent's expansion of simple functions (L3)
- Determine the nature of singularities and calculating residues (L3)
- Make use of Cauchy residue theorem to evaluate certain integral (L3)

Prescribed Text Books:

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

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 M. Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Understand the Properties of the Laplace transformations.	L2
2. Apply Inverse Laplace transformations to solve the ordinary differential equations in engineering.	L3
3. Study fundamentals of Fourier series and Fourier transforms and apply them to solve Engineering problems.	L3
4. Understand and apply the notation of analytic functions.	L2
5. Apply power series and residue theorem in evaluating the real line integrals.	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20AC32T.1	3	3	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC32T.2	2	2	-	-	-	-	-	-	-	-	-	2	-	-	-
20AC32T.3	3	3	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC32T.4	3	3	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC32T.5	2	2	-	-	-	-	-	-	-	-	-	2	-	-	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Signals and Systems
Category PCC
Couse Code 20A431T

Year II B.Tech.
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

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.

Unit1 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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the Classification of signals and Systems (L2)
- Analyze the Operations on Signals (L4)
- Understand the Fourier Series and its Properties (L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the Fourier Transform and its Properties (L2)
- Evaluate the Fourier Transform of the standard signals (L5)
- Understand the basics of Hilbert Transform (L2)

Unit 3 LTI Systems and Sampling 9

LTI systems, Properties & Transfer function, Filter Characteristics, Distortionless 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 SamplingTechniques,data Reconstruction, Sampling of Bandpass signals.

Learning Outcomes: At the end of the unit, the student will be able to :

- Understand LTI Systems and their Properties (L2, L3)
- Interpret the characteristics of filters and concerned parameters (L3)
- Understand the sampling theorem and corresponding phenomena (L2)

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 autocorrelation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between autocorrelation function and energy/power spectral density function. Relation between convolution and correlation.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the Convolution in time and frequency domains (L2)
- Understand Correlation functions and their properties (L2, L3)
- Understand the spectral density function (L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the Laplace Transform and its properties (L2, L3))
- Understand the Z-Transform and its properties (L2, L3)
- Evaluate the Laplace and Z Transforms of Signals and Region of Convergence (L5).

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 Edition

Reference Books:

1. Simon Haykin and VanVeen, Wiley-Signals & Systems–2nd Edition.

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Understand signal representation methods and operations 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. Analyze 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	PSO3
20A431T.1	3	1	1	1	-	-	-	1	-	-	-	1	3	-	-
20A431T.2	1	3	-	2	-	1	-	-	-	-	-	1	-	3	-
20A431T.3	1	-	2	3	1	-	1	-	-	1	-	3	-	1	-
20A431T.4	3	1	-	-	2	-	-	1	1	-	-	3	-	1	-
20A431T.5	1	1	-	2	-	3	-	1	-	1	-	3	1	-	-

Title of the Course Digital Logic Design
Category PCC
Couse Code 20A432T

Year II B.Tech.
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

The course aims to provide the student with the ability

- 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 Number systems, Codes & Boolean Algebra 9

Philosophy of number 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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the Importance of number systems and conversions (L2)
- Understand the fundamentals of Boolean algebra and logic gates (L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the various forms of boolean functions (L2)
- Implement Boolean functions using digital logic gates (L3)
- Apply minimization techniques to reduce Boolean functions (L4)

Unit 3 Combinational Logic Design & Programmable Logic Devices 9

Design using conventional logic gates-Binary Adders, Subtractors, Ripple Adder, Magnitude comparator, Encoder, Decoder, Multiplexer, De-Multiplexer, Code converters.

Learning Outcomes: At the end of the unit, the student will be able to :

- Design various Combinational Logic Circuits (L6)
- Design Programmable Logic Devices (L6)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the various types of sequential circuits (L2)
- Design of Synchronous Sequential Circuits and Counters (L6)

Unit 5 FSM Minimization 9

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

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the various types Finite state machines (L2)
- Minimize sequential machines (L2)
- Understand the Features of ASM charts (L2)

Prescribed 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 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:

At the end of the course, the 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
20A432T.1	2	-	2	-	2	-	-	1	-	-	2	-	3	-	-
20A432T.2	2	2	2	-	-	1	-	1	-	-	2	-	2	2	-
20A432T.3	2	2	2	-	-	1	-	1	-	-	2	-	-	3	-
20A432T.4	2	2	2	-	-	1	-	1	-	-	2	-	-	3	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Managerial Economics and Financial Analysis
Category HSMC
Course Code 20AC35T

Year II B.Tech.
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To understand the concepts and tools of economic analysis.
- To apply concepts in real life by developing problem solving skills there exists a relationship between Managerial Economics and Financial Accounting.
- To focus on picking up the basics of accounting such as Accounting Data and Financial Statements, which constitute the language of Business.
- The student is exposed and made familiar with journalizing, interpretation and use of Accounting Data

Unit 1 Introduction to Managerial Economics and Demand Analysis 12

Managerial Economics: Meaning and Nature, Definition, Scope, relationship with other areas. Demand Analysis: Definition and types of Demand, Demand Determinants, and Law of Demand and its exceptions, Elasticity of Demand-types, measurement and Significance, Demand forecasting methods.

Learning Outcomes: At the end of the unit, the student will be able to:

- Remember the scope and relationship with other areas of Managerial Economics. (L1)
- Explain types of demand and demand forecasting methods. (L2)

Unit 2 Production and Cost Analysis 10

Production: Production Function, Cobb-Douglas Production function, Iso-quants and Iso-costs, MRTS, Least Cost Combination of Inputs, Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost concepts, Determinants of cost, cost-output relationship in short run and Long run. Break-Even Analysis (BEA): Objectives, Assumptions, Importance, Graphical representation, Limitations, simple numerical problems.

Learning Outcomes: At the end of the unit, the student will be able to:

- Remember production function and economies of Scale. (L1)
- Differentiate cost concepts. (L4)
- Explain BEP concepts in practically. (L1)

Unit 3 Market Structure and Forms of Business Organizations 12

Markets: Perfect market, imperfect market- Monopoly, Monopolistic and Oligopoly Markets. Price-output determination in perfect competition and monopoly in long run and short run. Forms Of Business Organizations: Definition, Forms of Business Organizations-Private Sector-sole proprietorship, Partnership, Joint Hindu family business, co-operative societies, joint stock companies. Public Sector- Departmental organizations, public corporations, government companies.

Learning Outcomes: At the end of the unit, the student will be able to:

- State the functions of different forms of business organizations. (L1)
- Define Perfect market, imperfect market- Monopoly, Monopolistic and Oligopoly Markets(L1)

Unit 4 Capital and Capital Budgeting 10

Capital: Definition of Capital and its significance, Types of Capital, Sources of raising Capital. Capital Budgeting: Definition, Nature and scope of capital budgeting, features of capital budgeting, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method, Profitability Index Method (Simple Problems).

Learning Outcomes: At the end of the unit, the student will be able to:

- Remember types and Sources of raising Capital. (L1)
- Compare and select techniques of Investment Analysis.(L4)

Unit 5 Introduction to Financial Accounting and Analysis 10

Financial Accounting: Accounting definition, Principles of accounting, Book Keeping, Journal, Ledger, Trial Balance, Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysis: Definition of Financial Analysis, Ratios and its significance- types- liquidity Ratios, turnover Ratios - solvency Ratios and profitability ratios

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand Financial Accounting Concepts(L1)
- Use Financial Accounting and Analysis in practical life (L3)

Prescribed Text Books:

1. Gupta: Managerial Economics, TMH, 2009
2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2003
3. Mehta P.L., Managerial Economics-Analysis, Problems, Cases, S Chand and Sons,New Delhi, 2001.
4. M.E.Thukaram Rao., Accounting for Managers, New Age International Publishers.
5. T.S, Reddy and Y. Hari Prasad Reddy, Accounting and Financial Management, Margham Publications.

Reference Books:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, PHI, 4th Edition.
3. Suma Damodaran, Managerial Economics, Oxford University Press.
4. Lipsey & Chrystel, Economics, Oxford University Press.
5. Domnick Salvatore: Managerial Economics In a Global Economy, 4th Edition,Thomson.

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Predict the demand for a product or product mix of a company and to analyze various factors influencing demand elasticity.	L1
2. Assess the cost behavior, costs useful for managerial decision making and determine Break Even Point (BEP) of an enterprise.	L2
3. Differentiate private and public sector undertakings in their promotion, incorporation, regulation, administration, legal formalities and existence.	L2
4. List features, steps, merits, uses & limitations of Pay Back, ARR, NPV, PI and IRR methods of Capital Budgeting and compute rank of the projects.	L3
5. 5Analyze, interpret and comment on the financial statements of a business enterprise by using liquidity leverage, coverage and turnover & profitability ratios.	L3 and L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20AC35T.1	2	-	-	-	2	-	2	-	-	-	-	-	-	-	-
20AC35T.2	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
20AC35T.3	2	-	1	-	2	-	-	-	-	-	2	-	-	-	-
20AC35T.4	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
20AC35T.5	2	2	-	-	-	-	2	-	-	-	-	-	-	-	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Analog Circuits
Category PCC
Course Code 20A433T

Year II B.Tech.
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- 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 15

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 of Cascaded Transistor Amplifiers- RC Coupled amplifier, Frequency response of RC Coupled, Direct-coupled and Transformer coupled amplifiers.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the concept of basic amplifiers (L2)
- Design and analysis of single and multistage amplifiers (L4, L6)

Unit 2 Feedback Amplifiers 12

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)..

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the concept of feedback amplifiers (L2)
- Design and analysis of various feedback amplifiers (L4, L6)

Unit 3 Oscillators 10

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..

Learning Outcomes: At the end of the unit, the student will be able to :

- Understand the condition and working principle of oscillators (L2)
- Design and analysis of RC and LC oscillators (L4, L6)

Unit 4 Large Signal Amplifiers 15

Classifications, Class A power Amplifiers- Direct coupled and Transformer Coupled, Class B power Amplifiers-Push-pull and Complementary Symmetry-Transistor power dissipation, Power and Efficiency calculations.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the classification of power amplifiers (L2)
- Predict the efficiencies of various power amplifiers (L5)

Unit 5 Linear Wave Shaping & Non-Linear Wave Shaping 13

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Design Linear wave shaping circuits (L6)

- Design Non-Linear wave shaping circuits (L6)

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:

At the end of the course, the 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 and analyze the feedback amplifiers.	L2
3. Understand the working principle and operation of oscillators	L2
4. Analyze the concepts of large signal amplifiers	L4
5. Design and analyze linear and non-linear wave shaping circuits	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A433T.1	3	3	3	3	3	1	-	-	2	-	-	-	2	3	-
20A433T.2	3	2	3	2	2	-	-	-	2	-	-	-	3	-	-
20A433T.3	3	2	3	2	2	1	-	-	2	-	-	-	2	3	-
20A433T.4	3	3	3	2	2	1	-	-	2	-	-	-	2	3	-
20A433T.5	3	2	3	-	-	-	-	-	2	-	-	-	2	3	-

Department of Electronics and Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

(An Autonomous Institution)

Title of the Course Signals and Systems Lab
Category PCC
Couse Code 20A431L

Year II B.Tech.
Semester I Semester
Branch ECE

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, sawtooth, 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 Wiener-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. Apply 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
20A431L.1	3	1	-	2	-	-	3	-	-	-	-	3	3	3	-
20A431L.2	2	-	3	-	1	-	2	-	-	-	-	2	3	1	-
20A431L.3	1	2	-	3	-	3	-	-	-	-	-	2	2	-	-
20A431L.4	2	3	1	-	1	-	2	-	2	-	2	1	1	1	-

Department of Electronics and Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

(An Autonomous Institution)

Title of the Course Digital Logic Design Lab
Category PCC
Couse Code 20A432L
Year II B.Tech.
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives:

- To 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 the 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 and Mux
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:

Student will be able to	Blooms Level of Learning
1. Design different types of Combinational Logic Circuits	L6
2. Learn about Various Flip- Flops and their Conversions	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
20A432L.1	2	2	2	-	-	1	-	1	-	-	2	-	-	3	-
20A432L.2	2	2	2	-	-	1	-	1	-	-	2	-	-	3	-
20A432L.3	2	2	2	-	-	1	-	1	-	-	2	-	-	3	-

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

Title of the Course Analog Circuits Lab
Category PCC
Course Code 20A433L
Year II B.Tech.
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	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 the Experiments

Design and Simulation of following experiments with Multisim / PSPICE or equivalent software and also verify in Hardware Laboratory with discrete components (minimum of 6 experiments).

1. UJT Characteristics
2. FET characteristics- Drain and Transfer
3. Common Emitter Amplifier
4. Common Source Amplifier
5. Two stage RC-Coupled amplifier
6. Feedback amplifiers - Current / Voltage Series
7. RC Phase shift oscillator
8. Hartley / Colpitt's oscillator
9. Class A / Class B power amplifier
10. Linear wave shaping- RC High Pass and Low Pass circuits
11. Non-linear wave shaping –Clippers
12. Non-linear wave shaping- Clampers

Course Outcomes:

Student will be able to — Blooms Level of Learning

1. Understand the characteristics of FET and UJT — L2
2. Analyze and design single and multistage amplifiers and feedback amplifiers. — L4
3. Design different oscillators with different frequencies. — L6
4. Determine the efficiencies of power amplifiers — L4
5. Design wave shaping circuits — L6

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A433L.1	2	3	2	2	2	-	-	-	-	-	-	-	2	3	-
20A433L.2	2	3	2	2	3	-	-	-	2	-	-	-	2	3	-
20A433L.3	2	3	2	-	3	-	-	-	2	-	-	-	2	3	-
20A433L.4	2	3	1	-	3	-	-	-	-	-	-	-	2	3	-
20A433L.5	2	3	3	2	3	-	-	-	2	-	-	-	2	3	-

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

Title of the Course HDL Programming
Category SC
Couse Code 20A434L

Year II B.Tech.
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
1	0	2	2

Course Objectives:
- To understand the basics of Verilog
- To make the students renown to basics, syntax and semantics of new programming language

Name of the Module
1. HDL based Design Flow
2. Language constructs of Verilog HDL
3. Gate Level Modeling
4. Switch Level Modeling
5. Data Flow Modeling
6. Behavioral Modeling
7. User Defined Primitives
8. Functions & Tasks
9. Realization of FSM.
10. SM Charts
11. Design of Multiplier
12. Realization of Dice Game

Course Outcomes:

At the end of the course, the 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

CO-PO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A434L.1	3	3	3	3	3	-	-	-	3	3	3	1	2	2	2
20A434L.2	3	3	3	3	3	-	-	-	3	3	3	1	2	2	2
20A434L.3	3	3	3	3	3	-	-	-	3	3	3	1	2	2	2
20A434L.4	3	3	3	3	2	-	-	-	3	3	2	1	2	2	2

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Linear IC Applications
Category ESC
Course Code 20A441T

Year II B.Tech.
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- This course will provide the student with the ability
- To 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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the IC Chip size and Circuit complexity (L2)
- Understand the Basic Information of Op-amp (L2)
- Able to analyze the DC & AC Characteristics (L4)

Unit 2 Linear applications of OP-AMP **9**

Inverting and non-inverting summing amplifier, subtractor, adder-subtractor, integrator, differentiator, instrumentation amplifier, V-I & I-V converters..

Learning Outcomes: At the end of the unit, the student will be able to:

- Distinguish Inverting and non-inverting amplifiers (L4)
- Understand the Differentiator and Instrumentation Amplifier (L2)

Unit 3 Non-Linear Applications of OPAMP **9**

Comparators and its applications, Multi vibrators- astable and monostable, Schmitt trigger, Triangular and saw tooth wave generators, Log and antilog amplifiers, precision rectifiers, RC active filters.

Learning Outcomes: At the end of the unit, the student will be able to :

- Understand the Comparators and its applications (L2)
- Analyze astable and monostable vibrators (L4)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the Monostable and Astable operations and their applications (L2)
- Analyze the Schmitt Trigger and 565 PLL (L4)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Explain the Basic DAC techniques (L2)

- Understand the DAC and ADC specifications (L2)

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 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:

At the end of the course, the 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 linear applications .	L6
3. Design Op-Amp circuits for non-linear applications	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
20A441T.1	3	3	3	3	2	-	-	-	1	-	-	-	3	2	-
20A441T.2	3	2	2	3	2	-	-	-	1	-	-	-	2	2	-
20A441T.3	2	3	2	3	2	-	-	-	1	-	-	-	-	3	-
20A441T.4	1	2	2	3	1	2	-	2	-	-	-	-	2	-	1
20A441T.5	1	2	2	2	3	-	-	-	1	-	-	-	3	-	-

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

Title of the Course Numerical Methods and Random Variables
Category BSC
Couse Code 20AC42T

Year II B.Tech.
Semester II Semester
Branch EEE & ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:
- To explain various numerical methods to solve algebraic and transcendental equation and interpolation
- To introduce various numerical methods for evaluating definite integrals and numerical solution of ordinary differential equations
- To describe the measures of central tendency.
- To introduce the basic concepts of probability theory.
- To elucidate probability distribution for solving problems in engineering.

Unit 1 Solutions of algebraic and transcendental equations and Interpolation (10)

Bisection method – Regula Falsi method and Newton-Raphson method.

Finite differences - forward differences and backward differences - Newton's forward interpolation formula and Newton's backward interpolation formula - Lagrange's interpolation formula.

Learning Outcomes: At the end of the unit, the student will be able to:
- Find approximate roots of an equation by using different numerical methods (L3)
- Apply Newton's forward and backward formulae for equal interval (L3)

Unit 2 Numerical Solutions of ordinary differential equations of first order (10)

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, Euler's method, Modified Euler's method - Runge-Kutta method of fourth order.

Learning Outcomes: At the end of the unit, the student will be able to:
- Find integration of a function by using different numerical methods (L3)
- Solve ordinary differential equations by using different numerical schemes

Unit 3 Introduction to statistics (10)

Mean Median and Mode for ungrouped and grouped data.

Correlation - correlation coefficient – Karl Pearson's coefficient - Spearman's rank correlation,

Learning Outcomes: At the end of the unit, the student will be able to:
- Summarize the basic concepts of data science and its importance in engineering (L2)
- Analyze the data quantitatively or categorically measure of averages variability (L4)
- Adopt Correlation methods and principle of least squares, regression analysis

Unit 4 Probability (10)

Axioms of probability - addition theorem of probability - conditional probability- multiplication theorem of probability - Baye's theorem.

Random variables - discrete and continuous - Distribution functions - Mean and variance.

Learning Outcomes: At the end of the unit, the student will be able to:
- Define the terms trail, events, sample space, probability and laws of probability (L1)
- Make use of probabilities of events in finite sample space from experiments (L3)
- Apply Baye's theorem to real time problems (L3)
- Explain the notation of random variable, distribution functions and expected value (L2)

Unit 5 Probability distributions (8)

Probability distributions – Binomial and Poisson distribution - fitting - normal distribution - their properties.

Learning Outcomes: At the end of the unit, the student will be able to:

- Apply binomial, passion distributions for real data to compute probabilities, theoretical frequencies (L3)
- Interpret the probabilities of normal distribution and its applications (L2)

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 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:

At the end of the course, the 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 interpolation	L3
2. apply the techniques of numerical differentiation, Integration and numerical solutions of ordinary differential equations to engineering Problems.	L3
3. calculate and interpret the correlation between two variables.	L3
4. analyze the basic concepts of probability and random variables	L4
5. use probability distribution for random variables in Engineering field.	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20AC42T.1	3	3	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC42T.2	3	3	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC42T.3	3	3	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC42T.4	3	3	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC42T.5	2	2	-	-	-	-	-	-	-	-	-	2	-	-	-

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

Title of the Course Communication Systems
Category PCC
Couse Code 20A442T

Year II B.Tech.
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:
- To learn the fundamental concept of analog communication systems
- Acquire basics involved in digital communication
- Impart knowledge of analog and digital pulse modulation techniques
- Review and apply different analog and digital modulation Techniques

Unit 1 Amplitude Modulation 12

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, DSB-SC modulation, generation and detection of DSB-SC modulated waves, SSB-SC generation and detection, vestigial sideband modulation, generation and detection of VSB waves.

Learning Outcomes: At the end of the unit, the student will be able to:
- Describe the Elements of Analog communication system (L3)
- Classify different amplitude modulation methods (L4)
- solve different power relations in AM,DSB,SSB (L6)

Unit 2 Angle Modulation 10

Basic concepts, Frequency Modulation, Single tone frequency modulation, Narrowband FM, Wideband FM, Transmission bandwidth of FM Wave, Generation of FM Waves and Detection of FM Waves: Comparison of FM&AM

Learning Outcomes: At the end of the unit, the student will be able to:
- Classify different angle modulation methods (L4)
- Distinguish Amplitude modulation with Angle Modulation (L4)

Unit 3 Pulse Analog Modulation 8

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

Learning Outcomes: At the end of the unit, the student will be able to:
- Recall the Multiplexing Method (L1)
- Explain and apply different analog pulse modulation methods (L2)

Unit 4 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

Learning Outcomes: At the end of the unit, the student will be able to:
- Describe the Elements of digital communication system (L3)
- Analyze Noise in PCM and DM (L4)
- Distinguish and design different Modulation Schemes(L4)

Unit 5 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 and DEPSK

Learning Outcomes: At the end of the unit, the student will be able to:

- Classify and Review different Generation methods for Digital Modulation schemes (L4)
- Classify and Review different detection methods for Digital Modulation schemes (L1, L4)

Prescribed Text Books:

1. Simon Haykin,JohnWiley-PrinciplesofCommunicationSystems,2ndEd
2. "K.Sam shanmugam" - Digital and Analog communication Systems, Wiley, 2010
3. R.P.Singh & S.D.Sapre - Communication Systems Analog & Digital, TMH, 2008

Reference Books:

1. HTaub & D.Schilling,GautamSahe-PrinciplesofCommunicationSystems,TMH,20073rd Edition
2. John Proakis - Digital Communications, TMH, 1983

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Recall fundamentals of Analog communication system and Demonstrate Analog modulation techniques	L2
2. Analyze Various analog modulation methods and discriminate them	L3
3. Differentiate among different Pulse analog modulation techniques	L3
4. Apply and understand Digital communication system and Demonstrate digital pulse modulation techniques	L3
5. Analyze digital modulation methods and discriminate them	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A442T .1	3	1	-	-	-	1	-	-	-	3	-	3	3	2	-
20A442T.2	3	1	1	-	-	1	-	-	-	3	-	3	3	2	-
20A442T.3	3	1	-	1	-	1	-	-	-	3	-	3	3	2	-
20A442T.4	3	1	-	-	-	1	-	-	-	3	-	3	3	2	-
20A442T.5	3	1	-	-	-	1	-	-	-	3	-	3	3	2	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Electromagnetic Theory
Category PCC
Couse Code 20A443T

Year II B.Tech.
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

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 acquire knowledge on wave propagation in different medias and Transmission lines.

Unit 1 Introduction to Co-ordinate systems and Vector Analysis 12

Introduction to Vector Algebra, Coordinate systems and Transformation: Cartesian, circular cylindrical and spherical, Vector Calculus: Differential length, area and volume, line, surface and volume integrals, del operator and its operations, Divergence theorem, Stoke's theorem, problems.

