ACADEMIC REGULATIONS,

COURSE STRUCTURE

AND

DETAILED SYLLABUS

FOR

B.Tech - ECE I & II Year

(Applicable for the Batches admitted from 2020-2021)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY

(An Autonomous Institution under JNTUH)

AccreditedbyNAACwith 'A'Gradeand accreditedbyNBA)

(RecipientofTEQIPunderThe WorldBankAssistance)

Yamnampet,Ghatkesar,Hyderabad– 501301.

January 2021

VISION AND MISSION OF THE INSTITUTION

Vision

To emerge as a leading Institute for Technical Education and Research in India with focus to produce professionally competent and socially sensitive engineers capable of working in multidisciplinary global environment.

Mission

1. To train the students in the fundamentals of Engineering, Science and Technology by providing good academic environment to pursue undergraduate, Post graduate in chosen fields of Engineering and Technology for a successful professional career.

2. To be a continuous learning organization by developing strong liaison with Academia, R & D institutions and Industry for exposure in practical aspects of engineering and providing solutions to the industrial and societal problems for sustainable development. To imbibe skills for entrepreneurship, project and finance management.

3. To inculcate team work, leadership, professional ethics, use of modern tools, IPR issues so that graduates are encouraged to obtain patents and respond to competitive global environment.

4. To promote strong research culture in graduates for lifelong learning, to explore the frontiers of knowledge and present at technical fora/publish in Journals at national/international level.

DEPARTMENT OF

ELECTRONICS AND COMMUNICATION ENGINEERING

Department of Electronics and Communication Engineering is established in the year 1997 to meet the requirements of the emerging industry/discipline. The Vision and the Mission of the department are:

VISION

To create an educational environment for students to excel in their professional carrier, and to solve the challenges of industry in the field of Electronics and Communication Engineering with focus on human values, professional ethics and social responsibility.

MISSION

1. Training the students in the core subjects of Electronics and Communication engineering with due focus on multi-disciplinary areas.

2. Establishing liaison with relevant industries, R&D organizations and renowned academia for exposure to modern tools and practical aspects of technology.

3. Inculcating team work, leadership, professional ethics, effective communication and interpersonal skills to make students globally competent in employment as well as entrepreneurship.

4. Promoting scientific temper and research culture in the graduates towards lifelong learning, and to work towards the engineering solution in the contexts of society and environment.

Program Educational Objectives (PEOs)

PEO – I. To apply the knowledge of mathematics, science and engineering fundamentals to find the solution of complex engineering problems concerning societal, health, safety, cultural and environmental issues.

PEO – II. Empowering graduates to exhibit proficiency in core areas through evolving technologies in electronics and communication engineering and to identify, analyze, design, and conduct experiments for innovative solutions.

PEO – III. Facilitating graduates to achieve academic excellence and pursue R&D in multi-disciplinary domains leading to design of novel products using modern tools and to promote skills in project management, entrepreneurship and IPR.

PEO- IV. Developing human values, and professional ethics, improving the effective communication skills, team work, leadership qualities, and life-long learning.

The Program Outcomes

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

The Program Specific Outcomes (PSOs)

PSO1: Should be able to gain the in-depth knowledge in core subjects to identify, formulate, analyze, and suggest viable solutions to the real-life problems in the field of electronics and communication engineering.

PSO2: Should have the capability to apply modern design tools to analyze and design subsystems/processes for a variety of applications in the allied fields of electronics and communications.

PSO3: Should possess good interpersonal skills, and also an ability to work as a team member as well as team leader with good professional ethics, and also to become a life-long learner in the context of technological developments.

ACADEMIC REGULATIONS
FOR B.TECH. REGULAR STUDENTS
WITH EFFECT FROM
THE ACADEMIC YEAR 2020-21
(A-20)

1.0 Under-Graduate Degree Programme in Engineering & Technology (E&T)

1.1 SNIST offers a 4-year (8 semesters) **Bachelor of Technology** (B.Tech.) degree programme, under Choice Based Credit System (CBCS) with effect from the academic year 2020-21 in the following branches of Engineering.

Sl. No.	Branch
1.	Civil Engineering
2.	Electrical and Electronics Engineering
3.	Mechanical Engineering
4.	Electronics and Communication Engineering
5.	Computer Science and Engineering
6.	Information Technology
7.	Electronics and Computer Engineering

1.2. Credits (Semester system for B.Tech courses)

The existing credit system of giving one credit for a lecture hour/ tutorial hour per week and giving 0.5 credit for every hour of practical and drawing shall be continued in these regulations also.

2.0 Eligibility for admission

2.1 Admission to the Under Graduate courses shall be made either on the basis of the rank of the candidate in entrance test conducted by the Telangana State Government (EAMCET) or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government from time to time. However, admissions under Management / NRI Category shall be made on the relevant orders issued by the Govt. of Telangana from time to time.

2.2 The medium of instruction for the entire Under Graduate programme of study in E&T will be **English** only.

3.0 B.Tech. Programme structure

3.1 A student after securing admission shall pursue the Under Graduate programme in B.Tech. in a minimum period of **four** academic years (8 semesters), and a maximum period of **eight** academic years (16 semesters) starting from the date of commencement of first year first semester, failing which student shall forfeit seat in B.Tech course. However, the student can take two more years for appearing the examinations to clear the backlog subjects.

In the First year it is structured to provide **45 credits** and the credits in II , III and IV years should not exceed **119 credits** as per AICTE model curriculum for the B.Tech. programme. Each student shall secure **164 credits** (with CGPA $\geq$5) required for the completion of the Under Graduate programme and Award of B.Tech degree.

Each student shall secure **164 total credits** (with CGPA ≥ 5) for the completion of the Under Graduate programme for the award of the B.Tech. degree. However, any revision made in this regard and approved by the Academic Council of the college and by Parent University shall be implemented from the date of the revision.

3.2 **UGC/AICTE** specified definitions/ descriptions are adopted appropriately for various terms and abbreviations stated below.

3.2.1 Semester scheme

Each Under Graduate programme is of 4 academic years (8 semesters) with the academic year being divided into two semesters of 22 weeks (90 instructional days) each, each semester having - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'.

Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated curriculum / course structure as suggested by AICTE are followed.

3.2.2 Credit courses

- A student in a semester has to earn credits which shall be assigned to each subject/ course in an L: T: P: C (lecture periods: tutorial periods: practical periods: credits) structure based on the following general pattern.
- One credit for one hour/ week offered in the entire semester for theory lecture (L) / Tutorial (T) courses.
- One credit for two hours/ week offered in the entire semester for laboratory/ practical (P) courses.
- The orientation course recommended by AICTE in the model curriculum is offered for 3 weeks and Cyber Security in III year as mandatory course.
- Environmental Engineering is offered mandatory course for B. Tech Mechanical Engineering and ECE students in II year.
- However,these courses will be reflected in the Memo of Marks,the grading will be awarded below, with some total of 100 marks with CIE for 30 marks and SEE for 70 marks.

%of Marks Secured ina Subject/Course	LetterGrade
Greater thanorequalto90%	O (Outstanding)
80and lessthan 90%	A+ (Excellent)
70and lessthan 80%	A (VeryGood)
60and lessthan 70%	B+(Good)
50and lessthan 60%	B (Average)
40and lessthan 50%	C (Pass)
Below40%	F (FAIL)
Absent	Ab

- For mandatory courses i.e ., **Orientation Course** for B. Tech I year students to be taught for one week in I semester with Two Units and remaining Four Units in B. Tech. I year II semester and **Cyber Security** is offered as mandatory course for all the students of Civil, ME,EEE and will not have credits, but evaluation will be done as per the above table. A student cannot obtain degree unless he / she completes all the mandatory courses.

3.2.3 Subject Course Classification

All subjects / courses offered for the Under Graduate programme in E&T (B.Tech. Degree programmes) are broadly classified as follows. The Institution has followed all the guidelines issued by AICTE/UGC.

The groups of the subjects shall be as given in the table hereunder along with the credits suggested by AICTE. efforts are made by individual departments to make up the total credits equal to 164.

Sl. No.	Category	Suggested Breakup of Credits (Total 160)	CSE	ECE	CED	EEE	ME	IT	ECM
1	Humanities and social sciences including Management courses	12*	14	14	11	13	13	14	13
2	Basic Science including Mathematics courses	25*	22	23	29	30	24	22	26
3	Engineering Science courses including workshop, drawing, basic electrical /electronics mechanical course as well as various computer courses offered for Non – IT branches	24*	29	28	31	25	28	29	28
4	Professional core courses	48*	59	59	51	61	62	59	59
5	Professional Elective courses (five courses)relevant to chosen specialization / branch	18*	15	15	15	15	15	15	15
6	Open Electives(3 courses) offered by any other departments / MBA department **	18*	6	6	6	6	6	6	6
7	Project work, seminar and internship in industry or elsewhere	15*	19	19	21	14	16	19	17
8	Mandatory courses (Environmental Sciences, Induction training, Indian constitution, Essence of Indian Traditional Knowledge)	(Non-credit)	(Non-credit)	(Non-credit)	(Non-credit)	(Non-credit)	(Non-credit)	(Non-credit)	(Non-credit)
	Total	160*	164	164	164	164	164	164	**164**

The Joint Board of Studies and Academic Council of the institution has approved the total number of credits to be 164. The various groups of subjects mentioned above shall have credits suggested above with minor variations.

4.0 Course registration

4.1 A 'faculty advisor or counselor' shall be assigned to a group of 20 students, who will advise student about the under graduate programme, its course structure and curriculum, choice/option for Professional and open Electives based on their employment potential / further studies.

4.2 The student will progress semester after semester as the Institute is following cohort system to satisfying the conditions of promotion to the next semester.

4.3 **In the present system there shall be five subjects in each professional elective stream and three subjects in open elective stream.** A student can opt for a stream of professional/ open electives which should be submitted to the faculty Advisor/ Counselor and copy of it to the Examination Section through the Head of the department. A copy of it will be retained with the Head of the department/ faculty Advisor/ Counselor and the student.

4.4. **The student can take one extra subject in each semester and can complete the program in 3 ½ years but original degree will be issued along with his / her batch mates after 4 years.**

4.5. **If a student acquires 20 credits extra than the required credits as per the regulations he will be awarded honors.**

4.6 The purpose of offering Elective Streams in both Professional and Open Electives is to facilitate the students to have a minor specialization based on their interest, so that they will have multi disciplinary exposure. Hence, a student is to take a stream of Electives in either in Professional / Open Elective. He shall not be permitted to opt for other elective subjects in other streams in subsequent semesters.

4.7 Dropping of Electives may be permitted, only after obtaining prior approval from the faculty advisor / counselor, '**within a period of 15 days** from the beginning of the current semester.

5.0 Subjects / courses to be offered

5.1 A typical section (or class) nominal strength for each semester shall be 60.

5.2 A subject / course may be offered to the students, **only if** a minimum of **30 students** opt for it. The maximum strength of a section is limited to 80.

6.0 Attendance requirements:

6.1 A student shall be eligible to appear for the semester end examinations, if student acquires a minimum of 75% of attendance in aggregate of all the subjects / courses (excluding attendance in mandatory courses, Internship during II year, NCC / NSO and NSS) for that semester.

6.2 Shortage of attendance in aggregate upto 10% (65% and above and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.

6.3 A stipulated fee shall be payable towards condoning of shortage of attendance as decided by finance committee of SNIST from time to time.

6.4 Shortage of attendance below 65% in aggregate shall in**NO CASE** be condoned.

6.5 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester.

They get detained and their admission for that semester shall stand cancelled.

They will not be promoted to the next semester. They may seek re-admission for all those subjects registered in that semester in which student was detained, by seeking re-admission into that semester as and when offered; in case if 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 later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category. He will be governed by the new regulations in which he takes re-admission.

6.6 A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same semester.

7.0 Academic requirements

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

7.1 **A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject / course, if student secures not less than 35% marks (24 out of 70 marks) in the semester end examination, and a minimum of 40% of marks in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing 'C' grade or above in that subject / course.**

7.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to group projects, seminar, comprehensive test, viva-voce and major project.If a student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them.

The student would be treated as failed, if student

(i) does not complete all the mandatory courses offered during the course
(ii) doesnot submit a report on internship, group project, major project, or does not make a presentation of the same before the evaluation committee as per schedule, or
(iii) does not present the seminar as required in the I year and II year or
(iv) secures less than 40% marks in comprehensive test and seminar/ comprehensive test and viva-voce /group project/major project evaluations.

Student may reappear once for each of the above evaluations, when they are scheduled again; if student fails in such 'one re-appearance' evaluation also, student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

7.3 Promotion Rules based upon credits

S.No.	Promotion	Conditionstobefulfilled
1	First year First Semester to Second Semester	Regularcourseofstudyoffirstyear firstsemester and should have satisfied the minimum requirement of attendance to appear I year I semester.
2	Firstyearto secondyearfirstse mester	i. Regularcourseofstudyoffirstyear First and secondsemesters. ii. Musthavesecuredat least50%ofcredits (22) upto first year second semester from alltherelevantregularand supplementary examinations, whetherthestudent takesthose examinationsornot.

3.	II Year I Semester to II Semester	Regularcourseofstudyof second year firstsemester.
4	Second year tothirdyearfirstsemester	i. RegularcourseofstudyofFirst and secondsemesters of second year. ii. Must have secured at least 60%of credits (54) uptosecond yearsecond semester fromalltherelevant regular andsupplementary examinations, whetherthestudent takesthoseexaminationsornot.
5	Third year first semester to secondsemester	Regularcourseofstudyofthirdyear firstsemester.
6	Thirdyearsecondsemesterto fourthyearfirstsemester	i. Regular course of study of third yearsecondsemester. ii. Must have secured 60% ofcredits (79) uptothirdyear second semester fromalltherelevant regular andsupplementary examinations, whetherthestudent takesthoseexaminationsornot.
7	Fourth year first semester to fourthyearsecond semester	Regularcourseofstudyoffourthyear firstsemester.

7.4 A student (i) shall attend for all courses / subjects covering 164 credits as specified and listed in the course structure, (ii) fulfils all the attendance and academic requirements for 164 credits, (iii) earn all 164 credits by securing SGPA $\geq$ 5.0 (in each semester), and CGPA (at the end of each successive semester) $\geq$ 5.0, (iv) **passes all the mandatory courses,** to successfully complete the under graduate programme. The performance of the student in these 164 credits shall be taken into account for the calculation of 'the final CGPA (at the end of under graduate programme), and shall be indicated in the grade card of IV year II semester.

7.5 If a student registers for some more '**extra subjects'** (in the parent department or other departments / branches of engineering) other than those listed subjects as specified in the course structure of his Department, the performances in those ' **extra subjects**' will not be taken into account while calculating the SGPA and CGPA. For such '**extra subjects'** registered, Percentage (%) of marks and letter grade alone will be indicated in the grade card as a performance measure, subject to completion of the attendance and academic requirements as stated in the regulations 6 and 7.1 to 7.4 above.

7.6 A student eligible to appear in the semester end examination for any subject / course, but absent from it or failed (thereby failing to secure **'C'** grade or above) has to reappear for that subject/ course in the supplementary examination as and when conducted. In such cases, CIE assessed earlier for that subject / course will be carried over, and added to the marks obtained in the supplementary examination for evaluating performance in that subject.

7.7 A student **detained in a semester due to shortage of attendance, may be re-admitted when the same semester is offered in the subsequent academic years for the fulfillment of academic requirements**.

The academic regulations under which student has been readmitted shall be applicable. However, no grade allotments or SGPA / CGPA calculations will be done for the entire semester in which student has been detained.

7.8 A student detained **due to lack of credits, will be promoted to the next academic year only after acquiring the required credits as per academic regulations.**

The academic regulations shall be applicable to a student whatever they are in force at the time of re-admission.

8.0 Evaluation - Distribution and weightage of marks

8.1 The performance of a student in each semester shall be evaluated subject-wise for a maximum of 100 marks for a theory and 100 marks for every practical subject with 30 marks Continuous Internal Evaluations (CIE) and 70 marks for Semester End Examinations (SEE)

Summer Break: Internship-I and Internship-II will be organized during summer vacation of II-II and III-II and evaluation of the same will be carried out during lab examinations of III-I and IV-I.

In addition, there will beGroup Project-I in III year I semester, Group Project-II in III year II semester, and Group Project-III in IV year I semester, Major project in IV year II semester will be evaluated for 100 marks.

The pattern of continuous internal evaluation for Internship Project and Group Project is given below:

Sl.No	Description	Marks
1	Abstract, Design, implementation and Presentation in front of Project Review Committee consisting of HoD, Senior faculty and Internal guides (Average)	15 marks
2	Report	05 marks
3	Evaluation by Internal Guide	10 marks
	Total sessional marks	**30 marks**

Semester end examination - 70 marks

Pattern of external evaluation for Internship Project and Group Project.

Sl.No	Description	Marks
1	Final report	10 marks
2	Presentation	10 marks
3	Demonstration/defence of project	50 marks
	Total sessional marks	**70 marks**

Pattern of continuous internal evaluation for Major Project in IV year II semester is as follows:

Sl.No	Description	Marks
1	Progress of Project work and the corresponding interim report as evaluated by Project Review Committee at the end of 6 weeks	5 marks
2	Seminar at the end of 6 weeks	5 marks
3	Progress of Project work as evaluated by Project Review Committee at the end of 11 weeks	5 marks
4	Seminar at the end of 11 weeks	5 marks
5	Evaluation by Project Review Committee at the end of 15 weeks and Final Project Report	5 marks
6	Final presentation and defense of project	5 marks
	Total	**30 marks**

Pattern of External Evaluation for Major project - 70 Marks

Sl.No	Description	Marks
1	Final Project Report	10 marks
2	Presentation	20 marks
3	Demonstration / Defense of Project before committee	40 marks
4	**TOTAL**	**70 marks**

8.2 For all the other theory and lab subjects the distribution of marks shall be 30 for Continuous Internal Evaluation (CIE) and 70 for the Semester End-Examination (SEE).

8.3 Theory Subjects

8.3.1 Pattern for Continuous Internal Evaluation (CIE) 30 marks

The following procedure is to be adopted for awarding internal marks of 30 for all the B. Tech. students from the **Academic Year 2020-2021**

The distribution of marks for continuous internal evaluation (30 marks) is shown below. Average of two Mid Tests will be taken for final award of marks.

a)	**Part – A** of Mid Test will have 10 questions	5 marks
b)	**Part – B** of Mid Test will have 4 questions (1 from each unit and 4th question from any one unit or combination) and student has to answer 3 questions	15 marks
c)	**Part – C** Mid Test Question Paper Will have 3 questions – One fromeach unit taken from assignment questions. Student has to answer 1 question out of 3 questions	3 marks
d)	**Assignment– I** three questions from each unit (1,2,3 unit) – total of 9 questionsto be submitted before first mid test. **Similarly assignment – II**: will have three questions from each unit (4, 5, 6 units) total of 9 questions will be submitted before Mid Test IIand average of two assignments will be considered.	2 marks
e)	Attendance *	3 marks
f)	Class notes	2 marks
	Total	**30 marks**

* Three marks are awarded for each theory subject for the students who put in attendance in a graded manner as given below:

S.No.	Attendance Range	Marks Awarded
1.	65 % and above but less than 75%	1
2.	75% and above and less than 85%	2
3.	85% and above	3

Marks for attendance shall be added to each subject based on average of attendance of all subjects put together.

If any candidate is absent in any subject or mid-term examination, this student wishes to improve performance, a **third mid-test** will be conducted for that student by the Institution in the entire syllabus, on the same day of Semester End Examination (SEE) for $2^1/_2$ hours. That result will be treated as III mid test and average of better two of (mid test I,II,III) will be considered. III mid test

will have Part-A (compulsory) and Part-B with essay type questions and three out of four questions are to be answered.

b) <u>Pattern for External Examinations - (70 marks)</u>

- There shall be external examination in every theory course and consists of two parts (Part-A & Part-B). The total time duration for this semester end examination will be 3 hours.

- **Part-A** shall have 20 marks, which is compulsory. It will have 10 short questions set with 2 marks each. There shall be atleast one question to each of the six units and two questions from units 1,2,3 and two questions from unit 4,5,6 and number of questions from any unit shall not exceed two.

- **Part-B** of the question paper shall have essay type questions for 50 marks and shall have 8 questions out of which any 5 are to be answered. At least one question must appear from each Unit. Seventh question must have 2 to 3 bits taken from 1st, 2nd, and 3rd units and 8th question also with 2 to 3 bits taken from 4th, 5th and 6th units, such that not more than 2 questions shall be from any one unit. All the questions carry equal marks.

8.4 Pattern of Evaluation for Lab subjects - (100 marks)

8.4.1 For practical subjects there shall be a continuous evaluation during the semester for 30 sessional marks and 70 marks for semester end examination. Out of the 30 marks for Continuous Internal Evaluation, the distribution of marks is as follows

S. No	Item	Marks
1.	Day to Day work	05 marks
2.	Final Record and viva	09 marks
3.	Average of two tests including viva	05 marks
4.	Lab Based Project Report viva and demo	08 marks
5.	Attendance	03 marks
	Total	**30 marks**

8.4.2 The semester end examination for 70 marks for the lab subjects shall be conducted by an external examiner and an internal examiner appointed by the Chief Superintendent of Examinations of the college. The marks are distributed as follows:

S. No	Item	Marks
1.	Procedure to experiment and Tabulation	10 marks
2.	Conduct of experiment, observation, Calculation	30 marks
3.	Results including graphs, discussions and conclusion	20 marks
4.	Viva voce and Record	10 marks
	Total	70 marks

8.4.3 In case computer based examinations

S. No	Item	Marks
1.	Flow chart and algorithms	10 marks
2.	Program writing and execution	30 marks
3.	Result and conclusions	20 marks
4.	Viva voce and Record	10 marks
	Total	70 marks

8.5 **For the subject having design and / or drawing, (such as Engineering Drawing and Machine Drawing), the distribution shall be 30 marks for internal evaluation (10 marks for day-to-day work including drawing,3 marks for home assignment work, 12 marks for average of two internal tests and 2 marks for class notes 3 marks for attendance) and 70 marks for end semester end examination.**

There shall be two internal tests in a Semester and the average of the two shall be considered for the award of marks for internal tests.

Third test facility can be availed as mentioned above (8.3.1 (i) (a) and (b)

8.6. Technical Seminar

There shall be a technical seminar evaluated for 100 marks from I year I semester to II year II Semester. The evaluation is purely internal and will be conducted as follows:

Sl.No	Description	Marks
1	Literature survey, topic and content	10
2	Presentation including PPT	10
3	Seminar Notes	05
4	Interaction with audience after presentation	05
5	Final Report 3 copies	10
6	Class room participation	05
7	Punctuality in giving seminar as per Scheduled time and date	10
8	Mid Semester Viva (on the seminar topics completed up to the end of 9^{th} week	15
9	End Semester Viva	30
	Total	**100 Marks**

Student must secure 40% i.e. 40 marks to be successful in sum total (Hundred Marks) in Technical Seminar.

8.7 Comprehensive Test and Viva-voce:

Comprehensive test and Viva Voce	The subjects studied in the Semester concerned related to branches concerned and for placements
B.Tech I year I semester	I semester
B.Tech I year II semester	I and II semester
B.Tech II year I semester	I, II and III semester
B.Tech II year II semester	I, II, III and IV semester
B.Tech III year I semester	I, II, IIII, IV and V semester
B.Tech III year II semester	I, II, IIII, IV, V and VI semester
B.Tech IV year I semester	I, II, IIII, IV, V, VI and VII semester

Two Mid tests, Two mid Viva voce, one External Comprehensive Test and one External Comprehensive Viva Voce.

Allocation of marks :

*Comprehensive Test : 70 marks
**Viva Voce : 30 marks
Total : 100 marks

*Average of two best Mid Tests of Mid Test – I, Mid Test – II and Mid Test - III will be taken for 30 marks.

Total marks for Comprehensive Test will be 70.

The total sessional marks in this subject of Comprehensive Test and Viva Voce will be : 30 for sessionals and 70 for End Semester examination.

The grand total of marks for the subject of Comprehensive Test and Viva Voce will be 100. The student has to secure 40% of marks i.e. 40 marks in sum total of 100 marks to be successful in the subject.

8.8 The laboratory records and internal test papers shall be preserved in the respective departments as per the college norms and shall be produced to the Committee of the college or any external agency like AICTE, NAAC, JNTUH, NBA etc., as and when the same are called for.

8.9. There shall be aInternship 1 and Internship 2, in an Industry of their specialization. Students will register for this immediately after II year II semester end examinationand III year II semester examinations and pursue it during summer vacation. Internship 1 and Internship 2 shall be submitted as a project report and presented before the committee in III year I semester andIV year I semester along with lab examination. This project report will be evaluated for 30 internal marks and 70 external marks. The committee consists of an external examiner, Head of the Department, Supervisor of the Internship project and Senior Faculty Member of the Department.

8.10 The laboratory marks and the internal marks awarded by the college are subject to scrutiny and scaled down by the Departmental committees wherever necessary. In such cases, the internal and laboratory marks awarded by the department will be referred to a committee. The committee will arrive at a scaling factor and the marks will be scaled accordingly. The recommendation of the committee is final and binding. The laboratory records and internal test papers shall be preserved in the respective departments as per the college rules and produced before the visiting committees as and when they are asked for.

8.11. For mandatory courses like orientation course, cyber security, a student has to secure 40 marks out of 100 marks (i.e. 40% of the marks allotted) in sum total of continuous internal evaluation and external examination for passing the subject / course. These marks will be gradedas per table given in 3.2.2.

9.0 Grading procedure

9.1 Marks will be awarded to indicate the performance of student in each theory subject, laboratory / practicals, seminar, Group Project 1,2,3, in the Major project and Comprehensive Test and Viva.

Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade shall be given.

9.2 As a measure of the performance of student, a 10-point absolute grading system using the following letter grades (as per UGC / AICTE guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a Subject / Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points (GP)
Greater than or equal to 90%	O (Outstanding)	10
80% and less than 90%	A+ (Excellent)	9
70% and less than 80%	A (Very Good)	8
60% and less than 70%	B+ (Good)	7
50% and less than 60%	B (Average)	6
40% and less than 50%	C (Pass)	5
Below 40%	F (FAIL)	0
Absent	Ab	0

9.3 A student obtaining '**F**' grade in any subject shall be deemed to have '**failed**' and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

9.4 A student who has not appeared for examination in any subject, '**Ab**' grade will be allocated in that subject, and student shall be considered '**failed**'. Student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered.

9.5 A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

9.6 A student earns grade point (GP) in each subject / course, on the basis of the letter grade secured in that subject / course. The corresponding 'credit points' (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

Credit points (CP) = grade point (GP) x credits …. For a course

9.7 The student passes the subject / course only when **GP is not less than 5 (i.e. 'C' grade or above)**

9.8 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (CP) secured from all subjects / courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to two decimal places. SGPA is thus computed as

$$SGPA = \{ \sum_{i=1}^{N} C_i G_i \} / \{ \sum_{i=1}^{N} C_i \}$$ …. For each semester

(i.e., upto and inclusive of S semesters, S 2),

where '**N**' is the **total** number of subjects (as specifically required and listed under the course structure of the parent department) the student has '**registered**' i.e., from the 1st semester onwards upto and inclusive of the 8th semester, 'j' is the subject indicator index (takes into account the subjects from 1 to 8 semesters), C_J is the number of credits allotted to the Jth subjects and G_j represents the grade points (GP) corresponding to the letter grade awarded for that Jth subject.

After registration and completion of the first year first semester, SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA

Course / Subject	Credits	Letter Grade	Grade Points	Credit Points
Course1	4	A	8	4x8 =32
Course2	4	O	10	4x10=40
Course3	4	C	5	4x5 =20
Course4	3	B	6	3x6 =18
Course5	3	A+	9	3x9 =27
Course6	3	C	5	3x5 =15
	21			152

SGPA = 152/21 = 7.24

Illustration of calculation of CGPA:

Course / Subject	Credits	LetterGrade	GradePoints	Credit points Points
I				
Course1	4	A	8	4x8 =32
Course2	4	A	9	4x9 =36
Course3	4	B	6	4x6 =24
Course4	3	O	10	3x10=30
Course5	3	B	7	3x7 =21
Course6	3	A	8	3x8 =24
I				
Course7	4	B	7	4x7 =28
Course8	4	O	10	4x10=40
Course9	4	A	8	4x8 =32
Course10	3	B	6	3x6 =18
Course11	3	C	5	3x5 =15
Course12	3	A	9	3x9 =27
TotalCredits	= 42			TotalCreditPoints=327

CGPA = 327/42 = 7.79

9.9 For merit ranking or comparison purposes or any other listing, **only** the '**rounded off**' values of the CGPAs will be used.

9.10 For calculations listed in regulations 9.6 to 9.9, performance in failed subjects/ courses (securing **F** grade) will also be taken into account, and the credits of such subjects/courses will also be included in the multiplications and summations.

After passing the failed subject(s) newly secured letter grades will be taken into account for calculation of SGPA and CGPA.

However, mandatory courses will not be taken into consideration.

10.0 Passing standards

10.1 A student shall be declared successful or 'passed' in a semester, if student secures a GP ≥ 5 ('C' grade or above) in every subject/course in that semester (i.e. when student gets SGPA 5.00 at the end of that particular semester); and a student shall be declared successful or 'passed' in the entire under graduate programme, only when gets a CGPA 5.00 for the award of the degree as required.

10.2 After the completion of each semester, a grade card or grade sheet (or transcript) shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, and grade earned etc.), credits earned, SGPA, and CGPA.

11.0 Declaration of results

11.1 Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9.

11.2 For final percentage of formula may be used.

12.0 **Award of degree** marks equivalent to the computed final CGPA, the following
% of Marks = (final CGPA – 0.5) x 10

12.1 A student who registers for all the specified subjects/ courses as listed in the course structure and secures the total number of credits (with CGPA ≥5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have '**qualified'** for the award of the B.Tech. degree in the chosen branch of Engineering as selected at the time of admission.

12.2 A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes.

12.3 Students with final CGPA (at the end of the under graduate programme) 8.00 and above, and fulfilling the following conditions -

(i) Should have passed all the subjects/courses in '**first appearance'** within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.

(ii) Should have secured a CGPA ≥8.00, at the end of each of semesters, starting from first year first semester onwards.

(iii) Should not have been detained or prevented from writing the end semester examinations in any semester due to shortage of attendance or any other reason, shall be placed in **'FIRST CLASS WITH DISTINCTION'**, otherwise **FIRST CLASS**only.

12.4 Students with final CGPA (at the end of the under graduate programme) ≥ 6.5 but < 8.00, shall be placed in '**FIRST CLASS'**.

12.5 Students with final CGPA (at the end of the under graduate programme) ≥ 5.5 but < 6.5, shall be placed in '**SECOND CLASS'**.

12.6 All other students who qualify for the award of the degree (as per item 12.1), with final CGPA (at the end of the under graduate programme) ≥ 5 but <5.5, shall be placed in '**pass class**'.

12.7 A student with final CGPA (at the end of the under graduate programme) < 5.00 will not be eligible for the award of the degree.

12.8 Students fulfilling the conditions listed under item 12.3 alone will be eligible for award of '**university rank**' and '**gold medal**'.

13.0 Withholding of results

13.1 If the student has not paid the fees to the university / college at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

14.0 Transitory regulations

14.1 A student who has discontinued for any reason, or has been detained for want of attendance or lack of required credits as specified, or who has failed after having undergone the degree programme, may be considered eligible for readmission to the same subjects / courses (or equivalent subjects/ courses, as the case may be), and same professional electives / open electives (or from set/category of electives or equivalents suggested, as the case may be) as and when they are offered (within the time-frame of 8 years from the date of commencement of student's first year first semester).

A student admitted in one academic regulation and he is getting readmission in some other academic regulations , the college has to offer substitute / additional subjects based on the comparison of two academic regulations. The details of substitute / additional subjects offered with the recommendations of board of studies of the concerned branch has to be given from time to time. The student will be governed by the academic regulations at the time of re-admission.

15.0 Student transfers

15.1There shall be no branch transfers after the completion of admission process.

15.2 The students seeking transfer to Sreenidhi Institute of Science and Technology (SNIST) from various other Universities / institutions have to pass the failed subjects which are equivalent to the subjects of SNIST, and also pass the subjects of SNIST which the students have not studied at the earlier institution.

Further, though the students have passed some of the subjects at the earlier semesters of SNIST, the students have to study substitute subjects in SNIST and get sessional marks by attending 3rd mid test and paying requisite fee as per the rules.

15.3 The transferred students from other Universities/ institutions to SNIST who are on rolls to be provided one chance to write the CIE (internal marks) in the failed subjects and /or subjects not studied as per the clearance letter issued by the Institution.

15.4 The autonomous affiliated colleges have to provide one chance to write the internal examinations in the failed subjects and /or subjects not studied, to the students transferred from other universities / institutions to SNIST who are on rolls, as per the clearance (equivalence) letter issued by the University.

16.0 **Scope**

16.1 The academic regulations should be read as a whole, for the purpose of any interpretation.

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

16.3 The Institution may change or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the date notified by the Institution.

Academic Regulations for B.Tech.
(LATERAL ENTRY SCHEME)
w.e.f the AY 2021-22

1. Eligibility for award of B. Tech. Degree (LES)
The Lateral Entry Scheme (LES) students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years failing which he will forfeit the seat.

2. The student shall register and secure for all the credits with CGPA ≥ 5 from II year to IV year B.Tech. programme (LES) as per the regulations for the award of B.Tech. degree. **Out of the total credits secured, the student can avail exemption up to 6 credits**, that is, one open elective subject and one professional elective subject or two professional elective subjects for B.Tech programme to improve the performance of the Grade point average.

3. The students, who fail to fulfil the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.However, the student can take **two more** years for appearing the examinations.

4. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech. (LES).

5. <u>Promotion rules based on credits</u>

S.	Promotion	Conditionstobefulfilled
1	Second year first semester to second year second semester	Regularcourseofstudyofsecondyearfirst semester.
2	Secondyearsecondsemestertothird yearfirstsemester	(i)Regular course ofstudyofsecondyear secondsemester. (ii)Musthavesecuredatleast27credits outof45credits i.e.,60% ofcreditsup to second yearsecond semester fromall the relevant regular and supplementary examinations, whether thestudenttakes thoseexaminationsor not.
3	Thirdyearfirstsemestertothirdyear secondsemester	Regularcourseofstudyofthirdyearfirst semester.
4	Thirdyearsecondsemestertofourth yearfirstsemester	(i) Regularcourseof study ofthird year secondsemester. (ii)Musthavesecuredatleast52credits outof87credits i.e.,60% ofcreditsup to third year second semester from all the relevant regular and supplementary examinations, whether the student takes thoseexaminationsor not.

5	Fourth year first semester to fourth year secondsemester	Regularcourseofstudyoffourthyearfirst semester.

6. AlltheotherregulationsasapplicabletoB.Tech.4-yeardegreecourse(Regular) willholdgoodforB.Tech.(LateralEntryScheme).

MALPRACTICERULES
DISCIPLINARYACTIONFORMIS-CONDUCTOF STUDENTS DURING EXAMINATIONS

	Natureof Malpractice/ Mis-conduct of the conduct	**Punishment**
	If thestudent:	
1.(a)	Possesses or keeps accessible in examination hall,anypaper,notebook, programmable calculators,cellphones, pager, palm computers or any other form ofmaterialconcerned with or relatedtothesubject of theexamination (theory orpractical)inwhichstudentis appearing buthasnotmadeuseof (materialshallinclude any marks onthe bodyofthestudentwhichcanbeused asanaidinthe subject ofthe examination)	Expulsion fromtheexamination halland cancellationoftheperformance inthatsubject only.
(b)	Givesassistanceor guidanceorreceives itfromanyotherstudentorallyorby anyotherbody languagemethodsor communicates throughcellphoneswith any studentorpersons inoroutside the examhallinrespectofanymatter.	Expulsion fromtheexamination halland cancellationoftheperformance inthatsubject only ofallthestudentsinvolved. Incaseofan outsider, hewillbehanded overtothepolice andacaseisregisteredagainsthim.
2.	Has copiedintheexaminationhallfrom any paper,book,programmable calculators, palm computers or any other formofmaterialrelevant tothe subject ofthe examination(theoryor practical)inwhich thestudent is appearing.	Expulsion from the examination hall and cancellationoftheperformance inthatsubject andallother subjectsthestudenthasalready appearedincludingpracticalexaminations and UGmajorprojectandshallnotbepermitted to appearfortheremainingexaminations ofthe subjectsofthatsemester/year. Thehallticketofthestudent istobecancelled andsenttotheuniversity.
3.	Impersonates any other student in connectionwiththeexamination.	The student who has impersonated shall be expelledfromexamination hall. Thestudentis alsodebarred andforfeitstheseat.The performance oftheoriginalstudentwhohas beenimpersonated,shallbecancelledinallthe subjects ofthe examination (including practicalsandUGmajor project)already appeared andshallnotbeallowed toappearfor examinations oftheremainingsubjectsofthat semester/year. Thestudentisalsodebarred for twoconsecutivesemesters from classwork and alluniversityexaminations. Thecontinuation

		ofthecoursebythestudentissubjecttothe academicregulationsinconnection with forfeiture of seat. If theimposter is an outsider, hewillbehanded overtothepolice andacaseisregisteredagainsthim.