Learning Outcomes: At the end of the unit, the student will be able to:

- Learn different types of Coordinate systems (L1)
- Understand the vector calculus (L2)

Unit 2 Electrostatics-I 12

Introduction to Electrostatic Fields, Coulomb's Law, Electric Field Intensity, Fields due to continuous Charge Distributions, Electric Flux Density, Gauss's Law and its applications, Electric Potential, Relations between E and V-Maxwell's equations, Energy density, problems.

Learning Outcomes: At the end of the unit, the student will be able to:

- Learn the different law' and its applications (L1)
- Analyze the Electrostatics in free space (L4)

Unit 3 Electrostatics-II 10

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, procedures for solving Poisson's and Laplace's equations, Resistance and Capacitance, problems.

Learning Outcomes: At the end of the unit, the student will be able to :

- Learn the different types of current densities (L1)
- Analyze the electrostatic fields in material space with relevant equations (L4)

Unit 4 Magnetostatic Fields 10

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

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the different laws and its applications (L2)
- Analyze the magnetic forces and different emf (L4)

Unit 5 EM wave Propagation and transmission Lines 12

Introduction, waves in general, Wave propagation in Lossy Dielectrics, Plane waves in Lossless Dielectrics, Free space and Good conductors. Poynting Vector and Poynting Theorem, Reflection of a Plane Wave at Normalincidence, Classification of Electromagnetic waves based on Modes of propagation, Plane earth reflection in ground wave propagation, Super refraction, Wave propagation mechanism, Refraction and reflection of Sky

waves by Ionosphere. Types of transmission lines, Transmission line equation, characteristic impedance, smith chart and its applications.

Learning Outcomes: At the end of the unit, the student will be able to:

- Able to analyze the wave propagation in different media's (L4)
- Able to learn the different transmission lines (L1)
- Analyze the importance of smith chart (L4)

Prescribed Text Books:

1. Elements of Electromagnetics – Matthew N.O. Sadiku
2. ElectromagneticWavesandRadiatingSystems–E.C.JordanandK.G.Balmain
3. John D. Kraus, Ronald J. Marhefka and Ahmad S Khan – "Antennas and Wave Propagation" TMH, 4e, Special Indian Edition 2010.
4. 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.
3. K.D.Prasad - Antenna and wave propagation, Khanna Publications

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Understand the vector algebra, different co-ordinate systems and its transformation and vector calculus.	L2
2. Define the concepts of Electrostatic fields in free space.	L1
3. Analyze the concepts of Electrostatic fields in material space.	L3
4. Understand the Magneto static fields in free space &also understand the Magneto static forces.	L2
5. Analyze EM wave propagation characteristics on different mediums. And also acquire the knowledge on Transmission lines and smith chart.	L2 & L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A443T.1	3	3	3	-	2	-	-	-	-	-	-	-	-	-	-
20A443T.2	3	3	1	-	2	-	2	-	-	-	-	-	-	-	-
20A443T.3	3	3	1	-	2	-	2	-	-	-	-	-	-	-	-
20A443T.4	2	2	-	-	3	-	2	-	-	2	-	-	-	-	-
20A443T.5	3	3	3	2	1	-	1	-	-	2	2	2	1	1	-

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

Title of the Course Advanced Digital Design Concepts
Category PCC
Course Code 20A444T

Year II B.Tech.
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- 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.

Learning Outcomes: At the end of the unit, the student will be able to:

- To know the basics of CMOS and Bipolar logics (L1)
- To understand the comparison of logic families (L2)
- To know the procedure for implementing functions using CMOS and Bipolar logic (L3)

Unit 2 VHDL Elements & Structural Modeling 10

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- To understand the basics of VHDL programming (L2)
- To understand the structural modeling in VHDL programming (L2)
- To write VHDL programming in structural modeling (L3)

Unit 3 Dataflow & Behavioral Modeling 14

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- To understand the behavioral modeling and dataflow modeling in VHDL programming (L2)
- To write VHDL programs in behavioral modeling and dataflow modeling (L3)

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

Learning Outcomes: At the end of the unit, the student will be able to:

- To analyze various combinational circuits (L4)
- To design combinational circuits (L6)

- To write VHDL programming for combinational circuits (L3)

Unit 5 Sequential Logic Design **11**

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

Learning Outcomes: At the end of the unit, the student will be able to:

- To understand the operation of latches, flipflops, counters and shift registers circuits (L2)
- To design sequential circuits (L6)
- To write VHDL programming for sequential circuits (L3)

Prescribed Text 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 Books:

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

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Understand the theory of logic families &interfacing	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
20A444T.1	3	3	3	1	-	-	-	-	-	-	-	-	3	2	2
20A444T.2	-	-	2	-	3	-	-	-	-	-	3	-	3	-	1
20A444T.3	-	-	2	-	3	-	-	-	-	-	3	-	3	-	1
20A444T.4	1	3	3	2	3	-	-	-	-	-	3	-	3	3	3
20A444T.5	1	3	3	2	3	-	-	-	-	-	3	-	3	3	3

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

Title of the Course Life Sciences for Engineers
Category MC
Course Code 20AC44T

Year II B.Tech.
Semester II Semester
Branch EEE, ECE, ME

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	0

Course Objectives:
- To introduce the origin of life.
- To provide the basis for classification of living organisms.
- To describe the transfer of genetic information.
- To introduce the techniques used for modification of living organisms.
- To describe the applications of biomaterials

Unit 1 The Living World (8)
Nature and Scope of Biology, Origin and Evolution of Life, Systematics, Classification of living organisms, Viruses, Prokaryotes and Eukaryotes.
Learning Outcomes: At the end of the unit, the student will be able to:
- Explain the concept of origin of life. (L2)
- Classify the different types of organisms. (L2)

Unit 2 Cell and Cell Division (8)
Plant cell and Animal cell, Structure of the cell: Nucleus, Ribosome's. Molecules of the cell: Nucleic acids, Cell Cycle: Mitosis, Meiosis.
Learning Outcomes: At the end of the unit, the student will be able to:
- Discusses the structure and function of the cell. (L2)
- Differentiate the stages of cell division. (L2)

Unit 3 Physiology of Plants and Animals (12)
Photosynthesis, Respiration: Types of respirations, Glycolysis, TCA Cycle, Nervous system, Endocrine system in animals.
Learning Outcomes: At the end of the unit, the student will be able to:
- Describe the importance of photosynthesis and respiration process. (L1)
- Explain the vital role of Co-ordinate system in animals. (L2)

Unit 4 Genetics (12)
Genetic basis of Inheritance, Mendel's laws, Human genetic disorders: Hemophilia, Colour Blindness, Autosomal abnormalities: Down's, Patau's and Edward's syndromes. Genetic Engineering: Recombinant vaccines, Basis of DNA finger Printing, Animal cloning.
Learning Outcomes: At the end of the unit, the student will be able to:
- Define the gene and its importance in heredity. (L1)
- Describe the effects of gene mutations. (L2)
- Apply the concept of genetic engineering in development of vaccines. (L3)

Unit 5 Biology in Human Welfare (8)
Parasitism, Plasmodium vivax, Wuchereria bancrofti, Health and Disease: Bacterial, Viral diseases: HIV, Biomedical technologies: X-Ray, CT- Scan, MRI- Scan, PET-Scan.
Learning Outcomes: At the end of the unit, the student will be able to:
- Identify the causes of pathogenic diseases and effects on human health. (L1)
- Explain the importance of biomedical techniques. (L2)

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
4. PS Verma | VK Agarwal.Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, S. Chand Publishing, 2004.

Course Outcomes:

Upon successful completion of this course, the student will be able to	Blooms Level of Learning
1. explain stages of Systematics.	L2
2. summarize application of biomolecules.	L2
3. identify DNA as a genetic material in the molecular basis of information transfer.	L3
4. analyze biological processes at the Genetic Engineering.	L4
5. identify the potential of recombinant DNA technology.	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20AC44T.1	2	2	-	-	-	2	-	-	-	-	-	2	-	-	-
20AC44T.2	2	2	-	-	-	2	-	-	-	-	-	2	-	-	-
20AC44T.3	3	3	-	-	-	3	-	-	-	-	-	3	-	-	-
20AC44T.4	3	3	-	-	-	3	-	-	-	-	-	3	-	-	-
20AC44T.5	2	2	-	-	-	2	-	-	-	-	-	2	-	-	-

Department of Electronics and Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

(An Autonomous Institution)

Title of the Course Linear IC Applications Lab
Category ESC
Couse Code 20A441L

Year II B.Tech.
Semester II Semester
Branch ECE

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. Adder using Op-amp
2. Subtractor using Op-amp
3. Active Filter Applications - LPF,HPF(First Order)
4. Function Generator using Op-amps
5. Comparator using IC741
6. Monostable operation using IC-555 timer
7. Astable operation using IC-555 timer
8. Schmitt Trigger
9. 4-Bit DAC using Op-amp
10. PLL Applications(AM & FM)

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
20A441L.1	2	3	2	2	-	-	-	2	-	-	-	-	3	-	1
20A441L.2	3	3	2	2	-	-	-	2	-	-	-	-	3	-	-
20A441L.3	2	2	3	3	-	-	-	2	-	-	-	-	3	2	-
20A441L.4	2	3	2	2	-	-	-	2	-	-	-	-	3	-	1

Department of Electronics and Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

(An Autonomous Institution)

Title of the Course Communication Systems Lab
Category PCC
Couse Code 20A442L

Year II B.Tech.
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives:

This course will able

- To Discuss the basics of analog and digital modulation techniques.
- To integrate theory with experiments so that the students appreciate the knowledge gained from the theory course.
- To design and implement different modulation and demodulation techniques and their applications.
- To develop cognitive and behavioral skills for performance analysis of various modulation techniques.

Design the circuits and verify the following experiments taking minimum of six from each section shown below.

Section-A

1. AM Modulation and Demodulation
2. DSB-SC Modulation and Demodulation
3. SSB-SC Modulation and Demodulation
4. FM Modulation and Demodulation
5. PAM Modulation and Demodulation
6. PWM Modulation and Demodulation
7. PPM Modulation and Demodulation

Section-B

1. Sampling Theorem
2. Pulse Code Modulation and Demodulation
3. Delta Modulation
4. Time Division Multiplexing
5. FSK Modulation and Demodulation
6. PSK Modulation and Demodulation
7. DPSK Modulation & Demodulation

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Describe about the usage of equipment/components used to conduct the experiments in analog and digital modulation techniques	L6
2. Conduct the experiment based on the knowledge acquired in the theory about modulation and demodulation schemes	L2
3. Analyze the performance of a given modulation scheme to find the important metrics of the system theoretically.	L2
4. Practice the relevant graphs between important metrics of the system from the observed measurements.	L2
5. Compare the experimental results with that of theoretical ones and infer the conclusions.	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A442L.1	2	3	1	-	3	2	-	-	-	3	-	3	3	3	-
20A442L.2	2	3	1	-	3	2	-	-	-	3	-	3	3	3	-
20A442L.3	2	3	1	-	3	2	-	-	-	3	-	3	3	3	-
20A442L.4	2	3	1	-	3	2	-	-	-	3	-	3	3	3	-
20A442L.5	2	3	1	-	3	2	-	-	-	3	-	3	3	3	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Advanced Digital Design Concepts Lab
Category PCC
Course Code 20A444L
Year II B.Tech.
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
0	0	3	1.5

Course Objectives:

- 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

List of the Experiments

Design and Simulation of following experiments with equivalent simulation software using Data Flow, Structural, Behavioral Models (Minimum eight of the following)

1. Design of Logic gates
2. Design of Half adder, Full Adder and Ripple Carry Adder
3. Design of Half Subtractor, Full Subtractor
4. Design of Encoders
5. Design of Decoders
6. Design Mux and Demux
7. Design of Flip-Flops
8. Design of a Comparators
9. Design of One's Counter.
10. Design of Barrel Shifter

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Develop the VHDL code for combinational circuits and sequential circuits	L6
2. Be able to use different 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
20A444L.1	2	2	-	2	-	2	-	-	2	-	-	2	2	3	-
20A444L.2	1	2	-	2	-	2	-	-	1	-	-	2	-	2	-
20A444L.3	2	2	-	2	-	-	1	-	1	-	-	2	2	2	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::RAJAMPET
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Title of the Course Python Programming
Category SC
Couse Code 20A545L

Year II B.Tech.
Semester II Semester
Branch EEE, ME, ECE

Lecture Hours	Tutorial Hours	Practical	Credits
1	0	2	2

Course Objectives:
- 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 apply module design and usage of text files in python programming

Module 1 **Theory Hours: 4, Practice sessions: 6**
Introduction to python programming language, literals, variables and identifiers, operators, expressions and data types. Control Structures: Boolean expressions, selection control, and iterative control.
Learning Outcomes: At the end of the unit, the student will be able to
- Understand the importance of python programming (L2)
- remember control structures and use them in the python programs (L2)

Module 2 **Theory Hours: 3, Practice sessions: 06**
Lists: List structures, lists in python, iterating over lists in python, more on python lists. Dictionaries and sets, tuple.
Learning Outcomes: At the end of the unit, the student will be able to
- Construct python programs using list type (L3)
- Demonstrate programs on dictionaries and sets, tuple. (L3)

Module 3 **Theory Hours: 4, Practice sessions: 06**
Functions: Program routines, more on functions, Module Design: Modules, Top-Down design, python modules
Learning Outcomes: At the end of the unit, the student will be able to
- illustrate the importance of module and use them (L3)
- infer programs on text files (L4)

Module 4 **Theory Hours: 3, Practice sessions: 06**
Text Files: Text File, Using Text files, string processing, exception handling
Learning Outcomes: At the end of the unit, the student will be able to
- describe about text files and use in python programs (L3)
- analyze string processing and exception handling in programming (L4)

Module 5 **Theory Hours: 4, Practice sessions: 06**
Introduction to Object oriented programming: class, three fundamental features of object oriented programming, encapsulation-what is encapsulation, defining classes in python. Inheritance: subtypes, defining subclasses in python, Polymorphism: use of polymorphism.
Learning Outcomes: At the end of the unit, the student will be able to
- describe the fundamentals of object oriented programming (L3)
- reframe programs using class and object in python programming(L5)

Prescribed Text Books:

1. Introduction to Computer Science Using Python: A Computational Problem-Solving Focus, Charles Dierbach.

Reference Books:

1. Python Programming using problem solving approach, Reema Thareja, 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.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand computational problem solving and basic elements of python programming.	L2
2. Construct python programming basic constructs like lists, tuple, dictionaries, and sets.	L3
3. Implement string processing and exception handling in programming	L5
4. Analyze string processing and exception handling in programming.	L4
5. Reframe programs using class and object in python programming.	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A545L.1	3	-	3	-	-	-	-	-	-	-	-	3	-	-	-
20A545L.2	3	-	3	3	-	-	-	-	-	-	-	3	-	-	-
20A545L.3	3	-	3	3	-	-	-	-	-	-	-	3	-	-	-
20A545L.4	3	-	3	3	-	-	-	-	-	-	-	3	-	-	-
20A545L.5	3	-	3	3	-	-	-	-	-	-	-	3	-	-	-

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

Title of the Course VLSI Design
Category PCC
Couse Code 20A451T

Year III B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- 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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the Various steps involved in fabrication process (L2)
- Analyze the properties of semiconductor materials in MOS fabrication (L4)
- Understand the construction, operation and types of MOS circuits (L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the Various MOS layers representations with colors, design rules for circuit design and limitations of scaling. (L2)
- Design different gates following the design rules. (L6)

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.

Learning Outcomes: At the end of the unit, the student will be able to :

- Design different basic combinational logic functions. (L6)
- Apply the concepts of sheet resistance and area capacitance to analyze the delays. (L3)

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

Learning Outcomes: At the end of the unit, the student will be able to:

- Design different combinational logic circuits. (L6)
- Understand the Various IC Programmable Logic Devices. (L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the concepts of design and verification tools. (L2)
- Analyze and apply the strategies to test ICs at different levels. (L4)

Prescribed Text 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 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:

At the end of the course, the student will be able to — Blooms Level of Learning

1. Understand different IC technologies and their fabrication process. — L2
2. Analyze the basic electrical properties of MOS transistor and design of CMOS and Bi-CMOS inverters. — L4
3. Understand the VLSI design process. — L2
4. Design the gate level and sub system modules. — L6
5. Knowledge on design methods and testing techniques — L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A451T.1	3	3	3	-	3	3	2	-	2	-	2	2	2	2	3
20A451T.2	3	3	3	1	2	2	2	1	2	2	1	2	2	2	2
20A451T.3	3	3	3	2	3	-	-	2	-	-	3	2	2	2	2
20A451T.4	2	3	3	1	2	-	-	1	2	2	2	-	2	2	3
20A451T.5	2	3	3	-	-	-	-	1	3	-	-	-	3	2	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Control Systems
Category PCC
Couse Code 20A452T

Year III B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:
- 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 18

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.

Learning Outcomes: At the end of the unit, the student will be able to:
- Differentiate open loop and closed loop systems(L2)
- Derive the transfer function using block diagram reduction technique(L4)
- Derive the transfer function using mason's gain formula(L4)

Unit 2 Time Response Analysis 16

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. .

Learning Outcomes: At the end of the unit, the student will be able to:
- Identify type and order of different systems (L1)
- Design time domain specifications and steady state error concepts(L4)

Unit 3 Stability Analysis in Time Domain 15

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.

Learning Outcomes: At the end of the unit, the student will be able to :
- Analyze about stability using RH Criteria(L5)
- Analyze about stability using Root locus (L5)

Unit 4 Stability Analysis in Frequency domain 10

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. Introduction to Compensation networks – Lag, Lead and Lag-Lead

Learning Outcomes: At the end of the unit, the student will be able to:
- Derive the frequency domain specifications for system(L3)
- Draw different plots and identify gain margin and phase margin(L3)

Unit 5 State Space Analysis of Continuous Systems 10

Concepts of state, state variables and state model-derivation of state model for physical systems - State transition Matrix and its properties – Solution of linear state equation – Concepts of controllability and observability, Diagonalization.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the concepts state, state variable and state models for physical systems(L2)
- Able to identify the controllability and observability of continuous system.(L1)

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.Eugune, 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:

At the end of the course, the 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
20A452T.1	3	2	1	-	-	-	-	2		2	-	2	2	1	-
20A452T.2	3	2	-	-	-	-	-	-	2	2	-	-	-	1	-
20A452T.3	3	3	-	-	-	-	-	1	2	-	-	2	2	-	-
20A452T.4	-	3	3	-	-	-	-	-	-	-	-	2	-	2	-
20A452T.5	3	3	-	-	-	-	-	-	3	-	-	3	2	-	-

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

Title of the Course Microprocessors and Interfacing
Category PCC
Couse Code 20A453T

Year III B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To understand the basic concepts of first general purpose 8 bit & 16 bit Microprocessors
- To learn the Programming and Interfacing Concepts of Microprocessors

Unit 1 8085 & 8086 Architectures & Programming 14

8085: Salient features, Architecture and Register organization. Architecture of 8086, Register organization, Memory organization, Machine language instruction formats of 8086. Addressing modes of 8086, Instruction set of 8086, Assembler directives, Assembly language programs involving arithmetic, logical, branch and call instructions, sorting, string manipulation. Procedure and Macros.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the features of first 8-bit & 16-bit microprocessors. (L2)
- Learn the programming concepts of 8086 microprocessor. (L2)

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 with8086.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand types of memories and interfacing with 8086. (L2)
- Understand the working principle of DMA. (L2)

Unit 3 I/O Interfacing 12

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.

Learning Outcomes: At the end of the unit, the student will be able to :

- Understand the architectural features of Programmable Peripheral interface. (L2)
- Interface I/O devices with 8086 through 8255.(L3)

Unit 4 Programmable Interrupt Controller - 8259 & Programmable Interval Timer/Counter – 8253 12

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.

Architecture of 8253 programmable interval timer/counter, mode of operations, interfacing with 8086.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the interrupt structure of 8086. (L2)
- Interface programmable devices like 8259 & 8253.(L3)

Unit 5 Communication Interfaces 9

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, IEEE488 bus.

Learning Outcomes: At the end of the unit, the student will be able to:

- Learn various communication interfaces. (L2)
- Understand features and programming concepts of USART. (L2)

Prescribed Text 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 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, 2ndEd.
3. Intel 8086/8088 microprocessor architecture, programming, design and interfacing, Bhupendra singh chabra, Dhanpat Rai publications.

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Understand the Architectural features and programming concepts of8086.	L2
2. Designing the memory interfacing circuit with8086 based on requirement	L6
3. Interface I/O devices with 8086	L6
4. Interface different Programmable devices with 8086.	L6
5. Analyze various communication Interfaces.	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A453T.1	3	-	1	-	2	-	-	-	-	-	-	1	3	2	-
20A453T.2	3	2	2	1	2	-	-	-	-	2	-	1	3	2	-
20A453T.3	3	2	2	-	2	-	-	-	-	2	-	1	3	2	-
20A453T.4	3	2	2	2	2	-	-	-	-	2	-	1	3	2	-
20A453T.5	3	2	3	2	2	-	-	-	-	3	-	2	3	2	-

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

Title of the Course Computer System Architecture
Category PEC-I
Couse Code 20A45AT

Year III B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- Discuss basic structure and organization of computers
- Apply fixed- and floating-point arithmetic algorithms
- Explain micro-operations and input/output organization
- Demonstrate memory design and memory organizations

Unit 1 Basic Structure of Computers and Data Presentation 9

Basic Structure of Computers: Computer types, Functional units, Basic operational concepts, Bus structures, Software, performance, multiprocessors and multi computers.
Data Presentation: Data types, Complements, Data representation: Fixed point and floating-point representations, Error detection codes.
Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the basic principles of Computer Systems (L2)
- Understand various Data Representations (L2)

Unit 2 Register Transfer and Micro operations 9

Register Transfer and Micro operations: Register transfer language, register transfer, Bus and memory transfer, Arithmetic Micro Operations, logic micro-operations, shift micro-operations, arithmetic logic shift unit.
Basic Computer Organization and Design: Instruction codes, Computer registers, Computer instructions, Instruction cycle, memory-reference instructions, input-output and interrupt.
Learning Outcomes: At the end of the unit, the student will be able to:

- Describe Instruction Execution cycle (L2)
- Explain various types of micro operations (L2)

Unit 3 Central Processing Unit and Computer Arithmetic: 9

Central Processing Unit: Stack organization, Instruction formats, Addressing modes, data transfer and manipulation, Program control, reduced instruction set computer.
Computer Arithmetic: Addition and subtraction, multiplication algorithms, Division algorithms
Learning Outcomes: At the end of the unit, the student will be able to:

- Summarize various addressing modes for a Processor (L2)
- Summarize various Arithmetic Algorithms for fixed point Representation (L2)

Unit 4 Micro Programmed Control and Memory Organization 9

Micro Programmed Control: Control memory, Address sequencing, and micro program example.
Memory Organization: Memory hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, virtual memory, memory management hardware.
Learning Outcomes: At the end of the unit, the student will be able to:

- Demonstrate the concept of hierarchical memory organization (L3)
- Explain Selection of address for control memory. (L2)

Unit 5 Input-Output Organization and Multi Processors 9

Input-Output Organization: Peripheral devices, input-output interface, Priority Interrupt, Direct Memory Access, Input-output processor (IOP).

Multi Processors: Characteristics of multiprocessors, interconnection structures, Inter processor Arbitration.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand principles of I/O devices are accessed (L2)
- Understand concepts of Multiprocessors (L2)

Prescribed Text Books:

1. M.Moris Mano, Computer System Architecture, PHI, III Edition, 2006.
2. Car Hamacher, Zvonko Vranesic, SafwatZaky, Car Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, Mc.GrawHill Edition, 2002.

Reference Books:

1. William Stallings, Computer Organization and Architecture, PHI, Seventh Edition, 2006.
2. John P.Hayes, Computer Architecture and Organization, McGraw Hill International editions, 1998.

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Develop the ability and confidence to use the fundamentals of computer organization as a tool in the engineering of digital systems.	L1, L3
2. Classify the impact of instruction set architecture of computer design.	L3, L4
3. Evaluate computer arithmetic operations of binary number system.	L5
4. Design memory organization and control unit operations.	L6
5. Understand different hardware components associated with the input-output organization.	L1, L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A45AT.1	3	2	1	-	-	-	-	-	-	-	-	2	3	2	-
20A45AT.2	-	2	3	-	-	-	-	-	-	-	-	1	-	-	-
20A45AT.3	3	2	3	-	-	-	-	-	-	-	-	2	-	-	-
20A45AT.4	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20A45AT.5	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

Title of the Course Nano Electronics
Category PEC-I
Couse Code 20A45BT

Year III B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To learn the fundamentals of Nano electronics.
- To understand the applications and limitation of ICs.

Unit 1 Introduction 10

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the fundamental of Nano Technology. (L2)
- Learn different types of Microscopies. (L2)

Unit 2 Models of Semiconductor Quantum wells, Quantum Wires and Quantum Dots 10

Semiconductor Hetero structures and quantum wells – Quantum wires and nanowires – Quantum dots and Nanoparticles – Fabrication Techniques for Nanostructures: Lithography, Nano imprint lithography – split-gate technology, self-assembly.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the models of semiconductor Quantum wells.(L2)
- Learn the fabrication techniques for Nano structure. (L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to :

- Analyze the Quantum Electronics. (L4)
- Learn the, Mathematical Approach for QCA. (L2)

Unit 4 Tunneling Devices 10

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), technology SET circuit design, - wiring, drivers, logic and Memory circuits, SET Adder, Comparison between FET and SET circuit design.

Learning Outcomes: At the end of the unit, the student will be able to :

- Understand the Tunneling effect and its applications. (L2)
- Analyze the principle of SET. (L4)

Unit 5 Limits of Integrated Electronics 7

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Learn the Heat dissipation of IC`s. (L2)
- Learn the System Design of Nano systems, and it`s Hardware Architecture. (L2)

Prescribed Text Books:

1. Pradeep, “Nano: The Essentials”, TMH Edition (2008)
2. K. Goser, P. Glosekotter, J. Dienstuhl, “Nano electronics and Nano systems”, Springer Edition (2004)

Reference Books:

1. George W. Hanson, “Fundamentals of Nano electronics”, Pearson Education(2009)

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Learn the basics of microscopy’s and applications.	L1
2. Understand the models of semiconductor quantum wells	L2
3. Knows the fundamentals of Quantum electronics	L1
4. Understands the basics of Tunneling devices and SETs	L2
5. 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
20A45BT.1	3	3	3	2	1	1	-	-	-	3	-	3	3	3	3
20A45BT.2	3	3	3	3	2	2	-	-	-	3	-	3	3	3	3
20A45BT.3	3	3	3	3	2	2	-	-	-	2	-	3	3	3	3
20A45BT.4	3	3	3	3	2	2	-	-	-	2	-	3	3	3	3
20A45BT.5	3	3	3	3	3	3	-	-	-	2	-	3	3	3	3

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

Title of the Course Data Communication Systems
Category PEC-I
Couse Code 20A45CT

Year III B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- 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 Introduction to Data Communications, Networking and Modulation Techniques 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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the standard organizations in data communication and networks. (L2)
- Understand analog and digital modulations. (L2)

Unit 2 Metallic Cable and Optical Fiber Transmission Media 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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the electromagnetic wave transmission. (L2)
- Identify the required type of transmission media. (L1)

Unit 3 Digital Transmission, Multiplexing and T Carriers 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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand various digital transmission schemes. (L2)
- Understand and discriminate among various schemes. (L2)

Unit 4 Wireless Communications Systems 9

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand electromagnetic and radio waves. (L2)
- Understand microwave and satellite communication systems.(L2)

Unit 5 Telephone Instruments and Cellular Telephone Systems 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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Explain the telephone system. (L4)
- Understand the generations of telephone systems. (L2)

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 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:

At the end of the course, the 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:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A45CT.1	3	3	2	3	1	2	1	-	-	3	-	1	3	2	-
20A45CT.2	3	3	2	3	2	2	1	-	-	3	-	1	3	2	-
20A45CT.3	3	3	2	3	2	2	2	-	-	3	-	1	3	2	-
20A45CT.4	3	3	2	3	2	-	-	-	-	3	-	1	3	2	-
20A45CT.5	1	1	2	-	2	2	2	-	-	3	-	1	3	2	-

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

Title of the Course Pulse and Digital Circuits
Category PEC-I
Couse Code 20A45DT

Year III B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To study various wave shaping circuits and their applications.
- To study and acquire knowledge on different circuits that produce non- sinusoidal waveforms.
- To study various voltage time base generators, Logic gates etc.

Unit 1 Linear Wave Shaping **18**

High pass & low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and Exponential inputs. High pass RC network as differentiator, Low pass RC network as integrator, attenuators, ringing circuit.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the operation of High pass & Low pass circuits for different input signals. (L2)
- Understand the concept Attenuators and ringing circuits. (L2)

Unit 2 Switching Characteristics & Non-Linear Wave Shaping **16**

Switching Characteristics of Devices: Diode as a switch, Diode Switching Times, Transistor as a Switch, transistor-switching times

Non-Linear Wave Shaping: Diode clippers, Transistor clippers, clipping at two independent levels, Comparators, clamping operation, clamping circuit taking source and diode resistance into account, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage

Learning Outcomes: At the end of the unit, the student will be able to :

- Understand the switching characteristics of diode and transistor. (L2)
- Identify different clipper and clamper circuits. (L1)

Unit 3 Multivibrators **15**

Design and analysis of Bi-stable, Monostable & Astable Multivibrator with BJT. Schmitt trigger circuit, Symmetrical & Un Symmetrical Triggering of Bi-stable Multivibrator, Monostable Multivibrator.

Learning Outcomes: At the end of the unit, the student will be able to :

- Design different multivibrator circuits. (L6)
- Understand triggering concepts. (L2)

Unit 4 Time Base Generators **10**

Voltage time base generators: General features of a time base signal, methods of generating time base waveform, Principle and working of Miller and Bootstrap time base generators.

Current time base generators: Simple current sweep circuit, linearity correction through driving waveform.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand Miller and Bootstrap time base generators. (L2)
- Understand current time base generators. (L2)

Unit 5 Sampling Gates, Logic Gates and Logic Families **10**

Sampling Gates: Basic operation and principle of Sampling gates, uni-directional diode sampling gate, Bi-Directional diode & Transistor sampling gates, four diode sampling gate and their applications.

Realization of AND,OR,NOT gates using diodes and transistors, Inhibit operation, classification of logic families,

DTL, RTL, DCTL,TTL, and CMOS logic families, comparison of logic families.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the concepts sampling gates and logic families. (L2)
- Design logic gates using different logic families. (L6)

Prescribed Text Books:

1. J. Millman and H. Taub, "Pulse, Digital and Switching Waveforms", McGraw-Hill, second edition, 2007.
2. Anand Kumar, "Pulse and Digital Circuits", PHI, 2005.SecondEdition.

Reference Books:

1. Fundamentals of pulse and digital circuits-Ronald j. Tocci, third edition, 2008.
2. Solid state pulse circuits-David A. Bell, 4th Edition, 2002PHI.

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Design and analyze linear and non-linear wave shaping circuits	L3
2. Design and analyze different multivibrator circuits.	L3
3. Identify and differentiate various time base generators	L1, L2
4. Understand the operation and realization of different sampling gates and logic families	L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A45DT.1	3	-	-	-	3	1	-	-	-	1	-	-	3	-	-
20A45DT.2	3	1	-	-	3	-	-	-	-	-	-	-	3	-	-
20A45DT.3	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
20A45DT.4	3	-	-	-	3	-	-	-	-	-	-	-	3	-	-

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

Title of the Course Water Resources and Harvesting
Category OEC-I
Couse Code 20A15ET

Year III B.Tech
Semester I Semester
Branch ME,EEE, ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To familiarize students about the occupational hazards and remedial measures to say safe at work place.
- To enable students to learn the basics of the environmental management in order to make them job ready.

Unit 1 Water and wastewater 9

Introduction – Water resources (Surface and subsurface) and its significance – Water: distribution on earth, Water quality and standards; Water pollution: Types, sources and impacts – Surface water, ground water pollution, Wastewater: Domestic – black and grey water; industrial and agricultural wastewater. Waste water treatment – Methods.

Learning Outcomes: At the end of the unit, the student will be able to

- Know the significance of surface and sub-surface water resources. (L1)
- Know the impact of waste water on domestic, agricultural and industrial.(L1)

Unit 2 Water Resource Management 10

Hydrological cycle, Precipitation Evaporation and condensation, Groundwater - Classification, Aquifers – types and management. Soil conservation and water recharge. Ground water management and key factors.

Learning Outcomes: At the end of the unit, the student will be able to

- Learn the elements in hydrological cycle. (L2)
- Recharge and preserve subsurface water. (L1)

Unit 3 Rainwater Harvesting 10

Conservation and Harvesting of rain. Types and design of water harvesting structures; catchments – type and methods. Rainwater harvesting-Catchment and roof top harvesting, Check dams, Artificial recharge, Farm ponds, Percolation tanks, traditional rain water harvesting structures

Learning Outcomes: At the end of the unit, the student will be able to

- Know the difficulties in design of water harvesting structures. (L1)
- Know the rain water harvesting techniques. (L1)

Unit 4 Watershed Management 8

Definition, watershed delineation; watershed development: concepts, objectives and need- Integrated and multidisciplinary approach for watershed management- Characteristics of watershed: size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology- Socio-economic characteristics.

Learning Outcomes: At the end of the unit, the student will be able to

- Know Multidisciplinary approaches and characteristics for water shed managements.(L1)
- Know the hydrology, hydrogeology and socio economic characteristics. (L1)

Unit 5 Basin Management 12

Definition, Factors affecting basin management- Preparation of land drainage schemes-Types and design of surface drainage -Controlling of soil erosion and soil characteristics; Estimation of soil loss due to erosion. Water availability assessment – Surface water and groundwater-Water demand assessment: municipal, industrial,

agricultural and environmental-Water allocation - Principles and policies, State and National water conflicts and management.

Learning Outcomes: At the end of the unit, the student will be able to

- Know the schemes of various drainage systems. (L1)
- Assess the availability of water and water demand. (L5)

Prescribed Text Books:

1. Irrigation and Water Resources Engineering- G.L. Asawa, New age international Publisher
2. Watershed management and Field manuals -FAO
3. Watershed management in India, J.V.S. Moorthy, Wiley India.
4. Hydrology & Water Resources Engg. S K Garg, Khanna Pub., Delhi.

Reference Books:

1. Hydraulics &Fluid Dynamics -P.M.Modi and S.M.Seth, Standard book house, Delhi
2. Applied Hydrology - Chow V T., McGraw-Hill, Inc
3. Irrigation, Water Resources & Water Power Engg. P N Modi, New Age Publishers.

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Know about various sustainable materials	L4
2. Understand the concept of sustainable buildings	L3
3. Learn to maximize the efficacy of existing processes.	L4
4. Understand the importance of HVAC	L4
5. Understand the importance of using renewable materials and ambient air quality.	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A15ET.1	-	1	2	-	-	-	3	-	-	-	-	1	-	-	-
20A15ET.2	-	1	1	-	-	-	1	-	-	-	-	1	-	-	-
20A15ET.3	-	1	1	-	-	-	1	-	-	-	-	1	-	-	-
20A15ET.4	-	1	1	-	-	-	1	-	-	-	-	1	-	-	-
20A15ET.5	-	1	1	-	-	-	1	-	-	-	-	1	-	-	-

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

Title of the Course Disaster Management
Category OEC-I
Couse Code 20A15FT

Year III B.Tech
Semester I Semester
Branch ME,EEE, ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:
- To enable the learner to understand how disasters occur and keep them aware about different disasters.
- To enable students to plan measures against different disasters.
- To make students familiar with the topics of crisis, disaster and emergency management techniques.

Unit 1 Introduction to disasters and Natural Disasters 9

Introduction to disasters and Natural Disasters, Definitions Of Risk, Vulnerability and Disasters and Their Relationship; Classification of Disasters; Natural Disasters; Environmental; Floods: Urban Floods; Flash Floods; Cyclones; Earthquakes; Landslides; Avalanches; Mudslides, Impacts of Natural Disasters; Important Case Studies (2006 Tsunami, Covid 19 etc.,).

Learning Outcomes: At the end of the unit, the student will be able to learn
- Various natural disasters and what their preconditions. (L1)
- Impacts of different natural disasters on different aspects of human life. (L1)

Unit 2 Manmade Disaster 10

Classification of Manmade Disasters: Preconditions Various Manmade Disasters; Impacts of Manmade Disasters; Important Case Studies (Bhopal Gas Tragedy, Fukushima Disaster, Ennore Oil Spill, Vizag Styrene Leak).

Learning Outcomes: At the end of the unit, the student will be able to
- Discern between natural and manmade disasters (L1)
- Learn about cascading disasters (L1)
- Find the reasons why manmade disasters happen and how to avert them. (L1)

Unit 3 Crisis and Emergency Management 8

Definition, scope and methods of - Crisis Management, Emergency management; Importance of emergency management.

Learning Outcomes: At the end of the unit, the student will be able to
- Understand the importance of crisis and emergency management. (L4)
- Understand how evacuation drills are conducted and their importance. (L4)
- Devise plans for industrial monitoring and analyze various real-time disasters. (L1)

Unit 4 Disaster Risk Reduction 12

Global and national disaster trends, Common Disasters in India, Disaster management cycle–its phases; prevention, mitigation, preparedness, relief and recovery; structural and nonstructural safety and rehabilitation measures; Roles and responsibilities of government. DRR programs in India and the activities of National Disaster Management Authority

Learning Outcomes: At the end of the unit, the student will be able to
- Understand various phases in disaster management and importance of decision making (L3)
- Learn relating risk, vulnerability and capacity. (L3)
- Know various stages involved in disaster management and various disaster management authorities (L3)

Unit 5 Rehabilitation and Reconstruction 8

Post disaster situations; Rebuilding – Concepts, Types, Guiding Principles of Rehabilitation and Reconstruction Post-Disaster Story: The Tsunami Aftermath

Learning Outcomes: At the end of the unit, the student will be able to

- Understand and analyze dealing with post disaster situations. (L3)
- Learn the importance of incorporating environment in the design. (L3)
- Methods and strategies involved in rebuilding the society. (L3)

Prescribed Text Books:

1. Disaster Management, Dr. Mrinalini Pandey, 2014, Wiley India.
2. Introduction to Emergency Management, Bullock et al., 2020, Elsevier.
3. Techniques for Disaster Risk Management and Mitigation, Mohanty et al., 2020, Wiley.

Reference Books:

1. Harsh K Gupta, Disaster Management, 2003, Universities Press.
2. Larry Collins, Disaster Management and Preparedness, 2001, Lewis Publishers.
3. Li et al., Geomatics Solutions for Disaster Management, 2007, Springer International.

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
Know about various natural disasters and what their preconditions and impacts of different natural disasters on human life.	L1
Learn about cascading disasters and to find the reasons why manmade disasters happen and how to avert them.	L1, L4
Understand how evacuation drills are conducted and their importance, devise plans for industrial monitoring and analyze various real-time disasters.	L3
Learn relating risk, vulnerability and capacity and to know about various stages involved in disaster management and various disaster management authorities.	L3
Understand and analyze the dealing with post disaster situations and methods and strategies involved in rebuilding the society	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A15FT.1	-	1	-	-	-	1	1	1	1	-	-	1	-	-	-
20A15FT.2	-	1	-	-	-	1	1	1	1	-	-	1	-	-	-
20A15FT.3	-	1	1	1	1	1	1	-	-	-	-	-	-	-	-
20A15FT.4	-	-	-	1	1	1	1	-	-	-	-	-	-	-	-
20A15FT.5	1	1	1	1	-	-	1	1	-	1	-		-	-	-

Title of the Course Energy Auditing Conservation and Management
Category OEC-1
Couse Code 20A25ET

Year III B.Tech
Semester I Semester
Branch CE, ME, ECE

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives:

- To illustrate the present scenario of Energy Production and laws associated with it
- To illustrate the Energy conservation Codes
- To develop Management skills and communications of Energy manager/ Energy Auditor
- To illustrate the techniques, procedures, evaluation and energy audit reporting
- To evaluate life cycle costing analysis and return on investment on energy efficient technologies.

Unit 1 Energy Scenario 9

Global and Indian energy Scenario. Energy production, consumption and pricing. Long-term energy scenario. Salient features of Electricity Act 2003. Energy Conservation Act – 2001 and its features. Energy poverty and Human Development Indices, Energy and Human Development, Energy development index; Fing the link between economic growth and energy consumption.

Learning Outcomes: At the end of the unit, the student will be able to

- Discuss the Scenario of energy production (L2)
- Explain the Electricity Act 2003 (L2)

Unit 2 Energy conservation 9

Energy conservation areas, Energy transmission and storage, Plant Lecture wise energy optimization Models, Data base for energy management, Energy conservation through controls, Computer aided energy management, Program organization and methodology. Energy environment interaction, Energy Conservation in Buildings, Energy Efficiency Ratings & ECBC (Energy Conservation Building Code).

Learning Outcomes: At the end of the unit, the student will be able to

- Describe the Energy conservation through controls (L2)
- Discuss the Energy conservation in building with efficiency ratings and code (L2)

Unit 3 Energy Management 9

History of Energy Management, Definition and Objective of Energy Management and its importance. Need of energy management, General Principles of Energy Management, Energy Management Skills, and Energy Management Strategy. Organizing, Initiating and Managing an energy management program. Roles, responsibilities and accountability of Energy Managers

Learning Outcomes: At the end of the unit, the student will be able to

- Explain the importance of Energy management. (L2)

Unit 4 Energy Audit 9

Energy audit concepts, Definition, Need and Types of energy audit. Energy Audit Approach and Methodology. Systematic procedure for technical audit. Describing energy audit costs. Duties and responsibilities of energy auditors. Energy audit instruments and their usage for auditing. Report-writing, preparations and presentations of energy audit reports.

Learning Outcomes: At the end of the unit, the student will be able to

- Discuss the concepts of Energy Audit and its types (L2)
- Write the Energy Audit in the form of Report. (L1)

Unit 5 Economic Analysis 9

Economic analysis methods-cash flow model, time value of money, evaluation of proposals, pay-back method, average rate of return method, internal rate of return method, present value method, life cycle costing approach, Case studies.

Learning Outcomes: At the end of the unit, the student will be able to

- Analyze the benefits of adapting energy efficient equipment's with respect to investment. (L4)
- Analyze the benefits of usage of power factor equipment. (L4)

Prescribed Text Books:

1. Amlan Chakrabarti, Energy Engineering and Management, PHI learning, 2nd edition, 2011.
2. Smith CB, Energy Management Principles, science direct, 2nd edition, 2016.
3. Hamies, Energy Auditing and Conservation; Methods, Measurements, Management & Case discuss. Hemisphere Pub. Corp: Washington, 1980
4. Umesh Rathore, Energy management, S.K.Kataria&Sons,2nd edition,2014

Reference Books:

1. W.R.Murphy, G.Mckay, Energy Management, Butterworth-Heinemann Ltd, 2nd edition, 2009
2. Archie, W. Culp, Principles of Energy Conservation, McGraw Hill, 1979
3. Munasinghe, Mohan Desai, Ashok V, Energy Demand: Analysis, Management and Conservation, Wiley Eastern Ltd., New Delhi.1990.
4. A. J. McMichael, D. H. Campbell-Lendrum, C. F. Corvalan, K. L. Ebi, A. Githeko, J. D. Scheraga, A. Woodward, Climate Change and Human Health Risks and Responses, 2003.

Web Resources:

1. www.bee-india.org
2. https://www.youtube.com/watch?v=6vOg-u7c1IE
3. https://www.youtube.com/watch?v=M1zijCmeXJg
4. https://www.youtube.com/watch?v=2zWt-pBCU2I&t=80s

Course Outcomes:

At the end of the course, Student will be able to	Blooms Level of Learning
1. Describe the energy scenario and laws associated with it.	L2
2. Discuss the technical and commercial aspects of energy conservation	L2
3. Analyze the energy management	L4
4. Discuss the significance and procedure for Energy Audit.	L2
5. Evaluate the pay back periods for energy savings equipment	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
20A25ET.1	3	2	-	2	-	-	3	-	-	-	-	2	-	-
20A25ET.2	2	2	-	2	-	-	2	-	-	-	-	1	-	-
20A25ET.3	3	2	-	2	-	-	2	-	-	-	-	-	-	-
20A25ET.4	3	2	-	2	-	-	2	-	-	-	-	1	-	-
20A25ET.5	2	2	-	1	-	-	2	-	-	-	-	1	-	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::RAJAMPET
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Title of the Course Electric Vehicles
Category OEC-1
Couse Code 20A25FT

Year III B.Tech
Semester I Semester
Branch CE, ME, ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To study fundamentals of electric vehicles and its configuration.
- Discuss different energy sources used in Electric Vehicles
- Discuss different types of motors used in Electric Vehicles
- Demonstrate different converters used in Electric vehicles

Unit 1 Introduction to Electric Vehicles (EV) 8

Introduction to EV system, History of EV -Development towards 21st Century, Components of EV System – EV Advantages – Types–EV market - Electric Vehicles for the future.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the working vehicle and recent trends
- Understand Electric vehicle configuration and it's components

Unit 2 Electric Vehicle Mechanics 8

Road way fundamentals, law of motion, vehicle kinetic– Propulsion Power - Velocity and Acceleration - Tractive Power– Energy Consumption Energy Consumption- Electric Vehicle drivetrain.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand Propulsion Power and Energy Consumption.
- Understand Velocity and Acceleration of EV
- Understand the vehicle power drivetrain.

Unit 3 Energy Sources 8

Electric vehicle power source - Battery Basics - Lead-Acid Battery- Nickel-Cadmium Battery- Li-Ion Battery- capacity, state of charge and discharge, specific energy, specific power, Rag-one plot. Alternative Energy Sources- Fuel Cells- Super capacitors etc.

Learning Outcomes: At the end of the unit, the student will be able to:

- Identity the types of power sources for electric vehicle
- Understand the battery usage for electric vehicle
- Learn the different types of batteries.