4.	Smuggles intheanswerbookor additional sheetor takesoutorarranges tosendoutthequestionpaperduring theexamination oranswerbookor additional sheet,during orafterthe examination.	Expulsion fromtheexamination halland cancellationofperformance inthatsubjectand alltheother subjects thestudenthasalready appearedincludingpracticalexaminations and UGmajorprojectandshallnotbepermitted fortheremainingexaminations ofthesubjects ofthatsemester/year. Thestudent isalso debarred fortwoconsecutive semestersfrom classworkand all universityexaminations.The continuationof thecoursebythe studentis subjecttotheacademicregulations in
5.	Usesobjectionable,abusiveoroffensive language inthe answer paper or in letterstotheexaminers orwritestothe examinerrequesting himtoawardpass marks.	Cancellationoftheperformanceinthatsubject.
6.	Refusestoobeytheordersofthechief superintendent/assistant – superintendent /anyofficeronduty or misbehaves or creates disturbance of any kind inandaroundtheexamination hallororganizesawalkoutorinstigates others towalkout, orthreatensthe officer-inchargeoranyperson onduty inoroutsidetheexaminationhallofany injuryto his personor to anyof his relationswhether bywords,either spoken orwrittenorbysignsorby visiblerepresentation, assaultsthe officer-in-charge,oranypersononduty inoroutsidetheexaminationhallorany ofhisrelations,orindulgesinany other actofmisconduct ormischiefwhich result in damage to or destructionof property intheexaminationhallorany part of the collegecampusor engagesin anyotheractwhichintheopinionof theofficeronduty amountstouseof unfairmeansormisconduct orhasthe	Incaseofstudentsofthecollege,they shallbe expelledfromexamination hallsand cancellation of their performance in that subjectandallothersubjectsthestudent(s) has (have)already appearedandshallnotbe permitted toappearfortheremaining examinations ofthesubjectsofthat semester/year. Thestudents alsoaredebarred andforfeittheirseats. Incaseofoutsiders, they willbehandedovertothepoliceanda policecaseisregisteredagainstthem.

7.	Leaves theexamhalltaking away answerscriptorintentionallytears of thescriptorany partthereofinsideor outsidetheexaminationhall.	Expulsion from the examination hall and cancellationofperformance inthatsubjectand alltheother subjects thestudenthasalready appearedincludingpracticalexaminations and UGmajorprojectandshallnotbepermitted fortheremainingexaminations ofthesubjects of thatsemester/year. Thestudent isalso debarred fortwoconsecutive semestersfrom classworkand all universityexaminations.The continuationof thecoursebythe studentis subjecttotheacademicregulations in

8.	Possessanylethalweaponorfirearmin theexaminationhall.	Expulsion from the examination hall and cancellationoftheperformance inthatsubject andallother subjects thestudenthasalready appearedincludingpracticalexaminations and UGmajorprojectandshallnotbepermitted fortheremainingexaminations ofthesubjects of thatsemester/year. Thestudent isalso debarredandforfeitsthe seat.
9.	Ifstudent ofthecollege,whoisnota studentforthe particular examinationor any personnotconnectedwiththe collegeindulges inanymalpracticeor improperconduct mentionedinclause6 to8.	Student of the colleges expulsion from the examination hallandcancellationofthe performance inthatsubjectandallother subjectsthestudenthasalready appeared includingpracticalexaminationsandUGmajor projectandshallnotbepermitted forthe remainingexaminations ofthesubjectsofthat semester/year. Thestudentisalsodebarred and forfeitstheseat. Person(s)whodonotbelongtothecollege will behandedover topoliceand,apolicecasewill
10.	Comesin adrunkenconditionto the examinationhall.	Expulsion from the examination hall and cancellationoftheperformance inthatsubject andallother subjects thestudenthasalready appearedincludingpracticalexaminations and UGmajorprojectandshallnotbepermitted fortheremainingexaminations ofthesubjects ofthatsemester/year.
11.	Copying detected on the basis of internalevidence, suchas,during valuationorduringspecialscrutiny.	Cancellationoftheperformanceinthatsubject andallothersubjects thestudenthasappeared includingpracticalexaminationsandUGmajor projectofthatsemester/yearexaminations.

12. If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the university for further action to punishment award suitable.

Malpractices identified by squad or special invigilators

1. Punishments to the students as per the above guidelines.

2. Punishment for institutions: (if the squad reports that the college is encouraging malpractices)

    a. A show cause notice shall be issued to the college.
    b. Impose a suitable fine on the college.
    c. Shifting the examination centre from the college to another college for a specific period of not less than one year.

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I Year I Semester ECE

Sl. No	Course Type	Dept Course	Code	Name of the Course	L	T	P	C	CIE	SEE
1	BS	S&H	8HC04	Engineering Chemistry	4	0	0	4	30	70
2	ES	IT	8FC01	Problem Solving using C	3	0	0	3	30	70
3	BS	S&H	8HC09	Matrix Methods and Calculus	2	1	0	3	30	70
4	ES	S&H	8BC01	Workshop/Manufacturing Processes	1	0	0	1	30	70
5	HS	S&H	8HC01	Oral Communication Skills	1	0	0	1	30	70
6	BS	S&H	8HC08	Basic Mathematics, Analysis and Reasoning	2	1	0	3	30	70
7	BS	S&H	8HC64	Engineering Chemistry Lab	0	0	2	1	30	70
8	ES	IT	8FC61	Problem Solving using C Lab	0	0	2	1	30	70
9	ES	S&H	8BC61	Workshop/Manufacturing Processes Lab	0	0	2	1	30	70
10	HS	S&H	8HC61	Oral Communication Skills Lab	0	0	2	1	30	70
11	BS	ECE	8C160	Comprehensive Test and Viva Voce-I (2 Mids(Viva) and End Semester(Test and Viva) = 30+70)	1	0	0	1	30	70
12	BS	ECE	8C161	Technical Seminar – I	1	0	0	1	100	00
13	HS	S&H	8HC18	Orientation Course*	1	0	0	0	Marks and Grades will be given at the end of I – II Sem	
				Total	**16**	**2**	**8**	**21**	**430**	**770**

* a) Orientation Course for B. Tech I year I semester Students take place for 3 weeks durationcovering the first Two Units
b) Orientation Course for B. Tech I year II semester Students take place for covering theremaining Four Units (Units III, IV, V, and VI).

I Year II Semester ECE

Sl. No	Course Type	Dept Course	Code	Name of the Course	L	T	P	C	CIE	SEE
1	BS	S&H	8HC07	Engineering Physics	3	1	0	4	30	70
2	ES	CSE	8EC01	Data Structures and C++	3	0	0	3	30	70
3	BS	S&H	8HC11	Advanced Calculus and Complex Variable	3	1	0	4	30	70
4	ES	S&H	8BC02	Engineering Graphics	1	0	4	3	30	70
5	HS	S&H	8HC02	Written Communication Skills	1	0	0	1	30	70
6	ES	EEE	8AC42	Electrical Circuits & Networks Analysis	2	1	0	3	30	70
7	ES	EEE	8AC61	Electrical Circuits & Networks AnalysisLab	0	0	2	1	30	70
8	BS	S&H	8HC66	Engineering Physics Lab	0	0	2	1	30	70
9	ES	CSE	8EC61	Data Structures (C/C++) Lab	0	0	2	1	30	70
10	HS	S&H	8HC62	Written Communication Skills Lab	0	0	2	1	30	70
11	BS	ECE	8C262	Comprehensive Test and Viva Voce-II (2 Mids(Viva) and End Semester(Test and Viva) = 30+70)	1	0	0	1	30	70
12	BS	ECE	8C263	Technical Seminar – II	1	0	0	1	100	00
13	HS	S&H	8HC18	Orientation Course*	2	0	0	0	Grade evaluation	
									30	70
				Total	17	3	12	24	460	840

II Year I Semester ECE

Sl. No	Course Type	Dept Course	Code	Name of the Course	L	T	P	C	CIE	SEE
1	PC	ECE	8CC01	Electronic Devices and Circuits	3	0	0	3	30	70
2	PC	ECE	8CC02	Digital Logic Design	2	0	0	2	30	70
3	PC	ECE	8CC03	Signals and Systems	3	0	0	3	30	70
4	PC	ECE	8C304	Probability Theory and Stochastic Process	2	1	0	3	30	70
5	BS	S&H	8HC14	Transform Techniques and Numerical Methods	2	1	0	3	30	70
6	HS	S&H	8HC17	Universal Human Values	2	1	0	3	30	70
7	HS	S&H	8HC03	Soft Skills	1	0	2	2	30	70
8	PC	ECE	8CC71	Electronic Devices and Circuits Lab	0	0	2	1	30	70
9	PC	ECE	8CC72	Basic Simulation Lab	0	0	2	1	30	70
10	PC	ECE	8CC73	Digital Logic Design Lab	0	0	2	1	30	70
11	PW	ECE	8C364	Comprehensive Test and Viva Voce-III (2 Mids(Viva) and End Semester(Test and Viva) = 30+70)	1	0	0	1	30	70
12	PW	ECE	8C365	Technical Seminar - III	1	0	0	1	100	00
				Total	17	3	8	24	430	770

II Year II Semester ECE

Sl. No	Course Type	Dept Course	Code	Name of the Course	L	T	P	C	CIE	SEE
1	PC	ECE	8CC05	Analog Circuits	2	0	0	2	30	70
2	PC	ECE	8CC06	Analog& Digital Communications	2	1	0	3	30	70
3	PC	ECE	8CC07	IC Applications	2	0	0	2	30	70
4	PC	ECE	8C408	Electromagnetic Waves and Transmission Lines	3	0	0	3	30	70
5	HS	MBA	8ZC01	Economics, Accountancy and Management Science	2	0	0	2	30	70
6	ES	IT	8FC27	Python Programming Concepts	2	0	0	2	30	70
7	HS	S&H	8HC05	Environmental Science and Ecology	2	0	0	2	30	70
8	PC	ECE	8CC74	Analog Circuits Lab	0	0	2	1	30	70
9	PC	ECE	8CC75	Analog& Digital Communication Lab	0	0	2	1	30	70
10	PC	ECE	8CC76	IC Applications Lab	0	0	2	1	30	70
12	PW	ECE	8C466	Comprehensive Test and Viva Voce-IV (2 Mids(Viva) and End Semester(Test and Viva) = 30+70)	1	0	0	1	30	70
13	PW	ECE	8C467	Technical Seminar - IV	1	0	0	1	100	00
14	PW	ECE		Summer Industry Internship - I: Evaluation will be done along with 3-1 courses						
				Total	17	1	6	21	430	770

III Year I Semester ECE

Sl. No	Course Type	Dept Course	Code	Name of the Course	L	T	P	C	CIE	SEE
1	PC	ECE	8CC09	Digital Signal Processing	2	1	0	3	30	70
2	PC	ECE	8C510	VLSI Design	3	0	0	3	30	70
3	PC	ECM	8DC05	Microprocessors and Microcontrollers	3	0	0	3	30	70
4	PC	ECE	8C511	Cellular and Mobile Communication	2	0	0	2	30	70
5	PC	ECE	8C512	Antennas and Wave Propagations	2	1	0	3	30	70
6	PE	ECE		Professional Elective- I	3	0	0	3	30	70
7	PC	ECM	8DC71	Microprocessors and Microcontrollers Lab	0	0	2	1	30	70
8	PC	ECE	8C577	VLSI Design Lab	0	0	4	2	30	70
9	ES	IT	8FC72	Python Programming Lab	0	0	4	2	30	70
10	PW	ECE	8C591	Summer Industry Internship-I	0	0	1	1	30	70
11	MC	IT	8FC24	Cyber Security	2	0	0	0	Grade evaluation	
									30	70
				Total	16	2	11	23	330	770

III Year II Semester ECE

Sl. No	Course Type	Dept Course	Code	Name of the Course	L	T	P	C	CIE	SEE
1	PC	CSE	8EC47	Computer Networks	2	0	0	2	30	70
2	PC	ECE	8C613	Microwave and Optical Communications	3	0	0	3	30	70
3	MC	CSE	8EC45	Artificial Intelligence	2	0	0	0	Grade evaluation	
									30	70
4	ES	EEE	8AC07	Linear Control systems	3	0	0	3	30	70
5	PE	ECE		Professional Elective- II	3	0	0	3	30	70
6	OE			Open Elective- I	2	0	0	2	30	70
7	PC	ECE	8C678	Antenna Simulation Lab	0	0	4	1	30	70
8	PC	CSE	8EC65	Computer Networks Lab	0	0	2	1	30	70
9	PC	ECE	8CC79	Digital Signal Processing Lab	0	0	4	2	30	70
10	PW	ECE	8C692	Group Project	0	0	2	1	30	70
11	PW	ECE	8C668	Comprehensive Viva Voce	1	0	0	1	30	70
12	PW	ECE		Summer Industry Internship - II: Evaluation will be done along with 4-1 courses						
Total					16	0	12	19	330	770

IV Year I Semester ECE

Sl. No	Course Type	Dept Course	Code	Name of the Course	L	T	P	C	CIE	SEE
1	PC	ECE	8C714	Internet of Things and Applications	2	1	0	3	30	70
2	PC	ECE	8C715	Advanced Communications and Networks	3	1	0	3	30	70
3	HS	ECE	8C716	Intellectual Property Rights	1	0	0	1	30	70
4	PE	ECE		Professional Elective –III	3	0	0	3	30	70
5	PE	ECE		Professional Elective – IV	3	0	0	3	30	70
6	OE			Open Elective – II	2	0	0	2	30	70
7	PC	ECE	8C780	Internet of Things and Applications Lab	0	0	4	2	30	70
8	PC	ECE	8C781	Advanced Communications and Networks Lab	0	0	4	2	30	70
9	PC	ECE	8C782	Microwave and Optical Communications Lab	0	0	4	2	30	70
10	PW	ECE	8C793	Summer Industry Internship - II	0	0	1	1	30	70
				TOTAL	**14**	**2**	**13**	**22**	**300**	**700**

IV Year II Semester ECE

Sl. No	Course Type	Dept Course	Code	Name of the Course	L	T	P	C	CIE	SEE
1	PE	ECE		Professional Elective –V	3	0	0	3	30	70
2	OE			Open Elective – III	2	0	0	2	30	70
3	PW	ECE	8C894	Major Project	0	0	10	5	30	70
				TOTAL	**5**	**0**	**10**	**10**	**90**	**210**

Professional Electives

S. No	Stream	PE-I	PE- II	PE-III	PE-IV	PE-V
1	**Code**	**8C517**	**8C623**	**8C729**	**8C735**	**8C841**
	VLSI	Digital Design Through Verilog	Analog and Mixed Signal Design	VLSI Physical Design	Design Verification using System Verilog	Low Power VLSI Design
2	**Code**	**8C518**	**8C624**	**8C730**	**8C736**	**8C842**
	Embedded System	Advanced Computer Architecture	Embedded C Programming	Embedded System Design using ARM	Embedded Real Time Operating Systems	SystemonChip Architecture
3	**Code**	**8C519**	**8C625**	**8C731**	**8C737**	**8C843**
	Signal Processing	Digital Image & Video Processing	Transform Techniques	DSP Processors and Architectures	Bio-Medical Signal Processing	Radar Signal Processing
4	**Code**	**8C520**	**8C626**	**8C732**	**8C738**	**8C844**
	Communications	Information Theory and Coding Techniques	Software Defined Radio	Ad hoc and Wireless Sensor Networks	MIMO OFDM System	5G Communications
5		**8C521**	**8C627**	**8C733**	**8C739**	**8C845**
	Advanced Computing	Digital ImageProcessing	Artificial Neural Networks	Computer Vision	Machine Learning	Deep Learning
6		**8C522**	**8C628**	**8C734**	**8C740**	**8C846**
	Microwave and Radar	Phased Array Antennas	Satellite Communications	Radar Systems	Microwave Integrated Circuits	EMI/EMC

Open Electives

Sl. No	Stream	OE-I	OE-II	OE-III
1	**Code**	**8ZC05**	**8ZC19**	**8ZC15**
	Finance	Banking Operations, Insurance and Risk Management	Entrepreneurship, Project Management and Structured Finance	Financial Institutions , Markets and services
2	**Code**	**8EC72**	**8EC74**	**8EC76**
	Computer Science	Programming in Java	Database Systems Concepts	Operating Systems Concepts
	Code	**8ZC22**	**8ZC23**	**8ZC24**
3	Entrepreneurship	Basics of Entrepreneurship	Advanced Entrepreneurship	Product and Services
	Code	**8ZC25**	**8ZC26**	**8ZC27**
4	Social Sciences Stream	Basics of Indian Economy	Basics of Polity	Indian History, Culture and Geography
5	**Code**	**8CC51**	**8CC52**	**8CC53**
	ECE Stream	Electronics and Instrumentation	Fundamentals of Communication	Embedded Systems
		8CC56		
		Fundamentals of digital circuits & Microprocessors		
6	**Code**	**8AC47**	**8AC44**	**8AC45**
	EEE stream	Power Electronic Devices and Converters	Fundamentals of Measurements and Instrumentation	Fundamentals of Renewable energy sources
7	**Code**	**8BC51**	**8BC52**	**8BC53**
	Mechanical Stream	Introduction To Additive Manufacturing Processes	Principles of Operations Research	Principles of Automation and Robotics
8	**Code**	**8ZC08**	**8ZC09**	**8ZC10**
	Innovation and Design Thinking	Design literacy and Design Thinking	Co-Creation and Product Design	Entrepreneurship & Business Design

A20 - Total Credits
(Semester-wise Credit Distribution)

SL. NO	SEMESTER	CREDITS
1.	I-I	21
2	I-II	24
3	II-I	24
4.	II-II	21
5	III-I	22
6	III-II	20
7	IV-I	22
8	IV-II	10
	Total	**164**

Service Courses offered by ECE

Sl. No	Code	Name of Subject	Offered to Dept
1	8CC01	Electronic Devices and Circuits	ECM, EEE
2	8CC02	Digital Logic Design	ECM, EEE
3	8CC03	Signals and Systems	ECM, EEE
4	8CC71	Electronic Devices and Circuits Lab	ECM, EEE
5	8CC72	Basic Simulation Lab	ECM
6	8CC73	Digital Logic Design Lab	ECM
7	8CC05	Analog Circuits	ECM, EEE
8	8CC06	Analog& Digital Communications	ECM
9	8CC07	IC Applications	ECM, EEE
10	8CC74	Analog Circuits Lab	ECM, EEE
11	8CC75	Analog& Digital Communication Lab	ECM
12	8CC76	IC Applications Lab	ECM, EEE
13	8CC09	Digital Signal Processing	ECM, EEE
14	8CC79	Digital Signal Processing Lab	ECM
15	8CC54	Analog Electronic Circuits	CSE, IT
16	8CC83	Analog Electronic Circuits Lab	CSE, IT
17	8CC55	Digital Electronics	CSE, IT

ACADEMIC REGULATIONS,

COURSE STRUCTURE

AND

DETAILED SYLLABUS

FOR

B.Tech - ECE I & II Year

(Applicable for the Batches admitted from 2020-2021)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY

(An Autonomous Institution under JNTUH)

AccreditedbyNAACwith 'A'Gradeand accreditedbyNBA)

(RecipientofTEQIPunderThe WorldBankAssistance)

Yamnampet,Ghatkesar,Hyderabad– 501301.

January 2021

VISION AND MISSION OF THE INSTITUTION

Vision

To emerge as a leading Institute for Technical Education and Research in India with focus to produce professionally competent and socially sensitive engineers capable of working in multidisciplinary global environment.

Mission

1. To train the students in the fundamentals of Engineering, Science and Technology by providing good academic environment to pursue undergraduate, Post graduate in chosen fields of Engineering and Technology for a successful professional career.

2. To be a continuous learning organization by developing strong liaison with Academia, R & D institutions and Industry for exposure in practical aspects of engineering and providing solutions to the industrial and societal problems for sustainable development. To imbibe skills for entrepreneurship, project and finance management.

3. To inculcate team work, leadership, professional ethics, use of modern tools, IPR issues so that graduates are encouraged to obtain patents and respond to competitive global environment.

4. To promote strong research culture in graduates for lifelong learning, to explore the frontiers of knowledge and present at technical fora/publish in Journals at national/international level.

DEPARTMENT OF

ELECTRONICS AND COMMUNICATION ENGINEERING

Department of Electronics and Communication Engineering is established in the year 1997 to meet the requirements of the emerging industry/discipline. The Vision and the Mission of the department are:

VISION

To create an educational environment for students to excel in their professional carrier, and to solve the challenges of industry in the field of Electronics and Communication Engineering with focus on human values, professional ethics and social responsibility.

MISSION

1. Training the students in the core subjects of Electronics and Communication engineering with due focus on multi-disciplinary areas.

2. Establishing liaison with relevant industries, R&D organizations and renowned academia for exposure to modern tools and practical aspects of technology.

3. Inculcating team work, leadership, professional ethics, effective communication and interpersonal skills to make students globally competent in employment as well as entrepreneurship.

4. Promoting scientific temper and research culture in the graduates towards lifelong learning, and to work towards the engineering solution in the contexts of society and environment.

Program Educational Objectives (PEOs)

PEO – I. To apply the knowledge of mathematics, science and engineering fundamentals to find the solution of complex engineering problems concerning societal, health, safety, cultural and environmental issues.

PEO – II. Empowering graduates to exhibit proficiency in core areas through evolving technologies in electronics and communication engineering and to identify, analyze, design, and conduct experiments for innovative solutions.

PEO – III. Facilitating graduates to achieve academic excellence and pursue R&D in multi-disciplinary domains leading to design of novel products using modern tools and to promote skills in project management, entrepreneurship and IPR.

PEO- IV. Developing human values, and professional ethics, improving the effective communication skills, team work, leadership qualities, and life-long learning.

The Program Outcomes

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

The Program Specific Outcomes (PSOs)

PSO1: Should be able to gain the in-depth knowledge in core subjects to identify, formulate, analyze, and suggest viable solutions to the real-life problems in the field of electronics and communication engineering.

PSO2: Should have the capability to apply modern design tools to analyze and design subsystems/processes for a variety of applications in the allied fields of electronics and communications.

PSO3: Should possess good interpersonal skills, and also an ability to work as a team member as well as team leader with good professional ethics, and also to become a life-long learner in the context of technological developments.

ACADEMIC REGULATIONS
FOR B.TECH. REGULAR STUDENTS
WITH EFFECT FROM
THE ACADEMIC YEAR 2020-21
(A-20)

1.0 Under-Graduate Degree Programme in Engineering & Technology (E&T)

1.1 SNIST offers a 4-year (8 semesters) **Bachelor of Technology** (B.Tech.) degree programme, under Choice Based Credit System (CBCS) with effect from the academic year 2020-21 in the following branches of Engineering.

Sl. No.	Branch
1.	Civil Engineering
2.	Electrical and Electronics Engineering
3.	Mechanical Engineering
4.	Electronics and Communication Engineering
5.	Computer Science and Engineering
6.	Information Technology
7.	Electronics and Computer Engineering

1.2. Credits (Semester system for B.Tech courses)

The existing credit system of giving one credit for a lecture hour/ tutorial hour per week and giving 0.5 credit for every hour of practical and drawing shall be continued in these regulations also.

2.0 Eligibility for admission

2.1 Admission to the Under Graduate courses shall be made either on the basis of the rank of the candidate in entrance test conducted by the Telangana State Government (EAMCET) or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government from time to time. However, admissions under Management / NRI Category shall be made on the relevant orders issued by the Govt. of Telangana from time to time.

2.2 The medium of instruction for the entire Under Graduate programme of study in E&T will be **English** only.

3.0 B.Tech. Programme structure

3.1 A student after securing admission shall pursue the Under Graduate programme in B.Tech. in a minimum period of **four** academic years (8 semesters), and a maximum period of **eight** academic years (16 semesters) starting from the date of commencement of first year first semester, failing which student shall forfeit seat in B.Tech course. However, the student can take two more years for appearing the examinations to clear the backlog subjects.

In the First year it is structured to provide **45 credits** and the credits in II , III and IV years should not exceed **119 credits** as per AICTE model curriculum for the B.Tech. programme. Each student shall secure **164 credits** (with CGPA $\geq$5) required for the completion of the Under Graduate programme and Award of B.Tech degree.

Each student shall secure **164 total credits** (with CGPA ≥ 5) for the completion of the Under Graduate programme for the award of the B.Tech. degree. However, any revision made in this regard and approved by the Academic Council of the college and by Parent University shall be implemented from the date of the revision.

3.2 **UGC/AICTE** specified definitions/ descriptions are adopted appropriately for various terms and abbreviations stated below.

3.2.1 Semester scheme

Each Under Graduate programme is of 4 academic years (8 semesters) with the academic year being divided into two semesters of 22 weeks (90 instructional days) each, each semester having - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'.

Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated curriculum / course structure as suggested by AICTE are followed.

3.2.2 Credit courses

- A student in a semester has to earn credits which shall be assigned to each subject/ course in an L: T: P: C (lecture periods: tutorial periods: practical periods: credits) structure based on the following general pattern.
- One credit for one hour/ week offered in the entire semester for theory lecture (L) / Tutorial (T) courses.
- One credit for two hours/ week offered in the entire semester for laboratory/ practical (P) courses.
- The orientation course recommended by AICTE in the model curriculum is offered for 3 weeks and Cyber Security in III year as mandatory course.
- Environmental Engineering is offered mandatory course for B. Tech Mechanical Engineering and ECE students in II year.
- However,these courses will be reflected in the Memo of Marks,the grading will be awarded below, with some total of 100 marks with CIE for 30 marks and SEE for 70 marks.

%of Marks Secured ina Subject/Course	LetterGrade
Greater thanorequalto90%	O (Outstanding)
80and lessthan 90%	A+ (Excellent)
70and lessthan 80%	A (VeryGood)
60and lessthan 70%	B+(Good)
50and lessthan 60%	B (Average)
40and lessthan 50%	C (Pass)
Below40%	F (FAIL)
Absent	Ab

- For mandatory courses i.e ., **Orientation Course** for B. Tech I year students to be taught for one week in I semester with Two Units and remaining Four Units in B. Tech. I year II semester and **Cyber Security** is offered as mandatory course for all the students of Civil, ME,EEE and will not have credits, but evaluation will be done as per the above table. A student cannot obtain degree unless he / she completes all the mandatory courses.

3.2.3 Subject Course Classification

All subjects / courses offered for the Under Graduate programme in E&T (B.Tech. Degree programmes) are broadly classified as follows. The Institution has followed all the guidelines issued by AICTE/UGC.

The groups of the subjects shall be as given in the table hereunder along with the credits suggested by AICTE. efforts are made by individual departments to make up the total credits equal to 164.

Sl. No.	Category	Suggested Breakup of Credits (Total 160)	CSE	ECE	CED	EEE	ME	IT	ECM
1	Humanities and social sciences including Management courses	12*	14	14	11	13	13	14	13
2	Basic Science including Mathematics courses	25*	22	23	29	30	24	22	26
3	Engineering Science courses including workshop, drawing, basic electrical /electronics mechanical course as well as various computer courses offered for Non – IT branches	24*	29	28	31	25	28	29	28
4	Professional core courses	48*	59	59	51	61	62	59	59
5	Professional Elective courses (five courses)relevant to chosen specialization / branch	18*	15	15	15	15	15	15	15
6	Open Electives(3 courses) offered by any other departments / MBA department **	18*	6	6	6	6	6	6	6
7	Project work, seminar and internship in industry or elsewhere	15*	19	19	21	14	16	19	17
8	Mandatory courses (Environmental Sciences, Induction training, Indian constitution, Essence of Indian Traditional Knowledge)	(Non-credit)	(Non-credit)	(Non-credit)	(Non-credit)	(Non-credit)	(Non-credit)	(Non-credit)	(Non-credit)
	Total	160*	164	164	164	164	164	164	**164**

The Joint Board of Studies and Academic Council of the institution has approved the total number of credits to be 164. The various groups of subjects mentioned above shall have credits suggested above with minor variations.

4.0 Course registration

4.1 A 'faculty advisor or counselor' shall be assigned to a group of 20 students, who will advise student about the under graduate programme, its course structure and curriculum, choice/option for Professional and open Electives based on their employment potential / further studies.

4.2 The student will progress semester after semester as the Institute is following cohort system to satisfying the conditions of promotion to the next semester.

4.3 **In the present system there shall be five subjects in each professional elective stream and three subjects in open elective stream.** A student can opt for a stream of professional/ open electives which should be submitted to the faculty Advisor/ Counselor and copy of it to the Examination Section through the Head of the department. A copy of it will be retained with the Head of the department/ faculty Advisor/ Counselor and the student.

4.4. **The student can take one extra subject in each semester and can complete the program in 3 ½ years but original degree will be issued along with his / her batch mates after 4 years.**

4.5. **If a student acquires 20 credits extra than the required credits as per the regulations he will be awarded honors.**

4.6 The purpose of offering Elective Streams in both Professional and Open Electives is to facilitate the students to have a minor specialization based on their interest, so that they will have multi disciplinary exposure. Hence, a student is to take a stream of Electives in either in Professional / Open Elective. He shall not be permitted to opt for other elective subjects in other streams in subsequent semesters.

4.7 Dropping of Electives may be permitted, only after obtaining prior approval from the faculty advisor / counselor, '**within a period of 15 days** from the beginning of the current semester.

5.0 Subjects / courses to be offered

5.1 A typical section (or class) nominal strength for each semester shall be 60.

5.2 A subject / course may be offered to the students, **only if** a minimum of **30 students** opt for it. The maximum strength of a section is limited to 80.

6.0 Attendance requirements:

6.1 A student shall be eligible to appear for the semester end examinations, if student acquires a minimum of 75% of attendance in aggregate of all the subjects / courses (excluding attendance in mandatory courses, Internship during II year, NCC / NSO and NSS) for that semester.

6.2 Shortage of attendance in aggregate upto 10% (65% and above and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.

6.3 A stipulated fee shall be payable towards condoning of shortage of attendance as decided by finance committee of SNIST from time to time.

6.4 Shortage of attendance below 65% in aggregate shall in**NO CASE** be condoned.

6.5 **Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester.**

They get detained and their admission for that semester shall stand cancelled.

They will not be promoted to the next semester. They may seek re-admission for all those subjects registered in that semester in which student was detained, by seeking re-admission into that semester as and when offered; in case if 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 later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category. He will be governed by the new regulations in which he takes re-admission.

6.6 A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same semester.

7.0 Academic requirements

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

7.1 **A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject / course, if student secures not less than 35% marks (24 out of 70 marks) in the semester end examination, and a minimum of 40% of marks in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing 'C' grade or above in that subject / course.**

7.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to group projects, seminar, comprehensive test, viva-voce and major project.If a student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them.

The student would be treated as failed, if student

(i) does not complete all the mandatory courses offered during the course
(ii) doesnot submit a report on internship, group project, major project, or does not make a presentation of the same before the evaluation committee as per schedule, or
(iii) does not present the seminar as required in the I year and II year or
(iv) secures less than 40% marks in comprehensive test and seminar/ comprehensive test and viva-voce /group project/major project evaluations.

Student may reappear once for each of the above evaluations, when they are scheduled again; if student fails in such 'one re-appearance' evaluation also, student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

7.3 Promotion Rules based upon credits

S.No.	Promotion	Conditionstobefulfilled
1	First year First Semester to Second Semester	Regularcourseofstudyoffirstyear firstsemester and should have satisfied the minimum requirement of attendance to appear I year I semester.
2	Firstyearto secondyearfirstsemester	i. Regularcourseofstudyoffirstyear First and secondsemesters. ii. Musthavesecuredat least50%ofcredits (22) upto first year second semester from alltherelevantregularand supplementary examinations, whetherthestudent takesthose examinationsornot.
3.	II Year I Semester to II Semester	Regularcourseofstudyof second year firstsemester.
4	Second year tothirdyearfirstsemester	i. RegularcourseofstudyofFirst and secondsemesters of second year. ii. Must have secured at least 60%of credits (54) uptosecond yearsecond semester fromalltherelevant regular andsupplementary examinations, whetherthestudent

		takesthoseexaminationsornot.
5	Third year first semester to secondsemester	Regularcourseofstudyofthirdyear firstsemester.
6	Thirdyearseconds emesterto fourthyearfirstse mester	i. Regular course of study of third yearsecondsemester. ii. Must have secured 60% ofcredits (79) uptothirdyear second semester fromalltherelevant regular andsupplementary examinations, whetherthestudent takesthoseexaminationsornot.
7	Fourth year first semester to fourthyearsecond semester	Regularcourseofstudyoffourthyear firstsemester.

7.4 A student (i) shall attend for all courses / subjects covering 164 credits as specified and listed in the course structure, (ii) fulfils all the attendance and academic requirements for 164 credits, (iii) earn all 164 credits by securing SGPA $\geq$ 5.0 (in each semester), and CGPA (at the end of each successive semester) $\geq$ 5.0, (iv) **passes all the mandatory courses,** to successfully complete the under graduate programme. The performance of the student in these 164 credits shall be taken into account for the calculation of 'the final CGPA (at the end of under graduate programme), and shall be indicated in the grade card of IV year II semester.

7.5 If a student registers for some more '**extra subjects'** (in the parent department or other departments / branches of engineering) other than those listed subjects as specified in the course structure of his Department, the performances in those ' **extra subjects**' will not be taken into account while calculating the SGPA and CGPA. For such '**extra subjects'** registered, Percentage (%) of marks and letter grade alone will be indicated in the grade card as a performance measure, subject to completion of the attendance and academic requirements as stated in the regulations 6 and 7.1 to 7.4 above.

7.6 A student eligible to appear in the semester end examination for any subject / course, but absent from it or failed (thereby failing to secure **'C'** grade or above) has to reappear for that subject/ course in the supplementary examination as and when conducted. In such cases, CIE assessed earlier for that subject / course will be carried over, and added to the marks obtained in the supplementary examination for evaluating performance in that subject.

7.7 A student **detained in a semester due to shortage of attendance, may be re-admitted when the same semester is offered in the subsequent academic years for the fulfillment of academic requirements**.

The academic regulations under which student has been readmitted shall be applicable. However, no grade allotments or SGPA / CGPA calculations will be done for the entire semester in which student has been detained.

7.8 A student detained **due to lack of credits, will be promoted to the next academic year only after acquiring the required credits as per academic regulations.**

The academic regulations shall be applicable to a student whatever they are in force at the time of re-admission.

8.0 Evaluation - Distribution and weightage of marks

8.1 The performance of a student in each semester shall be evaluated subject-wise for a maximum of 100 marks for a theory and 100 marks for every practical subject with 30 marks Continuous Internal Evaluations (CIE) and 70 marks for Semester End Examinations (SEE)

Summer Break: Internship-I and Internship-II will be organized during summer vacation of II-II and III-II and evaluation of the same will be carried out during lab examinations of III-I and IV-I.

In addition, there will beGroup Project-I in III year I semester, Group Project-II in III year II semester, and Group Project-III in IV year I semester, Major project in IV year II semester will be evaluated for 100 marks.

The pattern of continuous internal evaluation for Internship Project and Group Project is given below:

Sl.No	Description	Marks
1	Abstract, Design, implementation and Presentation in front of Project Review Committee consisting of HoD, Senior faculty and Internal guides (Average)	15 marks
2	Report	05 marks
3	Evaluation by Internal Guide	10 marks
	Total sessional marks	**30 marks**

Semester end examination - 70 marks

Pattern of external evaluation for Internship Project and Group Project.

Sl.No	Description	Marks
1	Final report	10 marks
2	Presentation	10 marks
3	Demonstration/defence of project	50 marks
	Total sessional marks	**70 marks**

Pattern of continuous internal evaluation for Major Project in IV year II semester is as follows:

Sl.No	Description	Marks
1	Progress of Project work and the corresponding interim report as evaluated by Project Review Committee at the end of 6 weeks	5 marks
2	Seminar at the end of 6 weeks	5 marks
3	Progress of Project work as evaluated by Project Review Committee at the end of 11 weeks	5 marks
4	Seminar at the end of 11 weeks	5 marks
5	Evaluation by Project Review Committee at the end of 15 weeks and Final Project Report	5 marks
6	Final presentation and defense of project	5 marks
	Total	**30 marks**

Pattern of External Evaluation for Major project - 70 Marks

Sl.No	Description	Marks
1	Final Project Report	10 marks
2	Presentation	20 marks
3	Demonstration / Defense of Project before committee	40 marks
4	**TOTAL**	**70 marks**

8.2 For all the other theory and lab subjects the distribution of marks shall be 30 for Continuous Internal Evaluation (CIE) and 70 for the Semester End-Examination (SEE).

8.3 Theory Subjects

8.3.1 Pattern for Continuous Internal Evaluation (CIE) 30 marks

The following procedure is to be adopted for awarding internal marks of 30 for all the B. Tech. students from the **Academic Year 2020-2021**

The distribution of marks for continuous internal evaluation (30 marks) is shown below. Average of two Mid Tests will be taken for final award of marks.

a)	**Part – A** of Mid Test will have 10 questions	5 marks
b)	**Part – B** of Mid Test will have 4 questions (1 from each unit and 4th question from any one unit or combination) and student has to answer 3 questions	15 marks
c)	**Part – C** Mid Test Question Paper Will have 3 questions – One fromeach unit taken from assignment questions. Student has to answer 1 question out of 3 questions	3 marks
d)	**Assignment– I** three questions from each unit (1,2,3 unit) – total of 9 questionsto be submitted before first mid test. **Similarly assignment – II**: will have three questions from each unit (4, 5, 6 units) total of 9 questions will be submitted before Mid Test IIand average of two assignments will be considered.	2 marks
e)	Attendance *	3 marks
f)	Class notes	2 marks
	Total	**30 marks**

* Three marks are awarded for each theory subject for the students who put in attendance in a graded manner as given below:

S.No.	Attendance Range	Marks Awarded
1.	65 % and above but less than 75%	1
2.	75% and above and less than 85%	2
3.	85% and above	3

Marks for attendance shall be added to each subject based on average of attendance of all subjects put together.