Unit 4 EV Motors 8

Motor Ratings-sizing, selection of EV motors- Types of EV motors-overview (speed- torque characterizes) of Three-Phase induction Motor - BLDC and Switched reluctance motor.

Learning Outcomes: At the end of the unit, the student will be able to:

- Describe the various types of EV motors.
- Describe the characteristics of EV motors

Unit 5 EV Converters 8

Introduction to Electrical Vehicle converters- DC-DC converter, and DC-AC (PWM) converters.

Learning Outcomes: At the end of the unit, the student will be able to:

- Describe various EV converters.

Prescribed Text Books:

1. Iqbal Hussein, "Electric and Hybrid Vehicles: Design Fundamentals", 2nd edition, CRC Press, 2003.
2. Electric Vehicle Technology Explained – James Larminie, John Lowry – John Wiley & Sons Ltd, – 2003.

Reference Books:

1. James Larminie, John Lowry, "Electric Vehicle Technology", Explained, Wiley, 2003.
2. Hybrid electric Vehicles Principles and applications With practical perspectives -Chris Mi, Dearborn – M. Abul Masrur, David Wenzhong Gao – A John Wiley & Sons, Ltd., – 2011
3. Review of Battery Charger Topologies, Charging Power Levels, and Infrastructure for Plug-In Electric and Hybrid Vehicles – Murat Yilmaz, and Philip T. Krein, – IEEE transactions on power electronics, vol. 28, no. 5, May 2013
4. NPTEL Videos

Web Resources:

1. https://nptel.ac.in/courses/108/106/108106170/
2. https://nptel.ac.in/courses/108/102/108102121/
3. https://nptel.ac.in/courses/108/103/108103009/
4. https://nptel.ac.in/courses/108/106/108106182/

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level ofLearning
• Explain the working of electric vehicles	L2
• Explain power consumption and electric vehicle drivetrain.	L1
• Choose proper energy storage systems for vehicle applications.	L1
• Describe the operation of EV motor and its characteristics	
• Describe different type's converters in EV.	

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A25FT.1	-	2	-	3	-	-	2	-	3	-	-	-	2	2	-
20A25FT.2	3	-	-	2	-	3	-	-	3	-	-	-	2	-	-
20A25FT.3	3	2	2	-	-	-	-	-	2	-	-	-	2	-	-
20A25FT.3	-	3	-	2	-	-	-	-	-	-	-	-	2	2	-
20A25FT.3	3	-	-	3	-	-	2	-	-	-	2	-	2	-	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::RAJAMPET
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Title of the Course Non Conventional Sources of Energy
Category OEC-1
Course Code 20A35ET

Year III B.Tech
Semester I Semester
Branch CE, EEE, ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	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 9

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

Learning Outcomes: At the end of the unit, the student will be able to:

- Gain the knowledge on energy resources. (L1)
- Learn the different types of measuring instruments of solar radiation. (L2)

Unit 2 Solar Energy Collectors 9

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 tratified storage, solar ponds. Solar Applications solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion, potential in India.

Learning Outcomes: At the end of the unit, the student will be able to:

- Gain knowledge on different types of solar collectors. (L1)
- Learn the different types of energy storage systems and applications. (L2)

Unit 3 Wind Energy 8

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

Learning Outcomes: At the end of the unit, the student will be able to:

- Gain knowledge on wind energy and Bio-mass. (L1)
- Know the different types of windmills. (L1)
- Application of biomass energy. (L3)

Unit 4 Geothermal Energy 9

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Gain knowledge on Geothermal & Ocean Energy. (L1)
- Know the types of tidal & wave energy. (L1)
- Know how to extract the energy from Geothermal & Ocean energy. (L1)

Unit 5 Direct Energy Conversion 9

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Know basics of Direct energy conversion. (L2)
- Knowledge on basics of Fuel cells. (L1)

Prescribed Text Books:

1. Tiwari and MK. Ghosal, Renewable energy resources: Basic principles and applications, Narosa publications 2005, ISBN 10: 1842651250 ISBN 13: 9781842651254
2. G.D. Rai, Non-Conventional Energy Sources, khanna publications, 2011, ISBN 10: 8174090738, ISBN 13: 9788174090737

Reference Books:

1. Twidell & Weir, Renewable Energy Sources, Routledge , 3rd Ed.2015,ISBN 9780367200756
2. Non Conventional Energy Resources, B.H.Khan, Mc Graw HIll, 2015, ISBN 1259081397, 9781259081392

Course Outcomes:

At the end of the course, the 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.	L1, L2
2. Acquire the knowledge on different types of collectors and storage systems of solar energy and their applications	L1, L2
3. Achieve sufficient knowledge on Wind energy and Bio-mass energy.	L1, L2
4. Familiarize with the Geothermal and Ocean energy concepts and their potentiality	L1, L2
5. Gain the knowledge on direct energy conversion	L1, L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A35ET.1	3	2	-	-	-	3	3	-	-	-	-	3	-	-	-
20A35ET.2	3	3	-	1	3	3	-	-	-	-	-	3	-	-	-
20A35ET.3	3	2	3	-	-	3	3	-	-	-	-	3	-	-	-
20A35ET.4	3	3	-	-	3	3	-	-	-	-	-	3	-	-	-
20A35ET.5	3	3	-	-	3	3	-	-	-	-	-	3	-	-	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::RAJAMPET
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Title of the Course Industrial Management & Entrepreneurship
Category OEC-1
Course Code 20A35FT

Year III B.Tech
Semester I Semester
Branch CE, EEE, ECE & AIDS

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:
- To create awareness to learn principles, concepts, functions of management
- To learn the concepts of financial management.
- To learn the concepts of production, material &project management.
- To get awareness on Human Resource Management and its functions
- To analyze the need of entrepreneur development.

Unit 1 General management 10

Management definition, functions of management and principles of management. Forms of Business Organization: Salient features of Sole Proprietorship, Partnership, Joint Stock Company; Private Limited and Public Limited companies; Cooperative and Government owned companies; Merits and Demerits of above types;
Marketing Management: Functions of Marketing; Concepts of Selling and Marketing- Difference; Market Research; Product pricing; Distribution channels; Marketing mix (4 Ps); Advertising and sales promotion; Product life cycle

Learning Outcomes: At the end of the unit, the student will be able to
- Explain concepts of management (L2)
- Explain form Business Organization(L2)
- Discuss 4Ps of Marketing (L2)

Unit 2 Financial Management 8

Concept of time value of money; Interest formulae; Present and Future worth amounts for different cash flow patterns; Evaluation of alternative investment proposals (Capital budgeting); Types of Capital-Fixed and Working capital; Working capital management- Factors and Principles; Depreciation- Straight line depreciation, declining balance and Sum of Years digits methods

Learning Outcomes: At the end of the unit, the student will be able to:
- Explain concepts of time value of money, depreciation(L2)
- Evaluation of investment proposals(L3)

Unit 3 Production and Materials Management 12

Functions of Production planning and control; Production systems-Types; Inventory control-Relevant costs, EOQ, Deterministic single item model with static demand, ABC, VED and FSN analysis; Introduction to MRP.
Project management, network modeling-probabilistic model, various types of activity-times estimation-programme evaluation review techniques- Critical Path-probability of completing the project, deterministic model, critical path method -critical path calculation-crashing of simple of networks

Learning Outcomes: At the end of the unit, the student will be able to:
- Production and Materials Management (L2)
- Explain the concept of PERT (L4)
- Demonstrate Project Crashing. (L3)

Unit 4 Human Resources Management 7

Concepts of HRM, Functions of personnel management, human resource planning, recruitment, selection, placement, training and development and performance appraisal. Motivation theories, leadership styles

Learning Outcomes: At the end of the unit, the student will be able to:

- Explain the concept of HRM (L2)
- Distinguish between Personnel Management and HRM (L2)
- Discuss Training and Development methods. (L2)

Unit 5 Entrepreneur Development 8

Introduction, Entrepreneurial characteristics, Functions of an Entrepreneur; Factors affecting entrepreneurship, Role of communication in entrepreneurship; Entrepreneurial Development-Objectives, Need of Training for enterprises; Finance for the enterprises; Product, Process and Plant Design- Product analysis and Product Design process. Steps in process design and Plant Design

Learning Outcomes: At the end of the unit, the student will be able to:

- Outline the functions of an entrepreneur. (L2)
- Discuss product, process & plant design. (L2)

Prescribed Text Books:

1. Industrial Engineering and Operations Management, S.K.Sharma, Savita Sharma and Tushar Sharma.
2. Industrial engineering and production management, Mahajan
3. Operations Management, Joseph G Monk.

Reference Books:

1. Production, Planning and Control, Samuel Eilon.
2. Marketing Management, Phillip Kotler
3. The Essence of Small Business, Barrow colin.
4. Industrial Economics, R.R.Bharatwal
5. Financial Management I.M.Pandey.
6. Projects, Prasanna Chandra.
7. Small Industry Ram K Vepa

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Understand the principles and practices of general management.	L2
2. Understand the various issues of financial management.	L3
3. Acquire knowledge on production and material management & concepts of PERT, CPM & Crashing of simple networks.	L4
4. Learn the functions of personnel management	L3
5. Understand the importance of entrepreneur development	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A35FT.1	3	3	-	-	-	2	-	3	3	3	-	-	-	-	-
20A35FT.2	3	3	-	-	-	-	-	-	-	-	2	-	-	-	-
20A35FT.3	3	3	-	1	-	2	-	3	-	3	2	-	-	-	-
20A35FT.4	-	-	-	-	-	-	--	3	3	3	-	2	-	-	-
20A35FT.5	3	3	2	-	-	2	1	3	3	-	2	-	-	-	-

Department of Electronics and Communication Engineering
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Title of the Course Data Structures using Python
Category OEC-1
Couse Code 20A55FT

Year III B.Tech
Semester I Semester
Branch CE, EEE, ME & ECE

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives:

- To learn basic of data structures.
- To analyze algorithms and understand sets, maps, linked list using python programming
- To apply recursion in python programming and understand hashing operation
- To learn the implementation of binary trees, binary search trees and AVL trees.

Unit 1 **7**

Introduction to Data structures, definition, types of data structures, Array-Based Sequences: Python's Sequence Types, Low-Level Arrays, Dynamic Arrays and Amortization, Efficiency of Python's Sequence Types, Using Array-Based Sequences, Multidimensional Data Sets.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the definition of data structures (L2)
- Remember various data structures (L1)

Unit 2 **11**

Linked list structures: The Singly Linked List, Double linked list, Stacks. The Stack Abstract Data Type, Simple Array-Based Stack Implementation, Reversing Data Using a Stack, Queue, The Queue Abstract Data Type, Array-Based Queue Implementation

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the linear data structure linked list (L2)
- Illustrate Abstract Data types for various data structures (L4)

Unit 3 **9**

Recursion: Recursive functions, properties of recursion, recursion works, recursive applications-recursive binary search, towers of Hanoi, exponential operation. Sorting: Merge sort, Quick sort

Learning Outcomes: At the end of the unit, the student will be able to

- Understands the importance of recursion(L2)
- Use recursion in various examples (L3)

Unit 4 **9**

Binary Trees: The Tree structure, The binary search tree, The Priority Queue Abstract Data Type, Implementing a Priority Queue, heap sort.

Learning Outcomes: At the end of the unit, the student will be able to

- Explain binary tree data structure (L3)
- Demonstrate priority queue and heap sort (L2)

Unit 5 **9**

Pattern-Matching Algorithms: Brute Force, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Tries: Standard Tries, Compressed Tries, Suffix Tries.

Graphs, Graph Traversals, Depth-First Search, Breadth-First Search.

Learning Outcomes: At the end of the unit, the student will be able to

- Describe the pattern matching algorithms (L3)

- Justify the importance of graph data structure (L4)

Prescribed Text Books:

1. Data Structures and Algorithms in Python, Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, Wiley Publications
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. Core Python Programming, R. Nageswara Rao, Dream Tech Press (Wiley India), 2017 Edition
3. Problem solving with algorithms and data structures using python, Bradley Miller, David L. Ranum, Franklin, Beedle& Associates incorporated, independent publishers.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Remember and Understand he basics data structures.	L2
2. Illustrate Abstract Data types for various data structures	L4
3. Use recursion in different examples	L3
4. Explain binary tree, priority queue data structure	L3
5. Justify the importance of pattern matching, tires and graph data structure	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A55FT.1	3	3	3	-	-	-	-	-	-	-	-	2	-	-	-
20A55FT.2	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-
20A55FT.3	3	3	3	-	3	-	-	-	-	-	-	2	-	-	-
20A55FT.4	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
20A55FT.5	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-

Department of Electronics and Communication Engineering
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Title of the Course Database Management Systems
Category OEC-I
Couse Code 20A55GT

Year III B.Tech
Semester I Semester
Branch CE, EEE, ME & ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:
- To understand the role and uses of DBMS in an organization.
- To understand fundamental concepts of Database Management Systems like database design, database languages, and database-system implementation.
- To construct simple and moderately advanced database queries using Structured Query Language (SQL).
- To understand and successfully apply logical database design principles, including E-R diagrams and database normalization techniques.
- To explain the principle of transaction management design.

Unit 1 **9**

Introduction: Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Data Storage and Querying, Transaction Management, Data Base Architecture, Database Users and Administrators, History of Database Systems.

Learning Outcomes: At the end of the unit, the student will be able to
- Explain the Features of Database Management Systems, Architecture of database systems.(L2)
- Define the role of database users (L1)

Unit 2 **10**

Database Design: Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model, Case study: The Internet Shop.

The Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Data Base Design: ER to Relational.

Learning Outcomes: At the end of the unit, the student will be able to:
- Develops an Entity-Relationship model based on user requirements.(L5)
- Defines the basics of the relational data model. (L1)

Unit 3 **9**

SQL and PL/SQL: Introduction to SQL, Data Definition Commands, Data Manipulation Commands, Select Queries, Virtual Tables: Creating View, Altering View, Updating View, Destroying View, Relational Set Operators, SQL Join Operators, Sub Queries and Correlated Queries, Aggregate Functions, Procedural SQL: Stored Procedures, Stored Functions, Triggers, Cursors.

Learning Outcomes: At the end of the unit, the student will be able to:
- Designs SQL queries to create database tables and make structural modifications. (L5)
- Define and enforces integrity constraints on a database. (L1)

Unit 4 **12**

Introduction to Schema Refinement: Problems Caused by Redundancy, Decompositions, Problems Related to Decomposition, Functional Dependencies, Reasoning about FDs, Normal Forms: 1NF, 2NF, 3NF, BCNF, Properties of Decomposition: Lossless Join Decomposition, Dependency Preserving Decomposition, Multivalued Dependencies, 4 NF.

Learning Outcomes: At the end of the unit, the student will be able to:

- Describes Functional Dependency and Functional Decomposition. (L2)
- Applies various Normalization techniques for database design improvement. (L3)

Unit 5 **9**

ACID Properties: Consistency and Isolation, Atomicity and Durability, Transactions and Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control, Performance of Locking, Transaction Support in SQL.

Learning Outcomes: At the end of the unit, the student will be able to:

- Applies transaction processing mechanisms in relational databases.(L3)
- Explain the Concurrency Control and Recovery Algorithms. (L2)

Prescribed Text Books:

1. Silberschatz, Korth, Sudarshan, Database System Concepts. McGraw Hill, 5th Edition.
2. C.J.Date, Introduction to Database Systems. Pearson Education.

Reference Books:

1. Raghu Rama Krishnan, Johannes Gehrke, Database Management Systems, McGraw Hill, Third Edition.
2. Elmasri, Navate, Fundamentals of Database Systems. Pearson Education.
3. Peter Rob, A. Ananda Rao, Carlos Coronel, Database Management Systems, CENGAGE Learning.

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Memorize and recall the basic concepts of Database Systems to examine the applications of database systems.	L1
2. Demonstrate an Entity-Relationship (E-R) model from specifications and to convert the transformation of the conceptual model into corresponding logical data structures.	L2
3. Illustrate database concepts in structure query languages.	L3
4. Analyze the problems with redundancies and eliminate redundancies in a database schema using normalization.	L4
5. Judge the need of concurrency control in transaction management concepts in database systems.	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A55GT.1	-	3	-	3	3	-	-	-	-	-	-	-	-	-	-
20A55GT.2	-	3	3	3	3	-	-	-	-	-	-	-	-	-	-
20A55GT.3	-	3	3	3	3	-	-	-	-	-	-	-	-	-	-
20A55GT.4	-	3	3	3	3	-	-	-	-	-	-	-	-	-	-
20A55GT.5	-	3	3	3	3	-	-	-	-	-	-	-	-	-	-

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

Title of the Course Foundations of Artificial Intelligence and Data Science
Category OEC-I
Couse Code 20A305GT

Year III B.Tech
Semester I Semester
Branch CE, EEE, ME & ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To comprehend the building blocks of AI interms of intelligent agents.
- To understand the main approaches of artificial intelligence such as heuristic search, game search and logical inference.
- Fundamental knowledge of concepts underlying data science and give a hands-on experience with real-world data analysis.
- Demonstrate an understanding of statistics and machine learning concepts that are vital for data science.
- Critically evaluate data visualizations based on their design and use for communicating stories from data

Unit 1 Introduction 9

What is AI? Foundations of AI, History of AI, Agents and environments, The nature of the Environment, structure of agents, Problem solving Agents, Problem Formulation, Uninformed Search Strategies.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understands the basics of AI and Intelligent Systems (L2)
- Represents the problem formulation in real world environment (L3)

Unit 2 Informed Search methods 9

Informed search methods–heuristic Functions, Hill Climbing, Simulated Annealing, A*, Performance Evaluation. Constrained Satisfaction Problems: Constraint Satisfaction Problems like– map Coloring, Crypt Arithmetic, and Backtracking for CSP, Local Search. Adversarial search techniques.

Learning Outcomes: At the end of the unit, the student will be able to:

- Solves a problem for solution using state space search (L5)
- Learns different search methods for problem solving (L1)

Unit 3 Introduction to Data Science 9

What is Data Science: Big Data and Data Science hype – and getting past the hype, why now? – Deification, Current landscape of perspectives, Skill sets needed

Statistics for Data science: Populations and samples, Statistical modeling, probability distributions, fitting a model, Data Description, Probability, Distributions -Discrete and Continuous Distributions, Hypothesis testing, Regression Models – Linear and Multiple Regression models.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understands the fundamental concepts of Data Science (L2)
- Apply the statistical methods for Data science problems (L3)

Unit 4 Data exploration and Data Learning algorithms 9

Exploratory Data Analysis (EDA), Philosophy of EDA, tools for EDA, The Data Science Process, Feature Selection, Feature Generation and Extraction - Feature Selection algorithms – Filters; Wrappers.

Data Learning algorithms: Machine Learning Algorithms, Three Basic Algorithms - Linear Regression - k-Nearest Neighbors (k-NN) - k-means – SVM, Naïve Bayes, Logistic Regression.

Learning Outcomes: At the end of the unit, the student will be able to:

- Performs Exploratory Data Analysis for feature selection and decision making. (L5)
- Understands different Data Learning algorithms (L2)

Unit 5 Data visualization 9

Data visualization and presentation: Basic principles, ideas and tools for data visualization, Examples of inspiring

(industry) projects.

Applications of Data science in Business, Insurance, Energy, Health care, Biotechnology, Manufacturing, Utilities, Telecommunication, Travel, Governance, Gaming, Pharmaceuticals, Geospatial analytics and modeling

Learning Outcomes: At the end of the unit, the student will be able to:

- Design visual representations for processed data (L6)
- Apply data science methods in different application domains (L3)

Prescribed Text Books:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 2nd Edition, Pearson Publication.
2. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from the Frontline. O'Reilly Edition, 2014.

Reference Books:

1. Rich, E. and Knight, K.," Artificial Intelligence", Tata Mc Graw-Hill
2. GeorgeLugar,"AI-StructuresandStrategiesforComplexProblemSolving",4/e,2002,PearsonEducation
3. RobertJ.Schalkolf,ArtificialIntelligence:anEngineeringapproach,McGrawHill,1990
4. PatrickH.Winston,ArtificialIntelligence,3rdedition,Pearson
5. Jure Leskovek, Anand Rajaraman and Jerey Ullman. Mining of Massive Datasets. v2.1 Cambridge University Press. 2014
6. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. UnderstandtheimportanceofartificialIntelligenceinrealworldenvironment	L1, L2
2. Apply the artificial intelligence algorithms for problem solving	L3
3. Understand the key concepts, notations in data science and implement the standard methods of data analysis and decision making	L2, L3
4. Demonstrate the problem of knowledge extraction as combinations of data filtration, analysis and exploration methods	L3
5. Understand the importance of data visualization and the design and use of many visual components for effective communications and applications of data visualization in various domains.	L5, L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A305GT.1	3	3	-	-	-	3		-	3	2	-	2	-	-	-
20A305GT.2	3	3	3	3	-	3	2	-	3	-	-	2	-	-	-
20A305GT.3	3	-	-	-	-	-	-	-	3	-	-	3	-	-	-
20A305GT.4	3	3	3	-	3	-	-	-	3	-	3	3	-	-	-
20A305GT.5	3	3	3	-	3	-	-	-	3	3	3	3	-	-	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Machine Learning
Category OEC-I
Couse Code 20A305HT

Year III B.Tech
Semester I Semester
Branch CE, EEE, ME & ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:
- Formulate machine learning problems corresponding to different applications.
- Understand machine learning algorithms along with their strengths and weaknesses.
- Understand the basic theory underlying machine learning.
- Apply machine learning algorithms to solve problems of moderate complexity.
- Understand different types of learning approaches.

Unit 1 Introduction 9

Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias

Learning Outcomes: At the end of the unit, the student will be able to:
- Explore how to build computer programs that improve their performance at some task through experience. (L4)
- Analyze sample complexity and computational complexity for several learning Problems (L4)

Unit 2 Decision Tree learning & Artificial Neural Networks 9

Decision Tree learning – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning

Artificial Neural Networks – Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptrons, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition Advanced topics in artificial neural networks

Learning Outcomes: At the end of the unit, the student will be able to:
- Analyze artificial neural networks as one of the most effective learning methods currently known to interpret complex real-world sensor data (L4)
- Analyze and solves learning problem using Decision Tree (L5)

Unit 3 Bayesian learning & Genetic Algorithms 9

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm

Genetic Algorithms – Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms

Learning Outcomes: At the end of the unit, the student will be able to:
- Apply the principles of Probability for classification as an important area of Machine Learning Algorithms (L3)
- Illustrates the use of the genetic algorithm approach, and examine the nature of its hypothesis space

search (L3)

Unit 4 Learning Sets of Rules & Analytical Learning 9

Learning Sets of Rules – Introduction, Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First Order Rules, Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction, Inverting Resolution Analytical Learning - Introduction, Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge.