If any candidate is absent in any subject or mid-term examination, this student wishes to improve performance, a **third mid-test** will be conducted for that student by the Institution in the entire syllabus, on the same day of Semester End Examination (SEE) for $2^1/_2$ hours. That result will be treated as III mid test and average of better two of (mid test I,II,III) will be considered. III mid test will have Part-A (compulsory) and Part-B with essay type questions and three out of four questions are to be answered.

b) Pattern for External Examinations - (70 marks)

- There shall be external examination in every theory course and consists of two parts (Part-A & Part-B). The total time duration for this semester end examination will be 3 hours.

- **Part-A** shall have 20 marks, which is compulsory. It will have 10 short questions set with 2 marks each. There shall be atleast one question to each of the six units and two questions from units 1,2,3 and two questions from unit 4,5,6 and number of questions from any unit shall not exceed two.

- **Part-B** of the question paper shall have essay type questions for 50 marks and shall have 8 questions out of which any 5 are to be answered. At least one question must appear from each Unit. Seventh question must have 2 to 3 bits taken from 1st, 2nd, and 3rd units and 8th question also with 2 to 3 bits taken from 4th, 5th and 6th units, such that not more than 2 questions shall be from any one unit. All the questions carry equal marks.

8.4 Pattern of Evaluation for Lab subjects - (100 marks)

8.4.1 For practical subjects there shall be a continuous evaluation during the semester for 30 sessional marks and 70 marks for semester end examination. Out of the 30 marks for Continuous Internal Evaluation, the distribution of marks is as follows

S. No	Item	Marks
1.	Day to Day work	05 marks
2.	Final Record and viva	09 marks
3.	Average of two tests including viva	05 marks
4.	Lab Based Project Report viva and demo	08 marks
5.	Attendance	03 marks
	Total	**30 marks**

8.4.2 The semester end examination for 70 marks for the lab subjects shall be conducted by an external examiner and an internal examiner appointed by the Chief Superintendent of Examinations of the college. The marks are distributed as follows:

S. No	Item	Marks
1.	Procedure to experiment and Tabulation	10 marks
2.	Conduct of experiment, observation, Calculation	30 marks
3.	Results including graphs, discussions and conclusion	20 marks
4.	Viva voce and Record	10 marks
	Total	70 marks

8.4.3 In case computer based examinations

S. No	Item	Marks
1.	Flow chart and algorithms	10 marks
2.	Program writing and execution	30 marks
3.	Result and conclusions	20 marks
4.	Viva voce and Record	10 marks
	Total	70 marks

8.5 **For the subject having design and / or drawing, (such as Engineering Drawing and Machine Drawing), the distribution shall be 30 marks for internal evaluation (10 marks for day-to-day work including drawing,3 marks for home assignment work, 12 marks for average of two internal tests and 2 marks for class notes 3 marks for attendance) and 70 marks for end semester end examination.**

There shall be two internal tests in a Semester and the average of the two shall be considered for the award of marks for internal tests.

Third test facility can be availed as mentioned above (8.3.1 (i) (a) and (b)

8.6. Technical Seminar

There shall be a technical seminar evaluated for 100 marks from I year I semester to II year II Semester. The evaluation is purely internal and will be conducted as follows:

Sl.No	Description	Marks
1	Literature survey, topic and content	10
2	Presentation including PPT	10
3	Seminar Notes	05
4	Interaction with audience after presentation	05
5	Final Report 3 copies	10
6	Class room participation	05
7	Punctuality in giving seminar as per Scheduled time and date	10
8	Mid Semester Viva (on the seminar topics completed up to the end of 9th week	15
9	End Semester Viva	30
	Total	**100 Marks**

Student must secure 40% i.e. 40 marks to be successful in sum total (Hundred Marks) in Technical Seminar.

8.7 Comprehensive Test and Viva-voce:

Comprehensive test and Viva Voce	The subjects studied in the Semester concerned related to branches concerned and for placements
B.Tech I year I semester	I semester
B.Tech I year II semester	I and II semester
B.Tech II year I semester	I, II and III semester
B.Tech II year II semester	I, II, III and IV semester
B.Tech III year I semester	I, II, IIII, IV and V semester
B.Tech III year II semester	I, II, IIII, IV, V and VI semester
B.Tech IV year I semester	I, II, IIII, IV, V, VI and VII semester

Two Mid tests, Two mid Viva voce, one External Comprehensive Test and one External Comprehensive Viva Voce.

Allocation of marks :

*Comprehensive Test : 70 marks
**Viva Voce : 30 marks
Total **: 100 marks**

*Average of two best Mid Tests of Mid Test – I, Mid Test – II and Mid Test - III will be taken for 30 marks.

Total marks for Comprehensive Test will be 70.

The total sessional marks in this subject of Comprehensive Test and Viva Voce will be : 30 for sessionals and 70 for End Semester examination.

The grand total of marks for the subject of Comprehensive Test and Viva Voce will be 100. The student has to secure 40% of marks i.e. 40 marks in sum total of 100 marks to be successful in the subject.

8.8 The laboratory records and internal test papers shall be preserved in the respective departments as per the college norms and shall be produced to the Committee of the college or any external agency like AICTE, NAAC, JNTUH, NBA etc., as and when the same are called for.

8.9. There shall be aInternship 1 and Internship 2, in an Industry of their specialization. Students will register for this immediately after II year II semester end examinationand III year II semester examinations and pursue it during summer vacation. Internship 1 and Internship 2 shall be submitted as a project report and presented before the committee in III year I semester andIV year I semester along with lab examination. This project report will be evaluated for 30 internal marks and 70 external marks. The committee consists of an external examiner, Head of the Department, Supervisor of the Internship project and Senior Faculty Member of the Department.

8.10 The laboratory marks and the internal marks awarded by the college are subject to scrutiny and scaled down by the Departmental committees wherever necessary. In such cases, the internal and laboratory marks awarded by the department will be referred to a committee. The committee will arrive at a scaling factor and the marks will be scaled accordingly. The recommendation of the committee is final and binding. The laboratory records and internal test papers shall be preserved in the respective departments as per the college rules and produced before the visiting committees as and when they are asked for.

8.11. For mandatory courses like orientation course, cyber security, a student has to secure 40 marks out of 100 marks (i.e. 40% of the marks allotted) in sum total of continuous internal evaluation and external examination for passing the subject / course. These marks will be gradedas per table given in 3.2.2.

9.0 Grading procedure

9.1 Marks will be awarded to indicate the performance of student in each theory subject, laboratory / practicals, seminar, Group Project 1,2,3, in the Major project and Comprehensive Test and Viva.

Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade shall be given.

9.2 As a measure of the performance of student, a 10-point absolute grading system using the following letter grades (as per UGC / AICTE guidelines) and corresponding percentage of marks shall be followed:

%of Marks Secured ina Subject / Course (Class Intervals)	LetterGrade (UGCGuidelines)	GradePoints (GP)
Greater thanorequalto90%	O (Outstanding)	10
80%and lessthan 90%	A+ (Excellent)	9
70%and lessthan 80%	A (VeryGood)	8
60%and lessthan 70%	B+ (Good)	7
50%and lessthan 60%	B (Average)	6
40%and lessthan 50%	C (Pass)	5
Below40%	F (FAIL)	0
Absent	Ab	0

9.3 A student obtaining '**F'** grade in any subject shall be deemed to have '**failed'** and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

9.4 A student who has not appeared for examination in any subject, '**Ab'** grade will be allocated in that subject, and student shall be considered '**failed'**. Student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered.

9.5 A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

9.6 A student earns grade point (GP) in each subject / course, on the basis of the letter grade secured in that subject / course. The corresponding 'credit points' (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

Credit points (CP) = grade point (GP) x credits …. For a course

9.7 The student passes the subject / course only when **GP is not less than 5 (i.e. 'C' grade or above)**

9.8 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (CP) secured from all subjects / courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to two decimal places. SGPA is thus computed as

$$SGPA = \{ \sum_{i=1}^{N} C_i G_i \} / \{ \sum_{i=1}^{N} C_i \}$$ …. For each semester

(i.e., upto and inclusive of S semesters, S 2),

where '**N'** is the **total** number of subjects (as specifically required and listed under the course structure of the parent department) the student has '**registered'** i.e., from the 1st semester onwards upto and inclusive of the 8th semester, 'j' is the subject indicator index (takes into account the subjects from 1 to 8 semesters), C_J is the number of credits allotted to the Jth subjects and G_j represents the grade points (GP) corresponding to the letter grade awarded for that Jth subject.

After registration and completion of the first year first semester, SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA

Course / Subject	Credits	Letter Grade	Grade Points	Credit Points
Course1	4	A	8	4x8 =32
Course2	4	O	10	4x10=40
Course3	4	C	5	4x5 =20
Course4	3	B	6	3x6 =18
Course5	3	A+	9	3x9 =27
Course6	3	C	5	3x5 =15
	21			152

SGPA = 152/21 = 7.24

Illustration of calculation of CGPA:

Course / Subject	Credits	LetterGrade	GradePoints	Credit points Points
I				
Course1	4	A	8	4x8 =32
Course2	4	A	9	4x9 =36
Course3	4	B	6	4x6 =24
Course4	3	O	10	3x10=30
Course5	3	B	7	3x7 =21
Course6	3	A	8	3x8 =24
I				
Course7	4	B	7	4x7 =28
Course8	4	O	10	4x10=40
Course9	4	A	8	4x8 =32
Course10	3	B	6	3x6 =18
Course11	3	C	5	3x5 =15
Course12	3	A	9	3x9 =27
TotalCredits	= 42			TotalCreditPoints=327

CGPA = 327/42 = 7.79

9.9 For merit ranking or comparison purposes or any other listing, **only** the '**rounded off'** values of the CGPAs will be used.

9.10 For calculations listed in regulations 9.6 to 9.9, performance in failed subjects/ courses (securing **F** grade) will also be taken into account, and the credits of such subjects/courses will also be included in the multiplications and summations.

After passing the failed subject(s) newly secured letter grades will be taken into account for calculation of SGPA and CGPA.

However, mandatory courses will not be taken into consideration.

10.0 Passing standards

10.1 A student shall be declared successful or 'passed' in a semester, if student secures a GP ≥ 5 ('C' grade or above) in every subject/course in that semester (i.e. when student gets SGPA 5.00 at the end of that particular semester); and a student shall be declared successful or 'passed' in the entire under graduate programme, only when gets a CGPA 5.00 for the award of the degree as required.

10.2 After the completion of each semester, a grade card or grade sheet (or transcript) shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, and grade earned etc.), credits earned, SGPA, and CGPA.

11.0 Declaration of results

11.1 Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9.

11.2 For final percentage of formula may be used.

12.0 Award of degree marks equivalent to the computed final CGPA, the following
% of Marks = (final CGPA – 0.5) x 10

12.1 A student who registers for all the specified subjects/ courses as listed in the course structure and secures the total number of credits (with CGPA ≥5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have '**qualified'** for the award of the B.Tech. degree in the chosen branch of Engineering as selected at the time of admission.

12.2 A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes.

12.3 Students with final CGPA (at the end of the under graduate programme) 8.00 and above, and fulfilling the following conditions -

(i) Should have passed all the subjects/courses in '**first appearance'** within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.

(ii) Should have secured a CGPA ≥8.00, at the end of each of semesters, starting from first year first semester onwards.

(iii) Should not have been detained or prevented from writing the end semester examinations in any semester due to shortage of attendance or any other reason, shall be placed in **'FIRST CLASS WITH DISTINCTION'**, otherwise **FIRST CLASS**only.

12.4 Students with final CGPA (at the end of the under graduate programme) ≥ 6.5 but < 8.00, shall be placed in '**FIRST CLASS'**.

12.5 Students with final CGPA (at the end of the under graduate programme) ≥ 5.5 but < 6.5, shall be placed in '**SECOND CLASS'**.

12.6 All other students who qualify for the award of the degree (as per item 12.1), with final CGPA (at the end of the under graduate programme) ≥ 5 but <5.5, shall be placed in '**pass class**'.

12.7 A student with final CGPA (at the end of the under graduate programme) < 5.00 will not be eligible for the award of the degree.

12.8 Students fulfilling the conditions listed under item 12.3 alone will be eligible for award of '**university rank**' and '**gold medal**'.

13.0 Withholding of results

13.1 If the student has not paid the fees to the university / college at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

14.0 Transitory regulations

14.1 A student who has discontinued for any reason, or has been detained for want of attendance or lack of required credits as specified, or who has failed after having undergone the degree programme, may be considered eligible for readmission to the same subjects / courses (or equivalent subjects/ courses, as the case may be), and same professional electives / open electives (or from set/category of electives or equivalents suggested, as the case may be) as and when they are offered (within the time-frame of 8 years from the date of commencement of student's first year first semester).

A student admitted in one academic regulation and he is getting readmission in some other academic regulations , the college has to offer substitute / additional subjects based on the comparison of two academic regulations. The details of substitute / additional subjects offered with the recommendations of board of studies of the concerned branch has to be given from time to time. The student will be governed by the academic regulations at the time of re-admission.

15.0 Student transfers

15.1There shall be no branch transfers after the completion of admission process.

15.2 The students seeking transfer to Sreenidhi Institute of Science and Technology (SNIST) from various other Universities / institutions have to pass the failed subjects which are equivalent to the subjects of SNIST, and also pass the subjects of SNIST which the students have not studied at the earlier institution.

Further, though the students have passed some of the subjects at the earlier semesters of SNIST, the students have to study substitute subjects in SNIST and get sessional marks by attending 3rd mid test and paying requisite fee as per the rules.

15.3 The transferred students from other Universities/ institutions to SNIST who are on rolls to be provided one chance to write the CIE (internal marks) in the failed subjects and /or subjects not studied as per the clearance letter issued by the Institution.

15.4 The autonomous affiliated colleges have to provide one chance to write the internal examinations in the failed subjects and /or subjects not studied, to the students transferred from other universities / institutions to SNIST who are on rolls, as per the clearance (equivalence) letter issued by the University.

16.0 **Scope**

16.1 The academic regulations should be read as a whole, for the purpose of any interpretation.

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

16.3 The Institution may change or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the date notified by the Institution.

Academic Regulations for B.Tech.

(LATERAL ENTRY SCHEME)

w.e.f the AY 2021-22

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

The Lateral Entry Scheme (LES) students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years failing which he will forfeit the seat.

2. The student shall register and secure for all the credits with CGPA ≥ 5 from II year to IV year B.Tech. programme (LES) as per the regulations for the award of B.Tech. degree. **Out of the total credits secured, the student can avail exemption up to 6 credits**, that is, one open elective subject and one professional elective subject or two professional elective subjects for B.Tech programme to improve the performance of the Grade point average.

3. The students, who fail to fulfil the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.However, the student can take **two more** years for appearing the examinations.

4. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech. (LES).

5. <u>Promotion rules based on credits</u>

S.	Promotion	Conditionstobefulfilled
1	Second year first semester to second year second semester	Regularcourseofstudyofsecondyearfirst semester.
2	Secondyearsecondsemestertothird yearfirstsemester	(i)Regular course ofstudyofsecondyear secondsemester. (ii)Musthavesecuredatleast27credits outof45credits i.e.,60% ofcreditsup to second yearsecond semester fromall the relevant regular and supplementary examinations, whether thestudenttakes thoseexaminationsor not.
3	Thirdyearfirstsemestertothirdyear secondsemester	Regularcourseofstudyofthirdyearfirst semester.
4	Thirdyearsecondsemestertofourth yearfirstsemester	(i) Regularcourseof study ofthird year secondsemester. (ii)Musthavesecuredatleast52credits outof87credits i.e.,60% ofcreditsup to third year second semester from all the relevant regular and supplementary examinations, whether the student takes thoseexaminationsor not.
5	Fourth year first semester to fourth year secondsemester	Regularcourseofstudyoffourthyearfirst semester.

6. AlltheotherregulationsasapplicabletoB.Tech.4-yeardegreecourse(Regular) willholdgoodforB.Tech.(LateralEntryScheme).

MALPRACTICERULES
DISCIPLINARYACTIONFORMIS-CONDUCTOF STUDENTS DURING EXAMINATIONS

	Natureof Malpractice/ Mis-conduct of the conduct	**Punishment**
	If thestudent:	
1.(a)	Possesses or keeps accessible in examination hall,anypaper,notebook, programmable calculators,cellphones, pager, palm computers or any other form ofmaterialconcerned with or relatedtothesubject of theexamination (theory orpractical)inwhichstudentis appearing buthasnotmadeuseof (materialshallinclude any marks onthe bodyofthestudentwhichcanbeused asanaidinthe subject ofthe examination)	Expulsion fromtheexamination halland cancellationoftheperformance inthatsubject only.
(b)	Givesassistanceor guidanceorreceives itfromanyotherstudentorallyorby anyotherbody languagemethodsor communicates throughcellphoneswith any studentorpersons inoroutside the examhallinrespectofanymatter.	Expulsion fromtheexamination halland cancellationoftheperformance inthatsubject only ofallthestudentsinvolved. Incaseofan outsider, hewillbehanded overtothepolice andacaseisregisteredagainsthim.
2.	Has copiedintheexaminationhallfrom any paper,book,programmable calculators, palm computers or any other formofmaterialrelevant tothe subject ofthe examination(theoryor practical)inwhich thestudent is appearing.	Expulsion from the examination hall and cancellationoftheperformance inthatsubject andallother subjectsthestudenthasalready appearedincludingpracticalexaminations and UGmajorprojectandshallnotbepermitted to appearfortheremainingexaminations ofthe subjectsofthatsemester/year. Thehallticketofthestudent istobecancelled andsenttotheuniversity.
3.	Impersonates any other student in connectionwiththeexamination.	The student who has impersonated shall be expelledfromexamination hall. Thestudentis alsodebarred andforfeitstheseat.The performance oftheoriginalstudentwhohas beenimpersonated,shallbecancelledinallthe subjects ofthe examination (including practicalsandUGmajor project)already appeared andshallnotbeallowed toappearfor examinations oftheremainingsubjectsofthat semester/year. Thestudentisalsodebarred for twoconsecutivesemesters from classwork and alluniversityexaminations. Thecontinuation
		ofthecoursebythestudentissubjecttothe academicregulationsinconnection with forfeiture of seat. If theimposter is an outsider, hewillbehanded overtothepolice andacaseisregisteredagainsthim.

4.	Smuggles intheanswerbookor additional sheetor takesoutorarranges tosendoutthequestionpaperduring theexamination oranswerbookor additional sheet,during orafterthe examination.	Expulsion fromtheexamination halland cancellationofperformance inthatsubjectand alltheother subjects thestudenthasalready appearedincludingpracticalexaminations and UGmajorprojectandshallnotbepermitted fortheremainingexaminations ofthesubjects ofthatsemester/year. Thestudent isalso debarred fortwoconsecutive semestersfrom classworkand all universityexaminations.The continuationof thecoursebythe studentis subjecttotheacademicregulations in
5.	Usesobjectionable,abusiveoroffensive language inthe answer paper or in letterstotheexaminers orwritestothe examinerrequesting himtoawardpass marks.	Cancellationoftheperformanceinthatsubject.
6.	Refusestoobeytheordersofthechief superintendent/assistant – superintendent /anyofficeronduty or misbehaves or creates disturbance of any kind inandaroundtheexamination hallororganizesawalkoutorinstigates others towalkout, orthreatensthe officer-inchargeoranyperson onduty inoroutsidetheexaminationhallofany injuryto his personor to anyof his relationswhether bywords,either spoken orwrittenorbysignsorby visiblerepresentation, assaultsthe officer-in-charge,oranypersononduty inoroutsidetheexaminationhallorany ofhisrelations,orindulgesinany other actofmisconduct ormischiefwhich result in damage to or destructionof property intheexaminationhallorany part of the collegecampusor engagesin anyotheractwhichintheopinionof theofficeronduty amountstouseof unfairmeansormisconduct orhasthe	Incaseofstudentsofthecollege,they shallbe expelledfromexamination hallsand cancellation of their performance in that subjectandallothersubjectsthestudent(s) has (have)already appearedandshallnotbe permitted toappearfortheremaining examinations ofthesubjectsofthat semester/year. Thestudents alsoaredebarred andforfeittheirseats. Incaseofoutsiders, they willbehandedovertothepoliceanda policecaseisregisteredagainstthem.

7.	Leaves theexamhalltaking away answerscriptorintentionallytears of thescriptorany partthereofinsideor outsidetheexaminationhall.	Expulsion from the examination hall and cancellationofperformance inthatsubjectand alltheother subjects thestudenthasalready appearedincludingpracticalexaminations and UGmajorprojectandshallnotbepermitted fortheremainingexaminations ofthesubjects of thatsemester/year. Thestudent isalso debarred fortwoconsecutive semestersfrom classworkand all universityexaminations.The continuationof thecoursebythe studentis subjecttotheacademicregulations in

8.	Possessanylethalweaponorfirearmin theexaminationhall.	Expulsion from the examination hall and cancellationoftheperformance inthatsubject andallother subjects thestudenthasalready appearedincludingpracticalexaminations and UGmajorprojectandshallnotbepermitted fortheremainingexaminations ofthesubjects of thatsemester/year. Thestudent isalso debarredandforfeitsthe seat.
9.	Ifstudent ofthecollege,whoisnota studentforthe particular examinationor any personnotconnectedwiththe collegeindulges inanymalpracticeor improperconduct mentionedinclause6 to8.	Student of the colleges expulsion from the examination hallandcancellationofthe performance inthatsubjectandallother subjectsthestudenthasalready appeared includingpracticalexaminationsandUGmajor projectandshallnotbepermitted forthe remainingexaminations ofthesubjectsofthat semester/year. Thestudentisalsodebarred and forfeitstheseat. Person(s)whodonotbelongtothecollege will behandedover topoliceand,apolicecasewill
10.	Comesin adrunkenconditionto the examinationhall.	Expulsion from the examination hall and cancellationoftheperformance inthatsubject andallother subjects thestudenthasalready appearedincludingpracticalexaminations and UGmajorprojectandshallnotbepermitted fortheremainingexaminations ofthesubjects ofthatsemester/year.
11.	Copying detected on the basis of internalevidence, suchas,during valuationorduringspecialscrutiny.	Cancellationoftheperformanceinthatsubject andallothersubjects thestudenthasappeared includingpracticalexaminationsandUGmajor projectofthatsemester/yearexaminations.

12. If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the university for further action to punishment award suitable.

Malpractices identified by squad or special invigilators

1. Punishments to the students as per the above guidelines.

2. Punishment for institutions: (if the squad reports that the college is encouraging malpractices)

   a. A show cause notice shall be issued to the college.
   b. Impose a suitable fine on the college.
   c. Shifting the examination centre from the college to another college for a specific period of not less than one year.

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I Year I Semester ECE

Sl. No	Course Type	Dept Course	Code	Name of the Course	L	T	P	C	CIE	SEE
1	BS	S&H	8HC04	Engineering Chemistry	4	0	0	4	30	70
2	ES	IT	8FC01	Problem Solving using C	3	0	0	3	30	70
3	BS	S&H	8HC09	Matrix Methods and Calculus	2	1	0	3	30	70
4	ES	S&H	8BC01	Workshop/Manufacturing Processes	1	0	0	1	30	70
5	HS	S&H	8HC01	Oral Communication Skills	1	0	0	1	30	70
6	BS	S&H	8HC08	Basic Mathematics, Analysis and Reasoning	2	1	0	3	30	70
7	BS	S&H	8HC64	Engineering Chemistry Lab	0	0	2	1	30	70
8	ES	IT	8FC61	Problem Solving using C Lab	0	0	2	1	30	70
9	ES	S&H	8BC61	Workshop/Manufacturing Processes Lab	0	0	2	1	30	70
10	HS	S&H	8HC61	Oral Communication Skills Lab	0	0	2	1	30	70
11	BS	ECE	8C160	Comprehensive Test and Viva Voce-I (2 Mids(Viva) and End Semester(Test and Viva) = 30+70)	1	0	0	1	30	70
12	BS	ECE	8C161	Technical Seminar – I	1	0	0	1	100	00
13	HS	S&H	8HC18	Orientation Course*	1	0	0	0	Marks and Grades will be given at the end of I – II Sem	
				Total	**16**	**2**	**8**	**21**	**430**	**770**

* a) Orientation Course for B. Tech I year I semester Students take place for 3 weeks durationcovering the first Two Units
b) Orientation Course for B. Tech I year II semester Students take place for covering theremaining Four Units (Units III, IV, V, and VI).

I Year II Semester ECE

Sl. No	Course Type	Dept Course	Code	Name of the Course	L	T	P	C	CIE	SEE
1	BS	S&H	8HC07	Engineering Physics	3	1	0	4	30	70
2	ES	CSE	8EC01	Data Structures and C++	3	0	0	3	30	70
3	BS	S&H	8HC11	Advanced Calculus and Complex Variable	3	1	0	4	30	70
4	ES	S&H	8BC02	Engineering Graphics	1	0	4	3	30	70
5	HS	S&H	8HC02	Written Communication Skills	1	0	0	1	30	70
6	ES	EEE	8AC42	Electrical Circuits & Networks Analysis	2	1	0	3	30	70
7	ES	EEE	8AC61	Electrical Circuits & Networks AnalysisLab	0	0	2	1	30	70
8	BS	S&H	8HC66	Engineering Physics Lab	0	0	2	1	30	70
9	ES	CSE	8EC61	Data Structures (C/C++) Lab	0	0	2	1	30	70
10	HS	S&H	8HC62	Written Communication Skills Lab	0	0	2	1	30	70
11	BS	ECE	8C262	Comprehensive Test and Viva Voce-II (2 Mids(Viva) and End Semester(Test and Viva) = 30+70)	1	0	0	1	30	70
12	BS	ECE	8C263	Technical Seminar – II	1	0	0	1	100	00
13	HS	S&H	8HC18	Orientation Course*	2	0	0	0	Grade evaluation	
									30	70
				Total	17	3	12	24	460	840

II Year I Semester ECE

Sl. No	Course Type	Dept Course	Code	Name of the Course	L	T	P	C	CIE	SEE
1	PC	ECE	8CC01	Electronic Devices and Circuits	3	0	0	3	30	70
2	PC	ECE	8CC02	Digital Logic Design	2	0	0	2	30	70
3	PC	ECE	8CC03	Signals and Systems	3	0	0	3	30	70
4	PC	ECE	8C304	Probability Theory and Stochastic Process	2	1	0	3	30	70
5	BS	S&H	8HC14	Transform Techniques and Numerical Methods	2	1	0	3	30	70
6	HS	S&H	8HC17	Universal Human Values	2	1	0	3	30	70
7	HS	S&H	8HC03	Soft Skills	1	0	2	2	30	70
8	PC	ECE	8CC71	Electronic Devices and Circuits Lab	0	0	2	1	30	70
9	PC	ECE	8CC72	Basic Simulation Lab	0	0	2	1	30	70
10	PC	ECE	8CC73	Digital Logic Design Lab	0	0	2	1	30	70
11	PW	ECE	8C364	Comprehensive Test and Viva Voce-III (2 Mids(Viva) and End Semester(Test and Viva) = 30+70)	1	0	0	1	30	70
12	PW	ECE	8C365	Technical Seminar - III	1	0	0	1	100	00
				Total	17	3	8	24	430	770

II Year II Semester ECE

Sl. No	Course Type	Dept Course	Code	Name of the Course	L	T	P	C	CIE	SEE
1	PC	ECE	8CC05	Analog Circuits	2	0	0	2	30	70
2	PC	ECE	8CC06	Analog& Digital Communications	2	1	0	3	30	70
3	PC	ECE	8CC07	IC Applications	2	0	0	2	30	70
4	PC	ECE	8C408	Electromagnetic Waves and Transmission Lines	3	0	0	3	30	70
5	HS	MBA	8ZC01	Economics, Accountancy and Management Science	2	0	0	2	30	70
6	ES	IT	8FC27	Python Programming Concepts	2	0	0	2	30	70
7	HS	S&H	8HC05	Environmental Science and Ecology	2	0	0	2	30	70
8	PC	ECE	8CC74	Analog Circuits Lab	0	0	2	1	30	70
9	PC	ECE	8CC75	Analog& Digital Communication Lab	0	0	2	1	30	70
10	PC	ECE	8CC76	IC Applications Lab	0	0	2	1	30	70
12	PW	ECE	8C466	Comprehensive Test and Viva Voce-IV (2 Mids(Viva) and End Semester(Test and Viva) = 30+70)	1	0	0	1	30	70
13	PW	ECE	8C467	Technical Seminar - IV	1	0	0	1	100	00
14	PW	ECE		Summer Industry Internship - I: Evaluation will be done along with 3-1 courses						
				Total	17	1	6	21	430	770

III Year I Semester ECE

Sl. No	Course Type	Dept Course	Code	Name of the Course	L	T	P	C	CIE	SEE
1	PC	ECE	8CC09	Digital Signal Processing	2	1	0	3	30	70
2	PC	ECE	8C510	VLSI Design	3	0	0	3	30	70
3	PC	ECM	8DC05	Microprocessors and Microcontrollers	3	0	0	3	30	70
4	PC	ECE	8C511	Cellular and Mobile Communication	2	0	0	2	30	70
5	PC	ECE	8C512	Antennas and Wave Propagations	2	1	0	3	30	70
6	PE	ECE		Professional Elective- I	3	0	0	3	30	70
7	PC	ECM	8DC71	Microprocessors and Microcontrollers Lab	0	0	2	1	30	70
8	PC	ECE	8C577	VLSI Design Lab	0	0	4	2	30	70
9	ES	IT	8FC72	Python Programming Lab	0	0	4	2	30	70
10	PW	ECE	8C591	Summer Industry Internship-I	0	0	1	1	30	70
11	MC	IT	8FC24	Cyber Security	2	0	0	0	Grade evaluation	
									30	70
				Total	16	2	11	23	330	770

III Year II Semester ECE

Sl. No	Course Type	Dept Course	Code	Name of the Course	L	T	P	C	CIE	SEE
1	PC	CSE	8EC47	Computer Networks	2	0	0	2	30	70
2	PC	ECE	8C613	Microwave and Optical Communications	3	0	0	3	30	70
3	MC	CSE	8EC45	Artificial Intelligence	2	0	0	0	Grade evaluation	
									30	70
4	ES	EEE	8AC07	Linear Control systems	3	0	0	3	30	70
5	PE	ECE		Professional Elective- II	3	0	0	3	30	70
6	OE			Open Elective- I	2	0	0	2	30	70
7	PC	ECE	8C678	Antenna Simulation Lab	0	0	4	1	30	70
8	PC	CSE	8EC65	Computer Networks Lab	0	0	2	1	30	70
9	PC	ECE	8CC79	Digital Signal Processing Lab	0	0	4	2	30	70
10	PW	ECE	8C692	Group Project	0	0	2	1	30	70
11	PW	ECE	8C668	Comprehensive Viva Voce	1	0	0	1	30	70
12	PW	ECE		Summer Industry Internship - II: Evaluation will be done along with 4-1 courses						
Total					16	0	12	19	330	770

IV Year I Semester ECE

Sl. No	Course Type	Dept Course	Code	Name of the Course	L	T	P	C	CIE	SEE
1	PC	ECE	8C714	Internet of Things and Applications	2	1	0	3	30	70
2	PC	ECE	8C715	Advanced Communications and Networks	3	1	0	3	30	70
3	HS	ECE	8C716	Intellectual Property Rights	1	0	0	1	30	70
4	PE	ECE		Professional Elective –III	3	0	0	3	30	70
5	PE	ECE		Professional Elective – IV	3	0	0	3	30	70
6	OE			Open Elective – II	2	0	0	2	30	70
7	PC	ECE	8C780	Internet of Things and Applications Lab	0	0	4	2	30	70
8	PC	ECE	8C781	Advanced Communications and Networks Lab	0	0	4	2	30	70
9	PC	ECE	8C782	Microwave and Optical Communications Lab	0	0	4	2	30	70
10	PW	ECE	8C793	Summer Industry Internship - II	0	0	1	1	30	70
				TOTAL	**14**	**2**	**13**	**22**	**300**	**700**

IV Year II Semester ECE

Sl. No	Course Type	Dept Course	Code	Name of the Course	L	T	P	C	CIE	SEE
1	PE	ECE		Professional Elective –V	3	0	0	3	30	70
2	OE			Open Elective – III	2	0	0	2	30	70
3	PW	ECE	8C894	Major Project	0	0	10	5	30	70
				TOTAL	**5**	**0**	**10**	**10**	**90**	**210**

Professional Electives

S. No	Stream	PE-I	PE- II	PE-III	PE-IV	PE-V
1	**Code**	**8C517**	**8C623**	**8C729**	**8C735**	**8C841**
	VLSI	Digital Design Through Verilog	Analog and Mixed Signal Design	VLSI Physical Design	Design Verification using System Verilog	Low Power VLSI Design
2	**Code**	**8C518**	**8C624**	**8C730**	**8C736**	**8C842**
	Embedded System	Advanced Computer Architecture	Embedded C Programming	Embedded System Design using ARM	Embedded Real Time Operating Systems	SystemonChip Architecture
3	**Code**	**8C519**	**8C625**	**8C731**	**8C737**	**8C843**
	Signal Processing	Digital Image & Video Processing	Transform Techniques	DSP Processors and Architectures	Bio-Medical Signal Processing	Radar Signal Processing
4	**Code**	**8C520**	**8C626**	**8C732**	**8C738**	**8C844**
	Communications	Information Theory and Coding Techniques	Software Defined Radio	Ad hoc and Wireless Sensor Networks	MIMO OFDM System	5G Communications
5		**8C521**	**8C627**	**8C733**	**8C739**	**8C845**
	Advanced Computing	Digital ImageProcessing	Artificial Neural Networks	Computer Vision	Machine Learning	Deep Learning
6		**8C522**	**8C628**	**8C734**	**8C740**	**8C846**
	Microwave and Radar	Phased Array Antennas	Satellite Communications	Radar Systems	Microwave Integrated Circuits	EMI/EMC

Open Electives

Sl. No	Stream	OE-I	OE-II	OE-III
1	**Code**	**8ZC05**	**8ZC19**	**8ZC15**
	Finance	Banking Operations, Insurance and Risk Management	Entrepreneurship, Project Management and Structured Finance	Financial Institutions , Markets and services
2	**Code**	**8EC72**	**8EC74**	**8EC76**
	Computer Science	Programming in Java	Database Systems Concepts	Operating Systems Concepts
	Code	**8ZC22**	**8ZC23**	**8ZC24**
3	Entrepreneurship	Basics of Entrepreneurship	Advanced Entrepreneurship	Product and Services
	Code	**8ZC25**	**8ZC26**	**8ZC27**
4	Social Sciences Stream	Basics of Indian Economy	Basics of Polity	Indian History, Culture and Geography
5	**Code**	**8CC51**	**8CC52**	**8CC53**
	ECE Stream	Electronics and Instrumentation	Fundamentals of Communication	Embedded Systems
		8CC56		
		Fundamentals of digital circuits & Microprocessors		
6	**Code**	**8AC47**	**8AC44**	**8AC45**
	EEE stream	Power Electronic Devices and Converters	Fundamentals of Measurements and Instrumentation	Fundamentals of Renewable energy sources
7	**Code**	**8BC51**	**8BC52**	**8BC53**
	Mechanical Stream	Introduction To Additive Manufacturing Processes	Principles of Operations Research	Principles of Automation and Robotics
8	**Code**	**8ZC08**	**8ZC09**	**8ZC10**
	Innovation and Design Thinking	Design literacy and Design Thinking	Co-Creation and Product Design	Entrepreneurship & Business Design

A20 - Total Credits
(Semester-wise Credit Distribution)

SL. NO	SEMESTER	CREDITS
1.	I-I	21
2	I-II	24
3	II-I	24
4.	II-II	21
5	III-I	22
6	III-II	20
7	IV-I	22
8	IV-II	10
	Total	**164**

Service Courses offered by ECE

Sl. No	Code	Name of Subject	Offered to Dept
1	8CC01	Electronic Devices and Circuits	ECM, EEE
2	8CC02	Digital Logic Design	ECM, EEE
3	8CC03	Signals and Systems	ECM, EEE
4	8CC71	Electronic Devices and Circuits Lab	ECM, EEE
5	8CC72	Basic Simulation Lab	ECM
6	8CC73	Digital Logic Design Lab	ECM
7	8CC05	Analog Circuits	ECM, EEE
8	8CC06	Analog& Digital Communications	ECM
9	8CC07	IC Applications	ECM, EEE
10	8CC74	Analog Circuits Lab	ECM, EEE
11	8CC75	Analog& Digital Communication Lab	ECM
12	8CC76	IC Applications Lab	ECM, EEE
13	8CC09	Digital Signal Processing	ECM, EEE
14	8CC79	Digital Signal Processing Lab	ECM
15	8CC54	Analog Electronic Circuits	CSE, IT
16	8CC83	Analog Electronic Circuits Lab	CSE, IT
17	8CC55	Digital Electronics	CSE, IT

I - I

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
I – I	8HC04	ENGINEERING CHEMISTRY (Common to CSE, ECE and CE)	4	0	0	4

a	b	c	d	e	f	g	h	i	j	k	l
X					X	X					

Course Objectives:

1. To understand microscopic chemistry in terms of atomic and molecular orbitals
2. To learn the preparation and applications of commercial polymers and lubricant materials
3. To learn the industrial problems caused by water and municipal water treatment
4. To acquire knowledge about different types of batteries and their working mechanism
5. To develop the concepts and types of corrosion and the factors influence corrosion
6. To understand the control methods and protective coatings for metals and other surfaces

UNIT - I

Atomic and molecular structure (6L)

Molecular orbitals of diatomic molecules and plots of the multicentre orbitals.Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity.Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties.Band structure of solids and the role of doping on band structures.

UNIT - II

Plastics and Lubricants

Plastics (8L)

Polymerization-Addition and Condensation polymerization, Plastics – Thermosetting and Thermoplastics, preparation, properties and **engineering applications of plastics:** PVC, Teflon, Bakelite. Fibers: Nylon 6,6 and Dacron.

Rubbers – natural and artificial rubber, vulcanization of natural rubber, Buna-S, Buna-N and their **engineering applications.**

Fabricated Reinforcing Polymers**- engineering applications**

Lubricants

Definition, classification and function of lubricants, Types of lubrication and mechanisms – Thick Film or Hydrodynamic Lubrication, Thin Film or Boundary Lubrication, Extreme Pressure Lubrication. Classification and properties of lubricants – Viscosity, flash and fire point, cloud and pour point and acid value.**Engineering applications.**

UNIT - III

Water Technology (8L)

(a) Introduction: - Hardness of water – types of hardness (temporary and permanent), calculation of hardness- Numerical problems. Estimation of hardness of water by EDTA Method.

(b) Water for Industrial purpose: Food, sugar, textile, paper and pharma industries, water for steam making characteristics of boiler feed water, boiler troubles- scale and sludge & Carry over (priming &foaming), boiler corrosion, caustic embrittlement.

(c) Water Treatment: Internal conditioning- phosphate, carbonate &calgon conditioning. External Treatment: Ion-exchange process. Desalination-reverse osmosis. Municipal water treatment-sedimentation, coagulation, filtration, disinfection-chlorination, ozonization. **Engineering applications: Methodology and working of mineral water plant for drinking purpose.**

UNIT - IV

Electrochemistry (8L)

Conductance – conductors (metallic and electrolytic), types of conductance – specific, equivalent and molar conductance – effect of dilution on conductance.

Free energy and emf, cell potentials, electrode potential (oxidation and reduction).Types of electrodes - redox electrode (quinhydrode electrode), metal – metal insoluble salt electrode and Ion selective electrode.Cell notation and cell reaction –Nernst equation and applications.**Engineering Applications.**

Batteries : Types of batteries

(a) Primary batteries – Lechalanche cell (dry cell), Lithium cell
(b) Secondary batteries(Accumulators) – Lead acid battery, Lithium-ion battery
(c) Fuel cells- $H_2 – O_2$ fuel cell and MeOH-O_2 fuel cell-advantages and applications.

Engineering applications – future water powered car, Hydrogen production and storage.

UNIT - V

Corrosion and its prevention (7L)

Corrosion – basic concepts –types of corrosion, chemical, electrochemical corrosion (absorption of O_2 and evolution of H_2). Types of electrochemical corrosion – galvanic corrosion, pitting corrosion, waterline corrosion- factors affecting the rate of corrosion.

Cathodic protection – sacrificial anodic protection and impressed current cathodic protection method.

UNIT-VI

Surface treatment (5L)

Mechanical surface treatment and coatings, casehardening and surface coating, thermal spraying, vapour deposition, Ion implantation, Diffusion coating.

Methods of metallic coatings-hot dipping (tinning and galvanizing), metal cladding (Al cladding), electroplating (copper plating) and electroless plating (nickel plating) and electroforming, ceramic, organic and diamond coating

TEXT BOOKS:

1. Engineering Chemistry: PK Jain & MK Jain, Dhanapathrai Publications (2018)
2. Engineering Chemistry: by Thirumala Chary Laxminarayana&Shashikala, Pearson Publications (2020)

REFERENCE BOOKS:

1. Textbook of Engineering Chemistry: Jaya Shree Anireddy, Wiley Publications (2019)
2. Engineering Chemistry: by &B.Rama Devi, PrsantaRath& Ch. VenkataRamana Reddy, Cengage Publications (2018)
3. Engineering Chemistry: Shashi Chawla, Dhanapathrai Publications (2019)
4. Textbook of Engineering Chemistry: SS Dara, SS Umare S. Chand Publications (2004)

Course Outcomes

After completion of the course, the student will be able to:

1. Understand and analyse microscopic chemistry in terms of atomic orbitals, molecular orbitals and intermolecular forces.
2. Identify and differentiate polymers, thermoplastic, thermosetting plastics and various lubricants.
3. Recognize and select the domestic and industrial problems caused by hard water and also learn about the municipal water treatment using various methods.
4. Understand and interpret the important fundamental concepts of electrochemistry and solve the problems related to batteries.
5. Differentiate the types of corrosion and methods used to prevent the corrosion.
6. Learn and implement surface coating techniques.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
I – I	**8FC01**	Problem Solving using C (Common to All Branches)	3	0	0	3

Course Objectives

- To acquire problem solving skills
- To be able to develop flowcharts
- To understand structured programming concepts
- To be able to write programs in C Language

Course Outcomes:

After completion of this course student will learn

1. To formulate simple algorithms for arithmetic, logical problems and to translate the algorithms to programs(in C language)
2. To test and execute the programs and correct syntax and logical errors, to implement conditional branching, iteration and recursion
3. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
4. To use arrays, pointers and structures to formulate algorithms and programs.
5. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
6. To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

UNIT I

Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.

From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

UNIT II

History of C language, Characteristics of C language, Structure of C Language, C Tokens
Arithmetic expressions, Operator Precedence &**Associativity**Conditional Branching and Loops
Writing and evaluation of conditionals and consequent branching and **Jumping Constructs**
Pretest and Post test, Iteration and loops (3 lectures)

UNIT III

Function: Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference, **Storage Classes**

Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc.

Macros – Definition, comparison with functions.

UNIT IV

Arrays: Arrays (1-D, 2-D), Character arrays **Ragged Arrays and Dynamic Arrays**
Basic Algorithms Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required) Quick sort or Merge sort.

UNIT V

Pointers Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notation of linked list (no implementation) **Dynamic Memory allocation Functions**.

Strings:String Handling Functions.

UNIT IV

Structure: Structures, Defining structures and Array of Structures,
Nested Structures enum, typedef
File handling (only if time is available, otherwise should be done as part of the lab)
File Handling Functions, File Modes, File Operations

Suggested Text Books

(i) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

(ii) E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill Suggested

Reference Books

(i) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	**8HC09**	Matrix Methods and Calculus (Common to EEE, ECE, ME, CE)	2	1	0	3

a	b	c	d	e	f	g	h	i	j	k	l
H	M	H/M								L	

: High M: Medium L: Low

Pre Requisites: Mathematics Knowledge at Pre-University Level

Course Objectives: To make the students to understand and expected to learn

1. Mean value theorems and their applications to the given functions, series expansions of a function.
2. Special functions such as Beta & Gamma functions and their properties, evaluation of improper integrals and the applications of definite integrals.
3. To test the convergence of a series and expansion of a function in sine and cosine terms.
4. Basic concepts of multivariable differential calculus.
5. About the linear system and some analytical methods for solution.
6. Concept of Eigen values and Eigen vectors their properties and applications.

UNIT-I: Calculus-1

Rolle's Theorem and Mean value theorems (Statements and Geometrical Interpretations if any); Taylor's and Maclaurin's theorems with remainders (without proof); Taylor's and Maclaurin series expansion.

UNIT-II: Calculus-2

Evolutes and involutes; Beta and Gamma functions and their properties; Evaluation of improper integrals, Applications of definite integrals to evaluate surface areas and volumes of revolutions.

UNIT-III: Sequences and series

Convergence of sequence and series, tests for convergence of a series. Fourier series, half range sine and cosine series, Parseval's theorem (without proof).

UNIT-IV: Multivariable Calculus (Differentiation)

Limit, continuity and partial derivatives, total derivative; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, directional derivatives, Tangent plane; Concepts of divergence and curl with physical significance.

UNIT-V: Matrices-1

Inverse of a matrix by Gauss Jordan method, rank of a matrix; System of linear equations- Rank method/Gauss Elimination method. Symmetric, skew-symmetric and orthogonal matrices;

UNIT-VI: Matrices-2

Eigenvalues and Eigenvectors; Cayley - Hamilton Theorem, Hermitian, Skew-Hermitian and Unitary matrices, Diagonalization of matrices and Orthogonal transformation.

Text Books:

(i) R K Jain and S R K Iyengar Advanced Engineering Mathematics, Narosa Publications.

Reference Books:

(i) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
(ii) B.S. Grewal, Elementary Engineering Mathematics, Khanna Publishers
(iii) C Sankaraiah, A Text book of Engineering Mathematics – I, VGS Book Links
(iv) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
(v) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
(vi) P. Sivaramakrishna Das and C.Vijayakumari, Mathematics-I (calculus, Differential Equations and Linear Algebra), Pearson Publications

Course Outcomes: After the course completion the students will be able to

1. Verify the mean value theorems and also express the given function in series form using Taylor's theorem.
2. Solve the problems using special functions; evaluate surface areas and volumes of revolutions.
3. Determine the convergence, divergence or oscillating nature of a series and express the function as trigonometric series.
4. Compute the extreme values of a function defined with and without constraints.
5. Check the consistency or inconsistency of a linear system and ability to solve real time problems.
6. Calculate the Eigen values and Eigen vectors of a matrix and their application for orthogonal transformation.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	**8BC01**	WORKSHOP/MANUFACTURING PROCESSES	1	0	0	1

Course Objectives:
Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

COURSE OUTCOMES:

- To understand various basic tools to perform simple joints using metal and wood.
- To understand the principle of various electrical and electronic appliances and their applications.
- To understand the manufacturing process of welding, casting and tin smithy and their applications.
- To understand the operation of basic as well as advanced machines used for fabrication of Metals, Plastics and Glass.

Unit-I
Fitting & Power Tools : Fitting Tools- Marking and Measuring tools, Cutting tool, Finishing tools-etc- basic Fitting operations, Safe working practices
Introduction to power tools- Power Hacksaw, Drill, Grinder ,etc.

Unit-II
Electrical & Electronics Appliances: Introduction, wires and wires sizes, wiring boards, common house wiring methods, symbols and house hold electrical appliances.

Unit-III
Carpentry: Introduction-Timber, Wood joints- Lap, dovetail, Tools- Marking tools, Cutting tool, Finishing tools-etc- basic carpentry operations, Wood turning lathe

Unit-IV
Plastic molding & Glass Cutting: Types of Plastics, Processing of Plastics: Injection moulding and Blow moulding. Introduction to Glass materials and physical properties -Cutting tools.

Unit-V
Casting: Importance, Advantages and limitations, Pattern, Sand Casting – Casting terms, Procedure, Applications, Die Casting– Principle and Applications,Metal joining - Various methods of Joining, Welding - Types of Welding - Weld joints, Arc welding – Principle, Coated electrode, arc welding equipment, Applications, Resistance Spot welding, Soldering and Brazing
Sheet Metal Operations - Punching, Blanking

Unit-VI

Machining: meaning, Advantages and Drawbacks, Basic concepts of machine tool, chips and cutting tool, Principle of Lathe, Drilling, and Grinding, CNC machine tools - Advantages, parts of a CNC system,Additive manufacturing – Need, principles of SLS, FDM methods

Text Books:

1. HajraChoudhury S.K., HajraChoudhury A.K. and Nirjhar Roy S.K.,

2. Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

Reference Books:

Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, TataMcGrawHill House, 2017.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	**8HC01**	Oral Communication Skills Common to CSE, ECE, CIVIL	1	0	0	1

Maximum Marks: 100

(Internal – 30 / External – 70)

A	B	C	D	E	F	G	H	I	J	K	L
							X	X	X		X

Course Objectives:

To enable students to:

1. Enhance oral communication skills
2. Develop the skill of speaking extemporaneously
3. Enrich their vocabulary and subsequently hone their verbal aptitude
4. Learn to make formal presentations both online and offline.
5. Learn to listen and comprehend well
6. Learn the nuances of the art of group discussion

Unit: 1

Effective Oral Communication:

1.1. Introduction to Communication
1.2. Barriers to communication
1.3. Strategies to improve communication skills
1.4. Self introduction, introducing others and greetings

UNIT: 2

Extemporaneous Speaking:

2.1. Speaking on a topic - JAM
2.2. Use of cohesive devices in speaking
2.3. Common Errors in Spoken English

UNIT: 3 Soft Skills

3.1. Confidence Building
3.2. Etiquette

UNIT: 4

Presentation Skills:

4.1 Storytelling
4.2 Presenting data effectively in formal presentations
4.3 Managing online presentations

UNIT:5

Reading Comprehension

5.1: Reading comprehension Techniques

5.2: Practice passages

UNIT: 6

Group Discussion:

6.1 Importance of Group Discussions

6.2 Do's and Don'ts of Group Discussions

Text Book: Compiled by the faculty of Sreenidhi (for internal circulation only)

Suggested Readings: ***** SPOKEN ENGLISH A Self-Learning Guide to Conversation Practice by V Sasikumar P. V. Dhamija

- English for Professionals by S.S.Prabhakar Rao
- English for Business Communication by Dr.T.Farhathullah
- Professional Communication by Alok Jain, PravinS.R.Bhatia and A.M.Sheikh
- Objective English : Pearson's Publications
- Word Power Made Easy: Norman Lewis
- Business Communication Strategies :Monipally.

SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY
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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	**8HC08**	Basic Mathematics, Analysis and Reasoning (Common to All Branches)	2	1	0	3

Pre Requisites: Nil

Course objectives: By learning Quantitative Aptitude and Logical Reasoning, a student can answer general problems in his everyday life within a short time with the help of quicker methods. Also it improves the certain skills of a student such as numerical and logical ability, mental capacity and also in sharpening minds. This course is very much useful for competitive examinations.

Unit I:

Number System: Test for Divisibility, Test of prime number, Division and Remainders – HCF and LCM of Numbers – Fractions and Decimals-Vedic Mathematics-Average-Problems on Ages- Problems on Numbers- Ratio and Proportion.

Unit II:

Percentage – Profit, Loss and Discount – Partnership and Share-Simple Interest - Compound Interest.Time and Work- Pipes and Cisterns-Time and Distance- Problems on Trains- Boats and Streams, Allegation or Mixtures.

Unit III:

Mensuration: Area of Plane Figures, Volume and Surface Area of Solid Figures.
Data Interpretation: Tabulation, Bar Graphs, Pie Charts, Line Graphs-Logarithms-Permutation and Combination-Probability-Linear Equations-Quadratic Equations-Surds and Indices-Coordinate geometry.

Unit–IV:

Series Completion: Number Series, Alphabet Series, Alpha – Numeric Series.
Analogy: Completing the Analogous Pair, Simple Analogy, Choosing the Analogous pair, Double Analogy, Word Analogy, and Number Analogy.
Classification: Word Classification, Number Classification and Letter Classification.
Coding & Decoding: Letter Coding, Number Coding, Matrix Coding, Substitution, Deciphering Message Word Codes, Jumbled Coding. Crypt arithmetic-Inequalities-Input Output Tracing

Unit–V:

Blood Relations– Direction sense test- Number, Ranking & Time Sequence Test –Mathematical Operations-Arithmetical Reasoning. Puzzle Test: Classification Type Questions, Seating Arrangements, Comparison Type Questions, Sequential Order of Things, Selection Based on Given Conditions, Family Based Puzzles, Jumbled Problems.

Unit –VI:

Logical Venn Diagrams –Cubes and Dice – Analytical Reasoning-Assertions and Reason–Logical Deductions-Syllogism -Statement and Arguments-Statement and Conclusions-Clocks & Calendar-Data Sufficiency.

Text Books:

1. Quantitative Aptitude by R.S.Agarwal
2. Verbal and Non Verbal Reasoning by R.S.Agarwal.

Course Outcomes:

After completion of this course students will be able to solve, the questions given on testing divisibility, HCF and LCM,averages, percentage and profit and loss, ratio and proportion simple and compound interest, time and work, time and distance and etc. Also able to solve the questions given on series completion and analogy, odd one out and coding and decoding, blood relations, directions and Arithmetical reasoning, Venn diagrams,cubes and dice, clocks and calendar.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	**8HC64**	Engineering Chemistry Lab (Common to CSE, ECE and CE)	0	0	2	1

Course Objectives:

The student will be able to learn:

1. To reparation of Inorganic compounds
2. To determine surface tension of a liquid
3. To determine viscosity of lubricant
4. To determine acid value of an oil
5. To estimate hardness of water
6. To analyze the amount of chloride content
7. To determine cell constant and conductance of solutions
8. To determine redox potential and emf of solutions
9. To determine the rate constant of acid
10. To synthesize a polymer (Thiakol rubber / Urea-Farmaldehyde resin)
11. To synthesize a drug- Aspirin
12. To estimate of Mn^{+7} by Colorimetry method

List of Experiments

1. Preparation of coordination complex NiDMG Complex
2. Determination of surface tension
3. Determination of viscosity
4. Saponification/acid value of an oil
5. Ion exchange column for removal of hardness of water / Estimation of Hardness of water by EDTA Method
6. Determination of chloride content of water
7. Determination of cell constant and conductance of solutions (HCl Vs NaOH / Mixture of acid Vs Strong base)
8. Potentiometry - determination of redox potential and emf ($FeSO_4$ Vs $KMNO_4$ / HCl Vs NaOH)
9. Determination of the rate constant of acid catalyzed hydrolysis of methylacetete
10. Synthesis of a polymer- Thiakol rubber / Urea-Farmaldehyde resin
11. Synthesis of a drug- Aspirin
12. Estimation of Mn^{+7} by Colorimetry method

Course Outcomes

After completion of the course, the student will be able to learn:

1. Preparation of Inorganic compounds
2. Determination surface tension of a liquid
3. Determination viscosity of lubricant
4. Determination acid value of an oil
5. Estimation hardness of water
6. Analysis the amount of chloride content
7. Determination of cell constant and conductance of solutions
8. Determination of redox potential and emf of solutions
9. Determination of the rate constant of acid
10. Synthesis of a polymer (Thiakol rubber / Urea-Farmaldehyde resin)
11. Synthesis of a drug- Aspirin
12. Estimation of Mn^{+7} by Colorimetry method

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	**8FC61**	Problem Solving using C Lab (Common to CSE, ECE and CE)	0	0	2	1

Course Objectives:

1. To be able to understand the fundamentals of programming in C Language
2. To be able to write, compile and debug programs in C
3. To be able to formulate problems and implement in C.
4. To be able to effectively choose programming components
5. To solve computing problems in real-world.

Course Outcomes:

After completion of this course student will learn

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, strings and structures and manipulate them through a program
7. To be able to declare pointers of different types and use them in defining self referential structures.
8. To be able to create, read and write to and from simple text files.

[The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.]

1. Unit I (Cycle 1)
1. Write an algorithm for converting a given Celsius temperature to its equivalent Fahrenheit temperature and draw a flowchart.
2. Write an algorithm to find the largest of three given numbers and draw a flowchart.
3. Write an algorithm and draw a flowchart for finding the roots and nature of roots of a quadratic equation, given its coefficients.
4. Write an algorithm and flowchart for finding the first n Fibonacci numbers, give n.

2. Unit II (Cycle 2)
1. Write an algorithm, flowchart, and C program for:
2. Finding the area and circumference of a circle of given radius.
3. Finding the volume of a sphere of given radius.
4. Finding the lateral surface area of a right circular cone of given base radius and height.
5. Finding selling price of an item, given its cost price and profit percent.
6. Finding the interest on a given principal for a given period of time at a given rate of per year.
7. Write a C program to display all the sizes of data types in C.
8. Write a C program to display a given decimal integer into an equivalent octal number and hexadecimal number using %o and %x in printf function.

3. Unit II (Cycle 3)

1. Write a C program to find the roots and nature of the roots of a quadratic equation, given its coefficients.
2. Write a C program for finding the largest of three given numbers.
3. A salesman gets a commission of 5% on the sales he makes if his sales is below Rs.5000/- and a commission of 8% on the sales that exceeds Rs.5000/- together with Rs.250/-. Write an algorithm or a flowchart and develop C program for computing the commission of the salesman, given his sales.
4. Write a C Program to demonstrate Marcos.

4. Unit III (Cycle 4)

1. Write three C programs to print a multiplication table for a given number using while, do-while, and for loops.
2. Write a C program to compute the sum of:
3. $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$, given x and n.
4. 1! + 2! + 3! + . . . + n!, given n.
5. $1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10! + \ldots$ to n terms where the n^{th} term becomes less than 0.0001.

5. Unit III (Cycle 5)

1. Write a C program in the menu driven style to perform the operations +, -, *, /, % between two given integers.
2. Write a C program to find the largest and the least of some numbers given by the user.
3. Write a C program to find the sum of the digits of a positive integer.

6. Unit III (Cycle 6)

1. Write C functions for the following:
   a) A function that takes an integer n as argument and returns 1 if it is a prime number and 0 otherwise.
   b) A function that takes a real number x and a positive integer n as arguments and returns x^n.
   c) A function that takes a positive integer n as an argument and returns the n^{th} Fibonacci number.

2. Using recursion write C functions for the following:
   a) Factorial of a non-negative integer n.
   b) Number of combinations of n things taken r at a time.
   c) Greatest Common Divisor of two integers.
   d) Least Common Multiple of two integers.

7. Unit III (Cycle 7)

a) Write a menu driven style program to compute the above functions (cycle 6) on the choice of the function given by the user.
b) Define macros for the following and use them to find sum of the squares of the minimum and maximum of two given numbers.
   a) Larger of two numbers.
   b) Smaller of two numbers.
   c) Sum of the squares of two numbers.
c) Write a program to generate Pascal's triangle.
d) Write a program to count the number of letters, words, and lines in a given text.

8. Unit IV (Cycle 8)

1. Write a program to store the numbers given by the user in an array, and then to find the mean, deviations of the given values from the mean, and variance.
2. Write a C program to initially store user given numbers in an array, display them and then to insert a given number at a given location and to delete a number at a given location.

3. Write a program to store user given numbers in an array and find the locations of minimum and maximum values in the array and swap them and display the resulting array.

9. Unit IV (Cycle 9)

1. Write a C program to implement the operations of matrices – addition, subtraction, multiplication.
2. Write a program to find whether a given matrix is symmetric, lower triangular, upper triangular, diagonal, scalar, or unit matrix.

10. Unit V (Cycle 10)

1. Write a function to swap two numbers.
2. Write a function to compute area and circumference of a circle, having area and circumference as pointer arguments and radius as an ordinary argument.

11. Unit VI (Cycle 11)

1. Define a structure for complex number. Write functions on complex numbers (addition, subtraction, absolute value, multiplication, division, complex conjugate) and implement them in a menu driven style.
2. Define a structure point. Write a program to find the distance between two points.
3. Define a structure student having members roll no., name, class, section, marks. Create an array of 10 students give the data and find the average marks, section-wise.

12. Unit VI (Cycle 12)

1. Write a program to:
   a) Create a file by the name given by the user or by command line argument and add the text given by the user to that file.
   b) Open the file created above and display the contents of the file.
   c) Copy a file into some other file, file names given by the user or by command line arguments.
   d) Append a user mentioned file to another file.
   e) Reverse the first n characters of a file.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	**8BC61**	Workshop/Manufacturing Processes Lab	0	0	2	1

COURSE OBJECTIVES:

1) To know the different popular manufacturing process
2) To gain a good basic working knowledge required for the production of various engineering products
3) To provide hands on experience about use of different engineering materials, tools, equipment's and processes those are common in the engineering field
4) To identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances

COURSE OUTCOMES: After completion of the course, the student will be able to:

CO-1: Use various types of conventional manufacturing Processes

CO-2: Manufacture components from wood, MS flat, GI Sheet etc. – hands on experience

CO-3: Manufacturing of components by machining like shafts, holes & threaded holes, surface finishing of components etc.

CO-4: Produce small devices / products /appliances by assembling different components

LIST OF EXPERIMENTS

S.No	Trades	Experiment name
1	Fitting Shop	1. Preparation of T-Shape Work piece 2.Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
2	Carpentry	3. Cross Half Lap joint 4. Half Lap Dovetail joint
3	Electrical & Electronics	5. One lamp one switch 6. Stair case wiring
4	Welding (Arc & Gas) & Soldering	7. Practice of Lap and Butt joint by Arc welding Demonstration: Gaswelding, Resistance welding& Soldering
5	Casting	8. Preparation of mouldcavityusing solid pattern 9. Preparation of mouldcavityusing split pattern Demonstration: pouring of molten metal
6	Tin Smithy	10. Preparation of Rectangular Tray 11. Preparation of Square box
7	Machine Shop	Turning, Drilling and grinding operations on Lathe, Drilling and grinding machines

8	Plastic molding & Glass Cutting	12 a) Injection Moulding b) Glass Cutting with hand tools
9	Domestic Appliances	Study of internal components & circuit of appliances such as Fans, Mixers, Air blower, Iron box, Rice cooker, Emergency light etc.,
10	Lab project	Making various components and / or assembling the components which can be useful in domestic / engineering applications

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	**8HC61**	Oral Communication Skills Lab	0	0	2	1

Maximum Marks: 100

(Internal – 30 / External – 70)

A	B	C	D	E	F	G	H	I	J	K	L
							X	X	X		X

Course Objectives:

To enable students to:

1. Enhance oral communication skills
2. Develop the skill of speaking extemporaneously
3. Enrich their vocabulary and subsequently hone their verbal aptitude
4. Learn to make formal presentations both online and offline.
5. Learn to listen and comprehend well
6. Learn the nuances of the art of group discussion

Unit: 1

Effective Oral Communication:

1.1. Introduction to Communication
1.2. Barriers to communication
1.3. Strategies to improve communication skills
1.4. Self introduction, introducing others and greetings

UNIT: 2

Extemporaneous Speaking:

2.1. Speaking on a topic - JAM
2.2. Use of cohesive devices in speaking
2.3. Common Errors in Spoken English

UNIT: 3 Soft Skills

3.1. Confidence Building
3.2. Etiquette

UNIT: 4

Presentation Skills:

4.1 Storytelling
4.2 Presenting data effectively in formal presentations
4.3 Managing online presentations

UNIT:5

Reading Comprehension

5.1: Reading comprehension Techniques
5.2: Practice passages

UNIT: 6

Group Discussion:

6.1 Importance of Group Discussions
6.2 Do's and Don'ts of Group Discussions

Text Book: Compiled by the faculty of Sreenidhi (for internal circulation only)

Suggested Readings: ***** SPOKEN ENGLISH A Self-Learning Guide to Conversation Practice by V Sasikumar P. V. Dhamija

- English for Professionals by S.S.Prabhakar Rao
- English for Business Communication by Dr.T.Farhathullah
- Professional Communication by Alok Jain, PravinS.R.Bhatia and A.M.Sheikh
- Objective English : Pearson's Publications
- Word Power Made Easy: Norman Lewis
- Business Communication Strategies :Monipally.

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	**8C160**	Comprehensive Test and Viva –Voce – I	1	0	0	1

Comprehensive Test and Viva Voce	**The subjects studied in the Semester concerned related to branches concerned and for placements**
B.Tech I year I semester	I semester
B.Tech I year II semester	I and II semester
B.Tech II year I semester	I, II and III semester
B.Tech II year II semester	I, II, III and IV semester
B.Tech III year I semester	I, II, IIII, IV and V semester
B.Tech III year II semester	I, II, IIII, IV, V and VI semester
B.Tech IV year I semester	I, II, IIII, IV, V, VI and VII semester

Two Mid tests, Two mid Viva voce, one External Comprehensive Test and one External Comprehensive Viva Voce.

Allocation of marks :

*Comprehensive Test : 70 marks
**Viva Voce : 30 marks
Total : 100 marks

*Average of two best Mid Tests of Mid Test – I, Mid Test – II and Mid Test - III will be taken for 20 marks.
End Semester Examination for Comprehensive Test will be taken for 50 marks.
Total marks for Comprehensive Test will be 70.

**Average of best two of Mid Tests of Mid – I, Mid – II and Mid - III for Viva Voce will be taken for 10 marks.
End Semester Examination for Comprehensive Viva Voce shall be evaluated for 20 marks.
The total for Viva Voce will be 30.

Thus the total sessional marks in this subject of Comprehensive Test and Viva Voce will be : 30 for sessionals and 70 for End Semester examination.
The grand total of marks for the subject of Comprehensive Test and Viva Voce will be 100. The student has to secure 40% of marks i.e. 40 marks in sum total of 100 marks to be successful in the subject.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
I – I	**8C161**	Technical Seminar - I	1	0	0	1

Course Objective :

Develop ability to be a public speaker. Learn the importance of delivering seminars for demonstrating oratory and develop interview facing skills.

Course Outcomes: After completing this course, the student will be able to

1. Identify current general, political and technology related topics.
2. Arrange and present seminar in a effective manner
3. Collect, survey and organize content in presentable manner
4. Demonstrate oratory skills with the aid of Power Point Presentations
5. Exhibit interview facing skills and team leading qualities

Procedure

1. Seminar in-charges shall highlight the significance of technical seminar in the first two sessions and enlighten the students on the utility of these seminars.
2. The slots, titles shall be decided upfront and seminar in charge shall take signatures.
3. The same sheet shall be affixed in the respective classrooms and seminar register.
4. If any student fails to present his/her seminar on the given slot, to genuine reasons, they may be asked to present in the subsequent slot/week.
5. Progress of the seminars need to be reviewed by the concerned HOD once in 15 days.
6. The evaluation for technical seminars has to be informed to students and displayed in the classrooms.
7. Report and presentation must contain topic, introduction, explanation, diagrams, tables, applications and conclusions.

Distribution of marks

There shall be a Technical Paper writing and seminar evaluated for 100 marks in First Year Second Semester. The evaluation is purely internal and will be conducted as follows:

Sl.No	**Description**	**Marks**
1	Literature survey, topic and content	10
2	Presentation including PPT	10
3	Seminar Notes	05
4	Interaction with audience after presentation	05
5	Final Report 3 copies	10
6	Class room participation	05
7	Punctuality in giving seminar as per Scheduled time and date	10
8	Mid Semester Viva (on the seminar topics completed up to the end of 9^{th} week	15
9	End Semester Viva	30
	Total	**100 Marks**

Student must secure 40% i.e. 40 marks to be successful in sum total (Hundred Marks) in Technical Seminar.

1	2	3	4	5	6	7	8	9	10	11	12
					M		H		M		H

Syllabus for B. Tech I Year I semester
Electronics and Communication Engineering
ORIENTATION COURSE
(Common to all branches)

Code: 8HC18

L	T	P/D	C
1	0	0	0

Course Objectives:
This introductory course input is intended

- *To help the students appreciate the essential 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.*
- *To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.*
- *To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature. Thus, this course is intended to provide a much needed orientational input in value education to the young enquiring minds.*

Course Outcomes: *At the end of this course, the student will be able to*

1. *Learns Being a human, understands human values and purpose of education*
2. *Understands the importance of different harmony levels needed. Understand Self and being in the current moment are the sources of happiness.*
3. *Improves Learning capabilities and communication skills.*
4. *Improves Personality Development and Life Skills*
5. *Understands and appreciate the importance of personality development and yoga for a holistic life.*
6. *Understands the essence and Values and Social responsibilities for successful life.*

Unit	Name of the Module	Number of Periods
a) **Orientation Course for B. Tech I year I semester Students – 3 weeks duration covering the following Two Units**		
I	Universal Human Values – Introduction	8
II	Universal Human Values – Relationships	8
b) **Orientation Course for B. Tech I year II semester Students –covering the following Four Units**		
III	Improving Learning Capabilities (ILC) - Basic Skills of Learning	12
IV	Improving Learning Capabilities (ILC)- Personality Development and Life Skills	12
V	Literature, Proficiency Modules(PM) in English, Health, Yoga & Diet, Co-Curricular & Extracurricular activities	12
VI	Lectures by Eminent Persons on Science, Technology & Environment, Research, Innovation & Patents,Local Visit to Village and City including Hi-tech City. Feedback on last but one day of Orientation Course	12
Total Number of Periods		**64**

Unit - I

Universal Human Values

Introduction -Self – Exploration, Basic human aspirations, Need for a holistic perspective, Role of Education, Understanding Happiness, Understanding the human being – Self and Body.

Unit - II

Universal Human Values

Relationships-Understanding Relationship –Trust and Respect.Harmony in the Society, Natural Environment, Participation in nature Harmony in nature/existence.

Unit - III

Improving Learning Capabilities-Basic Skills of Learning

Principles of Learning, Study Skills & E-Learning, Listening Skills, Effective Reading and Reviewing, Reading Comprehension, Textbook Reading Strategies, Test taking strategies, Introduction to Soft Skills and Employability Skills, Interpersonal skills.

Unit - IV

Improving Learning Capabilities-Personality Development and Life Skills

Goal Setting, Motivation, Time Management, Positive Attitude, Decision Making, Building Self-confidence, Attributes of a Good Personality, Memory Management, Characteristics of a successful student, Responsibilities of Students in shaping themselves, Morals, Ethics & Values, Difference between Studying in a Professional College and High School / Junior College

Unit - V

Literature, Proficiency Modules(PM) in English, Health, Yoga & Diet, Co-Curricular & Extracurricular activities

Literature -History of human civilization, Indian civilization, Indus valley civilization and culture, history of religions, the basic tenets of Christianity, Islam, Hinduism, Buddhism, Jainism, Sikkim and Judaism, Indian culture and values.

Proficiency Modules in English - Strategies to improve proficiency in English skills(L/S/R/W), Exercises based on Remedial grammar, Exercises on Remedial Vocabulary

Health- Dimensions of Health, Basic activities of daily living, Instrumental activities of daily living, Types of Health, Factors affecting health

Yoga - Introduction to Yoga, Kinds of Yoga, Pranayama and Dhyana (Meditation)

Diet- Balanced Diet, Components of Diet, Health Eating Pyramid.

Co-curricular andExtraCurricular activities

Unit - VI

Lectures by Eminent Persons, Research, Innovation & Patents and Local Visit

Lectures by Eminent Persons on Science, Technology & Environment,

Innovations R&D and Entrepreneurship-Sreenidhi HUB, Basics of Innovation, Entrepreneurship and Intellectual Property Rights (IPR)

Local Visit to Village and City including Hi-tech City.

Feedback on last but one day of Orientation Course

Text Books:

1. RR Gaur, R Sangal, GP Bangaria, 2009, A Foundation Course in Value Education (English).

Reference Books:

1. Yoga, Food and Health (by Swami Guru PremanandaSaraswati)

I - II

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
I – II	**8HC07**	Engineering Physics	3	1	0	4

Course Objectives

- Explain about the Quantum Mechanics to understand wave particle duality, necessity of quantum mechanics to explore the behavior of sub atomic particles. Schroedinger's Time Independent Wave Equation, Physical Significance of the Wave Function – Application of Schroedinger wave equation.
- To understand the basic concepts of normal light, Laser and its applications and to know about the fiber optics, principle (TIR), Numerical Aperture, Types of optical Fibers, Step index and graded index Fibers, attenuation in optical fibers. Applications: optical fiber communication system, fiber optic sensors, medical endoscopy.
- To study the concepts of magnetism and superconductivity, Bohr magneton, Hysteresis nature, domain structure, Meissner effect, types of superconductors, BCS theory and applications of superconductors.
- To understand the concepts of dielectrics, polarizations and its types, internal fields, Clausius-Mossitti equation, Frequency and temperature effect on dielectrics and its applications – Piezo-electricity, Pyro-electricity and ferro-electricity.
- To know about the semiconductors, types, carrier concentration, Thermistor, Hall effect and also to understand the concept of PN-junction, I-V Characteristics, LED, Solar Cell and Photo diode.
- To discuss about the nano-technology, preparation techniques and characterization (XRD, SEM & TEM), CNTs and to know about the fundamentals of radioactivity and its applications.

Unit:1

Wave nature of particles, Schroedinger equation and its application

Waves and Particles, de Broglie Hypothesis, Matter waves, Davisson and Germer's Experiment, G.P. Thomson Experiment, Heisenberg's Uncertainty Principle, Schroedinger's Time Independent Wave Equation – Physical Significance of the Wave Function – Application of Schroedinger wave equation - Particle in One Dimensional Potential Box.

Unit:2

Lasers

Characteristics of LASER, Spontaneous and Stimulated Emission of Radiation, Meta-stable State, Population Inversion, Lasing Action, Einstein's Coefficients and Relation between them and significance, Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers in engineering and medicine.