Learning Outcomes: At the end of the unit, the student will be able to:

- Analyze the Instance based algorithms can be used to overcome memory complexity and overfitting problems. (L4)
- Infer the significance of Domain Theories (L2)

Unit 5 Reinforcement Learning 9

Reinforcement Learning – Introduction, The Learning Task, Q Learning, Non-Deterministic Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming

Learning Outcomes: At the end of the unit, the student will be able to:

- Infer that the combined methods outperform both purely inductive and purely analytical learning methods (L3)
- Recognize the importance of Reinforcement Learning in the industry (L1)

Prescribed Text Books:

1. Machine Learning – Tom M. Mitchell, - MGH
2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC) Reference

Reference Books:

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge University Press
2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc., 2001
3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Understand the basic knowledge about the key algorithms of machine learning	L1
2. Learn and use different machine learning algorithms	L2
3. Apply various machine learning algorithms Bayesian learning and genetic approaches	L3
4. Design the classification, pattern recognition, optimization and decision problems using machine learning algorithms	L4
5. Analyze different types of learning approaches	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A305HT.1	3	3	3	1	-	1	-	-	1	-	-	3	-	-	-
20A305HT.2	3	-	3	-	3	-	-	-	-	-	-	3	-	-	-
20A305HT.3	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-
20A305HT.4	3	3	3	-	-	-	-	-	-	-	-	3	-	-	-
20A305HT.5	3	-	3	-	3	-	-	-	-	-	-	3	-	-	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Human Resource Management
Category OEC-I
Course Code 20AE5AT

Year III B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- The course is designed broadly to promote understanding of procurement, development, maintenance, evaluation and overall effective utilization of manpower.

Unit 1 Introduction to Human Resource Management 10

Introduction-Definition-Nature of HRM-Scope of HRM-Functions of HRM-Managerial functions and Operative functions-Role of HRM-Personnel Management and HRM-Competitive challenges influencing HRM- Ethical aspects of HRM.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the differences between Personnel and Human resource Management (L2)
- Identify the ethical issues to be followed in the organization (L1)

Unit 2 Manpower Planning , Job analysis and Job design 12

Introduction to Manpower Planning- Nature of HRP-Need and Importance of HRP in Organizations-Factors affecting HRP-HRP process-Barriers to HRP- Human Resource Information System.
Job analysis: Definitions, Nature of Job analysis, process of Job analysis-methods of collecting job data.
Job design: Definition-Factors affecting Job Design-Job design Approaches.

Learning Outcomes: At the end of the unit, the student will be able to:

- Identify the need of Manpower planning in Organizations' (L1)
- Find the basic requirements of job analysis and job design (L1)

Unit 3 Recruitment and Selection of Human Capital 10

Recruitment: Nature of Recruitment-Purpose and Importance- Factors governing Recruitment-Recruitment process- Sources of Recruitment.
Selection: Nature of Selection-Selection Process- Selection tests-Barriers to effective selection.
Placement and orientation.

Learning Outcomes: At the end of the unit, the student will be able to:

- Determine the requirements of recruitment and selection (L3)
- Prepare himself when attending for different selection tests (L3)

Unit 4 Training and Development 10

Nature of Training and Development-Inputs in Training and development-Benefits of Employee Training-Training Process-Training Methods-Impediments to effective training-Career development: Definition-Initiatives-stages.

Learning Outcomes: At the end of the unit, the student will be able to:

- Extend the dynamic aspects of training and its applicability for the growth of organization(L2)
- Apply Training methods in order to make training effective(L3)

Unit 5 Evaluation and Compensation management 10

Performance Appraisal: Nature-objectives-Appraisal Process-Methods of Appraisal.
Compensation: Objectives-Objectives of Remuneration-Theories of Remuneration-Wage policy in India-Concept of Wages.

Grievance process- Importance and Approaches of Industrial relations-Collective Bargaining.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the various performance appraisal methods in an Organization(L2)
- Finds ways for evaluating compensation related pay in various organizations(L1)

Prescribed Textbooks:

1. K. Aswathappa, Human Resource Management: Text and cases, The McGraw-Hill Companies, 5th Edition,.
2. P.SubbaRao, Personnel and Human Resource Management, Himalaya Publishing House, 5th Revised Edition.

Reference Books:

1. Noe A.Raymond, John Hollenbeck, Barry Gerhart and Patrick Wright, Human Resource Management, Tata McGraw Hill.
2. Ian Beard well& Len Holden, Human Resource Management, Macmillan India Ltd.
3. Ivansevich, Human Resource Management, Tata McGraw Hill, 10th Edition.
4. Dessler Gary, Human Resource Management, Prentice Hall, 10th Edition.
5. Bernardi, Human Resource Management, Tata McGraw Hill, 4th Edition.

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Understand the basics of Human Resource Management.	L2
2. Know the basic requirements of Job and the way of designing the jobs in the organization.	L1
3. Apply different Recruitment and selection techniques in their practical life when attending for recruitment and selection processes.	L3
4. Get awareness of various Training and Development methods in the Organization.	L2
5. Identify various types of performance appraisal methods and compensation designs in the organization.	L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20AE5AT.1	-	-	-	-	-	-	-	2		-	-	3	-	-	-
20AE5AT.2	-	-	1	-	-	-	-		3	-	-	3	-	-	-
20AE5AT.3	-	-	1	-	-	-	-		-	-	3	3	-	-	-
20AE5AT.4	-	-	-	-	-	-	-	3	-	-	3	-	-	-	-
20AE5AT.5	2	-	-	-	-	-	-	-	-	-	-	3	-	-	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Intellectual Property Rights
Category OEC-I
Course Code 20AE5BT

Year III B.Tech
Semester V Semester
Branch CE, ME, EEE, ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To introduce fundamental aspects of Intellectual property rights to student who are going to play a vital role in development and management of innovative projects in industries
- To disseminate knowledge of kinds and types of intellectual property in India and abroad and registration aspects.
- To get aware about current trend in IPR and government steps in fostering IPR

Unit 1 CONCEPT OF PROPERTY 12

Meaning of Property, Kinds of property: Movable and Immovable property; Tangible and Intangible property; Intellectual property; Private and Public property. Possession and ownership.

Learning Outcomes: At the end of the unit, the student will be able to:

- Explain the meaning of property and kinds of properties (L1)
- Able to distinguish between different types of properties (L4)

Unit 2 INTELLECTUAL PROPERTY RIGHTS 12

Introduction and the need for Intellectual Property Rights (IPR), IPR in India – Genesis and Development, Forms of Intellectual Property- Copyright, Trademarks, Patents, Designs, Geographical Indicators, Merchandise, Franchise and Forms of Unfair Competition. Competing rationales of the legal regimes for the protection of Intellectual Property.

Learning Outcomes: At the end of the unit, the student will be able to:

- To get awareness of need for Intellectual Property Rights (IPR) (L1)
- To acquire knowledge in different forms of Intellectual Property- Copyright, Trademarks, Patents, Designs and Geographical Indicators (L2)

Unit 3 COPYRIGHTS & TRADEMARKS 14

Copy Right: Meaning of Copyright, Copyright in literary, dramatic, musical work and cinematograph films Ownership, Assignment, Author's special rights, Importation and infringement, Fair use provisions. Trademarks: Definition; conception of trademarks, Registration, Distinction between trademark and property mark, Standards of proof in passing off action.

Learning Outcomes: At the end of the unit, the student will be able to:

- understand the meaning of Copyright and infringement (L1)
- find the importance of Trademarks and its registration(L1)

Unit 4 PATENTS, DESIGNS AND GEOGRAPHICAL INDICATORS 14

Conception of Patent, Patentable Inventions, Process of obtaining a Patent: application, examination, opposition and sealing of patents; Rights and obligations of a Patentee, International Patents, Transfer of technology, know-how and problems of self-reliant development. Basic provisions related to Designs, Geographical Indicators.

Learning Outcomes: At the end of the unit, the student will be able to:

- understand the role of patent in innovation and Process of obtaining a Patent (L1)
- acquire knowledge about basic provisions related to Designs and Geographical Indicators (L2)

Unit 5 INTERNATIONAL INSTRUMENTS CONCERNINGINTELLECTUAL PROPERTY RIGHTS 10

The Berne Convention, Universal Copyright Convention, The Paris Union, The World Intellectual Property Rights Organization (WIPO), UNESCO, TRIPS, TRIMS, and WTO.

Learning Outcomes: At the end of the unit, the student will be able to:

- become familiar with international instruments concerning intellectual property (L2)
- Able to understand role of The World Intellectual Property Rights Organization (WIPO) and WTO in promoting IPRs (L2)

Prescribed Textbooks:

1. Intellectual Property Rights: Basic Concepts, MMS Karki, Atlantic, 2009.
2. Intellectual Property Rights, Pandey, Neeraj, Dharani, Khushdeep.

Reference Books:

1. Intellectual Property Rights in India: General Isuues and Implications, Dr. PrankrishnaPal, Regal Series.
2. Intellectual Property, W.R. Cornish, Sweet & Maxwell, London, 2012.
3. Principles of Intellectual Property, N.S. Gopalakrishnan & T.G. Agitha, Eastern BookCompany, Lucknow, 2009.

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Gain awareness about Intellectual Property Rights (IPRs).	L2
2. Acquire adequate knowledge in the kinds of Intellectual Property Rights (IPRs).	L1
3. learn the process of patent filing and registration in India	L3
4. Learn the basic concepts of relating to copy rights, trademarks, geographical indications and others Intellectual properties.	L2
5. Gain more insights into the regulatory aspects of Intellectual Property Rights (IPRs). in India	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20AE5BT	1	1	-	-	1	-	-	-	-	-	-	-	-	-	-
20AE5BT	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20AE5BT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20AE5BT	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-
20AE5BT	-	-	-	-	-	-	-	2	-	-	2	-	-	-	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	Literature and Life
Category	OEC
Couse Code	20AC5AT

Year	III B.Tech.
Semester	I Semester
Branch	ME, ECE, EEE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- Identify specific features of major literary genres
- Critically analyze the voices adopted by authors to convey their views on life
- Develop a style of reading and writing aligned with one's personality type.
- To construct a philosophy of life as a foundation for one's growth.

Unit 1 Prose **8**

- Abdul Kalam, "When I Failed"
- Chetan Bhagat, "My Stupid Suicide Plan"
- R.K. Narayan, "Toasted English"

Learning Outcomes: The first module examines the hiatus between aspiration and achievement in the essays of Kalamand Bhagat, the humorous and satirical presentation of common problems in the essays of Narayan. (L3)

Unit 2 Poetry **8**

- W. Shakespeare, "Let me not to the marriage of true minds"
- W.H. Davies, "Leisure"
- Robert Frost, 'The Road Not Taken'

Learning Outcomes: The second module discusses the hope and faith necessary for life in the poems of Shakespeare, Davies, and Frost. (L2)

Unit 3 Drama **12**

- Girish Karnad's Tughlaq

Learning Outcomes: The third module analyses the competitive, cunning, and commercial as well as political life in the play by Karnad (L4)

Unit 4 Drama **12**

- Girish Karnad's Tughlaq (Contd...)

Learning Outcomes: The fourth module analyses the competitive, cunning, and commercial as well as political life in the play by Karnad. (L4)

Unit 5 Short Story **8**

- G G Joshi, "The Letter"
- Katherine Mansfield, "A Cup of Tea"
- J G Rosa, "The Third Bank of the River"
- Anjana Appachana, "Sharmaji"

Learning Outcomes: The fifth module considers the delicate and fragile human feelings of a father, parents, a commoner, a son, a professional, and an employee in the stories of Joshi, Mansfield, Rosa, and Appachana. (L3)

Reference Books:

1. Barnet, S., Burto, W., and CainW.E.2008.An Introduction to Literature. New York: Pearson Longman.
2. Bennett, A., and Royle, N. 2015.ThisThingCalled Literature: Reading, Thinking, Writing. London: Routledge
3. Kusch, C. 2016.LiteraryAnalysis:TheBasics.London: Routledge.
4. Watson, L.E.Ed.1951.Light from Many Lamps. New York: Simon and Schuster.

Course Outcomes:

Upon the successful completion of the course, the student will be able to	Blooms Level of Learning
1. appreciate the close relationship between literature and life	L3
2. protect themselves against their own self-destructive thoughts	L4
3. establish better relationships with their close and distant relatives	L3
4. analyze the arbitrary nature of social and political structures	L3
5. face the challenges of family and business organizations	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20AC5AT.1	-	-	-	-	-	-	-	3	-	-	-	3	-	-	-
20AC5AT.2	-	-	-	-	-	-	-	3	-	-	-	3	-	-	-
20AC5AT.3	-	-	-	-	-	-	-	3	-	-	-	3	-	-	-
20AC5AT.4	-	-	-	-	-	-	-	3	-	-	-	3	-	-	-
20AC5AT.5	-	-	-	-	-	-	-	3	-	-	-	3	-	-	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	Linear Algebra and Numerical Analysis
Category	OEC
Course Code:	20AC5BT
Year and	III B.Tech.
Semester	I Semester
Branch	ME,ECE, EEE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	0

Course Objectives:
- To introduce the concept of vector space.
- To introduce the concept of linear transformation.
- To learn how to apply numerical methods to solve the equations

Unit 1 Vector Space 8
Vector spaces, Subspaces, Linear independence, Basis and dimension, Ordered basis and coordinates.
Learning Outcomes: At the end of the unit, the student will be able to:
- Define Vector space and Subspaces (L1)
- Understand the concept of basis and dimension(L2)

Unit 2 Linear transformations and Inner product spaces 12
Linear transformations, Rank-nullity theorem (without proof), Algebra of linear transformations, Isomorphism, Matrix representation, Change of basis.
Inner products, Norms on Vector spaces, orthogonal and orthonormal sets, Gram-Schmidt process
Learning Outcomes: At the end of the unit, the student will be able to:
- Define linear transformation (L1)
- Understand the concept of rank and nullity (L2)

Unit 3 Solution of simultaneous algebraic equations 10
Iterative methods of solutions-Gauss Jacobi's method, Gauss-Seidal method, Relaxation method. Solution of non-linear simultaneous equations-Newton-Raphson method.
Learning Outcomes: At the end of the unit, the student will be able to:
- Use iteration methods to solve system of linear equations (L3)
- Apply Newton-Raphson method to solve non-linear simultaneous equations (L3)

Unit 4 Numerical solution of Partial differential Equations 10
Introduction-Classification of second order equations, finite difference approximation to partial derivatives, Elliptic equation, solution of Laplace equation, solution of Poisson's equation.
Learning Outcomes: At the end of the unit, the student will be able to:
- Understand the concept of finite difference approximation (L2)
- Utilize the numerical methods to solve partial differential equations (L3)

Unit 5 Numerical solution of heat and wave Equations 8
Parabolic equation, Solutions of one-dimensional heat equation(Explicit & Implicit schemes), Hyperbolic equation, solution of wave equation
Learning Outcomes: At the end of the unit, the student will be able to:
- Define heat and wave equations (L1)
- Understand the concept of explicit and implicit schemes to solve heat and wave equations (L2)

Prescribed Textbooks:

1. A.R. Vasista and J.N. Sharma, Linear Algebra, Krishna Prakashan Media, 2019
2. S. Lang, Linear Algebra, 3rd edition, Springer, 2004.
3. D W Lewis, Matrix Theory, World Scientific, 1991.
4. B. S. Grewal, Numerical Methods in Engineering & Science, 9/e, Khanna Publishers, 2010.

Reference Books:

1. K. Janich, Linear Algebra, Springer, 1994.
2. B. Koleman and D Hill, Elementary Linear Algebra, 9/e, Pearson, 2007.
3. S.S. Sastry, Introductory Methods of Numerical Analysis, 7/e, PHI Publishers, 2014.

Course Outcomes:

Upon successful completion of the course, the student will be able to	Blooms Level of Learning
1. understand the concept of vector spaces	L2
2. understand the concept of Linear transformation	L2
3. apply numerical methods to solve algebraic equations	L3
4. apply numerical techniques to solve partial differential equations.	L3
5. use numerical methods to solve engineering problems	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20AC5BT.1	2	2	-	-	-	-	-	-	-	-	-	2	-	-	-
20AC5BT.2	3	3	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC5BT.3	3	3	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC5BT.4	3	3	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC5BT.5	2	2	-	-	-	-	-	-	-	-	-	2	-	-	-

Title of the Course Constitution of India
Category MC
Couse Code 20AC52T

Year III B.Tech
Semester I Semester
Branch EEE, ECE, ME

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	0

Course Objectives:

- To understand the importance of the constitution
- To learn the structure of executive, legislature, and judiciary
- To understand the philosophy of fundamental rights and duties
- To learn the autonomous nature of constitutional bodies like the Supreme Court and High Court, Controller and Auditor General of India and Election Commission of India.
- To understand the union and state financial and administrative relations

Unit 1 **8**

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the necessity of framed rules of constitution. (L2)
- Understand the process of citizenship. (L2)
- Distinguish fundamental rules from fundamental duties. (L2)

Unit 2 **12**

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, LokSabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand administrative structure of union government. (L2)
- Understand the federal nature of Indian Union. (L2)
- Understand judicial structure at various levels. (L2)

Unit 3 **10**

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

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the administrative structure of state government. (L2)
- Know the power distribution between CM and Governor. (L1)

Unit 4 **8**

Local Administration - District Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Panchayati Raj: Functions PRI: ZilaPanchayat, 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

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand district administrative structure. (L2)
- Understand various kinds of local governance in practice. (L2)
- Know the relevance of local administration in accomplishing grass-root democracy. (L2)

Unit 5 **10**

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

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the autonomous role of ECI in conducting free and fair elections. (L2)
- Understand the need of various National commissions in the uplift of weaker sections. (L2)

Prescribed Textbooks

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:

Upon successful completion of the course, student will be able to	Blooms Level of Learning
1. Understand the 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 citizens of India.	L2
4. Understand the decentralization of power between union, state and local self-government.	L2
5. Understand the operation of constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20AC52T.1	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
20AC52T.2	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC52T.3	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC52T.4	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
20AC52T.5	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-

Department of Electronics and Communication Engineering

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Title of the Course VLSI Design Lab
Category PCC
Couse Code 20A451L

Year III B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives:

1. To understand the programming language Verilog.
2. To analyze the write code for different logic Circuits
3. To observe the functionality of logic Circuits through output waveforms generated.

List of the Experiments (Simulation & Synthesis)- Perform any *EIGHT* of the following:

1. Design of CMOS gates
2. Design of Adder Circuits
3. Design of Multiplexers
4. Design of Demultiplexers
5. Design of Encoders
6. Design of Decoders
7. Design of Flip-Flops
8. Design of ALU.
9. Design of Synchronous Counters.
10. Design of 1-bit RAM Cell.

Course Outcomes:

Student will be able to — Blooms Level of Learning

1. Understand the digital circuits design using Verilog HDL — L2
2. Gain the knowledge on behavior of digital circuit's w.r.to area, speed, power. — L1

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A451L.1	2	2	2	2	2	-	2	-	2	-	-	2	2	2	-
20A451L.2	2	2	2	2	2	-	2	-	2	-	-	2	2	2	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Microprocessors and Interfacing Lab
Category PCC
Couse Code 20A453L

Year III B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives:

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

List of the Experiments

1. Arithmetic operations.
2. Signed Arithmetic operations.
3. ASCII – Arithmetic operations.
4. Addition of two BCD numbers (4-digitseach).
5. Logical Operations
    a. Code conversion.
    b. Identify the parity (even/Odd) of a given byte/word.
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.
7. Sorting using near procedure.
8. LED/Seven Segment Display Interfacing
9. DAC Interfacing.
10. Stepper Motor Interfacing
11. 8251 Interfacing.

Course Outcomes:	Blooms Level of Learning
Student will be able to	
1. Write Assembly Language programs.	L6
2. Understand the operations and applications of microprocessors	L2
3. 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
20A453L.1	3	-	-	-	2	2	-	-	1	-	-	-	3	2	-
20A453L.2	2	3	-	-	3	-	-	-	-	-	-	-	2	3	-
20A453L.3	3	-	-	-	-	-	-	-	-	-	-	1	1	1	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Professional Communication
Category SC
Couse Code 20AC51L

Year III B.Tech
Semester I Semester
Branch EEE, ECE, ME

Lecture Hours	Tutorial Hours	Practice Hours	Credits
0	1	2	2

Course Objectives:

- To understand various strategies of resume building
- To understand interview process and be prepared for facing it
- To learn group discussion techniques
- To learn about professional writing and presentations
- To be aware of managerial skills

Syllabus

Résumé preparation: Structure, formats and styles – planning - defining career objective - projecting one's strengths and skills - creative self-marketing - sample résumés -cover letter.

Interview Skills: Concepts and process - pre-interview planning - preparation body language -answering strategies - frequently asked questions - mock interviews - students taking up the roles of interviewer and interviewee

Group Discussion: Communicating views and opinions - discussing - intervening - agreeing and disagreeing – asking for and giving clarifications – substantiating - providing solutions on any given topics across a cross – section of individuals - modulations of voice and clarity - body language - case study – observation of group behaviors – social etiquette

Presentation Skills (Individual and Team): Collection of data from various sources - planning, preparation, and practice - types of audience - attention-getting strategies – transitions - handling questions from audience **–** dealing with difficult audience

Technical Report Writing: Types of formats and styles, subject matter, clarity, coherence and style, planning – data collection and analysis, report preparation, preparation of figures and tables, references

Managerial skills: Personality traits such as integrity, accountability, assertiveness, adaptability, diplomacy and dynamism - innovative strategies for dealing with different people in different contexts - showcasing live examples, sharing anecdotes and inspiring quotes related to leadership qualities

Learning Resources: Soft Skills lab manual prepared by Dept. of H&S, AITS Rajampet

Course Outcomes:

Upon successful completion of the course, students will be able to	Bloom's Level of Learning
1. Express themselves fluently in social and professional contexts.	L4
2. Make presentations confidently	L5
3. Face interviews confidently and to participate in meetings effectively	L4
4. Participate in group discussions confidently	L4
5. Write technical reports	L4
6. Lead a team as a manager of the group	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20AC51L.1	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-
20AC51L.2	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-
20AC51L.3	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-
20AC51L.4	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-
20AC51L.5	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-
20AC51L.6	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Embedded Systems
Category PCC
Couse Code 20A461T

Year III B.Tech
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To understand concepts of embedded systems.
- To apply the knowledge acquired on the design considerations

Unit 1 Overview of 8051 Microcontroller 20

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. Serial Communication & handling external interrupts.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the architecture of 8051 microcontroller along with its Instruction set.(L2)
- Learn the programming and on-chip Peripherals of 8051 microcontrollers. (L2)

Unit 2 Interfacing of 8051 microcontroller and its applications. 8

Interfacing with switches, display – LED, seven segment display, LCD. Keyboard interfacing, D/A and A/D interfacing, Stepper motor interfacing and sensor interfacing.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand various applications of embedded systems. (L2)
- Learn the interfacing of 8051 microcontroller with its programming skills.(L2)

Unit 3 Introduction and Architecture of Embedded Systems 14

Embedded systems overview, design challenges, Processor technology, IC technology, Design technology, Trade-offs, Hardware Architecture-Embedded systems, Software Architecture, Architecture and categories of Embedded Operating Systems, Application Software, Communication software, Process of generating Executable image, Development/Testing tools.

Learning Outcomes: At the end of the unit, the student will be able to :

- Understand the overview of embedded systems.(L2)
- Learn the Hardware and software architecture of the embedded systems.(L2)

Unit 4 Communication Interfaces 11

Need for Communication interface, RS232/UART, RS 422/RS 485, USB, Infrared, IECE 1394 fire wire, IEEE 802.11, Blue tooth, I2C and CAN Bus.