Fiber optics

Introduction, Principle of Optical Fiber, Acceptance Angle and Acceptance Cone, Numerical Aperture, Types of Optical Fibers, Step index and graded index Fibers Attenuation in Optical Fibers. Applications: Optical Fiber communication system, Fiber Optic Sensors, Medical Endoscopy.

Unit:3

Magnetic and Superconducting materials

Permeability, Field Intensity, Magnetic Induction, Magnetization, Magnetic Susceptibility, Origin of Magnetic Moment, Bohr Magneton.Hysteresis behavior of Ferro Magnetic materials based on Domain

theory. Hard and Soft Magnetic Materials, Properties of Anti-Ferro and Ferri Magnetic Materials and their applications, **Super conductivity**, effect of Magnetic Field, Critical current density, Meissner effect, Type-I and Type-II superconductors, BCS theory, applications of superconductors.

Unit:4

Dielectric materials and their properties

Electric Dipole, Dipole Moment, Dielectric Constant, Electric Susceptibility, Electronic and Ionic polarizability (Quantitative) Orientation Polarization (Qualitative), Internal fields in Solids, Clausius - Mossotti equation, Frequency and temperature effect on Dielectrics (Qualitative), Applications - Piezo-electricity, Pyro-electricity and Ferro-electricity.

Unit:5

Semiconductors

Fermi Level in Intrinsic and Extrinsic Semiconductors, calculation of carrier concentration of Intrinsic Semiconductors (quantitatively) and Extrinsic Semiconductors (qualitatively), Direct & Indirect Band Gap Semiconductors, Thermistor, Hall Effect in semiconductors and applications.

Semiconductor devices

Formation of a PN Junction and working of a PN Junction, Energy band Diagram of a open circuited PN Diode, I-V Characteristics of PN Junction, Application - LED, Solar Cell and Photo diode.

Unit:6

Nanotechnology

Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Bottom-up Fabrication, Sol-gel, Precipitation, Chemical vapor Deposition(CVD); Top-down Fabrication; Thermal evaporation, Ball Milling, Characterization of Nano materials (XRD&TEM), carbon nano tubes(CNTs), Applications of Nano Materials.

Nuclear Energy: Radioactivity, Nuclear binding energy, Nuclear fission, Nuclear fusion, □, β, γ rays decay, Geiger-Muller counter and practical applications of nuclear physics.

Text Books:

1. B.K. Pandey & S. Chaturvedi Engineering Physics, Cengage Learning

Reference Books:

1. P K Palanisamy, Engineering Physics, Sitech Publications
2. Charles Kittel, Introduction to Solid State Physics, John Wiley Publisher
3. A.S. Vasudeva , Modern engineering Physics, S Chand
4. Dekker, Solid State Physics
5. Dr.M.N. Avadhanulu, Engineering Physics, S Chand
6. Dekker, Solid State Physics
7. Halliday and Resnick, Physics
8. S.O. Pillai, Solid State Physics
9. A. Ghatak - Optics

Course Outcomes

After completing the course, students are able to

- Differentiate the wave and particle, de-Broglie matter waves-its experimental evidence, Schroedinger's wave concept and its application for a particle in one dimension box.
- Explain about emission, its types, laser principle, types, working and its applications and to reveals about TIR principle, optical fiber-types and signal propagation, attenuation, communication system and applications of optical fibers (sensors and medical endoscopy)
- Reveals about the magnetism-its origin and types, Hysteresis, domain theory, Anti-ferro and ferri-magnetism, Superconductivity, experimental facts, theoretical analysis, types of superconductors and its applications.
- Explain the basic concepts of dielectric materials, polarization and its types, local fields, frequency and temperature effect on dielectrics and their applications (piezo, ferro and Pyro electricity).
- Explain semiconductor behavior, types, carrier concentration, Hall effect, Thermistor, demonstrate and analyze semiconductor devices like a PN-junction, I-V characteristics, LED, solar cell, photo diode and their applications.
- Summarize nano& bulk concepts, surface to volume ratio, quantum confinement, CNTs and preparation methods (physical & chemical), analysis the techniques like XRD, SEM, TEM and also to understand the radioactivity, fusion & fission, alpha, beta and gamma rays decay and its applications.

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
I – II	**8EC01**	Data Structures and C++	3	0	0	3

Course Objective:

1. Understand the concepts of Abstract data Type, linear data structures such as stacks, queues and lists and theirapplications.
2. Comprehend different nonlinear data structures such as trees and graphs and analyze their timecomplexities.
3. Understand object-oriented programming and advanced C++ concepts and be able to write programs with C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, Templatesetc.

1	2	3	4	5	6	7	8	9	10	11	12
H	**M**	**M**									

Course Outcomes:

1 Explain Abstract data type, stack and Queues with theirapplications

2 Write programs on Singly linked lists, doubly linked lists, Circular list and explain their operations.

3 Explain concepts of Trees, AVL Trees and Graphs with examples andapplications.

4 Describe and solve problems of searching and sorting and evaluate the time complexity of eachalgorithm.

5 Explain concepts of OOPs and implement programs using objects, classes, constructors anddestructors.

6 Explain and apply concepts of oops, write programs implementing functions, operator overloading andinheritance.

UNIT I:

Introduction to data structures: Abstract data type (ADT), Stacks, Queues and Circular queues and their implementation with arrays.Applications of Stack: infix to post fix conversion, postfix expression evaluation. Applications of Queues.

UNIT II:

Singly linked lists, Advantages of Linked lists over Arrays, Doubly linked lists, Circular list and their operations, representing stacks and queues with Linked lists.

UNIT III:

Trees- Binary trees, terminology, representation, traversals. AVL trees, AVL tree operations: Insertion, deletion and searching. Graphs- terminology, representation, graph traversals (DFS and BFS).

UNIT IV:

Searching –Searching: Linear and binary search methods. Sorting: Quick sort, Merge sort.Performance analysis of Searching and Sorting Algorithms. Heaps: Introduction, Min Heap, Max Heap, Operations on Heaps, Heap Sort. Hashing: Hash Table, Hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing.

UNIT V:

Introduction to C++ programming-object oriented programming concepts, Structured Vs OOP. Classes and objects-class definition, Objects, class scope and accessing members, Constructors-default constructor, parameterized constructor, copy constructor.Destructor.

UNIT VI:

Static class members, this pointer, friend functions, Dynamic memory management with operators new and delete. Overloading-function overloading, Operator overloading, restrictions on operator overloading, overloading unary and binary operators, templates, inheritance: single, multiple and multi level inheritance.

TEXT BOOKS:

- Data Structures and C++ by Reema Thareja
- Data Structure through C by Yashavant Kanetkar.
- The complete reference C++ By HerbSchildt.

REFERENCES:

1. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft. Data Structures and Algorithms. Addison Wesley,1983.
2. Data Structures using c Aaron M.Tenenbaum , Yedidyah Langsam,Moshe JAugenstein.
3. Introduction to Data Structures in C ByKamtane
4. Data Structures, A pseudocode Approach with C by Richard F. Gilberg and Behrouz A. Forouzan.

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
I – II	**8HC11**	Advanced Calculus and Complex Variable (Common to EEE, ECE, ME & CE)	3	1	0	4

Course Objectives:

To make the students to understand and expected to learn

1. Various analytical methods to solve first order first degree and also the equations not of first degree ordinary differential equations.
2. Methods to solve higher order ordinary differential equations.
3. Multiple integration and its applications
4. Concepts of vector integration.
5. Basic concepts of Complex Analysis and conformal mapping and their properties.
6. Series expansion of a function using Taylor's and Laurent's series. Evaluation of definite integrals and improper integrals.

UNIT - I

First order ordinary differential equations: (10 L)
Exact, equations reduced to exact; linear and Bernoulli's equations; Orthogonal Trajectories, Newton's Law of Cooling, Law of natural Growth/Decay.

UNIT – II

Ordinary differential equations of higher order: (10 L)
Higher order linear differential equations with constant coefficients-Standard types of finding P.I, method of variation of parameters, Cauchy-Euler equation.

UNIT – III

Multivariable Calculus (Integration (12 L)
Multiple Integrals: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Triple integrals (Cartesian), Applications: areas and volumes.

UNIT – IV

Vector Integration (8 L)
Line integrals, Surface integrals, Volume Integrals, Green, Gauss divergence and Stokes theorems (without proofs).

UNIT – V

Complex Variable – Differentiation: (8 L)
Differentiation, analytic functions, Cauchy-Riemann equations, harmonic functions, finding harmonic conjugate.Conformal mapping:Translation, Inversion, Rotation and Magnification, Invariance of circles and cross ratio-Determination of bilinear transformation – mapping three given points.

UNIT – VI

Complex Variable – Integration: (12 L)

Cauchy - Integral theorem (without proof), Cauchy Integral formula (without proof), singularities, zeros of analytic functions, Taylor's series, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine.

Text Books:

1. R K Jain and S R K Iyengar Advanced Engineering Mathematics, Narosa Publications.

Reference Books:

(i) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

(ii) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

(iii) Engineering Mathematics, Srimanta Pal, OXFORD university press.

(iv) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

Course Outcomes:

After the course completion the students will be able to

1. Find the solutions of first order first degree and not of first degree differential equations and their applications such as Newton's law of cooling, Natural growth and decay.
2. Identify and solve higher order ordinary differential equations with constant coefficients using some standard methods and also their applications in LCR circuits.
3. Solve the problems of multiple integrals and apply these concepts for finding the parameters like surface area, volume, center of mass and centre of gravity.
4. Solve problems of Line, Surface and Volume integrals.
5. Understand the concept of analyticity of a function; solve the problems on conformal mapping.
6. Express the functions of a complex variable in series form also able to evaluate definite and improper integrals using complex integration.

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
I – II	**8BC02**	Engineering Graphics	1	0	4	3

Course objectives:

1. To teach students the basic principles of Engineering graphics and instruments used
2. To introduce the concept of projections in drawing and its applications for simple drawing entities
3. To impart the knowledge of various types of solids and their projections in different position wrt principle planes
4. To teach the concept of sections of solids and their applications
5. To develop a clear understanding of the basic principles involved in three dimensional Engineering drawings.
6. To train the students for the extraction of multiple views from a solid model using AutoCAD

Course outcomes

After completing this course, the student will able to:

1) Get familiar to use the instruments to solve the engineering problem and draw various type of curves used in engineering
2) Understand and Implement Orthographic projections and draw projections of simple drawing entities such as points Lines, and Planes
3) Draw projections of different types of regular solids in various positions wrt principal planes of projection
4) Draw Sections of various Solids including Cylinders, cones, prisms and pyramids and draw the developments of these solids and their sections.
5) Construct Isometric Scale, Isometric Projections and Views and convert 3D views to 2D orthographic views
6) Understand from basic sketching through 2D and 3-D solid modeling using computer aided design (CAD) software

UNIT – I

Introduction to Engineering Drawing: Drawing Instruments and their uses, types of lines, Lettering, Dimensioning-Terms & notations, placing of dimensions, general rules of dimensioning.

Curves used in Engineering Practice and their Constructions: Conic Sections including Rectangular Hyperbola - General method, Cycloid and Involutes of circles

Scales: Reducing, Enlarging and Full Scales, types of scales, Construction of plain scales and diagonal scales only-simple problems

UNIT – II

Orthographic Projection: Principles of Projection – Methods of projection, First angle and third angle projections, Projections of Points, Projections of straight lines –line inclined to one plane and line inclined to both reference planes

UNIT –III

Projections of regular Planes: types of planes, plane inclined to one reference plane, Oblique planes

Projections of regular Solids: types of solids, Projections of: Prisms, Cylinders, Pyramids, Cones – simple position and axis inclined to one plane only

UNIT –IV

Sections and sectional views of Solids: Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

Development of Surfaces: Methods of development, Development of lateral Surfaces of Right Regular Solids – Prisms, Cylinders, Pyramids, Cones and their sections.

UNIT – V

Isometric Projection: Meaning, Isometric axes, lines and planes, Isometric Scale – Isometric drawing or View – Isometric drawing of planes and simple solids such as prisms, pyramids, cylinder, cone

UNIT –VI

Conversion of isometric views to orthographic views of simple objects.
Overview of Computer Graphics(Demonstration only) : Demonstrating features of the CAD software - The Menu System, Toolbars, , Dialog boxes and windows, Drawing entities - lines, circles, arcs etc and editing commands, Dimensioning of objects, 2 D drawings-simple exercises , 3D wire-frame and shaded solids- Commands, Boolean operations.

TextBook:

Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House (In First-angle Projection Method)

Reference Books:

1. Shah, M.B. &Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
2. Agrawal B. &Agrawal C. M. (2012), Engineering Graphics, TMH Publication
3. AUTOCAD Software Theory and User Manuals

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
I – II	**8HC02**	Written Communication Skills	1	0	0	1

Maximum Marks: 100

(Internal – 30 / External – 70)

A	B	C	D	E	F	G	H	I	J	K	L
							X	X	X		X

Course Objectives:

To enable students to:

- Upgrade their knowledge of basic writing skills, writing cohesive paragraphs and effective letters.
- Differentiate between confusing words, learn correct spellings and have a sound grip over the use of phrasal verbs.
- Master the techniques of reading passages and comprehending them.
- Understand the nuances of technical communication and apply it in their academic and professional career.
- Acquaint themselves with soft skills like having the right attitude towards life and boosting self-confidence.
- Learn the importance of building strong resume and the ways of building it.

Unit: 1

Effective Written Communication:

1.1 Strategies for effective written communication

1.2 Paragraph Writing

1.3 Letter Writing/ E- Correspondence

Unit: 2

Basic writing skills emphasizing Verbal Aptitude:

2.1 Words often confused

2.2 Synonyms – Antonyms

2.3 Homophones, Homonyms, Homographs

2.4 One - word substitutes

2.5 Idioms and Phrases

Unit: 3

Reading Comprehension:

3.1 Skimming and Scanning

3.2 Prediction Techniques and Inferring

3.3 Literal Comprehension

3.4 Evaluative Comprehension

3.5 Inferential Comprehension

UNIT: 4

Technical Communication:

4.1 Definition and Importance of Technical Communication/Business Communication
4.2 Types of Technical Communication and Comprehension
4.3 Report Writing: Significance, types, steps, layout and mechanism
4.4 Review of technical articles

UNIT: 5

Soft Skills:

5.1 Introduction to Soft Skills
5.2 Attitude: Attitude Vs. Behaviour;Factors leading to the formation of AttitudeNegotiation and winning by influence

UNIT: 6

Resume Writing:

6.1Types, purpose and design of Résumé
6.2Differences among Bio-data, Curriculum Vitaé and Résumé
6.3Tips to build a winning Résumé and write and effective cover letter
6.4 Cover Letter

Text book: Compiled by the faculty of English (for internal circulation only).

Reference books:

- English for Professionals by S.S.Prabhakar Rao
- English for Technical Communication by K.R.Lakshminarayana
- English for Business Communication by Dr.T.Farhathullah
- Professional Communication by Alok Jain, PravinS.R.Bhatia and A.M.Sheikh
- Business Communication, Principles to Practice- Monipally.
- Advanced Technical Communication: KavitaTyagi and Padma Mistri

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
I – II	**8AC42**	Electrical Circuits & Networks Analysis	2	1	0	3

Course Objective:

To learn the fundamentals and applications of circuits and networks.

a	b	c	d	e	f	g	h	i	j	k	l	m
x	x			x								

Course outcomes:

1. Understand the principle of different methods of electrical circuit reduction.
2. Understand the principle of single phase A.C circuits.
3. Understand the principle of magnetic circuits.
4. Understand the principles of network theorems along with its applications.
5. Understand the principle two port networks along with its applications.
6. Understand the principle of transients with both DC and AC excitation.

UNIT – I: INTRODUCTION TO ELECTRICAL CIRCUITS:

Circuit concept, R-L-C parameters, Voltage and current sources, Independent and dependent sources, Source transformation, Kirchhoff's laws, Network reduction techniques, series, parallel, series – parallel, Star- to-delta and Delta-to-star transformation, Mesh Analysis, Nodal analysis, Super mesh, Super node concept.
Applications: For finding of voltage and current of different points of OPAMP circuit.

UNIT – II: **SINGLE PHASE A.C. CIRCUITS:**

R.M.S and Average values, Form factor for different periodic wave forms, Steady state Analysis of R, L and C (in series, parallel and series-parallel combinations) with sinusoidal excitation.
Resonance in series and parallel circuits, Concept of band width and Q factor.
APPLICATIONS: tuning of a channel in radio receiver.

UNIT – III MAGNETIC CIRCUITS:

Basic terms in Magnetic Circuits, Comparison between electric and magnetic circuits, Composite magnetic circuit, Analysis of series, parallel magnetic circuits, Faraday's Laws of electromagnetic induction, Concept of self and mutual inductance, Dot convention, Co-efficient of coupling.
APPLICATIONS: working of transformer and dc machines.

UNIT – IV: NETWORK THEOREMS:

Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer and Millman's Theorems - statements and problems solving using dependent and independent sources with D.C. excitation.
Applications: For finding of voltage and current of different points of OPAMP circuits.

UNIT – V: TWO–PORT NETWORKS:

Z,Y, ABCD and h-parameters, Conversion of one parameter to another parameter, Condition for reciprocity and symmetry, two port network connections in series, parallel and cascaded configurations, Problem solving.
APPLICATIONS: analysis of electrical transmission network.

UNIT – VI: TRANSIENT ANALYSIS:

Transient response of R-L, R-C, R-L-C series circuits with D.C. and A.C excitations, Initial conditions, Solution using differential equation approach and Laplace transform methods of solutions.
APPLICATIONS: transientanalysis of electrical machines.

TEXT BOOKS:

1. Engineering Circuit Analysis – William Hayt and Jack E Kemmerly, McGraw Hill 5th Edition, 1993.
2. Circuits & Networks – M.S. Sukhija, K.N. Nagasarkar, Oxford University Press, 2nd edition.

REFERENCES:

1. Network Analysis - M.E. Vanvalkenberg, 3rd edition, PHI.
2. Circuit theory (Analysis & Synthesis) – A.Chakravarthy, Dhanpath Rai & Co., 6th edition.
Circuits & Networks – A.Sudhakar and Shyamamohan S.Palli, Tata McGraw Hill, 3rdedition.

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
I – II	**8AC61**	Electrical Circuits & Networks Analysis Lab	0	0	2	1

Course Objectives:

To make the student to learn:

i. Verification of network theorems experimentally.
ii. To measure frequency of RLC series and parallel circuits under resonance
iii. To determine self & mutual inductance and co-efficient of coupling for coupled circuits
iv. The construction of current locus diagram for a given parallel circuit.
v. Simulation for analysis of electrical networks
vi. Method for determining the parameters of a coil

Course Outcomes:

At the end of the course, students will be able to

i. Perform the test for verification of various network theorems
ii. Measure the frequency for a RLC series/parallel circuits under resonance.
iii. Conduct an experiment for determination of self & mutual inductance and coefficient of coupling
iv. Construct current locus diagram by performing a test on single phase parallel circuits
v. Simulate for analysis of electrical circuits.
vi. Determine the parameters of the coil

List of Experiments (ANY 10 Experiments to be conducted)

1. Verification Thevenin's Theorem and Norton's Theorem
2. Verification of Maximum Power Transfer Theorem
3. Verification of Superposition Theorem
4. Verification of Compensation Theorem
5. Verification of Reciprocity Theorem and Millmann's Theorem
6. Finding resonant frequency in Series and Parallel circuits
7. Determination of Self Inductance, Mutual Inductance and Coefficient of coupling
8. Calculation of Z and Y Parameters
9. Construction of current locus diagram for RL and RC circuit
10. Mesh and Nodal Analysis by simulation
11. Determination of Average value and RMS value of a complex wave
12. Determination of parameters of a coil.
13. Determination of Time constant of RL and RC series circuit.

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
I – II	**8HC66**	Engineering Physics Lab	0	0	2	1

Course Objectives

- Understand the concept of photo electric effect using photo voltaic cell.
- Discuss the dispersive power of prism-minimum deviation method.
- Discussion of diffraction pattern using the grating – LASER.
- To study the concepts (numerical aperture) of an optical fiber.
- To explain about magnetic induction, Biot-Savart principle.
- Study the frequency of AC mains using Sonometer.
- Explaining about the electrical resonance by using the LCR circuit.
- To understand the rigidity modulus, periodicity.
- To discuss the energy gap (E_g) of a semiconductor diode.
- To study the LED characteristics and forward resistance.
- To know the time constant of RC circuit.
- To understand about the ionizing radiation by using the Geiger–Muller counter.

List of Experiments

1. Determination the Planck's constant using the photo voltaic cell - Photo voltaic cell.
2. Calculation of dispersive power of a given material of prism by using Spectrometer in minimum deviation method - Light.
3. Determination of wavelength of a given laser source of light by using diffraction grating in normal incidence method - LASER
4. Determination of a Numerical Aperture (NA) of an optical fiber – Fiber optics.
5. Determination of magnetic induction flux density along the axis of a current carrying circular coil using Stewart and Gee's experiment - Magnetism.
6. Calculating the frequency of AC supply by using the Sonometer – Magnetostriction method.
7. Study of series and parallel resonance of an LCR circuit – Electrical devices.
8. Determination of rigidity modulus of a given wire material using the Torsional pendulum - Vibrations
9. Determination of the energy gap (E_g) of a given semiconductor- Temperature/semiconductor.
10. Studying the characteristics and calculating the forward resistance of a LED – Semiconductor/devices.
11. Determination of time constant of an RC-circuit – Electrical/ Electronics.
12. Studying the characteristics of Geiger–Muller counter and verifying the inverse square law - Nuclear physics

NOTE: Any **TEN** of the above experiments are to be conducted.

Course Outcomes

After completing the experiment, students are able to

- Understand the concepts of photo electric effect, importance, photo current, colour filters, optical sensors (photo voltaic cell).
- Know about the light properties-dispersion, prism, spectrometer and minimum deviation arrangement.
- Recognize the difference between the interference and diffraction, grating, laser characteristics.
- Analyze the concepts of fiber optics, fundamentals, numerical aperture its importance, attenuation in fiber and applications.
- Understand and search to apply the fundamentals of magnetic induction, Ampere's law, Oersted's law and the Biot-Savart law.
- Know the difference between AC and DC fundamentals, Magnetostriction, resonance, air column vibrations.
- Analyze the LCR circuit combination, parallel, series electrical resonance, inductance, reactance, capacitance and electrical and electronic fundamentals.
- Summarize the fundamentals of modulus-types, stress, strain, elasticity, plasticity and Hook's law.
- Analyze the concept a semiconductors, types, calculation of energy gap of a semiconductor diode and importance.
- Analyze the difference between normal diode, LED, forward bias, reverse bias, I-V characteristics, direct and indirect band gap semiconductors.
- Characterize the RC network, time constant, capacitor functioning and its application.

Understand the concept of radiation, ionizing radiation, radiological protection and inverse square law

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
I – II	**8EC61**	Data Structures (C/C++) Lab	0	0	2	1

1	2	3	4	5	6	7	8	9	10	11	12
		H									

Course objective:

Understand the data structures: simple and complex and use them to write the programs for implementing searching, sorting, expression evaluations. Understand the applications that use the particular data structure and its significance in the development of operating systems and the softwares . Understand the object-oriented programming concepts of C++.

Course Outcomes:

1. Write programs to implement Stacks, Queues and circularqueues.
2. Write programs using tree traversals. Inorder, preorder and postorder.
3. Write Programs on searching, sorting and hashingoperations.
4. Write programs on Binarytrees
5. Write programs in C++ to implement classes and operatoroverloading.

UNIT –I:

1. Write a C program that implement stack and its operations usingarrays
2. Write a C program that implement Queue and its operations usingarrays.
3. Write a C program that implement Circular Queue and its operations usingarrays.
4. Write a C program that uses Stack operations to perform thefollowing
   i) Converting infix expression into postfixexpression
   ii) Evaluating the postfixexpression

UNIT –II:

5. Write a C program that uses functions to perform the following operations on singly linkedlist:
   i) Creation ii) Insertion iii) Deletion iv) Traversal

6. Write a C program using functions to perform the following operations on circular singly linkedlist:
   i) Creation ii) Insertion iii) Deletion iv) Traversal

7. Write a C program that uses functions to perform the following operations on doubly linkedlist:
   i) Creation ii) Insertion iii) Deletion iv) Traversal in bothways
8. Write a C program to implement operations on the following Data Structures UsingSingly linkedlist:
   i) Stack ii)Queue

UNIT- III

9. Write a C program that uses functions to perform thefollowing:
   i) Creating a Binary Tree ofintegers
   ii) Traversing the above binary tree in preorder, in order and postorder.

UNIT- IV

10. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list ofintegers:
    i) Linearsearch ii) Binarysearch

11. Write C programs that implement the following sorting methods to sort a given list of integers in ascendingorder:
    i) Bubblesort ii) Insertion sort iii) SelectionSort

12. Write C programs that implement the following sorting methods to sort a given list of integers in ascendingorder:
    i) Quick sort ii) Merge sort iii) HeapSort

13. Write a C Program to implement Separate Chaining using Hashing. Include Insertion, Deletion and Display of theElements.

UNIT –V

14. Write a C++ program to read and display the details of student class with data members as name, rollno and 3 subjects'marks.

15. Write a C++ program to implement all types ofconstructors.

UNIT VI

16. Write a C++ program to implement operator overloading for addition of two complex numbers.

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
I – II	**8HC62**	Written Communication Skills Lab	0	0	2	1

Course Objectives:

To enable students to:

- upgrade their knowledge of basic writing skills, writing cohesive paragraphs and effective letters.
- differentiate between confusing words, learn correct spellings and have a sound grip over the use of phrasal verbs.
- master the techniques of reading passages and comprehend them.
- understand the nuances of technical communication and apply it in their academic and professional career.
- acquaint themselves with the concept of soft skills, having the right attitude towards their education, career and life in general.
- learn the importance of building a strong resume.

Units	Theory (1 per week)	No. of Periods	Lab (2 per week) CS LAB	No. of Periods
1. Elements of effective writing skills	1.1 Use of appropriate words and phrases 1.2 Sentence structures 1.3 Vocabulary: Synonyms – Antonyms Homophones, Homonyms, Homographs, words often confused, One - word substitutes, Idioms and Phrases 1.4 Avoid discriminatory writing	**1** **1** **1**	Exercises on • Words often Confused • Synonyms – Antonyms • Identifying Homophones, Homonyms, Homographs • words often confused • One - word substitutes • Idioms and Phrases	**4**
2.Professional writing skills	2.1 Paragraph writing 2.2 Letter writing (language to be used in a formal letter) 2.3 Leave letter, letter of apology, complaint letters, enquiry letters with replies 2.4 e-correspondence	**1** **1**	Practice exercises on • Paragraph Writing using hints/guided Paragraphs • Writing different types of letters • Learning e-correspondence	**6**
3. Reading Comprehension	3.1 Prediction techniques, Skimming and Scanning 3.2 Literal Comprehension 3.3 Evaluative Comprehension 3.4 Inferential Comprehension	**1** **1** **1**	Practice sessions on • Using passages for skimming and scanning • Reading Comprehension using different techniques	**6**
4. Report Writing	4.1 Significance, types, steps, formats of a report 4.2 Detailed analysis of manuscript of a report 4.3 Language and structure to be used in a formal report 4.4 model reports, assignments	1 1 1	• Practice Writing reports and reviewing technical Articles • formal expressions, technical vocabulary, active voice and passive voice, introduction, body and conclusion of a report	6

5. Resume Writing & Cover Letter	5.1 Types, purpose and design of Résumé 5.2 Differences among Bio-data, Curriculum Vitaé and Résumé 5.3 Methods to build a winning Résumé 5.4 Writing an effective Cover Letter	1 1 1	Practice exercises on • Resume Building • Drafting cover letters	6
6. Technical Communication and Soft Skills	6.1 Technical vocabulary 6.2 Review of technical articles 6.3 Technical research paper writing 6.4 Attitude Vs Behavior in professional circles	1 1	Practice exercises on • Technical vocabulary • Writing articles and research papers • Activities based on Soft skills • Developing attitude and behavior	4

Text book : Compiled by the faculty of English (for internal circulation only).

Reference books: * English for Professionals by S.S.Prabhakar Rao * English for Technical Communication by K.R.Lakshminarayana

- English for Business Communication by Dr.T.Farhathullah
- Professional Communication by Alok Jain, Pravin S.R.Bhatia and A.M.Sheikh
- Business Communication, Principles to Practice- Monipally.
- Advanced Technical Communication: Kavita Tyagi and Padma Mistri

SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY
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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
I – II	**8C262**	Comprehensive Test and Viva –Voce – II	1	0	0	1

Comprehensive Test and Viva Voce	**The subjects studied in the Semester concerned related to branches concerned and for placements**
B.Tech I year I semester	I semester
B.Tech I year II semester	I and II semester
B.Tech II year I semester	I, II and III semester
B.Tech II year II semester	I, II, III and IV semester
B.Tech III year I semester	I, II, IIII, IV and V semester
B.Tech III year II semester	I, II, IIII, IV, V and VI semester
B.Tech IV year I semester	I, II, IIII, IV, V, VI and VII semester

Two Mid tests, Two mid Viva voce, one External Comprehensive Test and one External Comprehensive Viva Voce.

Allocation of marks :

*Comprehensive Test : 70 marks
**Viva Voce : 30 marks
Total : 100 marks

*Average of two best Mid Tests of Mid Test – I, Mid Test – II and Mid Test - III will be taken for 20 marks.
End Semester Examination for Comprehensive Test will be taken for 50 marks.
Total marks for Comprehensive Test will be 70.

**Average of best two of Mid Tests of Mid – I, Mid – II and Mid - III for Viva Voce will be taken for 10 marks.
End Semester Examination for Comprehensive Viva Voce shall be evaluated for 20 marks.
The total for Viva Voce will be 30.

Thus the total sessional marks in this subject of Comprehensive Test and Viva Voce will be : 30 for sessionals and 70 for End Semester examination.
The grand total of marks for the subject of Comprehensive Test and Viva Voce will be 100. The student has to secure 40% of marks i.e. 40 marks in sum total of 100 marks to be successful in the subject.

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Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
I – II	**8C263**	Technical Seminar - II	1	0	0	1

Course Objective :

Develop ability to be a public speaker. Learn the importance of delivering seminars for demonstrating oratory and develop interview facing skills.

Course Outcomes: After completing this course, the student will be able to

6. Identify current general, political and technology related topics.
7. Arrange and present seminar in a effective manner
8. Collect, survey and organize content in presentable manner
9. Demonstrate oratory skills with the aid of Power Point Presentations
10. Exhibit interview facing skills and team leading qualities

Procedure

8. Seminar in-charges shall highlight the significance of technical seminar in the first two sessions and enlighten the students on the utility of these seminars.
9. The slots, titles shall be decided upfront and seminar in charge shall take signatures.
10. The same sheet shall be affixed in the respective classrooms and seminar register.
11. If any student fails to present his/her seminar on the given slot, to genuine reasons, they may be asked to present in the subsequent slot/week.
12. Progress of the seminars need to be reviewed by the concerned HOD once in 15 days.
13. The evaluation for technical seminars has to be informed to students and displayed in the classrooms.
14. Report and presentation must contain topic, introduction, explanation, diagrams, tables, applications and conclusions.

Distribution of marks

There shall be a Technical Paper writing and seminar evaluated for 100 marks in First Year Second Semester. The evaluation is purely internal and will be conducted as follows:

Sl.No	**Description**	**Marks**
1	Literature survey, topic and content	10
2	Presentation including PPT	10
3	Seminar Notes	05
4	Interaction with audience after presentation	05
5	Final Report 3 copies	10
6	Class room participation	05
7	Punctuality in giving seminar as per Scheduled time and date	10
8	Mid Semester Viva (on the seminar topics completed up to the end of 9^{th} week	15
9	End Semester Viva	30
	Total	**100 Marks**

Student must secure 40% i.e. 40 marks to be successful in sum total (Hundred Marks) in Technical Seminar.

1	2	3	4	5	6	7	8	9	10	11	12
					M		H		M		H

Syllabus for B.Tech. I year II Semester
Electronics and Communication Engineering
Orientation Course
(Mandatory course)

Code: 8HC18 **L T P/D C**

Course Objectives: **2 0 0 0**

This introductory course input is intended

1. To help the students appreciate the essential 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature. Thus, this course is intended to provide a much needed orientational input in value education to the young enquiring minds.

Course Outcomes: At the end of this course, the student will be able to

7. Learns Being a human, understands human values and purpose of education
8. Understands the importance of different harmony levels needed. Understand Self and being in the current moment are the sources of happiness.
9. Improves Learning capabilities and communication skills.
10. Improves Personality Development and Life Skills
11. Understands and appreciate the importance of personality development and yoga for a holistic life.
12. Understands the essence and Values and Social responsibilities for successful life.

Unit	Name of the Module	Number of Periods
c) **Orientation Course for B. Tech I year I semester Students – 3 weeks duration covering the following Two Units**		
I	Universal Human Values – Introduction	8
II	Universal Human Values – Relationships	8
d) **Orientation Course for B. Tech I year II semester Students –covering the following Four Units**		
III	Improving Learning Capabilities (ILC) - Basic Skills of Learning	12

IV	Improving Learning Capabilities (ILC)- Personality Development and Life Skills	12
V	Literature , Proficiency Modules(PM) in English, Health, Yoga & Diet, Co-Curricular & Extracurricular activities	12
VI	Lectures by Eminent Persons on Science, Technology & Environment, Research, Innovation & Patents, Local Visit to Village and City including Hi-tech City. Feedback on last but one day of Orientation Course	12
Total Number of Periods		**64**

Unit - I
Universal Human Values

Introduction -Self – Exploration, Basic human aspirations, Need for a holistic perspective, Role of Education, Understanding Happiness, Understanding the human being – Self and Body.

Unit - II
Universal Human Values

Relationships-Understanding Relationship –Trust and Respect.Harmony in the Society, Natural Environment, Participation in nature Harmony in nature/existence.

Unit - III
Improving Learning Capabilities-Basic Skills of Learning

Principles of Learning, Study Skills & E-Learning, Listening Skills, Effective Reading and Reviewing, Reading Comprehension, Textbook Reading Strategies, Test taking strategies, Introduction to Soft Skills and Employability Skills, Interpersonal skills.

Unit - IV
Improving Learning Capabilities-Personality Development and Life Skills

Goal Setting, Motivation, Time Management, Positive Attitude, Decision Making, Building Self-confidence, Attributes of a Good Personality, Memory Management, Characteristics of a successful student, Responsibilities of Students in shaping themselves, Morals, Ethics & Values, Difference between Studying in a Professional College and High School / Junior College

Unit - V

Literature , Proficiency Modules(PM) in English, Health, Yoga & Diet, Co-Curricular & Extracurricular activities

Literature -History of human civilization, Indian civilization, Indus valley civilization and culture, history of religions, the basic tenets of Christianity, Islam, Hinduism, Buddhism, Jainism, Sikkim and Judaism, Indian culture and values.

Proficiency Modules in English - Strategies to improve proficiency in English skills(L/S/R/W), Exercises based on Remedial grammar, Exercises on Remedial Vocabulary

Health- Dimensions of Health, Basic activities of daily living, Instrumental activities of daily living, Types of Health, Factors affecting health

Yoga - Introduction to Yoga, Kinds of Yoga, Pranayama and Dhyana (Meditation)

Diet- Balanced Diet, Components of Diet, Health Eating Pyramid.

Co-curricular andExtra Curricular activities

Unit - VI

Lectures by Eminent Persons, Research, Innovation & Patents and Local Visit

Lectures by Eminent Persons on Science, Technology & Environment,

Innovations R&D and Entrepreneurship-Sreenidhi HUB, Basics of Innovation, Entrepreneurship and Intellectual Property Rights (IPR)

Local Visit to Village and City including Hi-tech City.

Feedback on last but one day of Orientation Course

Text Books:

1. RR Gaur, R Sangal, GP Bangaria, 2009, A Foundation Course in Value Education (English).

Reference Books:

1. Yoga, Food and Health (by Swami GurupremanandaSaraswati)

II - I

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – I	**8CC01**	Electronic Devices and Circuits	3	0	0	3

Course Objectives

- To provide the learners a comprehensive understanding of electronic Components like Diodes, Transistors, Field Effect transistors and their applications.
- To maintain the right blend of theory and practice in analyzingand designing of Amplifiers and Oscillators.

Course Outcomes

After studying this course, the students will be able to

[CO1] Demonstrate the concepts of pn Diode, Zener Diode, Bipolar Junction Transistor, Field Effect Transistor and their characteristics.

[CO2] Design and Analyze the Amplifier circuits usingBJT and FET.

[CO3] Classify and characterize the Feed Back amplifiers and design various Oscillator circuits.

[CO4] Understand the Basic regulator circuits and voltage multipliers.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	2	2	2									1	3		1
CO2	3	3	3									1	3		1
CO3	3	3	3									1	3		1
CO4	3	3	3									1	3		**1**
Overall mapping	3	3	3									1	3		1

UNIT-I

PN JUNCTION DIODE: [CO1][T1][Lecture hrs – 10]

P-N Junction diode characteristics and applications under forward & reverse bias.Transition capacitance and Diffusion capacitance. Break down of junctions (Avalanche Break Down and Zener Break down). Zener Diode Characteristics.

P-N junction diode as a Rectifier :Half wave Rectifier, Full wave Rectifier, Bridge Rectifier, Analysis of Rectifier circuits without and with filters (Inductor and Capacitor Filters).

UNIT- II

BIPOLAR JUNCTION TRANSISTOR:[CO1][T1][Lecture hrs – 10]

Fundamentals of BJT& Operation, Minority carrier profiles. I/P and O/P Characteristics CB, CE and CC configurations.Transistor as a switch. Switching characteristics (Rise time, Fall time, Delay Time and Storage time), Design of transistor as switch. Problems on transistor switch. BJT Biasing Methods & Stabilization. - Fixed Bias, Collector to Base Bias, Voltage Divider Bias and Problems, Concept of Thermal runway in BJT.

UNIT-III

Small signal & High frequency analysis of BJT:[CO2][T1][Lecture hrs – 8]
Small signal Low frequency Model of BJT, h-parameter representation – Exact analysis of .CE Amplifier-.Approximate analysis of CE, CB and CC Amplifiers. Concept of Multistage amplifier - N-stage cascaded amplifier, equivalent circuits, Frequency response of single & two stage RC coupled Amplifier, Analysis at Low and High frequencies.
Hybrid π model – relationship between high frequency parameters and h- parameters, β cut off Frequency (common Emitter short circuit Current gain), Millers Theorem.

UNIT-IV

FIELD EFFECT TRANSISTOR:[CO1][CO2][T1] [Lecture hrs – 9]
Construction & Working of JFET, JFET characteristics, FET Parameters, Construction & Working of MOSFET, MOSFET characteristics,(Enhancement and depletion mode); Comparison of JFET & MOSFET
Biasing of JFET - Self bias and fixed bias. Small signal Analysis of common source, common drain and common gate amplifier configurations

UNIT- V [CO3] [T1][Lecture hrs – 8]

FEED BACK AMPLIFIERS
Fundamentals-classification- Characteristics of feedback Amplifier effect of feedback in voltage series, voltage shunt, current series and current shunt amplifiers. Problems

OSCILLATORS
Classification of Oscillators. Condition for Oscillations. RC Phase shift Oscillator , Wein bridge oscillator- Hartley oscillator, Colpitts oscillator, Quartz crystal Oscillator,
UNIT-VI

VOLTAGE REGULATORS:[CO4][T1][T2][Lecture hrs – 9]

Classification of Voltage Regulators - Basic regulator circuit: Zener, Transistor Based: Shunt and Series Voltage regulators. Protection Circuits: Current limiting, Short circuit protection. Specifications of Voltage regulator, Voltage multipliers. Switching Regulators – (boost up, step down (buck) &Flyback)

Text Books

[T1]Electronic Devices and Crcuits-J.Millman, C.C.Halkias and satyabrathajit Tata McGraw Hill,2 Ed. 2007
[T2]Electronic Devices AND Circuits-R.L.Boylestad&LouisNashelsky, Pearson/Prentice Hall, 9th edition, 2006.

References

[R1]Electronic circuit analysis-K.Lal Kisshore,2004,BSP
[R2] Electronic Devices and Circuits by S.Salivahanan and N.Suresh Kumar, Tata Mc Graw Hill Publications
[R3] Electronic Devices and Crcuits by Sanjeev Guptha,Dhapat Rai Publications.
[R4] Electronic Devices and Circuits – K.LalKishore, 2 ed., 2005, BSP

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – I	**8CC02**	Digital Logic Design (Common to ECE/ECM/EEE)	2	0	0	2

COURSE OBJECTIVES:

To learn the different numbering systems, Boolean functions and design of Combinational circuits

To learn design of Sequential Circuits, design using PLDs and digital controllers using Algorithmic State machines

COURSE OUTCOMES:

After completing this course, the students will have demonstrated

[CO1]. An ability to understand number systems and apply the rules of Boolean algebra and K-maps to simplify Boolean expressions.

[CO2]. An ability to design MSI combinational circuits such as full adders, multiplexers, decoders, encoders.Code converters.

[CO3]. An ability to design basic memory units (latches and flip-flops) and sequential circuits such as counters and registers

[CO4]. An ability to design digital design using PLD's such as ROM's, PLA's, PALs and digital controllers using Algorithmic State Machine Charts.

Mapping of Course Outcomes with Program Outcomes andProgram specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3				2	2		2	3	3	2
CO2	3	3	3	2	3				2	2		2	3	3	2
CO3	3	3	3	2	3				2	2		2	3	3	2
CO4	3	3	2	2	3				2	2		2	3	2	2
Overall	3	3	3	2	3				2	2		2	3	3	2

UNIT – I[Lecture hrs – 9]

Number System: Binary, decimal, octal, hexa decimal, weighted and un-weighted codes.

Boolean Algebra: Axiomatic definition of Boolean algebra, Binary operators, postulates of and theorems. Boolean addition, subtraction, 1's complement, 2's complement. Switching functions, Canonical forms and Standard forms, Simplification of switching functions using theorems.

UNIT – II[Lecture hrs – 8]

Logic gates: Basic gates and universal gates.

Minimization of Switching Functions: simplification rules, Karnaugh map method, Prime implicants, don't care combinations, Minimal SOP and POS forms, Quine-McCluskey Tabular Method, Prime Implicant chart.
Application: Design of a Basic Calculator Using Logic Gates.

UNIT – III[Lecture hrs – 9]

Combinational Logic Design:
Single output and multiple output combinational logic circuit design, AND-OR, OR-AND, and NAND/NOR realizations, Exclusive-OR and Equivalence functions, Binary adders/subtractors, Encoder, Decoder, Multiplexer, Demultiplexer, MUX realization of switching functions, Parity bit generator, Code-converters, Concepts of threshold logic and threshold gates.
Applications: Application of Decoder in Seven Segment Display, application of Encoders in Servomotors.

UNIT - IV [Lecture hrs – 9]

Sequential Circuits-1:
Classification of sequential circuits (Synchronous, Asynchronous Pulse mode, and Level mode with examples).Basic flip-flops-Triggering and excitation tables.Conversion of flip-flops.
Applications: Application of SR Flip Flop in Switch Debounce Circuit.

UNIT – V[Lecture hrs – 9]

Sequential Circuits-2:
The sequential circuit model, Asynchronous counters, Design of simple synchronous sequential circuits such as counters (Design of modulo-N counter, Ring counter, twisted ring counter) and Shift registers
Applications: Design of 1010 sequence detector, Design of Digital Clock using Counters

UNIT – VI[Lecture hrs – 9]

Programmable LogicDevices:
Basic PLD's-ROM, PROM, PLA, and PLD Realization of Switching functions using PLDs. Algorithmic State Machines: State machines and state diagrams.
Applications: Design of a Weighing machine and Binary multiplier.

Text Books:

[T1]. Morris Mano-,Digital design –PHI, 2nd Edition.

[T2}. ZviKohavi and Niraj K Jha -Switching & Finite Automata theory – Cambridge, 3rd Edition.

References:

[R1]. Fletcher -An Engineering Approach to Digital Design – PHI.

[R2]. Fundamentals of Logic Design, Roth, Kenny, Seventh Edition, Cengage Learning

[R3]. R.P.Jain-Switching Theory and Logic Design- TMH Edition,2003.

[R4]. CVS Rao -Switching Theory and Logic Design –Pearson Education, 2005

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – I	**8CC03**	Signals and Systems (Common to ECE/ECM)	3	0	0	3

Pre Requisites: Mathematics-Integration, Differentiation and basic representation of Laplace & Z Transforms

Course Objectives :

To study the concepts of signals and systems their characterization in the Time as well as frequency domains

To know the importance of sampling theorem and various sampling methods to convert continuous time signals into discrete time signals

COURSE OUTCOMES:

After studying this course, the students will be able to

1. Understand the concepts of signals, comparison of signals, orthogonal signal space and Apply the orthogonality properties to understand the Fourier methods of signal analysis-Fouries series and Fourier Transforms.
2. Understand the concepts of systems, their characterization in the Time as well as Transformed domains and apply the mathematical tools, such as Convolution, Correlation and the Laplace transform to analyze signals and systems.
3. Determine the sampling frequency for any low pass and band pass signals applying the sampling theorem.
4. Distinguish between continuous and Discrete time signals and systems. Apply the concepts of Z-Transforms in the analysis of DT signals and systems.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes

UNIT I[Lecture hrs – 9]

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3				3	2		3	3	3	3
CO2	3	3	3	3	3				3	2		3	3	3	3
CO3	3	3	3	3	3				3	2		3	3	3	3
CO4	3	3	3	3	3				3	2		3	3	3	3
Overall	3	3	3	3	3				3	2		3	3	3	3

Signals: Signals. Classification of Signals.Even, Odd, Periodic.Non-periodic.Energy and Power Signals.Exponential and Sinusoidal Signals.Concepts of Impulse Function.Unit Step Function. Signum Function. [T1, T2]

Signal Analysis - Analogy between Vectors and Signals. Orthogonal Signal Space. Signal Approximation using Orthogonal Functions. Mean Square Error. Closed or Complete Set of Orthogonal Functions.Orthogonality in Complex Functions. [T1, T2]

Applications: The concepts of orthogonality find applications in DSP, DIP, DC, Design of experiments and so on.

UNIT-II[Lecture hrs – 10]

Fourier Representation of Continuous Time Signals

Periodic Signals- Fourier Series, Dirichlet's Conditions.Trigonometric.Exponential Fourier series. Fourier Spectrum.[T2]

Non- Periodic Signals - Fourier Transforms. Fourier Transform of Arbitrary Signal. Standard Signals. Fourier Transform of Periodic Signals. Properties of Fourier Transforms. Fourier Transforms Involving Impulse and Signum Function Introduction to Hilbert Transform. [T1, T2]

Applications: Knowledge of signal bandwidth is necessary in the design of a filter; in the determination of the carrier frequency and also the sampling frequency and analog communication.

UNIT-III[Lecture hrs – 11]

Signal Transmission through Linear Systems
Systems.Classification of Systems.Linear System.Impulse Response (IR) of a Linear System.Linear Time Invariant (LTI) System.Linear Time Variant (LTV) System. Transfer Function of a LTI System. Filter Characteristics of Linear Systems. Distortion Less Transmission Through a System. Signal Bandwidth. System Bandwidth.Ideal LPF, HPF and BPF Characteristics.Causality and Poly-Wiener Criterion for Physical Realization. Relationship between Bandwidth and Rise Time.[T2]

Applications: The concept of system bandwidth is applied in the design of a practical filter or system.

UNIT-IV[Lecture hrs – 11]

Convolution and Correlation of Signals
Concept of Convolution in Time Domain and Frequency Domain.Graphical Representation of Convolution.Convolution Properties. Cross Correlation and Auto Correlation of Functions. Properties of Correlation Function, Relation between Convolution and Correlation.Energy Density Spectrum, Parseval's Theorem, Power density spectrum, Detection of periodic signals in the presence of Noise by Auto and Cross Correlations.[T2]

Laplace Transforms - Review of Laplace Transforms. Partial Fraction Expansion. Inverse Laplace Transform. Concept of Region of Convergence (ROC) for Laplace Transforms. Constraints on ROC for Various Classes of Signals.Properties of LT.Initial and final value theorems, Relation between LT and FT of a Signal. Laplace Transform of Certain Signals using Waveform Synthesis. Laplace Transform of Periodic Signals.[T1, T2]

Applications: These math tools are required in the design, analysis and implementation of various filters, LT signals and systems.

UNIT-V[Lecture hrs – 9]

Sampling

Sampling Theorem.Graphical and Analytical Proof for Band Limited Signals.Impulse (Ideal) Sampling.Natural (Chopped) Sampling and Flat Top(S&H) Sampling.Reconstruction of Signal from its Samples.Effect of Under Sampling.Aliasing. Introduction to Band Pass Sampling.[T1, T2]

Applications: Sampling techniques are applied in the conversion of analog to digital conversion

UNIT-VI[Lecture hrs – 8]

Z–Transforms

Fundamental Difference between Continuous and Discrete Time Signals. Discrete Time Signal Representation using Complex Exponential and Sinusoidal Components. Periodicity of Discrete Time using Complex Exponential Signal.Concept of Z- Transform of a Discrete Sequence. Distinction Between Laplace, Fourier and Z Transforms. Region of Convergence in Z-Transform.Constraints on ROC for Various Classes of Signals.Inverse Z-Transform.Properties of Z-Transforms.Initial and final value theorems.Introduction to Discrete Time Systems. [T2]

Applications: Analysis and Synthesis of DT signals and systems.

Text Books

1. Signals, Systems and Communications- B. P. Lathi, BSPublications.
2. Signals and Systems – Anand Kumar, 2nd Edition, PHI Publications.

References

1. Signals & Systems – Simon Haykin and Van Veen, 2nd Edition, WileyPublications.
2. Signal processing and Linear Syustems - B. P. Lathi, BSPublications.
3. Signals & Systems -A.V. Oppenheim, A.S. Willsky and S.H. Nawab, 2ndEdn, PHI Publications.

4. Linear Systems and Signal Processing - B. P. Lathi, Oxford University Press.

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – I	**8C304**	Probability Theory and Stochastic Process	2	1	0	3

Course Objectives

- To establish basic foundations on the concepts of probability theory, random variables, random processes and statistical averages.
- To acquaint the learners with the applications of random variables and random processes, in communication systems.

Course Outcomes

After studying this course, the students will be able to

[CO5] Explore the concepts of Probability of Random Events, Joint, Marginal, Conditional and Total Probabilities, Bayes Theorem.

[CO6] Understand the concepts of probability distribution and probability density functions, their properties for single and multiple random variables. Also characterize various statistical averages based on probability density function.

[CO7] Analyze the different types of random processes, their statistical parameters such as Auto-correlation function, Power Density Spectrum.

[CO8] Characterize the response of LTI systems to random processes and explore the applications of probability in Information theory.

Mapping of Course Outcomes with Program Outcomes andProgram specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2				3			2	3	3	2
CO2	3	3	2	3	2				3			2	3	3	2
CO3	3	3	2	3	2				3			2	3	3	2
CO4	3	3	2	3	2				3			2	3	3	2
Overall	3	3	2	3	2				3			2	3	3	2

UNIT I[Lecture hrs – 10]

PROBABILITY THEORY [T1] [CO1]
Set Definitions.Sample Points and Sample Spaces.Probability of Random Events.Laws of Probability. Joint,Marginal and Conditional Probabilities. Total Probability. Bayes Theorem. Statistical Independence.

Applications. Bayes theorem in calculation of channel capacity, Information Theory i.e., Entropy, Mutual information (rate at which source generates information)

UNIT-II[Lecture hrs – 8]

RANDOM VARIABLES [T1] [CO2]
Probability Distribution Functions.Discrete Random Variables and Probability Mass Function.Expected values.Continuous Random Variables.Probability Density Functions.Complex Random Variables. Moments and Characteristic Functions. Distributions and Density Functions and their Properties.Expected Values. Moments and Characteristic Functions – Binomial. Poisson.Uniform.Gaussian.Exponential. Rayleigh. Transformations of Random Variables.
Applications : Design of queue for Tele communications using Binomial, Poisson distributions.

UNIT-III[Lecture hrs – 8]

RANDOM VECTORS [T1] [CO2]
Joint Probability Distribution Functions.Joint Probability Densities.Conditional Probability Distributions Functions.Marginal Distributions and Density Functions.Conditional Probability Densities.Expected Value of a Function of Random Variables.Joint Moments. Joint Characteristic Functions. Sum of Two RandomVariables.Sum of Several Random Variables.central limit theorem (proof not expected)Jointly Gaussian Random Variables. Independent Random Variables.Transformations (Functions) of Multiple Random Variables.
Applications :design of optimum filter,

UNIT-IV[Lecture hrs – 10]

RANDOM PROCESSES [T1] [CO3]
Definition: The concept. Probabilistic Structure.Classification.Formal Definition. Description: Joint Distribution. Analytical Description using Random Variables. Average Values: Mean. Auto-correlation, Auto-covariance and Auto-correlation Coefficient. Two or More Random Processes: Cross-correlation Function. Cross-covariance Function.Cross-correlation Coefficient.

Applications: Calculation Coding efficiency ofShanonFano Coding.

UNIT-V[Lecture hrs – 9]

STATIONARITY AND CORRELATION THEORY [T1] [CO3]
Strict-sense Stationarity. Wide-sense Stationarity (WSS). Auto-correlation Function of Real WSS Random Process and its Properties.Cross-correlation Function and its Properties.Power Spectral Density Function of a WSS Random Process and its properties.Wiener-Khinchine Theorem.Power and Bandwidth Calculations. Cross-power Spectral Density Function and its Properties
Time Averaging and Ergodicity: Time Averages – Interpretation. Mean and Variance. Ergodicity.General Definition.Mean-ergodic. Correlation -ergodic.

Applications: Removal of noise using correlation, probability of error in Digital Communications.

UNIT-VI[Lecture hrs – 9]

LINEAR SYSTEMS WITH RANDOM INPUTS [T2] [CO4]
Value of System Random Signal Response of Linear Systems: System Response – Convolution. Mean and Mean-squared Response. Autocorrelation Function of Response.Cross-Correlation Functions of Input and Output.Spectral Characteristics of System Response.Power Density Spectrum of Response.Cross-Power Density Spectrums of Input and Output.Band Pass. Band-Limited and Narrowband Processes. Properties.Thermal Noise. Shot noise.
Information Theory: Entropy, Joint Entropy, Conditional Entropy and Mutual Information

Applications– Modulation,SNR calculations.

Text Books

[T1] Peyton Z. Peebles Jr., Probability, Random Variables and Random Signal Principles, 4th edn., Tata McGraw-Hill, New Delhi, 2002.

[T2] R.P.Singh, S.D.Sapre, Communication Systems; Analog and Digital, Tata McGraw Hill, New Delhi, 3rd Ed, 2012.

References

[R1] G. R. Grimmett, D. R. Stirzaker, Probability and Random Processes, Second Edition, Oxford Science Publications, 1995.

[R2] Hwei HSU, Probability, Random Variables & Random Processes, Schaum's Outlines, TMH, 2009

[R3] Athanasios Papoulis, S.Unnikrishna Pillai, Probability, Random Variables and Stochastic Process , PHI, 4th Edition, 2002

SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY
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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – I	**8HC14**	Transform Techniques and Numerical Methods (Common to ECE & EEE)	2	1	0	3

a	b	c	d	e	f	g	h	i	j	k	l
H	M	M								L	

Pre Requisites: Engineering Mathematics – II

Objectives: The students are expected to learn

- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- Various methods to the find roots of an equation.
- Concept, properties of Z-Transforms, Solving Difference equations using Z-Transforms.
- Form partial differential equations and find the solution to first order linear and nonlinear partial differential equations.
- Applications of PDE.
- Concept of finite differences and to estimate the value for the given data using interpolation.
- Evaluation of integrals using numerical techniques
- Solving ordinary differential equations using numerical techniques.

Course outcomes

After learning the contents of this paper the student must be able to

- Use the Laplace transforms techniques for solving ODE's
- Use the Z-Tranforms technique for solving Difference equations
- Form partial differential equations and find the solution to first order linear and nonlinear partial differential equations.
- Find the root of a given equation.
- Estimate the value for the given data using interpolation
- Find the numerical solutions for a given ODE's

Syllabus

UNIT - I

Laplace Transformations:
Laplace transform of standard functions, shifting theorems, change of scale property, Laplace Transform of Derivatives and Integrals, Multiplication by powers of 't', Divison by 't' (without proofs). Laplace transform of unit step function, Impulse function. Inverse Laplacetransforms**:** properties, partial fraction method and convolution theorem (without proof). Solving ordinary differential equations with constant coefficients using Laplace Transforms.

UNIT – II

Z- Transforms:

Z- Transforms and Inverse Z-transforms, properties, damping rule, Shifting properties, Initial and final value theorems Convolution theorem (without proofs). Applications-Solution of difference equation by Z- transforms

UNIT– III

Partial Differential Equations:

Formation of Partial Differential Equations by Elimination of Arbitrary Constants and Arbitrary Functions. Solutions to First order Linear and Non-linear Equations-Standard Forms, Equations Reducible to Standard Forms. Classification of partial differential equations.Method of Separation of Variables, Solution of One dimensional Heat Equation.

UNIT- IV

Solution of algebraic and transcendental equations and Numerical integration:

The Bisection Method – The Method of False Position –Fixed point iteration Method – Newton-Raphson Method. Newton-Cotes Quadrature Formula, Trapezoidal rule – Simpson's 1/3 rule – Simpson's 3/8 rule.

UNIT – V

Interpolation:

Introduction– Finite differences- Forward Differences, Backward differences, Central differences. Newton's formulae for interpolation – Gauss Central Difference Formulae (without proofs), Lagrange's Interpolation formula for unevenly spaced points.

UNIT – VI

Numerical solution of Ordinary Differential equations:

Solution by Taylor's series – Picard's Method of successive Approximations – Euler's Method – Runge-Kutta Methods of fourth order, Predictor-Corrector Methods-Milne's Method.

Text Books:

(i) R K Jain and S R K Iyengar Advanced Engineering Mathematics, Narosa Publications.
(ii) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
(iii) S. S. Sastry, Introductory methods of numerical analysis. PHI, 4th Edition, 2005.

Reference Books:

(i) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.
(ii) Engineering Mathematics, Srimanta Pal, OXFORD university press.
(iii) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
(iv) Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – I	**8HC17**	Universal Human Values (Common to CSE, ECE &CE)	2	1	0	3

Human Values Courses

This course also discusses their role in their family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester for which the foundation course named as "H-102 Universal Human Values 2: Understanding Harmony"is designed which may be covered in their III or IV semester. During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.

OBJECTIVE

The objective of the course is four fold:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

COURSE TOPICS: The course has 28 lectures and 14 practice sessions in 5 modules:

Module 1

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

Method to fulfill 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.

Module 2

Understanding Harmony in the Human Being - Harmony in Myself!

1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
2. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

4. Understanding the characteristics and activities of 'I' and harmony in 'I'
5. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
6. Programs to ensureSanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

Module 3

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

1. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
2. Understanding the meaning of Trust; Difference between intention and competence
3. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
4. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
5. 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.

Module 4

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
21. 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.

Module 5

Implications of the above Holistic Understanding

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

Module 6

Harmony on Professional Ethics

25. Competence in professional ethics:
    a. Ability to utilize the professional competence for augmenting universal human order
    b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
    c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems
27. 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
28. Sum up

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. to discuss the conduct as an engineer or scientist etc.

3. READINGS

3.1 Text Book

a) Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 3.

b) Reference Books

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3.The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – I	**8HC03**	Soft Skills (Common to CSE, ECE, CIVIL)	1	0	2	2

Course objectives:

To enable students to:

- Make self-assessment.
- Know the importance of certain soft skills like time management, goal setting and etiquette so that they can make their mark in their career and life in general.
- Sharpen their verbal ability to handle the competitive exams.
- Enhance their team skills and design thinking capabilities for effective problem solving and decision making.
- Know their emotional information which guides their thinking, behavior and helps them manage stress efficiently.
- Equip themselves with the prerequisites, and the relevant techniques to effectively tackle the corporate interview process in vogue.

UNIT:1

Know Yourself:

1.1 Importance of knowing yourself
1.2 SWOT / SWOC Analysis
1.3 SWOT / SWOC Grid

UNIT: 2

Soft Skills III:

2.1 Time management
2.2 Goal Setting

UNIT: 3

Verbal Aptitude:

3.1 Reading Comprehension:Strategies to comprehend difficult passages from a book
3.2 Word Analogies
3.3 Spotting Errors
3.4 Sentence Completion / Sentence Equivalence

UNIT: 4

Skills to excel:

4.1 Team work and Team Dynamics -Collaboration and Leadership
4.2 Decision Making, Design Thinking,Critical thinking and Creative Problem Solving
4.3 Agile project/ Product life cycle management, Creativity and Innovation, Empathy, Customer centricity

UNIT: 5

Self-Management Skills:

5.1 Emotional Intelligence
5.2 Stress Management

UNIT: 6

Interview Skills:

6.1 Interview Skills: Meaning and Purpose of an Interview
6.2 Types of interviews; Interview Preparation techniques
6.3 Dress code at an interview
6.4 FAQs in HR Interview

Text Book: SOFT SKILLS – Dr. K. Alex, S. Chand publications

Suggested Readings:

- SOFT SKILLS – Meenakshi Raman ;
- Word Power made Easy – Norman Lewis
- Objective English - Pearson's Publications
- Skill Sutras- JayashreeMohanraj
- The Power of Soft Skills – Robert A. Johnson
- Soft Skills for Everyone – Jeff Butterfield

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – I	**8CC71**	Electronic Devices and Circuits Lab (Common to ECE/ECM/EEE)	0	0	2	1

Course Objectives:

This course introduces the characteristics and applications of semiconductor devices; emphasis is placed on characteristics and testing practically to strengthen the knowledge.

Course Outcomes:

After studying this course, the students will be able to

1. Understand color coding, operations on Diode, BJT, FET and other electronic components.
2. Correlate theoretical concepts with practical implementation.
3. Apply the knowledge of Diodes, Capacitors and Transistors for the realization of rectifiers, regulators, amplifiers and Oscillator circuits.
4. Adapt effective Communication, presentation and report writing skills

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	3				2			2	3	3	2
CO2	3	3	3	3	3				2			2	3	3	2
CO3	3	2	2	2	2						1	2		3	
CO4									2	1					
Overall	3	3	3	3	3				2	1	1	2	3	3	2

Mapping of Course Outcomes with Program Outcomes and Program specific outcomes

PART A

Electronic Workshop Practice (in 3 lab sessions):

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Bread Boards.
2. Identification and Specifications of Active Devices like Diodes, BJTs and JFETs.
3. Study and operation of
   - Digital Multimeters
   - Function Generator
   - Regulated Power Supplies
   - Soldering
   - SMD components

PART B

(For Laboratory examination – Minimum of 10 experiments)

1. Study and Operation of CRO:Oscilloscope, CRT features, vertical amplifiers, horizontal deflection system, sweep, trigger Pulse, delay line, probes for CRO, Measurement of amplitude and frequency. Time Period measurement, Lissajous patterns.
2. Determination of Cut-in Voltage, Forward and Reverse resistances of PN Junction diode usingV-I Characteristics.
3. Zener diode characteristics and Zener as voltage Regulator.
4. Input and output characteristics of BJT in CB Configuration.
5. Input and output characteristics of BJT in CE Configuration.
6. Half wave rectifier with and without filters.
7. Full wave rectifier (Center trapped and Bridge) with and without filters.
8. Drain and Transfer characteristics of FET in CS Configuration.
9. Common Emitter Amplifier Characteristics
10. Common Collector Amplifier Characteristics (Emitter Follower).
11. FET amplifier (Common Source).
12. RC Phase Shift Oscillator.

Major Equipment required for Laboratories:

1. Regulated Power Suppliers, 0-30V
2. 20 MHz, Dual Channel Cathode Ray Oscilloscopes.
3. Functions Generators-Sine and Square wave signals
4. Multimeters
5. Electronic Components

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – I	**8CC72**	Basic Simulation Lab (Common to ECE/ECM)	0	0	2	1

Course Objectives:

The objective of this lab is to generate continuous and discrete signals and analyze systems with various signals.

Course Outcomes:

After studying this course, the students will be able to

1. Basic operations on matrices
2. Generate various signals and systems.
3. To simulate operations on signals and systems.

Mapping of Course Outcomes with Program Outcomes andProgram specific outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3		3				2			3	3	3	3
CO2	3	1	3		3				2			3	3	3	3
CO3	3	3	3		3				2			3	3	3	3
Overall	3	3	3		3				2			3	3	3	3

SYLLABUS CONTENT

1. Basic Operations on Matrices

2. Generation of Various signals and sequences (Periodic and Aperiodic) such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc

3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.

4. Finding Even and Odd parts of a Signal/Sequence and Real and Imaginary Parts of a Signal.

5. Convolution of Signals and Sequences.

6. Auto Correlation and Cross Correlation of Signals and Sequences

7. Computation of unit sample, unit step and sinusoidal response of the given LTI system and
8. Computation of unit sample, unit step and sinusoidal response of the given LTI system and verifying its physical realiazability and stability properties.

9. Gibbs Phenomenon.

10. Sampling Theorem Verification.

11. Locating the Zeros and Poles and Plotting the Pole-Zero maps in the S-Plane and Z-Plane for the given transfer function.

12. Verification of Linearity and Time Invariance Properties of a given Continuous / Discrete System

13. Generation of Gaussian noise (Real and Complex), Computation of its Mean, Mean Square Value and its Skew, Kurtosis, and PSD , Probability Distribution Function.

14. Finding the Fourier transform of the signal using Fast Fourier Transform

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – I	**8CC73**	Digital Logic Design Lab	0	0	2	1

Course Objectives:

The objectives of this course are

- To Design and analyze the various circuits and systems using Digital ICs.

Course Outcomes:

After studying this course, the students will be able to

- Verify the operations of digital circuits using ICs

Mapping of Course Outcomes with Program Outcomes andProgram specific outcomes

	PO 1	PO 2	PO 3	PO4	PO5	PO 6	PO7	PO 8	PO9	PO1 0	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	3				2			2	3	3	2
Overal l	3	3	3	3	3				2			2	3	3	2

Syllabus Content

Verify the operations of the Digital ICs (Hardware) in the Laboratory

1. Realization of A-O-I Gates using Universal gates
2. Implementation of 4-Bit binary to Gray code converter
3. Implementation of 4-bit parity generator and checker
4. Verification of 4-bit Binary Adder using IC 74x283
5. Realization of 4x1 Multiplexer and 1x4 Demultiplexer
6. Verification of 3x8 Decoder using IC 74x138
7. Verification of Priority encoder using 74x148
8. Verification of D Flip-Flop IC 74x74
9. Conversion of JK-Flipflop to D-Flipflop
10. Verification of Decade counter using IC74x90
11. Implement 4-bit Ring Counter
12. Verification of Universal Shift Register

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – I	**8C364**	Comprehensive Test and Viva –Voce – III	1	0	0	1

Comprehensive Test and Viva Voce	**The subjects studied in the Semester concerned related to branches concerned and for placements**
B.Tech I year I semester	I semester
B.Tech I year II semester	I and II semester
B.Tech II year I semester	I, II and III semester
B.Tech II year II semester	I, II, III and IV semester
B.Tech III year I semester	I, II, IIII, IV and V semester
B.Tech III year II semester	I, II, IIII, IV, V and VI semester
B.Tech IV year I semester	I, II, IIII, IV, V, VI and VII semester

Two Mid tests, Two mid Viva voce, one External Comprehensive Test and one External Comprehensive Viva Voce.

Allocation of marks :

*Comprehensive Test : 70 marks
**Viva Voce : 30 marks
Total : 100 marks

*Average of two best Mid Tests of Mid Test – I, Mid Test – II and Mid Test - III will be taken for 20 marks.
End Semester Examination for Comprehensive Test will be taken for 50 marks.
Total marks for Comprehensive Test will be 70.

**Average of best two of Mid Tests of Mid – I, Mid – II and Mid - III for Viva Voce will be taken for 10 marks.
End Semester Examination for Comprehensive Viva Voce shall be evaluated for 20 marks.
The total for Viva Voce will be 30.

Thus the total sessional marks in this subject of Comprehensive Test and Viva Voce will be : 30 for sessionals and 70 for End Semester examination.
The grand total of marks for the subject of Comprehensive Test and Viva Voce will be 100. The student has to secure 40% of marks i.e. 40 marks in sum total of 100 marks to be successful in the subject.

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – I	**8C365**	Technical Seminar – III	1	0	0	1

Course Objective :

Develop ability to be a public speaker. Learn the importance of delivering seminars for demonstrating oratory and develop interview facing skills.

Course Outcomes: After completing this course, the student will be able to

1. Identify current general, political and technology related topics.
2. Arrange and present seminar in a effective manner
3. Collect, survey and organize content in presentable manner
4. Demonstrate oratory skills with the aid of Power Point Presentations
5. Exhibit interview facing skills and team leading qualities

Procedure

1. Seminar in-charges shall highlight the significance of technical seminar in the first two sessions and enlighten the students on the utility of these seminars.
2. The slots, titles shall be decided upfront and seminar in charge shall take signatures.
3. The same sheet shall be affixed in the respective classrooms and seminar register.
4. If any student fails to present his/her seminar on the given slot, to genuine reasons, they may be asked to present in the subsequent slot/week.
5. Progress of the seminars need to be reviewed by the concerned HOD once in 15 days.
6. The evaluation for technical seminars has to be informed to students and displayed in the classrooms.
7. Report and presentation must contain topic, introduction, explanation, diagrams, tables, applications and conclusions.

Distribution of marks

There shall be a Technical Paper writing and seminar evaluated for 100 marks in SecondYear First Semester. The evaluation is purely internal and will be conducted as follows:

Sl.No	**Description**	**Marks**
1	Literature survey, topic and content	10
2	Presentation including PPT	10
3	Seminar Notes	05
4	Interaction with audience after presentation	05
5	Final Report 3 copies	10
6	Class room participation	05
7	Punctuality in giving seminar as per Scheduled time and date	10
8	Mid Semester Viva (on the seminar topics completed up to the end of 9th week	15
9	End Semester Viva	30
	Total	**100 Marks**

Student must secure 40% i.e. 40 marks to be successful in sum total (Hundred Marks) in Technical Seminar.

II - II

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – II	**8CC05**	Analog Circuits (Common to ECE, EEE AND ECM)	2	0	0	2

Course Objectives :
To understand the basic functioning and applications of the basic building blocks of analog electronic circuits - amplifiers and oscillators.

COURSE OUTCOMES :
After studying this course, the students will be able to

1. Distinguish between small and large signal amplifier and able to compare the conversion efficiency levels
2. Analyze and Design tuned RF amplifiers and different types of sweep generators
3. Understand linear and non-linear wave shaping methods and able to Analyze various types of Logic gates and Sampling gates.
4. Understand and design various types of multivibrators and applications

Mapping of Course Outcomes with Program Outcomes andProgram specific outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	2	2	3										3		
CO2	2	2	3										3		
CO3	2	2	2										3		
CO4	2	3	3										3		
Overa ll	2	2	3										3		

UNIT I[Lecture hrs – 9]

POWER AMPLIFIERS [T1] [CO1]
Classification of Power Amplifiers - Class A, B, AB & C power amplifiers –push pull configuration, complementary symmetry circuits, Distortion in Amplifiers. Harmonic distortion and Crossover Distortion in Power Amplifiers– Conversion efficiency and relative performance.

UNIT II[Lecture hrs – 9]

TUNED AMPLIFIERS [T1] [CO2]
Introduction to Tuned Amplifiers, Q-Factor. single tuned capacitive coupled amplifier, tapped single tuned capacitance coupled amplifier, single tuned inductively coupled amplifier, stagger tuning, synchronous tuned Amplifier.

UNIT III[Lecture hrs – 9]

WAVE SHAPING – Linear and Non-linear: **[T2,T3] [CO3]**

RC high pass, low pass circuit response for sinusoidal, step, pulse, square, ramp & exponential inputs- Differentiator –Integrator. RL, Diode clippers- Transistor clipper- clipping at two independent levels – Emitter coupled clipper- comparator-– Applications of voltage comparators.

Clamping operation – clamping with source, diode resistances- clamping circuits theorem- practical clamping circuits.

UNIT IV[Lecture hrs – 9]

MULTIVIBRATORS: [T2] [CO4]

Stable states of BistableMultivibrator A fixed bias transistor BistableMultivibrator -A self biased transistor BistableMultivibrator - commutating capacitor – Unsymmetric triggering of BistableMultivibrator - triggering through a unilateral device- symmetrical triggering – Schmitt trigger circuit.

General operation of monostablemultivibrator, collector coupled monostablemultivibrator - wave forms of collector coupled monostablemultivibrator - Emitter coupled monostablemultivibrator - triggering of monostablemultivibrator. Astablemultivibrator, collector coupled Astablemultivibrator -Emitter coupled Astablemultivibrator. Designing ofBistable, Monostable and AstableMultivibrators.

UNIT V[Lecture hrs – 9]

TIME BASE GENERATORS: [T2] [CO2]

General features of time base signals-sweep circuit using a transistor switch-UJT,UJT characteristics, UJT as a sweep circuit, - General considerations & principles of Miller & Boot strap time base generators- the transistor miller time base- the transistor, Boot strap time base generator- A simple current sweep transistor current time base generator.

UNIT VI[Lecture hrs – 9]

SAMPLING and LOGIC GATES: [T2] [CO3]

Basic operating principle unidirectional, Bidirectional sampling gates using diodes, transistors-reduction of pedestal effect and sampling oscilloscope.

LOGIC GATES: Digital operation of a system- OR, AND, NOT, NAND &NOR gates- DTL Logic– RTL Logic, TTL logic – comparison.

Text Books:

[T1] Integrated electronics-J.Milliman and C.C.Halkias, MC Graw –Hill-1972

[T2] Pulse digital and switching wave forms-J. Millman and H. Taub, Tata McGraw-Hill, New Delhi,2001.

[T3] Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002 .

References:

[R1] Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.

[R2] Wave Generation and Shaping - L. Strauss

[R3] Electronic Circuit Analysis-K.Lal Kishore, 2004, BSP

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – II	**8CC06**	Analog & Digital Communications	2	1	0	3

Prerequisite: Probability theory and Stochastic Processes

Course Objectives:

- To develop ability to analyze system requirements of analog and digital communication systems.
- To understand the generation, detection of various analog and digital modulation techniques.
- To acquire theoretical knowledge of each block in AM, FM transmitters and receivers.
- To understand the concepts of baseband transmissions,source coding and channel coding..