Learning Outcomes: At the end of the unit, the student will be able to:

- Learn the various communication Interface Protocols.(L2)

Unit 5 Embedded Real Time Operating System 10

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.

Learning Outcomes: At the end of the unit, the student will be able to :

- Understand the architecture of the Kernel.(L2)
- Apply the various operating system principles in embedded system.(L3)

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.
3. Embedded System Design – a unified Hardware/software Introduction-Frank Vahid, Tony.D, Givargis, John Wiely,2002.
4. Embedded Microcomputer systems-Jonathan W.Valvano, Brooks/cole, Thompson Learning.
5. The 8051 Microcontroller and Embedded Systems (2nd Edition) By Muhammad Ali Mazidi, Janice G. Mazidi, Rolin D. McKinley, TMH publications

Reference Books:

1. Computers and Components, Wayne Wolf, Elsevier.
2. Embedded Systems, Raj Kamal, TMH. 2nd edition.2008.,Pearson Ed.,2005
3. An Embedded system Primer-David E.Simon

Course Outcomes:

	At the end of the course, the student will be able to	Blooms Level of Learning
1.	Understand the overview of basic microcontroller.	L2
2.	Learn the interfacing methods for 8051 microcontroller for various applications.	L2
3.	Study the fundamental concepts and architecture of the embedded systems.	L4
4.	learn the various communication Interface Protocols	L5
5.	Understanding the basic principles of real time operating systems.	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A461T.1	3	2	1	2	2	-	1	-	2	-	1	2	3	-	-
20A461T.2	3	3	3	2	-	-	2	-	1	2	1	2	2	-	-
20A461T.3	3	3	2	2	-	2	1	-	2	-	2	1	-	2	-
20A461T.4	2	3	3	2	2	1	-	1	2	-	-	1	-	-	1
20A461T.5	3	3	1	2	-	-	1	-	2	-	1	2	3	-	-

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Title of the Course Microwave Engineering
Category PCC
Course Code 20A462T

Year III B.Tech
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:
- To understand EM Wave theory at microwave frequencies.
- 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.

Learning Outcomes: At the end of the unit, the student will be able to:
- Understand about the Microwave Frequencies and it's Applications.(L2)
- Understand the different types of waveguides and their respective modes of propagation.(L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to:
- Understand the modes of propagation in circular waveguides.(L2)
- Understand the different types of cavity resonators.(L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to :
- Analyze the S-Matrix for different Microwave Junctions. (L4)
- Understand the working mechanism of various Microwave devices.(L2)
- Understand the working of microwave passive circuits such as isolator, circulator, directional coupler, attenuators etc..(L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Analyze the difference between the conventional tubes and the microwave tubes for the transmission of the EM waves. (L4)
- Understand the basic principle of microwave sources.(L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand and analyze various semiconductor solid state devices.(L2)
- Understand about the measurements of different microwave parameters.(L2)

Prescribed Text Books:

1. Samuel Y. Liao, PHI- Microwave Devices and Circuits, 3rd Edition, 2003
2. Microwave and Radar Engineering, M Kulkarni– Umesh Publications, 1998.

Reference 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:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Ability to solve 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
20A462T.1	1	3	3	1	-	-	-	-	-	2	-	-	-	3	-
20A462T.2	-	3	3	-	-	-	-	-	-	2	1	-	-	3	-
20A462T.3	-	3	3	-	1	-	-	-	-	-	-	-	-	3	1

Department of Electronics and Communication Engineering
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Title of the Course Digital Signal Processing
Category PCC
Couse Code 20A463T

Year III B.Tech
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To do analysis of signals & systems (discrete) using time domain & frequency domain methods.
- To understand application of Discrete Fourier series and Transforms
- To learn design techniques and applications of Digital signal processing

Unit1 Introduction and Discrete Fourier Series 15

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the Classification of discrete time signals and systems.(L2)
- Analyze the Operations on Sequences. (L4)
- Understand the DFT and its Properties.(L2)

Unit2 Fast Fourier Transforms 10

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

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the FFT Algorithm.(L2)
- Evaluate the DFT of sequences using FFT Algorithms.(L5)
- Understand the FFT for composite N.(L2)

Unit 3 IIR and FIR Digital Filters 15

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the design of IIR Filters.(L2)
- Evaluate the Z Transform of different sequences. (L5)
- Understand the design of FIR Filters.(L2)

Unit4 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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the Multirate digital signal processing.(L2)
- Understand the multi stage implementation of sampling rate conversion.(L2)

Unit5 Applications of Digital Signal Processing 10

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

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the Applications of digital signal processing.(L2)

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 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& L2
3. Understand the concepts of decimation and interpolation	L2
4. know the applications in Real life	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A463T.1	2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
20A463T.2	2	3	3	3	-	-	-	-	-	-	3	2	3	3	-
20A463T.3	-	3	3	3	2	-	-	-	-	-	3	-	3	3	-
20A463T.4	-	-	3	3	2	1	-	-	-	-	3	2	3	3	1

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

Title of the Course Electronic Measurements and Instrumentation
Category PEC - II
Course Code 20A46AT

Year III B.Tech
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:
- 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-Milli ammeter. Digital voltmeters (DVMs): Ramp type & dual slope integrator, Digital Multimeter.

Learning Outcomes: At the end of the unit, the student will be able to:
- Explain the significance of measurement system.(L2)
- Describe characteristics of different instruments.(L2)
- Analyze the circuits for measuring Voltage, Current and Resistance. (L4)

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.

Learning Outcomes: At the end of the unit, the student will be able to:
- Understand various types of Signal generators and signal analyzers.(L2)
- Describe the working of Simple frequency Counter.(L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to :
- Explain the working of CRO.(L2)
- Compare different types of Oscilloscopes. (L5)

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.

Learning Outcomes: At the end of the unit, the student will be able to:
- Analyze the performance of various types of DC and AC bridges. (L4)
- Describe the principle of operation of Q-meter.(L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Explain the importance of Transducer.(L2)
- Illustrate different types of transducers and Recorders.(L3)

Prescribed Text Books:

1. Electronic Instrumentation and Measurements, Third edition – David A. Bell, Eastern Economy Edition, PHI, 2013.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PEARSON Education.

Reference Books:

1. Electronic instrumentation, Third edition - H.S.Kalsi, Tata McGraw Hill, 2018.
2. A course in electrical and electronic measurements and instrumentation. A.K.Sawhney., Dhanpat Rai& Co publishers.

Course Outcomes:

At the end of the course, the 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
20A46AT.1	3	3	3	-	3	-	-	-	-	-	-	3	3	3	-
20A46AT.2	3	-	-	-	3	-	-	-	-	-	-	3	3	-	-
20A46AT.3	3	3	3	-	3	-	-	-	-	-	-	3	3	3	-
20A46AT.4.	3	3	3	-	3	-	-	-	-	-	-	3	3	3	-
20A46AT.5	3	-	-	-	3	-	-	-	-	-	-	3	3	-	-

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

Title of the Course Digital System Design
Category PEC-II
Couse Code 20A46BT

Year III B.Tech
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To Understand Concept of digital system designs.
- To analyse 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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the function of ASM charts, HDL & state tables.(L2)
- Design the sequential circuits using ROMs and PLAs. (L6)

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

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the different faults classes and models.(L2)
- Diagnosis and analyze the functions of combinational circuits with different techniques. (L4)

Unit 3 Fault Diagnosis In Sequential Circuits 12

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

Learning Outcomes: At the end of the unit, the student will be able to:

- Diagnosis and analyze the functions of sequential circuits with different techniques. (L4)
- Gain the knowledge in how to design a fault detection circuits. (L1)

Unit 4 Programming Logic Arrays & Testing 12

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

Learning Outcomes: At the end of the unit, the student will be able to:

- Learn how to design the circuits using PLA's.(L2)
- Design the testable PLA designs. (L6)

Unit 5 Asynchronous Sequential Machine 9

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

Learning Outcomes: At the end of the unit, the student will be able to:

- Acquire a knowledge on asynchronous sequential machine concepts like flow tables and state reductions.(L1)
- Understand how to evaluate minimal closed covers, races, cycles and hazards.(L2)

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 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:

At the end of the course, the 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
20A46BT.1	1	3	3	3	2	-	-	-	-	-	2	-	3	2	2
20A46BT.2	3	3	3	3	3	1	-	-	-	-	3	-	3	-	1
20A46BT.3	3	3	3	3	3	1	-	-	-	-	2	-	3	-	1
20A46BT.4	3	3	3	3	3	-	-	-	-	-	3	-	3	3	3
20A46BT.5	3	3	3	3	2	-	-	-	-	-	1	-	3	3	3

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

Title of the Course Radar Engineering
Category PEC-II
Couse Code 20A46CT

Year III B.Tech
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:
- 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 12
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
Learning Outcomes: At the end of the unit, the student will be able to:
- Understand the basic concept of Radar.(L2)
- Learn the Working Principle of Pulse Radar.(L2)
- Analyze the signal to noise ratio & losses of Radar System.(L4)

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.
Learning Outcomes: At the end of the unit, the student will be able to:
- Understand the Working Principle of CW & FM-CW Radar.(L2)
- Learn the fundamental operation of Altimeter &Multiple Frequency CW Radar.(L2)

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.
Learning Outcomes: At the end of the unit, the student will be able to :
- Understand the working principles of various MTI Radars.(L2)
- Analyze the concepts of Delay Line Cancellers and solve problems.(L4)

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
Learning Outcomes: At the end of the unit, the student will be able to:
- Understand the working principles of various Tracking Radars.(L2)
- Learn the various acquisition patterns of Tracking Radar.(L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Analyze the concepts of matched and Non-matched filter receivers. (L4)
- Analyze the noise figure & noise temperature of Radar systems. (L4)
- Understand the concepts of Radar Displays & Duplexers.(L2)

Prescribed Text Books:

1.Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd Edition, 2007

Reference Books:

1.Radar Principles – Peebles, Jr., P.Z.Wiley, New York, 1998

Course Outcomes:

At the end of the course, the 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
20A46CT.1	1	3	3	-	-	-	-	2	-	1	2	3	2	-	-
20A46CT.2	1	3	3	-	-	2	-	2	-	-	2	3	2	2	-
20A46CT.3	1	3	3	-	-	2	-	2	-	-	3	3	1	-	1
20A46CT.4	1	3	3	-	-	2	-	2	-	-	2	3	-	1	-
20A46CT.5	1	3	3	-	1		1	2	-	-	2	3	1	-	-

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

Title of the Course Antennas and Wave Propagation
Category PEC-II
Couse Code 20A46DT

Year III B.Tech
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:
- 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.
Learning Outcomes: At the end of the unit, the student will be able to:
- Understand the basic antenna parameters such as directivity gain.(L2)
- Analyze fields oscillation and antenna dual nature. (L4)

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.
Learning Outcomes: At the end of the unit, the student will be able to:
- Design antenna arrays like BSA and EFA. (L6)
- Design parasitic arrays – yagi Uda antenna.(L6)

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..
Learning Outcomes: At the end of the unit, the student will be able to :
- Analyze design considerations of Horn and helical antennas. (L4)
- Study the advantages applications of various antenna types.(L2)

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.
Learning Outcomes: At the end of the unit, the student will be able to:
- Analyze the differences between flat earth and curved earth in propagation. (L4)
- Study the different wave environments.(L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the wave reflection refraction and super refraction.(L2)
- Understand the wave mechanisms.(L2)

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 Books:

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

Course Outcomes:

At the end of the course, the 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
20A46DT.1	3	3	3	2	-	-	-	-	-	2	-	-	3	2	1
20A46DT.2	2	2	3	2	-	-	-	-	-	2	-	2	3	2	1
20A46DT.3	1	1	3	3	-	1	1	-	-	-	-	1	3	2	1
20A46DT.4	2	2	2	2	-	2	2	-	-	2	-	2	3	2	3

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

Title of the Course	Essence of Indian Traditional Knowledge
Category	MC
Couse Code	20AC63T

Year	III B.Tech
Semester	II Semester
Branch	EEE, ECE, ME

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	0

Course Objectives:

- To learn basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
- To understand Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature in modern society with rapid technological advancements and societal disruptions.
- To understand Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.
- To understand Indian philosophical traditions, Indian linguistic Tradition, and Indian artistic tradition.

Unit 1 **10**

Indian Tradition: Fundamental unity of India, India's heroic role in world civilization, The Indian way of life, Introduction to Indian tradition, The Scientific Outlook and Human Values.

Learning Outcomes: At the end of the unit, the student will be able to:

- Appreciate incorporated traditions in Indian culture. (L1)
- Understand the value of culture and traditions in leading peaceful life.(L2)
- Understand the hidden scientific outlook and imbibed human values in the Indian way of life.(L2)

Unit 2 **10**

Basic structure of Indian Knowledge System: Indian Traditional Scriptures, Exposure to 4-Vedas (the Rigveda, the Yajurveda, the Samaveda and the Atharvaveda) , 4-Upvedas (Ayurveda, Dhanurveda, Gandharvaveda, Sthapatya etc.), 6-Vedangas (Shiksha, Kalp, Nirukta, Vyakaran, Jyotish), 6-Upangas (Dharmashastra, Meemansa, Puranas, Tarkashastra/Logic) etc.

Learning Outcomes: At the end of the unit, the student will be able to:

- Grasp basic structure of Indian knowledge system. (L1)
- Understand the essence of Vedas and their value.(L2)
- Understand the systematic classification of holy scriptures.(L2)

Unit 3 **10**

Indian Knowledge System and Modern Science: Relevance of Science and Spirituality, Science and Technology in Ancient India, Superior intelligence of Indian sages and scientists.

Indian Traditional Health Care: Importance and Practice of Yoga, Pranayama and other prevailing health care techniques.

Learning Outcomes: At the end of the unit, the student will be able to:

- Establish connection between Indian knowledge system and Modern science.(L2)
- Understand spirituality in relation to science.(L2)
- Appreciate the superior intelligence of Indian saints and scientists. (L1)

Unit 4 **8**

Indian Artistic Tradition: Introduction and overview of significant art forms in ancient India such as painting, sculpture, Civil Engineering, Architecture, Music, Dance, Literature etc.

Indian Linguistic Tradition: Ancient Indian languages and literary Heritages, Phonology, Morphology, Syntax and Semantics.

Learning Outcomes: At the end of the unit, the student will be able to:

- Get an overview of significant art forms of ancient India. (L1)
- Understand pioneering efforts of ancient civil engineering technology.(L2)
- Trace the basic Indian linguistic tradition.(L2)

Unit 5 **10**

Indian Philosophical Tradition: (Sarvadarshan)- Nyaya, Viaisheshiika, Sankhya, Yoga, Meemansa, Brief understanding of Philosophy of Charvaka, Bhagwan Mahaveer Jain, Bhagwan Buddha, Kabeer, Guru Nanak Dev and other eminent ancient Indian Philosophers.

Activities: Activities will consist of one assignment on each module, group discussions, presentations, case study on various topics based on above curriculum

Learning Outcomes: At the end of the unit, the student will be able to:

- Find the essence of Indian philosophical tradition.(L2)
- Assimilate the philosophical speculations of different sects and the preachings of eminent philosophers of ancient days.(L2)

Prescribed Text Books

1. Ajwani L.H., Immortal India, Vora& Co. Publishers, 1997.
2. Swami Jitmananda, Modern Physics and Vedanta, BharatiyaVidyaBhavan, 2004.
3. Krishnamurthy,V. Science and Spirituality- A Vedanta Perception, BharatiyaVidyaBhavan, 2002.
4. Sharma D.S., The Upanishads- An Anthology, BharatiyaVidyaBhavan, 1989.
5. Raman V.V., Glimpses of Indian Heritage, Popular Prakashan,1993.

Reference Books:

1. Sivaramakrishnan, V., Cultural Heritage of India- Course Material, BharatiyaVidyaBhavan, Mumbai, 5th Edition, 2014.
2. Capra F., Tao of Physics, Shambhala, 2010.
3. Chaterjee S.C. and Datta D.M., An Introduction to Indian Philosophy, University of Calcutta, 1984.
4. Krishna Chaitanya, Arts of India, Abhinav Publications, 1987.
5. Jha V.N., Language, Thought and Reality.

Course Outcomes:

At the end of the course, the student will be able to	Bloom's Level of Learning
1. Explain basics of Indian tradition and Indian traditional knowledge systems.	L3
2. Describe basics of Indian traditional health care, technologies and its scientific perspectives.	L3
3. Explain basics of Indian artistic, linguistic and philosophical tradition.	L3
4. Co-relate the Indian traditional knowledge in modern scientific perspective.	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20AC63T.1	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC63T.2	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC63T.3	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC63T.4	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Embedded Systems Lab
Category PCC
Couse Code 20A461L

Year III B.Tech
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives:

- To learn the interfacing concepts of embedded systems.
- To develop Embedded Applications.

List of Experiments
(Minimum Eight Experiments to be conducted)

1. Data Transfer and Arithmetic Operations
2. Switch and LED Interfacing
3. LCD Interfacing
4. Serial Transmission
5. Serial Reception
6. Key Pad Interfacing
7. Elevator Interfacing
8. Seven segment Display
9. Door Sensor Buzzer
10. GSM Interfacing.
11. Sorting RTOS
12. Analog Interfacing

Course Outcomes:
Student will be able to Bloom's Level of Learning

1. Understand the interfacing concepts of embedded systems through experimentations L2
2. Verify the applications of real time Embedded system applications. L2

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A461L.1	-	1	3	2	2	-	-	-	2	-	1	2	-	2	-
20A461L.2	3	2	2	3	2	-	2	1	2	-	2	2	3	2	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Microwave Engineering Lab
Category PCC
Couse Code 20A462L

Year III B.Tech
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives:

- To analyze the characteristics of various microwave components using microwave test bench
- To enable the students to know about microwave measurements.

List of the Experiments

1. Study of Reflex Klystron Characteristics.
2. Study of Gunn Diode Characteristics.
3. Study of Attenuation Measurement.
4. Verification of Directional Coupler Characteristics.
5. Determination of VSWR Measurement.
6. Impedance Measurement using smith chart
7. Waveguide parameters measurement
8. Scattering parameters of Circulator
9. Scattering parameters of Magic Tee.
10. Study of Horn Antenna
11. Scattering parameters of E plane Tee
12. Scattering parameters of H Plane Tee

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand applications and testing of microwave components	L2
2. Understand the connections regarding various microwave components	L2
3. Acquire knowledge on Horn antenna	L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A462L.1	2	2	3	-	1	-	3	-	-	2	-	-	2	3	-
20A462L.2	2	2	3	-	-	-	3	-	-	-	-	-	2	3	-
20A462L.3	-	-	3	-	-	-	3	-	-	2	-	-	-	3	-

Department of Electronics and Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

(An Autonomous Institution)

Title of the Course Digital Signal Processing Lab
Category PCC
Couse Code 20A463L

Year III B.Tech
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives:

- The course aims to enable the students to learn and design the concepts of MATLAB in signal processing applications.

List of Experiments

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. Write MATLAB programs.	L6
2. Understand the operations on signals.	L2
3. 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
20A463L.1	-	-	-	1	3	-	2	-	-	-	-	3	-	3	-
20A463L.2	2	2	-	-	3	-	2	-	-	-	-	3	2	3	-
20A463L.3	2	2	-	-	3	-	-	-	-	-	-	3	2	3	-

Department of Electronics and Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

(An Autonomous Institution)

Title of the Course Java Programming
Category SC
Couse Code 20A564L

Year III B.Tech
Semester II Semester
Branch EEE, ME & ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
1	0	2	2

Course Objectives:

- Understand the basic concepts of java programming.
- Analyze and apply concepts like packages, interfaces, and exception handling.
- Implement the multi-threading and GUI applications developed using JAVA.

Module 1 **Theory Hours: 4, Practice sessions: 6**

What is Java? Install Java & Java IDE, First Java Program, Variables and Data Types in Java, Operators in Java, Flow Control Statements in Java, functions in java, arrays in java, Strings in java

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the data types, operators and control statements in Java (L2)
- Know the importance of functions, arrays and strings in Java Programming (L2)

Module 2 **Theory Hours: 3, Practice sessions: 6**

Object-Oriented Programming, Classes and Objects, Encapsulation, Abstraction, Inheritance, polymorphism

Learning Outcomes: At the end of the unit, the student will be able to:

- Demonstrate the importance of object oriented programming (L3)
- Define object oriented concepts (L2)

Module 3 **Theory Hours: 3, Practice sessions: 6**

Packages and Interfaces: Packages, Defining a Package, A Short Package Example, Access Protection, an Access Example, Importing Packages.

Abstract keyword, Interfaces: Defining an Interface, Implementing Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces, Interfaces Can Be Extended

Learning Outcomes: At the end of the unit, the student will be able to:

- Apply packages in the java programs (L3)
- Differentiate abstract class and interfaces (L3)

Module 4 **Theory Hours: 4, Practice sessions: 8**

Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Displaying a Description of an Exception, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Built-in Exceptions

Multithreaded Programming: The Java Thread Model, Thread Priorities, Synchronization, Messaging, The Thread Class and the Runnable Interface, The Main Thread, Creating a Thread, Implementing Runnable, Extending Thread, Choosing an Approach, Creating Multiple Threads

Learning Outcomes: At the end of the unit, the student will be able to:

- Acquire knowledge on multithreading, exception handling and apply the same in developing real time java based applications (L1)
- Construct and classify error and exception handling (L4)

Module 5 **Theory Hours: 3, Practice sessions: 6**

Generics: What Are Generics, Generics Work Only with Reference Types, A Generic Class with Two Type Parameters, The General Form of a Generic Class

JavaFX Basic Concepts, Using Image and Image View, Button, Radio Button, Check Box, Text Field

Learning Outcomes: At the end of the unit, the student will be able to:

- Articulate the generics in java programming (L3)
- Implement JavaFX Basic Concepts in java programs (L5)

Prescribed Text Books:

1. Herbert Schildt Java. The complete reference, TMH, 9th Edition.

Reference Books:

1. J. Nino and F.A. Hosch, An Introduction to programming and OO design using Java, John Wiley& sons.
2. Y. Daniel Liang, Introduction to Java programming, Pearson Education. 6th Edition
3. R.A. Johnson- Thomson, An introduction to Java programming and object oriented application development,

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Understand the importance of data types, operators, functions, arrays and strings in Java Programming.	L2
2. apply reusability concepts like Inheritance, interfaces and packages in real time applications developed using JAVA	L3
3. relate the abstract class and interfaces in java programming	L3
4. Construct and classify error and exception handling	L4
5. Implement genetics and JavaFX basic concepts in java programs.	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A564L.1	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
20A564L.2	-	3	3	2	-	-	-	-	-	-	-	-	-	-	-
20A564L.3	3	3	3	2	-	-	-	-	-	-	3	3	-	-	-
20A564L.4	3	3	3	-	-	-	-	-	-	-	3	3	-	-	-
20A564L.5	3	3	3	-	-	-	-	-	-	-	3	3	-	-	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Digital Image Processing
Category PEC-III
Couse Code 20A47AT

Year IV B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:
- To understand the Digital Image Processing fundamentals
- To acquire the knowledge of Image enhancement and restoration techniques
- To acquire basic knowledge on color image processing
- To analyze various Image Segmentation and Compression methods

Unit 1 DIGITAL IMAGE FUNDAMENTALS 13
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.
Learning Outcomes: At the end of the unit, the student will be able to:
- Learn the fundamental concepts of Digital Image Processing(L2)
- understand about Image sampling and quantization(L2)
- understand the mathematical foundations for digital manipulation of images(L2)
- Apply different transforms on images(L3)

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
Learning Outcomes: At the end of the unit, the student will be able to:
- Learn different techniques employed for the enhancement of images in both spatial and frequency domain(L2)
- Learn different filtering techniques in spatial and frequency domains and apply them on original images(L2)

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.
Learning Outcomes: At the end of the unit, the student will be able to :
- Analyze the mathematical modeling of image restoration(L4)
- Estimate the noise and degradation function for image restoration(L2)
- Learn different filtering techniques for restoration and apply them on original images(L2)

Unit 4 COLOR IMAGE PROCESSING 9
Color Models, Pseudo Color Image Processing, Basics of Full Color Image Processing
Learning Outcomes: At the end of the unit, the student will be able to:
- Understand the use of different color models to represent an image(L2)
- Understand the operation and design requirements leading to choices of color image processing techniques(L2)

Unit 5 IMAGE SEGMENTATION & COMPRESSION 10
Point, Line and Edge Detection, Thresholding – Global and Optimum Global, Region based segmentation, Coding Redundancy, Spatial and temporal Redundancy, Image Compression Models
Learning Outcomes: At the end of the unit, the student will be able to:

- Apply the basic methods of image segmentation on images for different applications(L3)
- Understand image compression model and standards(L2)

Prescribed Text 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 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:

At the end of the course, the student will be able to **Blooms Level of Learning**

1. Understand how images are acquired, sampled, quantized and represented in digital form and analyze images in the frequency domain using various transforms. L2
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
20A47AT.1	3	3	3	2	1	1	-	-	-	3	-	3	3	3	3
20A47AT.2	3	3	3	3	2	2	-	-	-	3	-	3	3	3	3
20A47AT.3	3	3	3	3	2	2	-	-	-	2	-	3	3	3	3
20A47AT.4	3	3	3	3	2	2	-	-	-	2	-	3	3	3	3
20A47AT.5	3	3	3	3	3	3	-	-	-	2	-	3	3	3	3

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course DSP Processors and Architectures
Category PEC-III
Couse Code 20A47BT

Year IV B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	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.