Course Outcomes: Upon completing this course, the student will be able to

- Analyze and design of various continuous wave and angle modulation and demodulation techniques
- Understand the effect of noise present in continuous wave and angle modulation techniques.
- Attain the knowledge about AM , FM Transmitters and Receivers
- Analyze and design the various Pulse Modulation Techniques.
- Understand the concepts of Digital Modulation Techniques and Baseband transmission, source coding and channel coding **.**

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	1	2		2	1	1	1	3	3	3	3
CO2	3	3	3	3	2	2		2	1	1	1	3	3	3	2
CO3	3	3	3	3	3	2			1		1	2	2	3	2
CO4	3	2	2	2	2	2	2	2	1	1	1	2	2	3	3
Overall mapping	3	3	3	3	2	2	1	2	1	1	1	3	3	3	3

UNIT – I[Lecture hrs – 9]

Amplitude Modulation

Need for modulation, Amplitude Modulation - Time and frequency domaindescription, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, COSTAS Loop, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, principle of Vestigial side band modulation.

Applications: AM transmitter system

UNIT –II[Lecture hrs – 9]

Angle Modulation

Basic concepts of Phase Modulation, Frequency Modulation: Single tonefrequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Signal- Armstrong Method, Detection of FM Signal: Balanced slope detector, Phase locked loop, Comparison of FM and AM., Concept of Pre-emphasis and de-emphasis.

Applications: Design of a 88-108 MHz FM system using FDM

UNIT - III

Transmitters

Classification of Transmitters, AM Transmitters, FM Transmitters

Receivers

Radio Receiver - Receiver Types - Tuned radio frequency receiver, Superhetrodynereceiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, AGC, Amplitude limiting, FM Receiver, Comparison of AM and FM Receivers.

Applications: Design of an AM transmitter system.

UNIT - IV

Pulse Modulation

Types of Pulse modulation- PAM, PWM and PPM.Comparison of FDM and TDM.

Pulse Code Modulation

PCM Generation and Reconstruction, Quantization Noise, Non-UniformQuantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

Applications: Design of E1 and T1 digital-carrier systems

UNIT - V

Digital Modulation Techniques

ASK- Modulator, Coherent ASK Detector, FSK- Modulator, Non-Coherent FSK Detector, BPSK-Modulator, Coherent BPSK Detection. Principles of QPSK, Differential PSK and QAM.

Baseband Transmission and Optimal Reception of Digital Signal

A Baseband Signal Receiver,Probability of Error, Optimum Receiver, Coherent Reception, ISI, Eye Diagrams.

Applications: Design of MODEM for voice transmission

Unit-VI:

SOURCE CODING

Introduction, advantages, Shannon's theorem for Channel capacity, Huffman code, Shannon-Fano coding, bandwidth –S/N trade off.

CHANNEL CODING

Introduction - types of errors, redundancy, detection vs correction, forward error correction versus retransmission; linear block codes, error detection and correction capabilities of linear block codes, Hamming code, cyclic codes: encoding, syndrome calculation, decoding, CRC codes – hardware realization; convolutional codes: encoding using state, tree and trellis diagrams, decoding using Viterbi algorithm

APLLICATIONS : Design of channel coding for 3G

TEXTBOOKS:

1. Analog and Digital Communications – Simon Haykin, John Wiley, 2005.
2. Electronics Communication Systems-Fundamentals through Advanced-Wayne Tomasi, 5th Edition, 2009, PHI.

REFERENCE BOOKS:

1. Principles of Communication Systems - Herbert Taub, Donald L Schilling, GoutamSaha, 3rd Edition, McGraw-Hill, 2008.
2. Electronic Communications – Dennis Roddy and John Coolean , 4th Edition , PEA, 2004
3. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004 Analog and Digital Communication – K. Sam Shanmugam, Willey,20

SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – II	**8CC07**	IC Applications	**2**	**0**	**0**	**2**

Course Objectives

- To maintain the right blend of theory and practice in analyzing and designing a wide variety of applications using IC 741 op-amps
- To acquaint the learners with a wide variety of IC logic families, and their applications.

Course Outcomes

After studying this course, the students will be able to

[CO9] Demonstrate the concepts of Differential Amplifier and Operational Amplifier and their characteristics.

[CO10] Design the basic circuits using IC 741 op-amp.

[CO11] Explore, design and analyze active filters, timers, oscillators, voltage controlled oscillator DACs and ADCs, and IC regulators.

[CO12] Classify and characterize the TTL/ECL/CMOS Logic Families and design of various logic gates using them.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1		2	2									2	3		2
CO2	2	3	3	3								2	3		3
CO3	2	3	3	3								3	3		3
CO4		2	3	3	2							3	3	2	3
Overall mapping	2	3	3	3	2							3	3	2	3

UNIT – I[Lecture hrs – 9]

OPAMP & ITS CHARACTERISTICS [T1] [CO1]

Differential Amplifiers and its Characteristics.Op-Amp Block Diagram, Ideal OP-AMP Characteristics, DC and AC Characteristics.741 Op-Amp and its Features and Characteristics. Parameters Measurement: Offset Voltage and Current, Slew Rate and CMRR. Frequency Compensation.

UNIT – II [Lecture hrs – 9]

BASIC APPLICATIONS OF OP-AMPs [T1] [CO2]

Adder/Subtractor, Difference Amplifier, Instrumentation Amplifier, Differentiator, Integrator, V/I & I/V Converters, Comparators, Multivibrators, Square and Triangular Waveform Generators, Clippers, Clampers, Peak Detector, S/H circuit.

UNIT – III[Lecture hrs – 9]

FILTERs, TIMERs & PLLs [T1] [CO3]

Filters:Introduction, Butterworth Filters- First and Second Order Active Filters- LPF, HPF, BPF, BRF. Introduction to 555 Timer, Functional Block, 555 timers as Monostable and AstableMultivibrators and Applications, Schmitt Trigger. Voltage Controlled Oscillator (IC 566), Phase Locked Loop.

Applications: Design of visitors counter using 555 timer.

UNIT – IV[Lecture hrs – 9]

OSCILLATORS, D/A AND A/D CONVERTERS, IC REGULATORS [T1] [CO3]

Oscillators: Introduction, Design and Analysis of Wein Bridge, RC Phase shift Oscillators using op-amp. D/A Converters: Introduction, Characteristic Parameters, R-2R Ladder, Weighted Resistor, Inverter R-2R type D/A Converter, A/D Converters: Introduction, Characteristic Parameters, Counter Type, Dual Slope, Successive Approximation and Flash types A/D Converters, IC REGULATORS: Three terminal voltage regulators 7805, 7809, 7912, IC 723.

UNIT – V[Lecture hrs – 9]

LOGIC FAMILIES [T2] [CO4]

Classification of IC Logic Families, Multi emitter transistor logic. Standard TTL NAND & NOR Gate-Analysis & TTL Open Collector Outputs ,Tristate TTL. Unsaturated logic- ECL logic family ,ECL Inverter/Buffer, ECL NOR/OR logic. Electrical characteristics of logic gates.

UNIT – VI[Lecture hrs – 9]

MOS& CMOS LOGIC FAMILY [T2] [CO4]

NMOS & PMOS logic- Logic gates implementation, Passive pull up & active pull up .CMOS logic family- Design of logic gates and Boolean functions. CMOS Open Drain and Tristate Outputs. Comparison of Various Logic Families.IC interfacing, TTL driving CMOS & CMOS driving TTL.

Applications: Design of 4x1 MUX using CMOS

Text Books

[T1] D. Roy Chowdhary, Linear Integrated Circuits , New Age Publications (P) Ltd, 2nd Edition, 2003.

[T2] John F. Wakerly, Digital Design Principles & Practices, PHI/ Pearson Education Asia, 3rd Ed., 2005.

References

[R1] Ramakanth A. Gayakwad, Op-Amps & Linear ICs, PHI,1987.

[R2] Sergio Franco, Design with Operational Amplifiers & Analog Integrated Circuits, McGraw Hill, 1988.

[R3] R.F. Coughlin & Fredrick Driscoll, Operational Amplifiers & Linear Integrated Circuits, PHI, 6th Edition.

[R4] K. Lal Kishore, Linear Integrated Circuit Application, Pearson Educations,2005.

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – II	**8C408**	Electromagnetic Waves and Transmission Lines	**3**	**0**	**0**	**3**

Prerequisites: Coordinate Systems and Vector Calculus

Course Objectives

- To be confident about the fundamentals of electrostatics and magneto statics and their concepts in field calculations
- To acquire the knowledge about the wave concepts and properties of transmission lines which are required as prerequisites to antennas and wave propagation.

Course Outcomes

After studying this course, the students will be able to

[CO1]. Apply the concepts of electrostatics in the study electric field and in understanding the Maxwell's two equations which are useful in understanding propagation of EM waves.

[CO2].Apply the concepts of static magnetic field in the study magnetic field and in understanding the Maxwell's two equations which are useful in understanding propagation of EM waves.

[CO3]. Understand the property of EM energy at different boundary conditions and Maxwell's equations which will be helpful in understanding the reflection properties of EM Energy when the EM energy propagates through different media.

[CO4].Design different transmission lines andUnderstand the concepts of high frequency dissipation less and open& short circuited lines

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	2	2		2								2	3		3
CO2	3	3		3								2	3		2
CO3	2	3		3								3	3		3
CO4		2	3	3	2							2	3	3	2
Overall mapping	2	2	3	3	2							3	2	2	3

UNIT I

REVIEW OF VECTOR ANALYSIS AND ORTHOGONAL COORDINATE SYSTEMS
Line, surface, and volume integrals. Curl, divergence and gradient of fields.

ELECTROSTATICS [T1],[T2],[CO1]

Static electric fields, Coulomb's Law, Gauss Law and Applications, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation time, Parallel plate, Coaxial and Spherical capacitors.

Applications: Electric current in vacuum and gases, photocopier.

UNIT II

MAGNETOSTATICS:[T1],[T2],[CO2]

Static magnetic fields, Ampere's Circuital Law, Magnetic Flux Density, Magnetic Scalar and Vector Potentials. Forces due to Magnetic fields, Ampere's Force Law, Inductance and magnetic energy.

Applications: Electromagnetic suspension (EMS) maglev train, speakers and micro phones.

UNIT III

MAXWELL'S EQUATIONS:[T1],[T2],[CO3]

Differential and Integral forms-word statement-proofs and conversion. Faraday's Law and their Application in free space, polarization,Poynting vector, Power flow and energy storage; Skin depth,Boundary conditions and boundary value problems.

.**Applications: Electromagnetic wave propagation**

UNIT I V

REFLECTION AND REFRACTION OF EM WAVES:[T1][T2][R2][CO3]

Reflection by a perfect conductor-Normal and Oblique Incidence-Reflection by a perfect Insulator-Normal and Oblique Incidence. Brewster angle.EM Wave characteristics, wave equations,Guided waves between parallel Planes, Power losses in plane conductor. Pointing Theorem.Phase and group velocity.

Applications: Calculation of power loss in plane conductor.

UNIT V

TRANSMISSION LINE THEORY:[T2][R1][CO4]

Transmission line – general solution –The infinite line – Wavelength, velocity of propagation – Waveform distortion – the distortion less line - Loading and different methods of loading – Line not terminated in Z_0 – Reflection coefficient – calculation of current , voltage, power delivered and efficiency of transmission – Input and transfer impedance – Open and short circuited lines – reflection factor and reflection loss.

Applications: Calculation of voltage and current distribution in a 10-Km transmission line.

UNIT VI

HIGH FREQUENCY TRANSMISSION LINES:[T2][R1][CO4]

Transmission line equations at radio frequencies – Line of Zero dissipation – Voltage and current on the dissipation less line, Standing Waves, Nodes, Standing Wave Ratio – Input impedance of the dissipation less line - Open and short-circuited lines – Power and impedance measurement on lines – Reflection losses. S-Parameters, Smith Chart-Construction and applications.

Applications: determination of load standing wave ratio and reflection coefficient with smith chart

Text Books:

1.W.H.Hayt Jr., Engineering Electromagnetics, Tata Mc-Graw-Hill, 2001.
2. Elements of Electromagnetics-Mathew N.OSadiku, 4ed., 2008, Oxford Univ.Press

References:

1. Transmission Lines and Networks by Umesh Sinha
2.EC Jordan, EM waves and radiating systems, PHI, 1995.
3. N. Narayana Rao, Elements of Engineering Electro magnetics, Pearson Education, 2006.
4. J.D.Ryder, Networks lines and fields, PHI, 1990

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – II	**8ZC01**	Economics, Accountancy and Management Science	2	0	0	2

Course Objectives:

- To understand the basics of Managerial Economics at Micro level, Demand analysis and production analysis in particular.
- To understand cost concept, Revenues and Market structure
- To understand and identify various basic concepts of Accounting, Double entry system and Book keeping.
- To understand the concepts of Capital expenditure, Revenue expenditure and Final accounts.
- To make student understand the basics of Management, its principles and various functions performed in organization.
- To make student learn about various personality traits, perception, attitudes of individuals working in organization.

UNIT-1

INTRODUCTION TO MANAGERIAL ECONOMICS:
Definition, Nature and scope of Managerial Economics, consumer's Equilibrium.Theory of Demand, Demand function, Determinants, exceptions - Price Elasticity of Demand and Demand forecasting.Theory of supply, Production function and Economies of scale.

UNIT- 2

INTRODUCTION TO COST, REVENUE AND MARKET STRUCTURE:
Cost Analysis, types of costs, Revenue Analysis, Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems). Market structures: Types of competition, Features of Perfect competition, Monopoly, Monopolistic Competition and oligopolistic competition.

UNIT-3

INTRODUCTIONT O FINANCIAL ACCOUNTING:
Meaning and Definition of Accounting, principles of Accounting, Double-Entry system of Accounting, Book Keeping, introduction to Journal, Ledger and its types, Introduction to Trial balance, problems and solutions of trial balance.

UNIT-4

INTRODUCTION TO FINAL ACCOUNTS:
Introduction to Final Accounts, Concepts of classifications of Revenue and Capital expenditures, Final accounts: Trading account, Profit and Loss Account, Balance sheet, Problems and solutions of Final accounts with adjustments.

UNIT-5

INTRODUCTION TO MANAGEMENT:
Management- Definitions, Fayol's principles of Management, Levels of Management, functions of management. Planning: types of planning, planning process; Organizing: Organizational Design and structure, staffing; Directing;, Controlling: Basic control process.

UNIT-6

INTRODUCTION TO ORGANIZATIONAL BEHAVIOR: Definition, Nature and Scope, Perception – Perceptual selectivity and organization, Personality and Attitudes, Determinants of personality Formation of Attitudes-**,** Perceptual Distortions Attribution analysis Attribution theories, Johari Window and Transactional Analysis.

Essential Readings:

1. A R Aryasri: Managerial Economics, Tata Mc Graw Hill
2. A R Aryasri: Management Science, Tata Mc Graw Hill

Suggested Readings:

1. S A Siddiqui & A S Siddiqui, Managerial Economics & Financial Analysis, New Age
2. Accountancy – I Tulasian Tata Mcgraw Hill Co
3. Koontz &Weihrich: Essentials of Management, 6/e, TMH, 2005

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – II	8FC27	Python Programming Concepts	2	0	0	2

Course Objectives:-

After taking this course, you should be able to:

Use Python interactively, execute a Python script at the shell prompt, use Python types, expressions, and None, use string literals and string type, use Python statements (if...elif..else, for, pass, continue, . . .), understand the difference between expressions and statements, understand assignment semantics, write and call a simple function., utilize high-level data types such as lists and dictionaries, understand the difference between mutable and immutable types, write a simple class and access methods and attributes, import and utilize a module, read from and write to a text file.

Course Outcomes:

After taking this course, you should be able to:

CO1: Gains exposure towards Python versions and their specifications.
CO2: Build programs using primitive data types.
CO3: Write applications that include functions, modules, packages along with respective exceptional handling mechanism.
CO4: Writes applications using OO features of Python
CO5: Write applications using Files.
CO6: Hands on exposure on NumPy/Tkinter/Plotpy modules.

Unit -I :

Introduction to Python: History, Features, Modes of Execution, Setting up path, working with Python Basic Syntax, Variable and Data Types, Operators. Conditional Statements (If, If- else, Nested if-else) Looping (for, While Nested loops) Control Statements (Break, Continue, Pass).

Input-Output: Printing on screen, Reading data from keyboard, Opening and closing file

Unit-II:

Functions: Defining a function, calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables

String Manipulation: Accessing Strings, Basic Operations, String slices, Function and Methods

Lists: Accessing list, Operations, Working with lists Function and Methods

Tuple: Accessing tuples, Operations, Working.

Dictionaries: Accessing values in dictionaries, working with dictionaries, Properties Functions and Methods.

Unit-III:

Modules: Importing module, Math module, Random module, Packages

Exception Handling: Exception, Exception Handling, Except clause, Try? Finally clause User Defined Exceptions

Unit-IV:

Python- OOPs concept: Class and object, Attributes, Inheritance, Overloading Overriding, Data hiding.

Regular expressions: Match function, Search function, Matching VS Searching, Modifiers Patterns.

Unit -V:

Introduction to Files, File Handling, Working with File Structure, Directories, Handling Directories

Unit -VI:

Case Study with NumPy/PlotPy/SciPy/GUI Programming, Introduction, Tkinter programming, Tkinter widgets

TEXT BOOK:

1. [Apress]-Beginning Python. From Novice to Professional, 2nd ed. - [Hetland] (2008)

Reference books:

1. Introduction to Computation and Programming using Python, Revised and Expanded Edition, John V. Guttag, The MIT Press.
2. Programming Python, Fourth Edition by Mark Lutz, O'Relly
3. Python Programming using problem solving approach, Reema Thareja, Oxford Higher Education.

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – II	**8HC05**	Environmental Science and Ecology	2	0	0	2

a	b	c	d	e	f	g	h	i	j	k	l	m
L					H	H	M					

Course Objectives:

1. To understand structure and function of ecosystem
2. To learn classification and uses of natural resources
3. To learn about Understanding the impacts of developmental activities and mitigation measures.
4. To know the source, causes and preventive methods of pollution
5. To understand the importance of ecological balance for sustainable development.
6. To understand the environmental policies and regulations

Course Outcomes

After completion of the course, the student will be able to:

1. Understand about ecosystem and energy flow among the organisms.
2. Know the resources available, use of them and overexploitation of the resources in the nature.
3. Learn the value, use and value of biodiversity.
4. Understand the causes and effect of pollution and implement measures in control of pollution.
5. Understand the sustainable development and implement green technology for sustainable development.
6. Learn and implement policy to protect the environment.

UNIT-I Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity.

UNIT-II Natural Resources: Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land Energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy source.

UNIT-III Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation.

UNIT-IV Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants. Acid rain-Threshold limit values of chemicals present in environment, Global warming, Ozone layer depletion, Water pollution: Sources and types of pollution. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Sewage water Treatment, Kyoto protocol, and Montréal Protocol.

UNIT-V Sustainable development and Green Technology: Concept of sustainable development, threats to sustainability population and its explosion, Crazy consumerism, over- exploitation of resources, strategies for achieving sustainable development environmental education, conservation of

resources, urban sprawl sustainable cities and sustainable communities, human health , role of IT in Environment, Environmental Ethics, Environmental Economic – Concept of Green Building, Clean Development Mechanism (CDM).

UNIT-VI Environmental Policy, Legislation & Environment Impact Assessment: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects.Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).

TEXT BOOKS:

1. Perspectives in Environmental Studies: Kaushik A. and Kaushik, C.P. New Age International (P) Ltd. (2008)

REFERENCE BOOKS:

1. Environmental Studies by Erach Bharucha, 2005 University Press.
2. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
3. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
4. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
5. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
6. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – II	**8CC74**	Analog Circuits Lab (Common to ECE, EEE AND ECM)	**0**	**0**	**2**	**1**

Course Objectives
To prepare students to practice the design and analysis of any Analog electronics circuit.

Course Outcomes:
At the end of the laboratory course, the students will be able to

1. To understand the design and working of various linear and non-linear wave shaping circuits.
2. To demonstrate the working principle of various multivibrators and functionalities of various logic gates.
3. To perform and verify the working of oscillators, feedback amplifiers and voltage regulators.
4. To perform laboratory experiment to verify the conversion efficiency of various power amplifiers.

Mapping of Course Outcomes with Program Outcomes andProgram specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		3		3				2			1	2	2	2
CO2	2		3		3				2			1	2	2	2
CO3	2		3		3				2			1	2	2	2
CO4	2		3		3				2			1	2	2	2
Overall	2		3		3				2			1	2	2	2

Syllabus Content:

Part-A
Hardware based experiments

1. Linear wave shaping.
2. Non Linear wave shaping – Clippers. clampers.
3. UJT Relaxation Oscillator
4. Astable and monostableMultivibrator.
5. BistableMultivibrator.
6. Study of Logic Gates with discrete components.

Part-B
Software Simulation based experiments (Multisim OR Pspice OR Tina Pro Or Equivalent Simulation Software)

1. Common Emitter and Common Source amplifier
2. Voltage shunt and Feedback Amplifier
3. Cascade Amplifier (CE+CE, CE+CC)
4. RC Phase Shift Oscillator using Transistors
5. Class- A and Class-B Complementary Symmetry Power Amplifier
6. Series and Shunt Voltage Regulator.

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – II	**8CC75**	Analog & Digital Communication Lab	**0**	**0**	**2**	**1**

Prerequisites: SS, PTSP, BS Lab

Course Objectives:
The objectives of this course are

- To perform laboratory experiments on various analog and digital modulation techniques and measure the performance parameters.

Course Outcomes: After studying this course, the students will be able to

CO1	Demonstrate the modulation and demodulation of few analog and digital modulation techniques.
CO2	Verifying the spectral components of AM and FM&the concepts of frequencyand time division multiplexing techniques
CO3	Demonstrate the modulation and demodulation of few pulse analog, and pulse digital modulation techniques &Verifying sampling theorem
CO4	Demonstrate the modulation and demodulation of digital modulation technique&Generation of line coding techniques.

Mapping of Course Outcomes with Program Outcomes andProgram specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		3	1	3							1	2	2	2
CO2	2		3	11	3							1	2	2	2
CO3	2		3	1	3							1	2	2	2
CO4	2		3	1	3							1	2	2	2
Overall	2		3	1	3							1	2	2	2

Part A:

1. AM - Generation and Detection
2. DSBSC - Generation and Detection
3. FM - Generation and Detection
4. Spectrum Analysis of AM and FM signals
5. FDM – Verification
6. Receiver Characteristics

Part B:

1. Sampling Theorem – Verification
2. PPM - Generation and Detection
3. TDM – Verification
4. PCM - Generation and Detection
5. DM - Generation and Detection
6. Line Coding Techniques
7. ASK, FSK,PSK - Generation and Detection

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – II	**8CC76**	IC Applications Lab (Common to ECE, EEE and ECM)	0	0	2	1

Prerequisites: EDC, DLD, DLD Lab, ECNA.

Course Objectives:

The objectives of this course are

- To Design and analyze the various circuits and systems using IC 741 Op-Amp.
- To Design and analyze the various circuits and systems using Analog ICs.

Course Outcomes: After studying this course, the students will be able to

- To explore the operating modesof IC 741 OP-AMP.
- To design applications using 741Op-Amp
- To understand and implement applications using 555 Timers
- To design D to A converters and IC voltage regulators

Mapping of Course Outcomes with Program Outcomes andProgram specific outcomes

	i	ii	iii	iii	iv	v	vi	vii	viii	ix	x	xi	xii	PSO1	PSO2	PSO3
CO1	3	2	2	2	2								2	3	2	
CO2	3	2	2	2	2								2	3	2	
CO3	3	2	2	2	2								2	3	2	
CO4	3	2	2	2	2								2	3	2	

Syllabus Content

(IC Application Lab)

Design and testing of

1. OP AMP Modes(-vefeed back) – Inverting ,Non inverting, Differential amp, Unity gain.
2. OP AMP Applications – Adders, Subtractor.
3. OP AMP Applications – Comparator Circuits.
4. OP AMP Applications – Clipper Circuits.
5. Square wave generator using OP AMP
6. Triangular wave generator using OP AMP
7. Active Filter Applications – LPF, HPF (first order)
8. Oscillators-RC phase shift ,Wein bridge.
9. IC 555 Timer – Monostable
10. IC 555 Timer -Astable
11. 4 bit DAC using OP AMP.
12. IC 723 voltage regulator

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – II	**8C466**	Comprehensive Test and Viva –Voce – IV	1	0	0	1

Comprehensive Test and Viva Voce	**The subjects studied in the Semester concerned related to branches concerned and for placements**
B.Tech I year I semester	I semester
B.Tech I year II semester	I and II semester
B.Tech II year I semester	I, II and III semester
B.Tech II year II semester	I, II, III and IV semester
B.Tech III year I semester	I, II, IIII, IV and V semester
B.Tech III year II semester	I, II, IIII, IV, V and VI semester
B.Tech IV year I semester	I, II, IIII, IV, V, VI and VII semester

Two Mid tests, Two mid Viva voce, one External Comprehensive Test and one External Comprehensive Viva Voce.

Allocation of marks :

*Comprehensive Test : 70 marks

**Viva Voce : 30 marks

Total : 100 marks

*Average of two best Mid Tests of Mid Test – I, Mid Test – II and Mid Test - III will be taken for 20 marks.

End Semester Examination for Comprehensive Test will be taken for 50 marks.

Total marks for Comprehensive Test will be 70.

**Average of best two of Mid Tests of Mid – I, Mid – II and Mid - III for Viva Voce will be taken for 10 marks.

End Semester Examination for Comprehensive Viva Voce shall be evaluated for 20 marks.

The total for Viva Voce will be 30.

Thus the total sessional marks in this subject of Comprehensive Test and Viva Voce will be : 30 for sessionals and 70 for End Semester examination.

The grand total of marks for the subject of Comprehensive Test and Viva Voce will be 100. The student has to secure 40% of marks i.e. 40 marks in sum total of 100 marks to be successful in the subject.

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – II	**8C467**	Technical Seminar - IV	1	0	0	1

Course Objective :

Develop ability to be a public speaker. Learn the importance of delivering seminars for demonstrating oratory and develop interview facing skills.

Course Outcomes: After completing this course, the student will be able to

1. Identify current general, political and technology related topics.
2. Arrange and present seminar in a effective manner
3. Collect, survey and organize content in presentable manner
4. Demonstrate oratory skills with the aid of Power Point Presentations
5. Exhibit interview facing skills and team leading qualities

Procedure

1. Seminar in-charges shall highlight the significance of technical seminar in the first two sessions and enlighten the students on the utility of these seminars.
2. The slots, titles shall be decided upfront and seminar in charge shall take signatures.
3. The same sheet shall be affixed in the respective classrooms and seminar register.
4. If any student fails to present his/her seminar on the given slot, to genuine reasons, they may be asked to present in the subsequent slot/week.
5. Progress of the seminars need to be reviewed by the concerned HOD once in 15 days.
6. The evaluation for technical seminars has to be informed to students and displayed in the classrooms.
7. Report and presentation must contain topic, introduction, explanation, diagrams, tables, applications and conclusions.

Distribution of marks

There shall be a Technical Paper writing and seminar evaluated for 100 marks in SecondYear SecondSemester. The evaluation is purely internal and will be conducted as follows:

Sl.No	**Description**	**Marks**
1	Literature survey, topic and content	10
2	Presentation including PPT	10
3	Seminar Notes	05
4	Interaction with audience after presentation	05
5	Final Report 3 copies	10
6	Class room participation	05
7	Punctuality in giving seminar as per Scheduled time and date	10
8	Mid Semester Viva (on the seminar topics completed up to the end of 9^{th} week	15
9	End Semester Viva	30
	Total	**100 Marks**

Student must secure 40% i.e. 40 marks to be successful in sum total (Hundred Marks) in Technical Seminar.

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Syllabus for B. Tech (E.C.E.) – A20 regulation						
Year/Sem	**Sub. Code**	**Subject Name**	L	T	P/D	C
II – II		Summer Break - Internship–I				

Course Objective :

Develop ability to be a public speaker. Learn the importance of delivering seminars for demonstrating oratory and develop interview facing skills.

Course Outcomes: After completing this course, the student will be able to

1. Identify current general, political and technology related topics.
2. Arrange and present seminar in a effective manner
3. Collect, survey and organize content in presentable manner
4. Demonstrate oratory skills with the aid of Power Point Presentations
5. Exhibit interview facing skills and team leading qualities

Procedure

1. Seminar in-charges shall highlight the significance of technical seminar in the first two sessions and enlighten the students on the utility of these seminars.
2. The slots, titles shall be decided upfront and seminar in charge shall take signatures.
3. The same sheet shall be affixed in the respective classrooms and seminar register.
4. If any student fails to present his/her seminar on the given slot, to genuine reasons, they may be asked to present in the subsequent slot/week.
5. Progress of the seminars need to be reviewed by the concerned HOD once in 15 days.
6. The evaluation for technical seminars has to be informed to students and displayed in the classrooms.
7. Report and presentation must contain topic, introduction, explanation, diagrams, tables, applications and conclusions.

Distribution of marks

There shall be a Technical Paper writing and seminar evaluated for 100 marks in Second Year Second Semester. The evaluation is purely internal and will be conducted as follows:

Sl.No	**Description**	**Marks**
1	Literature survey, topic and content	10
2	Presentation including PPT	10
3	Seminar Notes	05
4	Interaction with audience after presentation	05
5	Final Report 3 copies	10
6	Class room participation	05
7	Punctuality in giving seminar as per Scheduled time and date	10
8	Mid Semester Viva (on the seminar topics completed up to the end of 9^{th} week	15
9	End Semester Viva	30
	Total	**100 Marks**

Student must secure 40% i.e. 40 marks to be successful in sum total (Hundred Marks) in Technical Seminar.

III – I

Year/Sem	Sub. Code	Subject Name	L	T	P/D	C
III-I	8CC09	Digital Signal Processing	2	1	0	3

Course objectives: To develop skills for analyzing and synthesizing algorithms and systems that process discrete time signals, with emphasis on realization and implementation.

Course outcomes*:*

1. *Distinguish between CT and DT signals and systems and understand the growing need of DSP and study the concepts of discrete time signals and systems.*
2. *Represent periodic DT signals as a Fourier series; non-periodic DT signals as a Fourier Transform and use a powerful mathematical tool called DFT.*
3. *Compute the Fourier Transform of DT signals using the FFT algorithms.*
4. *Realize a digital IIR filter in several forms and structures for a given transfer function H(z)and can design IIR filter as per specifications .*
5. *Design of digital FIR filters by several methods as per the given specifications and can realize FIR Filter*
6. *Understand the need and implement the multirate sampling techniques.*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	3				2			3	3	3	
CO2	2	3	3	3	3				2			2	3	3	
CO3	1	3	3	3	3				2			2	3	3	
CO4	2	3	3	3	3				2			2	3	3	
CO5	1	3	3	3	3				2			2	3	3	3
CO6	1	3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

UNIT I : INTRODUCTION:

Introduction to Digital Signal Processing: Discrete time signals & sequences, Periodicity, linear shift invariant systems, stability, and causality, Linear constant coefficient difference equations, Block diagram representation of linear constant-coefficient difference equations,Frequency domain representation of discrete time signals and systems.

Applications: Contents form the foundation for DSP.

UNIT II : DISCRETE FOURIER TRANSFORM:

Discrete Fourier series representation of periodic sequences, Discrete-Time Fourier Transform(DTFT), Discrete Fourier transform (DFT): Properties of DFT, Relation between Z-transform and DFT, Convolution: Linear and circular convolutions, Overlap add and Overlap save methods, Computation of DFT.

Applications: Analysis of DT signals-Periodic and Aperiodic.

UNIT III : FAST FOURIER TRANSFORMS:

Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

Applications: Design of spectrally efficient system such as OFDM system.

UNIT IV: DIGITALIIR FILTERS:

ANALOG FILTER APPROXIMATIONS – Butterworth and Chebyshev Approximations.

IIR DIGITAL FILTERS: Design of IIR Digital filters from analog filters-Impulse Invariance, Step invariance and Bilinear Transformation methods, Design Examples, Analog-Digital transformations.Basic structures of IIR systems, Transposed forms,

Applications: Design of IIR digital filter conforming to given specifications.

UNITV: DIGITALFIR FILTERS:

FIR DIGITAL FILTERS:Characteristics of FIR Digital Filters, frequency response, Design of FIR Digital Filters using Fourier series method, Windowing Techniques-Rectangular, Triangular, Hamming, Hanning and Bartlett's Windows, Steps in Kaiser windowing method, Frequency Sampling technique, Comparison of IIR and FIR filters.Basic structures of FIR systems

Applications: Design of FIR digital filter conforming to given specifications.

UNIT VI: MULTIRATE DIGITAL SIGNAL PROCESSING:

Decimation, interpolation, sampling rate conversion. Introduction to DSP Processors.

Applications of Multirate Digital Signal processing: Design of digital filter banks and quadrature mirror filters etc.

TEXT BOOKS:

1. Digital Signal Processing – Alan V. Oppenheim, Ronald W. Schafer, PHI Ed., 2006
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.
3. Digital Signal Processing: A Modern Introduction, Ashok Ambardar, 9th Indian Reprint, 2012, Cengage Learning.

REFERENCE BOOKS:

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006
2. Digital Signal Processing: MH Hayes, Schaum's Outlines, TATA Mc-Graw Hill, 2007.
3. DSP Primer - C. Britton Rorabaugh, Tata McGraw Hill, 2005.
4. Fundamentals of Digital Signal Processing using MatLab – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
5. Discrete Time Signal Processing – A.V.Oppenheim

Year/Sem	Sub. Code	Subject Name	L	T	P/D	C
III-I	8C510	VLSI Design	3	0	0	3

Prerequisites:*EDC,STLD, LDICA*

Course Objectives*:*

The objectives of this course is to provide the students an in-depth knowledge on various aspects of VLSI circuits and their design including testing.

Course Outcomes*: After studying this course, the students will be able to*

CO1	*Understand the existing device technologies and IC fabrication process*
CO2	*Explore and analyze the electrical properties of the devices of CMMOS device.*
CO3	*Design basic logic gates, combinational and sequential circuits using CMOS logic.*
CO4	*Analyze the effects of parasitic on IC power and performance.*
CO5	*Design memory cells and basic data path units.*
CO6	*Explore the need for testing and design verification of VLSI circuits.*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

Syllabus Content

UNIT I

INTRODUCTION TO MOS TECHNOLOGIES: MOS, PMOS, NMOS, CMOS &BiCMOS

INTRODUCTION TO IC TECHNOLOGY AND FABRICATION PROCESS: VLSI Design Flow, Oxidation, Lithography, Diffusion, Ion Implantation, Metallisation, Encapsulation, Probe testing, Integrated Resistors and Capacitors [T1-CH1, 2 & 3].

Application – CMOS IC Manufacturing

UNIT II

BASIC ELECTRICAL PROPERTIES: Basic Electrical Properties of MOS and BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, Figure of Merit (ω_o), Zpu/Zpd, Latch-Up in CMOS, Pass Transistors [T1-CH2]

INVERTERS: NMOS Inverter, Various Pull-Ups, CMOS Inverter Analysis and Design, Bi-CMOS Inverters [T1-CH2]

UNIT III

CIRCUIT DESIGN PROCESSES: MOS Layers, Stick Diagrams, Lamda-based CMOS Design rules for Wires, Contacts and Transistors, Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling. [T1-CH3]

GATES: CMOS Logic Gates and Structures, Switch logic, Layout Diagrams Gates [T1-CH5]
Application – IC Physical Design – NAND and NOR

UNIT IV
DELAYS: Sheet Resistance R_s and its concept to MOS, Area Capacitance Units, Calculations - C_g, τ-Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out [T1- CH 4 & 5, T2-CH4]
Semiconductor Integrated circuit Design: PLD's, Introduction to CPLD's and FPGA's.

UNIT V
MEMORY AND SUBSYSTEM DESIGN: Latches and Registers [T2-CH7]**,** Clocking strategies (Single Phase) [T1-CH5.5],Memory cells (SRAM & DRAM), Adders, Shifter, Multipliers and ALUs [T1- CH8]
Applications – SRAM Based FPGAs and Multiply and Accumulate (MAC) Units

UNIT VI
INTRODUCTION TO CMOS TESTING: CMOS Testing, Need for testing, Test Principles, Design Strategies for Test, Chip level Test Techniques, System-level Test Techniques [T1-CH7]
Applications – Implementation of basic ATPG

TEXTBOOKS:

1. Basic VLSI Design –Douglas A. Pucknell, Kamran Eshraghian, PHI, 3rd Edition,2005.
2. Principles of CMOS VLSI Design - Weste and Eshraghian, Pearson Education, Second Edition, 2009.
.

REFERENCES:

1. Chip Design for Submicron VLSI: CMOS Layout & Simulation, - John P. Uyemura, Thomson Learning.
2. Introduction to VLSI Circuits and Systems - John .P. Uyemura, JohnWiley, 2003.
3. Digital Integrated Circuits: A Design Perspective - John M. Rabaey, 2/E, 2002
4. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
5. VLSI Technology – S.M. SZE, 2nd Edition, TMH, 2003.