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.
Learning Outcomes: At the end of the unit, the student will be able to:
- Understand the processing of digital signals in DSP processor(L2)
- Learn number formats and the representation of signal coefficients(L2)

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.
Learning Outcomes: At the end of the unit, the student will be able to:
- Learn the architectural blocks of programmable DSP processors(L2)
- Understand the programmability and execution issues in DSP processor(L2)

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..
Learning Outcomes: At the end of the unit, the student will be able to :
- Learn the architectural details of TMS320C54XX DSP(L2)
- Learn the instructions and programming of TMS320C54XX DSP(L2)

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.
Learning Outcomes: At the end of the unit, the student will be able to:
- Learn the concepts of digital filters(L2)
- Learn the implementation of digital filters in TMS320C54XX DSP instructions(L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to :

- Learn interfacing concepts and DMA(L2)
- Learn synchronous serial interface with an example(L2)

Prescribed Text Books:

1. Avtar Singh and S. Srinivasan, Digital Signal Processing, Thomson Publications, 2004
2. B. VenkataRamani and M. Bhaskar, Digital Signal Processors, Architecture, Programming and Applications, TMH, 2004.

Reference Books:

1. Jonathan Stein, Digital Signal Processing, John Wiley, 2005.
2. 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:

At the end of the course, the student will be able to	**Blooms Level of Learning**
1. Understand the concepts of DSP systems and representation of signal coefficients.	L2
2. Get the knowledge of programmable DSP architectures and program execution issues.	L3
3. Acquire the knowledge on programming features of TMS320C54XX processor.	L2
4. Design and formulate the implementations of DSP algorithms on TMS320C54XX processor.	L6
5. Learn about interfacing of serial & parallel communication devices to the DSP processor.	L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A47BT.1	3	2	2	-	-	-	-	-	-	-	-	-	2	2	-
20A47BT.2	3	-	-	-	-	-	-	-	-	-	-	-	2	2	-
20A47BT.3	3	3	3	-	-	-	-	-	-	-	-	-	2	2	-
20A47BT.4	3	2	2	-	-	-	-	-	-	-	-	-	2	2	-
20A47BT.5	3	2	2	-	-	-	-	-	-	-	-	-	2	2	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Coding Theory And Techniques
Category PEC-III
Course Code 20A47CT

Year IV B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- 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 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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the basic notion of Information(L2)
- Able to analyze codes for detecting and correcting of errors using Block codes(L4)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Able to learn generation of code words with cyclic codes(L2)
- Able to design syndrome circuit for correcting errors(L6)

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.

Learning Outcomes: At the end of the unit, the student will be able to :

- Analyze basic concepts of Convolutional codes(L4)
- Able to learn the design of encoder and decoder circuits(L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the fundamental concepts of Galois fields(L2)

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 $\frac{GF(q)[x]}{X^n-1}$

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the Euclidean and Euclid's algorithms(L2)
- Analyze the Galois Fields and polynomial arithmetic(L4)

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 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.
4. Error Control Coding- Fundamentals and Applications – Shu Lin, Daniel J.Costello,Jr, Prentice Hall, Inc.
5. Error Correcting Coding Theory - Man Young Rhee- 1989, McGraw-Hill.
6. Error control systems for Digital communication and storage - Stephen B. Wicker, Prentice Hall, Upper Saddle River, NJ, 1995.
7. Error Control Coding- Fundamentals and Applications – Shu Lin, Daniel J.Costello,Jr, Prentice Hall, Inc.

Course Outcomes:

At the end of the course, the student will be able to	**Blooms Level of Learning**
1. Gain Knowledge about measuring information and error detection and correction using Block codes	L1
2. Understand how Cyclic codes are applied in communication systems	L2
3. Familiar in designing encoder and decoder circuits using convolution codes,	L1
4. Understand Galois fields	L2
5. Apply the Polynomials over Galois field arithmetic and its implementation in coding theory.	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A47CT.1	3	3	2	2	2	-	-	-	-	3	2	2	3	3	3
20A47CT.2	3	3	2	2	2	-	-	-	-	3	2	2	3	3	3
20A47CT.3	2	2	3	3	2	-	-	-	-	3	2	2	3	3	3
20A47CT.4	3	3	2	3	3	-	-	-	-	3	2	2	3	3	3
20A47CT.5	3	3	2	2	2	-	-	-	-	3	2	2	3	3	3

Department of Electronics and Communication Engineering
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Title of the Course Testing & Testability
Category PEC-III
Course Code 20A47DT

Year IV B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	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 12

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.

Learning Outcomes: At the end of the unit, the student will be able to

- Contrast the abstraction levels and modelling of digital circuits (L4)
- List the digital circuit simulation and types (L4)
- Build the delay models associated with digital circuits (L3)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Differentiate various faults possible in digital circuits and fault modeling (L3)
- Analyze the single stuck and multiple stuck faults (L4)

Unit 3 Testing for Single Stuck Faults 10

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

Compression Techniques: Different Techniques, Syndrome Test and Signature Analysis.

Learning Outcomes: At the end of the unit, the student will be able to:

- Derive teat vectors for single stuck fault models in both combinational and sequential circuits (L5)
- Develop test patterns for specific fault models (L6)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Outline the design for testability need and techniques (L2)
- Illustrate scan storage cell based testable designs (L2)
- Classify boundary scan standards and DFT at system and board level (L2)

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Unit 5 Built-In Self-Test 10

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Interpret BIST concepts (L2)
- Demonstrate various available BIST architectures (L2)

Prescribed Text 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 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, 1998.

Course Outcomes:

At the end of the course, the student will be able to	**Blooms Level of Learning**
1. Detect faults in digital systems	L4
2. Model faults to simplify fault detection	L4
3. Generate test vectors to detect and diagnose the faults using various algorithms	L5
4. Design testable architecture for digital circuits	L6
5. Implement Built-In Self-Test architectures for digital circuits	L5

CO-PO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A47DT.1	3	3	1	2	-	-	-	-	-	-	-	-	2	2	-
20A47DT.2	3	3	3	2	-	-	-	-	-	-	-	-	2	2	-
20A47DT.3	3	3	3	3	-	-	-	-	-	-	-	-	2	2	-
20A47DT.4	2	2	3	2	-	-	1	-	-	-	-	-	2	2	-
20A47DT.5	2	2	3	2	-	-	1	-	-	-	-	-	2	2	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course Satellite Communications
Category PEC-IV
Couse Code 20A47ET

Year IV B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

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

- Thorough information of Satellite communication and their applications.
- Understanding of orbital theory and budget link analysis.
- Knowledge of different multiple access schemes defined in satellite communication systems.
- Know how of small satellites, their usage and applicability.
- Concepts, methods, operation and improvements in GPS.

Unit 1 Introduction & Orbital Mechanics 9

Introduction: Background and History of satellite communications, Basic concepts of satellite communications, frequency allocations for satellite services, applications, and future trends.
Orbital Mechanics*:* Achieving stable orbit, Kepler's Laws, Describing orbit, Locating Satellite, Orbital elements, look angle determination, orbital perturbations, orbit determination, Launch vehicles, Orbital effects in communication systems performance.
Learning Outcomes: At the end of the unit, the student will be able to

- Know the History and background of satellite communications (L1)
- Understand the basic concepts of satellite communications (L2)
- Know the orbital mechanics of satellite systems (L1)

Unit 2 Satellite Subsystems 9

Attitude and Orbital Control System (AOCS), Telemetry, Tracking, Command and Monitoring (TTC&M), Power Systems, Communication subsystems, Satellite Antenna, Equipment Reliability and Space Qualification.
Learning Outcomes: At the end of the unit, the student will be able to

- Understand the different subsystems of satellite, their selection, operation and maintenance (L2)

Unit 3 Satellite Link Design & Multiple Access 9

Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Downlinks, Uplink Design, Design of Satellite links for specified CNR, System Design for Specific Performance, Propagation Effects and their impact on Links. Basic concepts of Multiple Access, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Onboard Processing, Demand Assignment Multiple Access (DAMA), Random Access (RA), Code Division Multiple Access (CDMA).
Learning Outcomes: At the end of the unit, the student will be able to

- Understand and apply the transmission theory for satellite link design(L2)
- Evaluate and analyze the design of satellite links for improved performance(L5)
- Understand different multiple access schemes for a satellite communication link(L2)

Unit 4 Low Throughput, Small and NGSO Satellite systems 9

Low throughput and Small satellites*:* Small satellites, Operational use of Small Sats, Low Throughput Satellite Systems, VSAT Systems, Signal Formats, Orbital Debris.
NGSO Satellites: Orbit Consideration, Coverage and Frequency Considerations, System considerations, Operational and Proposed NGSO Constellation Designs.
Learning Outcomes: At the end of the unit, the student will be able to

- Know the low throughput and small satellites operation and maintenance(L1)
- Understand the orbits, coverage and frequency considerations for NGSO satellites(L2)

- Architect and propose NGSO constellation design(L6)

Unit 5 Satellite Navigation & The Global Positioning System 9

Low throughput and Small satellites*:* Small satellites, Operational use of Small Sats, Low Throughput Satellite Systems, VSAT Systems, Signal Formats, Orbital Debris.

NGSO Satellites: Orbit Consideration, Coverage and Frequency Considerations, System considerations, Operational and Proposed NGSO Constellation Designs.

Learning Outcomes: At the end of the unit, the student will be able to

- Know the basic concepts of GPS system (L1)
- Understand different GPS systems and improvements in GPS system (L2)

Prescribed Text Books:

1. Satellite communications, Timothi Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley publications, 3rd Edition,2020.
2. Satellite communications- Satellite communications systems: systems, Techniques and Technology- Gerard Maral, Michel Bousquet, Zhili Sun, Wiley Publications, 6th Edition, 2020.

Reference Books:

1. Satellite communications Engineering-Wilbur L. Prichard, Robert A. Nelson & Henry G. Suyderhoud, 2nd Edition, Pearson Publications, 2003..
2. Satellite communications-D.C.Agarwal, Khanna publications, 5thEd
3. Satellite communications-Dennis Roddy, McGraw Hill, 2nd Edition, 1996.
4. Satellite communications-Dennis Roddy, McGraw Hill, 2nd Edition, 1996.

Course Outcomes:

At the end of the course, the student will be able to	**Blooms Level of Learning**
1. Understand the principles of satellite communications and orbital mechanics necessary for it.	L2
2. Understand the different subsystems of satellite, their selection, operation and maintenance.	L2
3. To analyze, evaluate and suggest the design of satellite links for improved performance.	L4
4. Select and apply appropriate multiple access scheme for the given satellite communication link.	L3
5. Understand and suggest the use of a low throughput, small and NGSO systems for an appropriate satellite communication system.	L3
6. Learn the satellite navigation and different GPS operation & applications.	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A47ET.1	3	3	-	1	-	2	1	-	-	-	-	1	2	2	1
20A47ET.2	3	2	1	1	-	2	-	-	1	-	-	-	2	2	-
20A47ET.3	3	3	3	2	-		-	-	1	-	-	-	3	2	-
20A47ET.4	3	1	1	1	1	1			-	-	-	1	2	-	2
20A47ET.5	3	1	1	1	1	1	2	2	-	-	-	-	2	-	2
20A47ET.6	3	1	1	1	1	2	2	2	-	-	-	1	2	-	2

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

Title of the Course FPGA Architectures and applications
Category PEC-IV
Couse Code 20A47FT

Year IV B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives: This course will able to
- Understand the concepts of ROM, PLA, PAL, PLD, PGA, FPGAs
- To understand the complexities of commercial grade FPGAs, programming and implementation of 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); Cypress FLASH 370 Device Technology, Lattice Plsi's Architectures – 3000 Series – Speed Performance and in System Programmability.

Learning Outcomes: At the end of the unit, the student will be able to:
- Understand the ROM, PLA, PAL, PLD and PGA features(L2)
- Able to analyze the architectures of different PLDs(L4)

Unit 2 FPGAs 9

Field Programmable Gate Arrays – Programming technologies, Logic Blocks, Routing Architecture, Design Flow, Technology Mapping for FPGAs.

Learning Outcomes: At the end of the unit, the student will be able to:
- FPGAs and their programming technologies(L2)
- Design flow, Routing architectures and of FPGAs(L6)

Unit 3 COMMERCIAL FPGAs 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.

Learning Outcomes: At the end of the unit, the student will be able to :
- Review the architectures of Commercial FPGAs(L4)
- Study the Speed Performance of Commercial FPGAs(L1)

Unit 4 REALIZATION OF STATE MACHINES 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.

Learning Outcomes: At the end of the unit, the student will be able to:
- Analyze the design approaches of State machines(L4)
- Understand the operation and usage of Petrinets in State machines(L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the concepts of FSM architectures of PLDs(L2)
- Analyze the One –Hot design method using ASMs(L4)

Prescribed Text Books:

1. "Digital Design Using Field Programmable Gate Arrays", P. K. Chan & S. Mourad, Prentice Hall Pvt. Ltd., 1994.
2. "Field Programmable Gate Array Technology", S. Trimberger, Kluwer Academic Publicataions, 1994.
3. "Field Programmable Gate Arrays", J. Old Field, R. Dorf, John Wiley & Sons, Newyork, 1995..

Reference Books:

1. "Field Programmable Gate Arrays", S.Brown, R.Francis, J.Rose, Z.Vransic, KluwerPubin, 1992.
2. "Engineering Digital Design", Richard F. Tinder, Second Edition, Academic Press.

Course Outcomes:

At the end of the course, the student will be able to	**Blooms Level of Learning**
1. Analyze the features and architectures of various PLDs.	L4
2. Analyze the Physical design cycle concepts of FPGAs.	L4
3. Have the knowledge of Speed Performance and architectures of FPGAs.	L2
4. Understand the operation design approaches and usage of Petrinets State machines.	L2
5. Understand the concepts of FSM architectures in System level design.	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A47FT.1	2	2	2	2	2	-	-	-	2	-	-	-	2	2	-
20A47FT.2	3	2	2	3	2	-	-	-	2	-	-	-	2	2	-
20A47FT.3	2	2	2	3	2	-	-	-	2	-	-	-	2	2	-
20A47FT.4	2	2	2	3	2	-	-	-	2	-	-	-	2	2	-
20A47FT.5	2	2	2	3	2	-	-	-	2	-	-	-	2	2	-

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

Title of the Course Computer Networks
Category PEC-IV
Couse Code 20A47GT

Year IV B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To understand the protocol layering and physical level communication.
- To analyze the performance of a network.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer.
- To understand the working of various Application Layer Protocols.

Unit 1 INTRODUCTION AND PHYSICAL LAYER 9

Introduction: Data Communications, Networks, The Internet, Protocols and Standards, Network Models, Layered Tasks, The OSI Model, TCP/IP Protocol Suite, Addressing. Physical Layer and Media: Data and Signals, Analog and Digital transmission Media: Guided Media, Unguided Media

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the Basic Layers and its functions in Computer Networks.(L2)
- Demonstrate the importance of Transmission Media (L3)

Unit 2 Data Link Layer 12

Data link layer: Error Detection and Correction, Framing, Flow and Error Control, Protocols, Noiseless Channels, Noisy Channels, HDLC, Point to Point Protocol, Multiple Access, Random Access, Controlled Access, Channelization, Wired LANs: Ethernet Wireless LANs: IEEE 802.11, Bluetooth – Connecting Devices.

Learning Outcomes: At the end of the unit, the student will be able to

- Examine the Performance of a Network. (L2)
- Analyze the Wired and Wireless LAN's. (L4)

Unit 3 Network Layer 9

Network Layer: Logical Addressing, IPv4 Addresses, CIDR, Subnets, Classfull and special addressing, IPv6 Addresses, Transition from IPv4 to IPv6,

Network Layer: Address Mapping, ICMP, IGMP, ICMPv6, Delivery, Forwarding, Unicast Routing Protocols, Multicast Routing Protocols.

Learning Outcomes: At the end of the unit, the student will be able to:

- Demonstrate and Classify IPV4 and IPV6.(L3)
- Classify the Routing Protocols(L4)

Unit 4 Transport Layer 9

Transport Layer: Process to Process Delivery: UDP, TCP and SCTP, Data Traffic, Congestion, Congestion Control, Two Examples, Quality of Service, Techniques to improve QoS.

Learning Outcomes: At the end of the unit, the student will be able to:

- Classify the Parameters of UDP,TCP AND SCTP.(L4)
- Summarize the Importance of Quality of Service(L5)

Unit 5 Application Layer 10

Domain Name System: DNS, The DNS Name Space, Domain Resource Records, Name Servers

Electronic Mail: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery

The World Wide Web: Architectural Overview, Static Web Pages, Dynamic Web Pages and Web Applications, HTTP: The Hypertext Transfer Protocol, TELNET, SSH, SNMP, The Mobile Web, Web Search

Learning Outcomes: At the end of the unit, the student will be able to:

- Demonstrate the Importance of Domain Name System.(L4)
- Summarize the Importance of World wide web Applications.(L5)

Prescribed Text Books:

1. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw– Hill, Fifth Edition, 2017.
2. Andrew.S.Tanenbaum, Nick Feamster,David J. Wetherall "Computer Networks", Pearson Education, Sixth Edition, 2021

Reference Books:

1. James F. Kurose, Keith W. Ross, "Computer Networking: A Top–Down Approach", Pearson Education, Eight Edition 2021.
2. Larry Peterson, Peter S. Davie, "Computer Networks", A System Approach, Elsevier, Sixth Edition, 2021.
3. William Stallings, "Data and Computer Communication", Tenth Edition, Pearson Education, 2014.

Course Outcomes: Student will be able to	**Blooms Level of Learning**
1. Classify the different aspects of networks, protocols and network design models.	L2
2. Examine various Data Link layer design issues and Data Link protocols.	L4
3. Analyze, Compare and select appropriate routing algorithms for a network	L2, L4, L5
4. Examine the various end to end protocols helps in analyzing and interpreting the quality of networks.	L4
5. Identify and analyze the various applications over internet	L3, L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A47GT.1	3	2	-	3	-	-	-	-	-	-	-	-	-	-	-
20A47GT.2	2	3	3	3	-	-	-	-	3	-	-	-	-	-	-
20A47GT.3	3	3	3	3	3	-	-	-	-	-	-	-	-	-	-
20A47GT.4	2	3	3	3	3	-	-	-	3	2	-	-	-	-	-
20A47GT.5	3	-	-	3	3	-	-	-	3	2	1	2	-	-	-

Department of Electronics and Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

(An Autonomous Institution)

Title of the Course Advance Digital Signal Processing
Category PEC-IV
Course Code 20A47HT

Year IV B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- At the completion of this course, the student should have in depth knowledge of processing digital signals.

Unit 1 Multi Rate Signal Processing 10

Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the basic mulitrate sampling concepts(L2)
- Able to design practical sampling rate converters.(L6)

Unit 2 Applications of Multi Rate Signal Processing 10

Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters, Implementation of Digital Filter Banks, Sub-band Coding of Speech Signals, Quadrature Mirror Filters, Trans-multiplexers, Over Sampling A/D and D/A Conversion.

Learning Outcomes: At the end of the unit, the student will be able to:

- Able to learn the implementation of digital filter banks(L2)
- Able to understand the concepts of sub-band coding and oversampling A/D& D/A converters.(L2)

Unit 3 Non-Parametric Methods of Power Spectral Estimation 9

Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman- Tukey methods, Comparison of all Non-Parametric methods.

Learning Outcomes: At the end of the unit, the student will be able to :

- Able to learn the estimation of Power Spectrum through Non-Parametric Methods (L2)

Unit 4 Implementation of Digital Filters: 9

Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

Learning Outcomes: At the end of the unit, the student will be able to:

- Able to Design of optimal FIR and IIR digital filters.(L6)

Unit 5 Parametric Methods of Power Spectrum Estimation 10

Autocorrelation & Its Properties, Relation between auto correlation & model parameters, AR Models - Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation, Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

Learning Outcomes: At the end of the unit, the student will be able to:

- Able to learn the estimation of Power Spectrum through Parametric Methods(L2)

Prescribed Text Books:

1. Digital Signal Processing: Principles, Algorithms & Applications - J.G.Proakis& D. G. Manolakis, 4th Ed., PHI.
2. Discrete Time Signal Processing - Alan V Oppenheim & R. W Schaffer, PHI.
3. DSP – A Practical Approach – Emmanuel C. Ifeacher, Barrie. W. Jervis, 2 Ed., Pearson Education.

Reference Books:

1. Modern Spectral Estimation: Theory & Application – S. M .Kay, 1988, PHI.
2. Multi Rate Systems and Filter Banks – P.P.Vaidyanathan – Pearson Education.
3. Digital Signal Processing – S.Salivahanan, A.Vallavaraj, C.Gnanapriya, 2000,TMH
4. Digital Spectral Analysis – Jr. Marple.

Course Outcomes:

At the end of the course, the student will be able to	**Blooms Level of Learning**
1. Understand theory of Multirate DSP, and capable of designing different sampling rate converters	L2
2. Understand the Applications of Multirate signal Processing	L2
3. Evaluate the power spectrum of signals using Non-Parametric methods	L5
4. Design and implement digital finite impulse response (FIR) filters and infinite impulse response (IIR) filters.	L6
5. Evaluate the power spectrum of signals using Parametric methods	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A47HT.1	3	3	3	1	-	-	-	-	-	3	2	2	3	3	2
20A47HT.2	3	3	2	2	-	-	-	-	-	3	2	2	3	3	2
20A47HT.3	3	2	2	1	-	-	-	-	-	3	2	2	3	3	2
20A47HT.4	3	3	2	3	-	-	-	-	-	3	2	2	3	3	2
20A47HT.5	3	2	2	1	-	-	-	-	-	3	2	2	3	3	2

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

Title of the Course Digital IC Design
Category PEC – V
Course Code 20A47IT

Year IV B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To understand the design of subsystems and layout of CMOS chip.
- To study about different CMOS characteristics and it's design.
- Verify different methods to reduce the size and power consumption of CMOS IC.

Unit 1 CMOS Characteristics 15

CMOS inverter - static and dynamic characteristics.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the Basics of CMOS Logic Design(L2)
- Analyze the CMOS Circuit characteristics(L4)

Unit 2 CMOS Circuits Design 12

Static and Dynamic CMOS design- Domino and NORA logic – Alternative gate circuits of CMOS.

Learning Outcomes: At the end of the unit, the student will be able to:

- Get the knowledge about CMOS Design.(L1)
- Design various Logic circuits using CMOS Logic(L6)

Unit 3 CMOS Gates Behavior 10

Method of Logical Effort for transistor sizing -power consumption in CMOS gates- Low power CMOS design

Learning Outcomes: At the end of the unit, the student will be able to :

- Understand the concept of Transistor Sizing.(L2)
- Know the need of reducing Power Consumption in CMOS Circuits(L1)

Unit 4 Layout Design Rules 15

Need for Design Rules, NMOS and CMOS Based Design Rules, Simple Layout Examples, Sheet Resistance, Area Capacitance, Wiring Capacitances, Drive Large Capacitive Load**.**

Learning Outcomes: At the end of the unit, the student will be able to:

- Learn the Layout design rules(L2)
- Evaluate different design constraints for CMOS Circuits.(L5)

Unit 5 Subsystem Design Process 13

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Design various arithmetic Circuits using CMOS Logic(L6)
- Analyze different CMOS subsystem designs.(L4)

Prescribed Text 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 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:

At the end of the course, the 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
20A47IT.1	2	1	2	-	-	2	-	3	2	-	3	2	3	3	2
20A47IT.2	2	2	3	-	-	3	-	3	2	-	3	2	3	3	2
20A47IT.3	2		2	-	-	1	-	2	-	-	2	1	3	2	-
20A47IT.4	1	1	3	-	-	1	-	2	2	-	2	2	3	3	-
20A47IT.5	2	2	2	-	-	1	-	3	3	-	3	2	3	3	2

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

Title of the Course Optical Fiber Communication
Category PEC-V
Couse Code 20A47JT

Year IV B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To understand the different Optical fibers with the structures and materials.
- To Understand and analyze the 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 **10**

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the different Optical fibers with its structures and materials(L2)
- Understand the basic principles of optics(L2)
- Analyze the transmission of optical signal through fibers(L4)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the construction and working principle of optical sources(L2)
- Calculate key parameters of Lasers and LEDs(L4)

Unit 3 : Optical detectors **10**

Physical principles of photo diodes, photo detector noise, detector response time, avalanche multiplication noise, structures for InGaAs APDs, temperature effect on avalanche gain, comparisons of photo detectors.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the working principle and the characteristics of optical detectors (L2)
- Identify a suitable detector and its structure for a given application(L4)

Unit 4 : Fiber Losses and Power Coupling **9**

Attenuation, Fiber Bend Loss, Dispersion, Chromatic dispersion, Intermodal dispersion, Overall fiber dispersion, Polarization dispersion, Fiber alignment and joint loss. Source to Fiber Power Launching, Lensing schemes for Coupling Improvement, fiber-to-fiber Joints, semiconductor optical amplifiers.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the different kinds of fiber losses (L2)
- Learn about the design and alignment of Optical fiber cables(L2)
- Understand the various power coupling mechanisms(L2)

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: Over-view, Necessity, Principles, Types of WDM.

Learning Outcomes: At the end of the unit, the student will be able to:

- Learn the design constraints of analog and digital optical links (L2)
- Study the use and different types of WDM concepts(L1)

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:

1. Fiber-optic communication systems, Third edition, GovindP.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 the structures and materials of OFC and Analyze the transmission of optical signal through fibers	L2
2. Understand and analyze the operation of different optical sources and their characteristics	L2,L3
3. Understand and analyze the detectors and their operating mechanisms.	L2,L3
4. Understand the fiber losses and power launching and power coupling techniques.	L3
5. Design the optical links for different applications.	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A47JT.1	3	-	2	-	-	-	-	-	-	1	-	-	1	-	-
20A47JT.2	3	2	1	-	-	-	-	-	-	-	-	-	2	3	-
20A47JT.3	3	2	3	-	1	-	-	-	-	-	-	-	2	3	-
20A47JT.4	3	2	3	-	1	-	-	-	-	-	-	-	2	3	-
20A47JT.5	3	-	3	3	3	-	-	-	-	1	-	-	3	2	-

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

Title of the Course Wireless Communications & Networks
Category PEC-V
Couse Code 20A47KT

Year IV B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	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:** **13**

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the basic concepts of wireless communication systems(L2)
- Understand the various multiple access techniques(L2)

Unit 2 **WIRELESS NETWORKING AND DATA SERVICES: Wireless Networking:** **10**

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

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the difference between fixed and wireless networks(L2)
- Understand and analyze various wireless data network services. (L2)

Unit 3 **MOBILE IP AND WIRELESS ACCESS PROTOCOL:** **15**

Mobile IP: Mobile IP Operation of mobile IP, Co-located address, Registration, Tunneling. WAP: WAP Architecture, overview, WML scripts, WAP service, WAP session protocol.

Learning Outcomes: At the end of the unit, the student will be able to :

- Understand the mobile IP scenario(L2)
- Analyze the WAP architecture and its protocols(L4)

Unit 4 **WIRELESS LAN TECHNOLOGY AND BLUETOOTH** **10**

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, WPAN

Learning Outcomes: At the end of the unit, the student will be able to:

- Analyze the 802.11 architecture and its services(L4)
- Understand the architecture and the specifications of Bluetooth(L2)

Unit 5 **MOBILE DATA NETWORKS AND HIPER LAN: Mobile Data Networks:** **10**

CDPD Network, GPRS and higher data rates, Short messaging service in GSM, HIPER LAN: HIPERLAN-1.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the applications of mobile data networks(L2)
- Analyze the HIPERLAN network. (L4)

Prescribed Text Books:

1. Wireless Communications, Principles, Practice – Theodore S. Rappaport, PHI, 2 nd Ed., 2002.

2. Wireless Communication and Networking – William Stallings, PHI, 2003.
3. Principles of Wireless Networks – KavehPahLaven and P. Krishna Murthy, Pearson Education, 2002.

Reference Books:

1. Wireless Digital Communications – KamiloFeher, PHI, 1999.

Course Outcomes:

At the end of the course, the student will be able to	**Blooms Level of Learning**
1. Understand the effective bandwidth utilization to accommodate large number of mobile users by using various accessing techniques	L2
2. Analyze networking considerations, practical networking approaches with mobile data services.	L4
3. Understand the concept of mobility management	L2
4. Analyze the protocols used in wireless LAN technologies.	L4
5. Identify mobile data and advanced wireless networks and their applications in real time.	L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A47KT.1	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-
20A47KT.2	1	2	2	2	-	1	-	-	-	1	-	2	1	2	-
20A47KT.3	2	-	-	-	-	2	-	-	-	2	-	-	2	-	-
20A47KT.4	1	2	2	2	-	1	-	-	-	1	-	2	1	2	-
20A47KT.5	1	2	-	-	-	-	-	-	-	1	-	2	-	-	-

Department of Electronics and Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

(An Autonomous Institution)

Title of the Course Image and Video Processing

Category PEC-V

Couse Code 20A47LT

Year IV B.Tech

Semester I Semester

Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To study the image fundamentals and mathematical transforms necessary for image Processing.
- To study the image enhancement techniques &image restoration procedures.
- To study image segmentation and the image compression procedures.
- To study video processing techniques and 2D estimation techniques

Unit 1 **Fundamentals of Image Processing and Image Transforms** **9**

Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing. Introduction, Need for transform, image transforms,Fouriertransform,2DDiscreteFourier transform and its transforms, Importance of phase, Walshtransform,Hadamardtransform,Haartransform,slanttransformDiscrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the image sampling and its relation with the digital images(L2)
- Able to analyze the basic 2D image transforms. (L4)

Unit 2 **Image Enhancement** 9

Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, smoothing spatial filters, Sharpening spatial filters. Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering. Image Restoration: Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind deconvolution.

Learning Outcomes: At the end of the unit, the student will be able to:

- Apply Spatial domain methods on image for enhancement.(L3)
- Use basic filtering methods in frequency domain.(L3)
- Apply the concept of image restoration model for nonlinear images.(L3)

Unit 3 **Image Segmentation& Compression** 9

Image Segmentation: Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation., Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform, Active contour Image.

Compression: Introduction Need for image compression, Redundancy in images, Classification of redundancy in images ,image compression scheme, Classification of image compression schemes, Fundamentals of information theory, Run length coding, Shannon–Fano coding, Huffman coding, Arithmetic coding, Predictive coding, Transformed based compression, Image compression standard, Wavelet-based image compression, JPEG Standards.

Learning Outcomes: At the end of the unit, the student will be able to :

- Analyze concepts of image Segmentation techniques. (L4)
- Study the principles and procedures of image compression.(L1)

Unit 4 **Basic Steps of Video Processing** **9**

Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.

Learning Outcomes: At the end of the unit, the student will be able to:

- Analyze the performance of time varying image formation models(L4)
- Understand the operation of sampling of video signals. (L2)

Unit 5 2-DMotionEstimation 9

Optical flow, General Methodologies, Pixel Based Motion Estimation, Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multiresolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application ofmotion estimation in Video coding.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the basic operation principles of Block- Matching Algorithm. (L2)
- Analyze the different video coding techniques. (L4)

Prescribed Text Books:

1. Digital image Processing– Gonzalez and Woods, 3rdEd., Pearson.
2. Video Processing and Communication– Yao Wang, JoemOstermannandYa–quinZhang.1st Ed., PHInt.
3. S.Jayaraman, S.Esakkirajan and T.VeeraKumar,"Digital Image processing, Tata Mc Graw Hill publishers, 2009

Reference Books:

1. Digital Image Processing and Analysis-Humanand Computer Vision Application with CVIP Tools– ScotteUmbaugh,2nd Ed, CRCPress, 2011.
2. Digital Video Processing– M. Tekalp, Prentice Hall International.
3. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar– TMH, 2009.
4. Multi dimensional Signal, Image and Video Processing and Coding– John Woods, 2ndEd, Elsevier.

Course Outcomes:

At the end of the course, the student will be able to	**Blooms Level of Learning**
1. Defining the digital image, representation of digital image, importance of image resolution, applications in image processing.	L1,L2
2. Knowhow an image can be enhanced by using histogram techniques, filtering techniques etc	L3
3. Understand image degradation, image restoration techniques using spatial filters and frequency domain	L2,L3
4. Know the video technology from analog color TV systems to digital video systems, how video signal is sampled and filtering operations in video processing.	L2
5. Know the general methodologies for 2Dmotion estimation, various coding used in video processing.	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A47LT.1	3	2	2	-	2	-	-	-	-	2	1	-	-	-	2
20A47LT.2	3	3	3	3	3	-	2	-	1	-	-	-	-	-	-
20A47LT.3	3	2	2	2	3	3	2	2	-	-	-	-	-	-	2
20A47LT.4	3	3	2	-	2	-	3	-	-	2	-	-	1	-	2
20A47LT.5	3	-	2	3	-	3	2	2	-	2	-	-	-	-	2

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

Title of the Course Cellular And Mobile Communications
Category OEC-III
Couse Code 20A47MT

Year IV B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:
- 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 9

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.

Learning Outcomes: At the end of the unit, the student will be able to:
- Understand the basic structure of cellular system(L2)
- Able to analyze co-channel Interference and its reduction factor(L4)

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 noncochannel interference-Measurement of SINAD, adjacent channel interference, cross talk

Learning Outcomes: At the end of the unit, the student will be able to:
- Able to design Omni directional antenna systems for cellular communications(L6)
- Able to distinguish the effect of co-channel and non co-channel interference (L3)

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.

Learning Outcomes: At the end of the unit, the student will be able to :
- Analyze concepts of signal reflection mechanism at various terrains(L4)
- Study the point to point model and different antennas used in cellular(L1)

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

Learning Outcomes: At the end of the unit, the student will be able to:
- Analyze the channel sharing and channel borrowing(L4)
- Understand the frequency management system(L2)

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

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the mechanism of different handoffs in cellular systems(L2)
- Analyze the GSM and multiple access techniques(L4)

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 Books:

1. Principles of Mobile communications-Gordon L. Stuber, Springer International 2nd Edition, 2007.
2. Wireless and Mobile Communications-Lee McGraw Hills, 3rd Edition, 2006.

Course Outcomes:

At the end of the course, the 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 system	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A47MT.1	3	3	2	2	1	2	-	-	-	3	2	3	3	3	3
20A47MT.2	3	3	3	3	2	-	-	-	-	3	3	3	3	3	1
20A47MT.3	3	3	3	3	2	2	-	-	-	2	2	3	3	3	2
20A47MT.4	3	2	3	2	1	2	-	3	-	3	3	3	3	3	3
20A47MT.5	3	2	3	1	3	1	-	3	-	3	3	3	3	2	3

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

Title of the Course Ad-hoc Wireless Networks
Category OEC-III
Couse Code 20A47NT

Year IV B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- Understand the basics and applications of Adhoc 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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the basics of Adhoc networks. (L2)
- Explain the concepts of Adhoc networks. (L2)

Unit 2 **Routing Protocols for Adhoc 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: Adhoc 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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand various routing protocols in Adhoc networks. (L2)
- Understand the applications of each protocols(L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to :

- Analyze and design routing protocols. (L4)
- Understand the applications of multicast routing. (L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Analyze the design of transport layer. (L4)
- Understand the need of security issues and challenges in Adhoc wireless networks. (L2)

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.

Learning Outcomes: At the end of the unit, the student will be able to:

- Evaluate solutions for issues and challenges of QoS solutions.(L5)
- Understand the energy management schemes. (L2)

Prescribed Text Books:

1. "Ad Hoc Wireless Networks Architectures and Protocols", C. Siva Ram Murthy and B. S. Manoj, Prentice Hall, PTR, 2004. ISBN, 013147023X.
2. "Ad Hoc Mobile Wireless Networks Protocols and Systems", K. Toh, Prentice Hall, PTR,2001. ISBN, 0130078174.

Reference Books:

1. "Ad Hoc Networking", Charles E. Perkins, Addison Wesley, 2000. ISBN-13: 978-0321579072

Course Outcomes:

At the end of the course, the student will be able to	**Blooms Level of Learning**
1. Explain the concepts and applications of Adhoc 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 Adhoc 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
20A47NT.1	1	2	-	2	-	-	-	-	-	-	-	-	1	1	-
20A47NT.2	3	3	-	3	-	2	-	-	1	-	-	2	2	2	-
20A47NT.3	2	3	-	2	-	2	-	-	1	-	-	2	2	2	-
20A47NT.4	2	3	-	3	-	2	-	-	1	-	-	2	2	2	-
20A47NT.5	1	2	-	2	-	-	-	-	-	-	-	-	1	1	-

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

Title of the Course Embedded Real Time Systems
Category OEC-III
Couse Code 20A47OT

Year IV B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:
- To learn the concepts of an embedded system
- To apply the knowledge on Real-Time Operating Systems

Unit 1 Introduction to Embedded Systems 8
Definition of embedded system, embedded systems vs general computing systems, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, Core of the embedded system.
Learning Outcomes: At the end of the unit, the student will be able to:
- Differentiate embedded system and general computing system (L4)
- Classify embedded systems based on performance, complexity and era in which they are evolved (L4)

Unit 2 The Typical Embedded System 8
Memory, sensors and actuators, communication interface, embedded firmware, other system components.
Learning Outcomes: At the end of the unit, the student will be able to:
- Summarize different factors to be considered in the selection of memory for an embedded system (L4)
- Describe role of sensors, actuators and their interfacing with I/O subsystems (L2)
- Explain role of embedded firmware in embedded system (L2)

Unit 3 Embedded System Characteristics & Applications 8
Characteristics of an embedded system, Quality attributes of embedded systems, Washing Machine-Application-Specific Embedded System, Automotive-Domain- Specific Examples of Embedded System.
Learning Outcomes: At the end of the unit, the student will be able to:
- Understand the characteristics of describing an embedded system (L2)
- Discuss important quality attributes of the embedded system for online and offline modes(L2)
- Learn the applications of embedded system(L2)

Unit 4 Real-Time Operating Systems-I 8
Operating System Services, Process Management, Timer Functions, Event Functions, Memory Management, Device, File & I/O Subsystems Management, Interrupt Routines in RTOS Environment and Handling of Interrupt source calls.
Learning Outcomes: At the end of the unit, the student will be able to:
- Explain about operating system services and RTOS (L2)
- Summarize different features of RTOS (L4)

Unit 5 Real-Time Operating Systems-II 8
Introduction to Real Time Operating Systems, Basic Design using a Real Time Operating System, RTOS Task Scheduling Models, OS security Issues ,OS standards ,RTOS interrupt Latency, OS performance Guidelines, Middleware, Application-layer Software.
Learning Outcomes: At the end of the unit, the student will be able to:
- Design using a Real Time Operating System.(L6)
- Explain about OS Standards, Performance Guidelines & Security Issues. (L2)

Prescribed Text Books:

1. Shibu K V, "Introduction to Embedded Systems", 2nd edition, McGraw Hill Education, 2017.
2. Raj Kamal, "Embedded Systems: Architecture, Programming and Design", 3rd edition, McGraw Hill Education, 2017.

Reference Books:

1. David. E. Simon, "An Embedded Software Primer" 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007.
2. Embedded/ Real Time Systems, K.V.K.K. Prasad, Dream tech press.

Course Outcomes:

At the end of the course, the student will be able to	**Blooms Level of Learning**
1. Study the fundamental concepts of embedded systems.	L2
2. Learn the typical embedded systems.	L2
3. Understand the Embedded System Characteristics & Applications	L2
4. Understand the basics of real time operating systems.	L2
5. Design an RTOS based embedded system.	L6

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A47OT.1	3	-	2	-	1	-	-	-	-	1	-	2	2	-	-
20A47OT.2	3	-	1	-	1	-	-	-	-	2	-	2	2	-	-
20A47OT.3	3	-	-	-	1	1	-	-	-	2	-	-	2	-	-
20A47OT.4	3	-	2	-	1	-	-	-	-	1	-	2	2	2	-
20A47OT.5	3	2	3	2	2	-	-	-	-	2	1	2	2	-	-

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

Title of the Course	ASIC Design
Category	OEC-III
Couse Code	20A47PT

Year	IV B.Tech
Semester	I Semester
Branch	ECE

Lecture Hours	Tutorial Hours	Practice Hours	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. (L4)
- 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.

Learning Outcomes :

- To understand the basic types of ASICs(L2)
- To know about PLDs (L2)

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

Learning Outcomes :

- To overview the various structures of PLDs(L2)
- To get basic idea on FPGAs(L1)
- To analyze ASIC Design issues(L4)

Unit 3 : ASICs- Characteristics And Performance **8**

Design styles, gate arrays, and standard cell -based ASICs, Mixed mode and analogue ASICs.

Learning Outcomes :

- To understand the concepts of Gate arrays(L2)
- To understand ASIC design styles(L2)

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.

Learning Outcomes :

- To simulate the design through Hardware description languages(L3)
- To get basic idea on fault tolerant systems.(L1)

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.

Learning Outcomes :

- To analyze the basic steps of physical design(L4)
- To know the procedures for Floor Planning- Placement- Routing. (L2)

Prescribed Text Books:

1. 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
20A47PT.1	2	-	2	-	-	-	-	-	-	1	-	1	2	2	-
20A47PT.2	3	3	3	-	-	-	-	-	-	2	-	1	2	2	-
20A47PT.3	2	-	2	-	-	-	-	-	-	2	-	1	2	2	-
20A47PT.4	3	3	3	-	-	-	-	-	-	2	-	1	2	2	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	Universal Human Values – II
Category	HSMC
Couse Code	20AC71T
Year	IV B.Tech
Semester	I Semester
Branch	Common to all

Lecture Hours	Tutorial Hours	Practical	Credits
2	1	0	3

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 programs 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 the 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
- Summing up.

Include practice Exercises and Case Studies (tutorial) Sessions e.g., to discuss the conduct of an engineer or a scientist, etc.

Prescribed Textbooks:

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. Cecile Andrews, Slow is Beautiful
7. J C Kumarappa. Economy of Permanence
8. PanditSunderlal. Bharat Mein Angreji Raj
9. Dharampal, Rediscovering India.
10. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. Maulana Abdul Kalam Azad. India Wins Freedom
12. Romain Rolland. Vivekananda (English)
13. Romain Rolland. Gandhi (English)
14. Jawaharlal Nehru. Rediscovery of India

Course Outcomes: Upon successful completion of the course, student will	**Blooms Level of Learning**
1. become more aware of themselves, and their surroundings (family, society, nature)	L2
2. become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.	L2
3. have better critical ability.	L3

4. become sensitive to their commitment towards what they have understood (human values, human relationship and human society). L3
5. 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. L4

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20AC71T.1	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC71T.2	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC71T.3	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC71T.4	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-
20AC71T.5	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-

Department of Electronics and Communication Engineering
ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

Title of the Course IOT Based Embedded System Design
Category SC
Couse Code 20A471L

Year IV B.Tech
Semester I Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practical	Credits
1	0	2	2

Name of the Modules

1. Introduction to Embedded Systems
2. Introduction to IoT
3. AWS IoT: Tutorial and demonstration
4. IoT: Components, operating systems and protocols
5. Arduino programming
6. Arduino programming: Tutorial
7. IoT Applications
8. IoT Applications: Tutorial and demonstration - 1
9. IoT Applications: Tutorial and demonstration - 2
10. Cloud, edge and fog computing for IoT: Part I
11. Cloud, edge and fog computing for IoT: Part II
12. IoT Communication

Course Outcomes: Upon successful completion of the course, student will	**Blooms Level of Learning**
1. Able to understand the basic operational elements of IoT and its characteristics.	L2
2. Able to analyze various application areas of IoT.	L4
3. Able to comprehend the revolution of IoT in cloud networks	L3

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
20A471L.1	3	-	2	-	-	-	-	-	-	1	-	1	2	2	-
20A471L.2	3	3	3	1	-	-	-	-	-	2	-	1	3	2	-
20A471L.3	3	-	2	-	-	-	-	-	-	2	-	1	2	2	1