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8DC05**	**Microprocessors and Microcontrollers**	**2**	**0**	**0**	**2**

Course objectives: To develop skills for programming and interfacing using 8086 Microprocessor and 8051 Microcontroller.

Course outcomes*:*

1. *Understand Architecture of 8086 and analyzing in single mode and in multi processor mode.*
2. *Understand instructions of 8086 and to write Assembly Language Programs*
3. *Interface I/0 devices with 8086*
4. *Understand Architecture of 8051 microcontroller.*
5. *Understand instructions of 8051 and to Interface I/0 devices with 8051*
6. *Understand the need advanced processors.*

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2								2	2	2	
CO2	2	2	2	2								2	2	2	
CO3	2	2	2	2								2	2	2	
CO4		2	2	2	3							2			
CO5		2	3	2	3		2					2			3
CO6		2	3	2	2		2					2			
Overall		2	3	2	2		2		2			2	2	2	3

UNIT - I

Architecture of 8086 Microprocessor: Memory segmentation, BIU and E.U General purpose registers. 8086 flag register and function of 8086 Flags. Pin diagram of 8086-Minimum mode and maximum mode of operation. Timing Diagram.

UNIT – II

Instruction set of 8086: Addressing modes of 8086. Assembly directives. Simple programs, procedures, and macros. Assembly language programs involving logical, Branch & Call instructions, sorting, evaluation of arithmetic expressions, string manipulation. Introduction to DOS and BIOS interrupts.

Applications: Design of an 8-bit Calculator

UNIT - III

Interfacing with 8086: Interfacing with RAMs, ROMs along with the explanation of timing diagrams. 8255 PPI – various modes of operation. Interfacing with key boards, ADCs, and DACs Stepper Motor .Interrupt structure of 8086. Vector interrupt table. Interrupt service routines. 8259 PIC Architecture and interfacing cascading of interrupt controller and its importance.

Applications: Interfacing of a Temperature sensor with 8086

UNIT - IV

The 8051 Architecture: Architecture of 8051 Micro controller, Memory Organization. Special Function Registers. Input/Output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/Output, Interrupts.

UNIT – V

Instruction set of 8051: Programming the 8051, Data Transfer and Logical Instructions. Arithmetic Operations, Decimal Arithmetic. Jump and Call Instructions, Simple programs. Programs based on SFRs on Timers ,Interrupts.

Applications of 8051: Interfacing 7 segment LEDs, LCDs, Interfacing with ADCs. Interfacing with DACs.

UNIT – VI

Introduction to ARM Processors: Harvard and Von Neumann architectures, CISC & RISC Architecture CPU Registers, CPU Operating Modes, The ARM 7 TDMI architecture-ARM organization and implementation-The ARM instruction set-The Thumb instruction set-Basic ARM assembly language programs

TEXT BOOKS :

1. Advanced microprocessor & Peripherals - A.K.Ray&K.M.Bhurchandi, TMH, 2000.
2. Microprocessors and interfacing – Douglas V. Hall, TMH, 2nd Edition, 1999.
3. 8051 Microcontroller–Kenneth J. Ayala, Penram International/ Thomson, 3rd Edition, 2005.
4. The 8051 Microcontroller And Embedded Systems Using Assembly And C – Mazidi, Pearson Education India,2nd edition, 2008. Jane W. S Liu, " Real Time Systems" Pearson Higher Education ,3rd Edition, 2000.
5. Steve Furber, ARM System on-chip Architecture, Addison Wesley

REFERENCES :

1. Micro computer systems, The 8086/8088 Family Architecture, Programming and Design – Y.Liu and G.A. Gibson, PHI, 2nd Edition.
2. 8051 Micro Controllers and Embedded Systems – Dr. Rajiv Kapadia, Jaico Publishers.

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C511**	**Cellular and Mobile Communication**	**3**	**0**	**0**	**3**

Prerequisites: *Analog & Digital Communications*

Course Objectives*:*

The objectives of this course are

- *Be acquainted with the role of cellular and mobile communications in frequency management issues.*
- *Be acquainted with different interference factors influencing cellular and mobile communications.*
- *Be able to efficiently use the background behind developing different path loss and/or radio coverage in cellular environment*

Course Outcomes*: After studying this course, the students will be able to*

CO1	*Understand the working principle and limitations/advancements of conventional mobile telephone systems, cellular mobile systems and Advanced generations of cellular wireless systems*
CO2	*Analyze Frequency reuse concept and avoidance of Co-channel interference.*
CO3	*Explore the concepts of adjacent channel interference, its effects and avoidance mechanism.*
CO4	*Analyze signal reflections, path loss, propagation delay/loss, near and long distance propagation loss under different conditions, Merits of Lee model*
CO5	*Analyze frequency allocation of cellular systems*
CO6	*Demostrate the concept of handoff mechanism and dropped calls.*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
CO6															
Overall		3	3	3	3				2			3	3	3	3

Syllabus Content

UNIT I

INTRODUCTION TO CELLULAR MOBILE RADIO SYSTEMS:

Limitations of conventional mobile telephone systems, Significance of 800MHz, Basic cellular wireless systems; 1G, 2G, 2.5G, 3G, 4G, 5G cellular wireless systems; Uniqueness of mobile radio environment – Long term fading, factors influencing short term fading, parameters of mobile multi path fading: time dispersion parameters, coherence bandwidth, Doppler spread and coherence time. Types of small scale fading. Diversity techniques – time, space, frequency.

UNIT-II
FUNDAMENTALS OF CELLULAR RADIO SYSTEM DESIGN:

Concept of Frequency reuse, Co-channel Interference, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni directional Antenna system, System capacity, Trunking and grade of service; Improving coverage and capacity in cellular system – cell splitting, sectoring, micro cell zone concept.

UNIT-III
CHANNEL INTERFERENCE:

Measurement of real time Co-Channel Interference, Design of antenna system, Antenna parameters and their effects; Diversity techniques- Space diversity, polarization diversity, Frequency diversity and Time Diversity. Non-co-channel interference-Adjacent channel Interference, near end and far end interference, cross talk, effect on coverage and Interference by power decrease, antenna height decrease, effect of cell site components, UHF TV interference

Applications: Design of a cellular systems using frequency reuse factor (k=19) for directional and Omni-directional antenna systems

UNIT-IV
CELL COVERAGE FOR SIGNAL AND TRAFFIC :

Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation, path loss from a point to point prediction model in different conditions, merits-of-LEE-model.

UNIT-V
FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT:

Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment.
HANDOFF, DROPPED CALLS:

Handoff initiation, types of Handoff, delayed handoff, Advantages of handoffs, Power difference handoff, forced handoff, mobile assigned handoff and soft handoff, Intersystem handoff. Introduction to dropped call rates and their evaluation.

UNIT-VI

DIGITAL CELLULAR NETWORKS: GSM architecture, GSM channels, multiple access scheme, TDMA, FDMA, CDMA,WCDMA, SDMA, OFDM.

TEXTBOOKS :

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

REFERENCES:

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

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C512**	**Antennas and Wave Propagations**	**2**	**1**	**0**	**3**

Prerequisites: *EMTL*

Course Objectives:

The objectives of this course are

- *To study and learn various antennas, their working principle, arrays and radiation patterns of antennas.*
- *To understand various techniques involved in various antenna parameter measurements.*
- *To understand the radio wave propagation in the atmosphere*

Course Objectives*: After studying this course, the students will be able to*

CO1	*Learning the radiation mechanism of antenna and antenna parameters*
CO2	*Design and analyze wire antennas and antenna arrays*
CO3	*Evaluate knowledge on Horn, Parabolic and Lens antennas.*
CO4	*Analysis of Horizontal Polarized antennas, Helical antennas , Patch antennas etc.*
CO5	*Understand the propagation mechanisms of ground wave, sky wave and space wave concepts.*
CO6	*Analysethe concepts of sky wave propagation .*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2		2				2			2	3	2	1
CO2	3	3	3	2	3				2				3	3	1
CO3	3	3	3		3				2				3	3	1
CO4	3	3	3		3				3			2	3	3	1
CO5	2	2											2	1	
CO6	2	3											2	1	
Overall	3	3	3	2	3				2			2	2	2	1

Syllabus Content

Unit-I:

FUNDAMENTAL PARAMETERS OF ANTENNAS

Review of Electromagnetic Theory: Vector Potential, Solution of Wave Equation, Retarded Case, Hertizian Dipole. Antenna Characteristics: Radiation Pattern, Beam Solid Angle, Directivity, Gain, Input Impedance, Polarization, Bandwidth, Reciprocity, Equivalence of Radiation Patterns, Equivalence of Impedances, Effective Aperture, Vector Effective Length, Antenna efficiency.

Unit-II:

LINEAR WIRE ANTENNAS AND ARRAYS

Wire Antennas: Short Dipole, Radiation Resistance and Directivity, Half Wave Dipole, Monopole, Small Loop Antennas. Antenna Arrays: Linear Array and Pattern Multiplication, Two-Element Array, Uniform Array, BSA and EFA, EFA With increased Directivity. BSA with Non- uniform Amplitude Distributions and Binomial Arrays.

Unit-III:

APERTUREAND REFLECTOR ANTENNAS

Magnetic Current and its Fields, Uniqueness Theorem, Field Equivalence Principle, Duality Principle, Method Of Images, Pattern Properties, Slot Antenna, Horn Antenna, Pyramidal Horn Antenna, Reflector Antenna-Flat Reflector, Corner Reflector, Common Curved Reflector Shapes, Lens Antenna.

Applications: Design of parabolic reflector for DTH.

Unit-IV:

Long Wire, V and Rhombic Antenna, Yagi-Uda Antenna, Turnstile Antenna, Helical Antenna- Axial Mode Helix, Normal Mode Helix, Biconical Antenna, Log Periodic Dipole Array, Spiral Antenna, Microstrip Patch Antennas. Antenna Measurements: Radiation Pattern Measurement, Gain and Directivity.

Applications: Design of a 3-element Yagi guda Antenna for given specifications

Unit-V:

Surface Wave Propagation-Modes of Wave Propagation-Surface Wave Propagation and Surface Wave Tilt-Plane Earth Reflection, Reflection and Refraction of Waves-Field Strength due to Ground Wave-Multi-Hop Transmission. Tropospheric and Space Wave Propagation

UNIT VI:

Ionospheric Propagation: Structure of Ionosphere-Measures of Ionosphere Propagation-Critical Frequency-Angle of Incidence-MUF And LUF ,Optimum Working Frequency-Skip Distance, Virtual Height , Refractive Index of The Ionosphere, Effect of the Earth Magnetic Field and Fading

TEXT BOOKS -

1. John D. Kraus and Ronald J. Marhefka, *Antennas for All Applications* –TMH, 3rd Edn., 2003.
2. E.C. Jordan and K.G. Balmain ,*Electromagnetic Waves and Radiating Systems* –, PHI, 2nd ed., 2000. .

REFERENCES –

1. C.A. Balanis, *Antenna Theory* -John Wiley & Sons, 2nd ed., 2001.
2. K.D. Prasad, *Antennas and Wave Propagation* –, Satya Prakashan, Tech India Publications, New Delhi, 2001.
3. E.V.D. Glazier and H.R.L. Lamont ,*Transmission and Propagation* –, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
4. F.E. Terman*Electronic and Radio Engineering* –, McGraw-Hill, 4th edition, 1955.

John D. Kraus, *Antennas* – McGraw-Hill, 2nd ed, 1988.

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C517**	**Digital Design Through Verilog (PE-I)**	**3**	**0**	**0**	**3**

Prerequisites: *STLD, Programmaing concepts of any language*

Course Objectives:

The objectives of this course are

- *To introduce syntax, lexical conventions, data types and memory related to Verilog HDL.*
- *To design, test and implementation of thedigital hardware using various modeling styles.*
- *To design digital systems using FSM modeling.*

Course Outcomes*: After studying this course, the students will be able to*

CO1	*Understand levels of design description, concurrency, simulation and synthesis.*
CO2	*Apply language constructs, data types, operators available in verilog HDL.*
CO3	*Design combinational logic and sequential logic in gate level modeling.*
CO4	*Explain Gate and Switch level modeling.*
CO5	*Use system tasks, functions and UDPs.*
CO6	*Demonstrate SM charts and realize digital design using SM charts.*

CO	**Digital Design Through Verilog (7C615)**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	Understand levels of design description, concurrency, simulation and synthesis.			2									1	1		
CO2	Apply language constructs, data types, operators available in verilog HDL.		1			2								1	2	
CO3	Design combinationa l logic and sequential logic in gate level modeling.		1	3										2		
CO4	Explain Gate and Switch level modeling.		2	3	3	2								1	2	

CO5	Use system tasks, functions and UDPs.			1	2	3								2	3	
CO6	Demonstrate SM charts and realize digital design using SM charts.		3	3	3	1							1	3	1	
CO	Overall		2	2	3	2							1	2	2	

Syllabus Content

UNIT I

INTRODUCTION TO VERILOG HDL: Verilog HDL, Levels of Design Description, Concurrency, System Tasks, Simulation and Synthesis, Functional Verification.

LANGUAGE CONSTRUCTS AND CONVENTIONS: Introduction, Keywords, Identifiers, White Space, Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Operators. Verilog Module structure, Test bench module- Net types, Strengths and Contention Resolution, Delays.

UNIT-II

MODELING AT DATA FLOW LEVEL: Introduction, Continuous Assignment Structures, Delays and Continuous Assignments, Assignment to Vectors, Operators.

BEHAVIORAL MODELING: Introduction, Initial Construct, Always Construct, Assignments with delays, Blocking and Non blocking Assignments - Examples, Wait construct, Multiple Always Blocks, Design at Behavioral Level constructs- Case statements, i*f* and i*f*-else, repeat, for loop, while loop, forever loop. Other constructs- assign-deassign, disable, force-release.

UNIT-III

GATE LEVEL MODELING: Introduction, Gate Primitives- Illustrative Examples, Tri-State Gates, Design of Basic Circuits using Instantiation of Gate Primitives- Half, Full and Parallel Adders, Decoders, Multiplexers. Design of Flip-flops with Gate Primitives.

SWITCH LEVEL MODELING: Introduction, Basic Transistor Switches, CMOS Switch, Bi-directional Gates, Time Delays with Switch Primitives, Instantiations with Strengths and Delays, Strength Contention with Trireg Nets-Examples.

UNIT-IV

SYSTEM TASKS, FUNCTIONS, AND COMPILER DIRECTIVES: Introduction, Parameters, Path Delays, Module Parameters, System Tasks and Functions, File-Based Tasks and Functions, Compiler Directives, Hierarchical Access, User- Defined Primitives (UDP).

UNIT-V

COMPONENT TEST AND VERIFICATION: Test bench – combinational circuit testing, sequential circuit testing, test bench techniques, design verification, assertion verification.

UNIT-VI

DIGITAL SYSTEM DESIGN AND VERIFICATION:FSM Design (Moore and Mealy Machines) – Vending Machine design and verification , Derivation and Realization of Algorithmic State Machine Chart Design and Verification examples - Binary Multiplier, Dice game. Other design examples - RAM (Single &DualPort), UART Design.

Text Books

1. T.R. Padmanabhan and B. Bala Tripura Sundari, Design through Verilog HDL – WSE, 2004 IEEE Press.
2. Charles H Roth, Digital Systems Design using VHDL , Jr. Thomson Publications, 2004.
3. Samir Palnitkar, Verilog HDL , 2nd Edition, Pearson Education, 2009

References

1. Sunggu Lee, Advanced Digital Logic Design using Verilog, State machines and Synthesis for FPGAs, - Cengage Learning
2. Stephen. Brown and ZvonkoVranesic, Fundamentals of Logic Design with Verilog, TMH, 2005.
3. J. Bhaskar, A Verilog Primier, BSP, 2003.
4. Michael D. Ciletti, Advanced Digital Design with Verilog HDL, PHI, 2005.
5. Sunggu Lee, Digital Logic Design using Verilog, State machine and synthesis for FPGA, Cengage Learning, 2009.

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C518**	**Advanced Computer Architecture (PE-I)**	**3**	**0**	**0**	**3**

Course Objectives: *Students will learn about*

1. *Various basic computer architectures, data representations and instruction sets.*
2. *Arithmetic unit, control unit and efficient computation using pipelining*
3. *Memory organization and optimization*
4. *I/O Communications and interfaces*

Course Outcomes: *After completing this course, student should be able to*

1. *To analyze the internal architecture of the computer*
2. *Understand the different data types and instruction set, of the computer*
3. *Understand the memory structure of the computer and learn CISC & RISC.*
4. *Understand processor structure and function and know the input output interfacings*

CO	**COMPUTER ORGANIZATION AND ARCHITECTURE (7DC11)**	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	*To analyze the internal architecture of the computer*	1	1											1		
CO2	*Understand the different data types and instruction set, of the computer*	2	2	2										2		
CO3	*Understand the memory structure of the computer and learn CISC & RISC*	2	2	2										2		
CO4	*Understand processor structure and function and know the input output interfacings*	2	2	2										2		
CO		2	2	2										2		

Unit – I

Introduction: Organization and Architecture, Structure and Function – Computer Evolution - Brief history of computers – Designing for performance.
Computer System: Components, Function – Interconnection Structures – Bus interconnection – PCI.

Unit – II
Instruction Set: Characteristics – Operand Types – Operation Types – Addressing Modes – Instruction formats
CPU: Computer Arithmetic operations: ALU – Integer Representation and Arithmetic – Floating Point Representation and Arithmetic.

Unit – III
Computer Memory System Overview - Cache Memory Principles - Elements of Cache Design
Internal Memory - Semiconductor Main Memory - Error Correction - Advanced Dram Organization
External Memory - Magnetic Disk – Raid

Unit – IV
Characteristics of CISC and RISC
Control unit: Micro–Operations – Control of Processors – Hardwired Implementation.
Micro Programmed Control: Basic concepts – Control Memory - Microinstruction Sequencing – Conditional branching – Mapping of instruction – Microinstruction Execution – Microprogram Example

Unit – V
Processor Structure and Function - Processor Organization - Register Organization - Instruction Cycle - Instruction Pipelining - Instruction Execution Characteristics - The Use of a Large Register File - Compiler-Based Register Optimization - Reduced Instruction Set Architecture - RISC Pipelining

Unit – VI
Input/Output - External Devices - I/O Modules - Programmed I/O - Interrupt - Driven I/O - Direct Memory Access - I/O Channels and Processors.

TEXT BOOKS:
1. William Stallings, "Computer Organization and Architecture – Designing for Performance", Prentice Hall, 9th Edition, 2013
2. John P.Hayes, "Computer Architecture and Organization", Tata McGraw Hill, 3rd Edition, 2002.

REFERENCES:
1. Patterson, D. A., and Hennessy, J. L., "Computer Organization and Design: The Hardware/Software Interface", Morgan Kaufmann Publishers, 4th Edition, 2008.
2. D.A.Godse A.P.Godse, Computer Architecture & Organization, Technical Publications, 2007.
3. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Tata McGraw Hill, 5th Edition, 2002.
4. Morris Mano, " Computer Systems Architecture ", 3rd Edition, Pearson PHI Publication, 1993

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C519**	**Digital Image & Video Processing (PE-I)**	**3**	**0**	**0**	**3**

Course Objectives:

This course aims to:

1. Understand the image formation and its digital representation.
2. Learn representation of images in frequency domain and enhancement techniques.
3. Students would be able to solve the problems related to image compression and restoration.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Describe basic concepts of image processing system.
2. Summarize and compare various digital image transform techniques.
3. Demonstrate and survey digital image enhancement in practical applications.
4. Analyse the case study related to various techniques of image restoration.
5. Apply compression techniques on digital image.
6. Know the difference between analog video and digital video, different types of image formation and sampling of video signals.

UNIT-1: DIGITAL IMAGE FUNDAMENTALS&IMAGE TRANSFORMS

Elements of digital image processing systems, An image model, Basic relationships between pixels and basic transformation, Image acquisition, sampling and quantization, Image file formats, Two dimensional convolution, Two dimensional correlation, Two dimensional frequency responses.

UNIT-2: IMAGE ENHANCEMENT

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.

UNIT-3: IMAGE RESTORATION

Image Degradation model, Algebraic approach to restoration, inverse filtering, Least mean square filter - Wiener filtering, Constrained least square restoration

UNIT-4: IMAGE SEGMENTATION AND RECOGNITION

Edge detection, Image segmentation: Region growing, Region splitting and merging, Edge linking, Morphological operations: Dilation, Erosion, Opening, Closing, Image recognition:

Patterns and pattern classes, Matching by minimum distance classifier, Statistical classifier, Matching by correlation.

UNIT-5: IMAGE COMPRESSION

Need for image compression, Image coding, Huffman coding, Run length encoding, Arithmetic coding, Vector Quantization, Block truncation coding, Transform coding, Image compression standards

UNIT-6:

Basic steps of Video Processing

Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals and filtering operations.

TEXT BOOKS:

1. Rafeel C Gonzalez, Richard E Woods, 'Digital Image Processing', Pearson education, Inc., second edition, 2004.
2. Anil K Jain, 'Fundamentals of Digital Image Processing', Prentice hall of India
3. William K Pratt, 'Digital Image Processing' , John Wiley, New York, 2002
4. Video processing and communication – Yao Wang, JoemOstermann and Ya–quin Zhang.1st Ed., PHI.

REFERENCES:

1. Lim JS, 'Two Dimensional Signal and Image Processing' , Prentice - hall New Jersey, 1990
2. Sid Ahmed M A, 'Image processing Theory, Algorithms and architectures', Mc Graw Hill, 1995
3. J T Tou and R.C. Gonzalez, 'pattern Recognition Principles', Addison Wesley publishing company
4. E. Gose and R. Johnson Bough, 'pattern Recognition and Image Analysis', Prentice hall of India
5. Digital Video Processing – M. Tekalp, Prentice Hall International

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C520**	**Information Theory and Coding Techniques(PE-I)**	**3**	**0**	**0**	**3**

Prerequisites:PTSP,DC,M-II

Course Objectives: After studying this course, the students will be able to

CO1	Explain different kind of networking models
CO2	Define different addressing schemes for networks.
CO3	Detailed idea of data link layer protocol and medium access protocol
CO4	Gain the knowledge of router configuration and network layer protocols and their working.
CO5	Differentiate the IPv4 and IPv6 addressing schemes for different networks.
CO6	Gain the knowledge of application layer protocols like DHCP, DNS.

CO	**Information Theory and Coding Techniques(PE-I) 6C519**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	Explain different kind of networking models		3	3	3	3				2			3	3	3	
CO2	Define different addressing schemes for networks.		3	3	3	3				2			2	3	3	

CO3	Detailed idea of data link layer protocol and medium access protocol.		3	3	3	3				2			2	3	3	
CO4	Gain the knowledge of router configuration and network layer protocols and their working.		3	3	3	3				2			2	3	3	
CO5	Differentiate the IPv4 and IPv6 addressing schemes for different networks.		3	3	3	3				2			2	3	3	3
CO6	Gain the knowledge of application layer protocols like DHCP, DNS.															
CO	overall		3	3	3	3				2			3	3	3	3

Syllabus Content

Unit – I

Information Theory: Introduction, Measure of information, Average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequences. Mark-off statistical model for information source, Entropy and information rate of mark-off source.

Unit – II

Source Coding: Encoding of the source output, Communication Channels, Discrete communication channels, Continuous channels, Shannon's encoding algorithm, Huffman Coding, Run-Length Encoding, Calculation of Coding efficiency and redundancy, Channel capacity for continuous channel and BSC.

Unit – III

Linear Block codes and cyclic codes

Introduction to Error Control Coding: Introduction, Types of errors, examples, Types of codes: Linear Block Codes: Matrix description, Error-Detecting and Error-correcting Capabilities of a Block code and Hamming codes.

Cyclic Codes: Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes

Unit – IV

Convolution Codes: Encoding of Convolution Codes, Structural and Distance Properties, State diagram, Code tree diagram, Maximum-Likelihood decoding, Soft decision and hard decision decoding, the Viterbi algorithm.

Unit – V

Low Density Parity Check codes: Introduction, Matrix and Graphical representation, Galleger's method of construction, Regular and Irregular LDPC codes, other methods of constructing LDPC codes, Tanner graphs, Decoding of LDPC codes.

Unit – VI

Other coding techniques: BCH code, RS Code, Hamming Code, Golay Codes, Turbo codes- Definition, encoding and decoding process.

Text Books

1. Digital and analog communication systems, K. Sam Shanmugam, John Wiley, 1996.
2. Digital communication, Simon Haykin, John Wiley, 2003.

Reference Books:

1. ITC and Cryptography, Ranjan Bose, TMH, II edition, 2007

Digital Communications - Glover and Grant; Pearson Ed. 2nd Ed 2008

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C521**	**Digital Image Processing (PE-I)**	**3**	**0**	**0**	**3**

Course Objectives:

This course aims to:

1. Understand the image formation and its digital representation.
2. Learn representation of images in frequency domain and enhancement techniques.
3. Students would be able to solve the problems related to image compression and restoration.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Describe basic concepts of image processing system.
2. Summarize and compare various digital image transform techniques.
3. Demonstrate and survey digital image enhancement in practical applications.
4. Analyse the case study related to various techniques of image restoration.
5. Apply compression techniques on digital image.

UNIT-1: DIGITAL IMAGE FUNDAMENTALS

Elements of digital image processing systems, An image model, Basic relationships betweenpixels and basic transformation, Image acquisition, sampling and quantization, Image fileformats, Two dimensional convolution, Two dimensional correlation, Two dimensionalfrequency responses.

UNIT-2: IMAGE TRANSFORMS

Study analysis with examples of 2D transforms, Transforms: DFT, DCT, Walsh,Hadamard, Slant, Haar, KLT, Radon, Hough,

UNIT-3: IMAGE ENHANCEMENT

Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothingspatial filters, Sharpening spatial filters. Frequency domain methods: Basics of filtering infrequency domain, image smoothing, image sharpening, Selective filtering.

UNIT-4: IMAGE RESTORATION

Image Degradation model, Algebraic approach to restoration, inverse filtering, Least meansquare filter - Wiener filtering, Constrained least square restoration

UNIT-5: IMAGE SEGMENTATION AND RECOGNITION

Edge detection, Image segmentation: Region growing, Region splitting and merging, Edgelinking, Morphological operations: Dilation, Erosion, Opening, Closing, Image recognition:Patterns andpattern classes, Matching by minimum distance classifier, Statistical classifier,Matching bycorrelation.

UNIT-6: IMAGE COMPRESSION

Need for image compression, Image coding, Huffman coding, Run length encoding, Arithmeticcoding, Vector Quantization, Block truncation coding, Transform coding, Image compressionstandards

TEXT BOOKS:

1. Rafeel C Gonzalez, Richard E Woods, 'Digital Image Processing', Pearson education, Inc., second edition, 2004.
2. Anil K Jain, 'Fundamentals of Digital Image Processing', Prentice hall of India
3. William K Pratt, 'Digital Image Processing' , John Wiley, New York, 2002

REFERENCES:

1. Lim JS, 'Two Dimensional Signal and Image Processing' , Prentice - hall New Jersey, 1990
2. Sid Ahmed M A, 'Image processing Theory, Algorithms and architectures', Mc Graw Hill, 1995
3. J T Tou and R.C. Gonzalez, 'pattern Recognition Principles', Addison Wesley publishing company
4. E. Gose and R. Johnson Bough, 'pattern Recognition and Image Analysis', Prentice hall of India

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C522**	**Phased Array Antennas (PE-I)**	**3**	**0**	**0**	**3**

UNIT – I
Introduction to Antennas, fundamentals of various antennas

UNIT – II
Conventional Scanning Techniques: Mechanical versus electronic scanning, Techniques of Electronic scanning, Frequency, Phase and time delay scanning principle, Hybrid scanning techniques.
UNIT – III
Array Theory: Linear and Planar arrays, various grid configurations, Concept of cell and grid, Calculation of minimum number of elements, Radiation pattern, Grating lobe formation, Rectangular and triangular grid design of arrays.
UNIT – IV
Feed Networks for phased Arrays: Corporate Feed, Lens and Reflect feed Techniques, Optimum f/d ratio, basic building block for corporate feed network, Series, Parallel feed networks, Comparison of various feeding techniques, Antenna Array Architecture, Brick/ Tile Type construction.
UNIT –V
Frequency Scanned Array Design: Snake feed, Frequency-phase scanning, Phase scanning, Digital phase shifter PIN diode and Ferrite phase shifters for phased arrays, Beam pointing errors due to digitization, Beam pointing accuracy.
UNIT – VI
Search Patterns: Calculation of search frame time, airborne phased array design, Electronic scanning radar, parameter calculation, Application of phased arrays, Phased Array Radar Systems, Active Phased Array, TR/ATR Modules.

TEXT BOOKS:
1. Olliner, A.A, and G.H. Knittel, “Phased Array Antennas”, Artech House, 1972.
2. Kahrilas. PJ, “Electronic Scanning Radar Systems Design Handbook”, Artech House, 1976.

REFERENCE BOOKS:
1. Skolnik. MI, “Radar Handbook”, Mc Graw Hill, NY, Mc Graw Hills-2007
2. Galati,G-(editor), “Advanced Radar Technique and Systems”, Peter Peregrinus Ltd, London, 1993.

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8DC71**	**Microprocessors and Microcontrollers Lab**	**0**	**0**	**2**	**1**

Course Objectives:

The objective of this course is to develop the Assembly language programming skills and real-time applications of Microprocessor as well as microcontroller.

Course Outcomes*: After studying this course, the students will be able to*

CO1	*Explore to write the Assembly Language Programs using Arithmetic instructions of 8086*
CO2	*Explore to write the Assembly Language Programs using String instructions of 8086*
CO3	*Explore to write the Assembly Language Programs for I/O interface with 8086*
CO4	*Explore to write the Assembly Language Programs using Arithmetic instructions of 8051*
CO5	*Explore to write the Assembly Language Programs using Timers and interrupts of 8051*

Mapping of Course Outcomes with Program Outcomes

	a (PO 1)	b (PO 2)	c (PO 3)	d (PO 4)	e (PO 5)	f (PO 6)	g (PO 7)	h (PO 8)	I (PO 9)	j (PO10)	k (PO10)	l (PO12)	m (PO13)
CO1		3	2		3								
CO2	2	2	3							2		2	
CO3		2	3						2				
CO4		2											3
CO5				2									3
Over all	**X**	**x**		**x**					**x**	x		X	x

Prerequisites:*STLD,LDICA*

Syllabus Content

Introduction to MASM/TASM, KIEL Assemblers

Familiarization with 8086, 8051 Kits

Cycle - I

8086 ALP using kit and MASM

1. Basic arithmetic and logical operations
2. Code conversion decimal arithmetic programs
3. String manipulation programs
4. Display a message on the screen of a computer using DOS / BIOS interrupts.

Cycle – II

Following peripherals and interfacing experiments to be implemented on 8086 and 8051 kits

1. A/D and D/A interfacing
2. Serial interfacing with PC
3. Keyboard and display interfacing
4. Stepper motor controller

Following simple programs may be given as lab assignment for students to executive at home by using 8086 emulator like EMU86 or MASM.

Write ALP and execute the program to

1. Find square of a number
2. Exchange two numbers
3. Find average of a given series of numbers
4. Add a constant to a series of values in memory & store the result back in memory
5. Find sum of cubes of a given series of numbers
6. Display squares of a given series of numbers in memory
7. Find factorial of a given number
8. Find largest number from a given series of numbers
9. Sort a series of given numbers in ascending order
10. Find whether the given number is even or odd number
11. Find sum of all even no.s from a given series of even and odd numbers
12. Find GCD of two given numbers
13. Find LCM of two given numbers
14. Display Fibonacci series
15. Reverse a String
16. Programs based on DOS/BIOS interrupts

Programs on 8051

1. Arithmatic Operations
2. Timers
3. Interrupts
4. Serial communication

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C577**	**VLSI Design Lab**	**0**	**0**	**4**	**2**

Prerequisites: *EDC, STLD, LDICA*

Course Outcomes*: After studying this course, the students must have demonstrated*

CO1	*An ability to use VLSI CAD Tools (NGSPICE, Xilinx, and Cadence).*
CO2	*An ability to understand and implement digital logic gates and circuits using SPICE and Verilog HDL.*
CO3	*An ability to perform physical design- layouts using Cadence EDA Tool.*
CO4	*An ability to implement combinatorial and sequential designs on FPGA boards (SPARTAN 3) using Xilinx tools.*
CO5	*An ability to use VLSI CAD Tools (NGSPICE, Xilinx, and Cadence).*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

Syllabus Content

PART A

The following Experiments are to simulate the design in Xilinx Vivado2017.1 using Verilog HDL and implement it on Artix 7 FPGA.

1. Design of all Logic Gates.
2. Design of Adders(Half Adder,FullAdder,Parallel Adder).
3. Design of 3-8 Decoder.
4. Design of 8-3 Encoder.
5. Design of 8*1Multiplexer.
6. Design of 4*1 Demultiplexer.
7. Design of Flip-flops:D,SR,JK,T.
8. Design of 4-bit Comparator.

PART B

The following Experiments are to Design and Verify the Operation using Cadence Tool.

1. Design and Simulatethe CMOS Inverter.
2. Design and Simulate the CMOS AND Gate.
3. Design and Simulate the CMOS OR Gate.

4. Design and Simulate the CMOS NAND Gate.
5. Design and Simulate the CMOS NOR Gate.
6. Design and Simulate the CMOS Ex-OR Gate.
7. Design and Simulate the CMOS Ex-NORGate.
8. Design and Simulate the Layout diagram for CMOS Inverter using 180nm Technology.

Note: Any Six Experiments From Each Part.

Part-D Lab Project –

1. Hierarchical design and layout of MSI circuits (multiplexer, decoders, etc.)
2. FPGA based traffic light controller using Verilog HDL
3. FPGA based Beverage Vending Machine
4. FPGA based UART serial communication interface
5. Implement 8-bit 3-stage pipeline processor
6. Using SPICE Implement 6T SRAM memory with read and write logic

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8FC72**	**Python Programming Lab**	**0**	**0**	**4**	**2**

Course Objectives

Students will try to learn

- Basics of Python programming, Decision Making and Functions in Python, Object Oriented Programming using Python.
- To introduce to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers.

Course outcomes

Students will be able to

1. Apply knowledge for computer assembling and software installation and ability to solve the trouble shooting problems.
2. Apply the tools for preparation of PPT, Documentation and budget sheet etc.
3. Install and run the Python interpreter ,Create and execute Python programs.
4. Apply the best features of mathematics, engineering and natural sciences to program real life problems.
5. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python, Express different Decision Making statements and Functions, Interpret Object oriented programming in Python.
6. Understand and summarize different File handling operations, explain how to design GUI Applications in Python.

Python Programming Lab

Week -1:

1. Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
2. Start the Python interpreter and type help() to start the online help utility.
3. Start Python interpreter and use it as Calculator.

Week -2:

4. If you run a 10 kilometer race in 43 minutes 30 seconds, what is your average time per mile? What is your average speed in miles per hour? (Hint: there are 1.61 kilometers in a mile).
5. The volume of a sphere with radius r is 5? (Use Sphere volume formula)

6. Suppose the cover price of a book is $24.95, but bookstores get a 40% discount. Shipping costs $3 for the first copy and 75 cents for each additional copy. What is the total wholesale cost for 60 copies?

Week -3:

7. A function object is a value you can assign to a variable or pass as an argument. For example, do_twice is a function that takes a function object as an argument and calls it twice:

```
def do_twice(f):
f()
f()
```

Here's an example that uses do_twice to call a function named print_spam twice.

```
def print_spam():
print 'spam'
do_twice(print_spam)
```

a. Type this example into a script and test it.

b. Modify do_twice so that it takes two arguments, a function object and a value, and calls the function twice, passing the value as an argument.

c. Write a more general version of print_spam, called print_twice, that takes a string as a parameter and prints it twice.

d. Use the modified version of do_twice to call print_twice twice, passing 'spam' as an argument.

8. Write a function that draws a grid like the following:

```
+ - - - - + - - - - +
|         |         |

|         |         |
```

```
|       |       |
+ - - - - + - - - - +
|       |       |
|       |       |
|       |       |
|       |       |
+ - - - - + - - - - +
```

Hint: to print more than one value on a line, you can print a comma-separated sequence.

9. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.
10. Write a function called is_palindrome that takes a string argument and returns True if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

Week-4:

11. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
12. Write a function called has_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.
1. Write a function called remove_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
2. The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.
3. Write a python code to read a dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.

Week-5:

4. If there are 23 students in your class, what are the chances that two of you have the same birthday? You can estimate this probability by generating random samples of 23 birthdays and checking for matches.
   Hint: you can generate random birthdays with the randint function in the random module.

5. How does a module source code file become a module object?

6. Why might you have to set your PYTHONPATH environment variable?
7. What is a namespace, and what does a module's namespace contain?
8. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.
9. What is the purpose of a _ _init_ _.py file in a module package directory? Explain with a suitable example.
10. Use the structure of exception handling all general purpose exceptions.

Week-6:

11. a. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.

    b. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.

    c. Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.

    d. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw_circle that draws circles on the canvas.

12. Write a Python program to demonstrate the usage of MRO in multiple levels of Inheritances.
13. Write a python code to read a phone number and email-id from the user and validate it for correctness.

Week-7:

14. Write a Python code to merge two given file contents into third file.
15. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.

Week-8:

16. Import numpy, Plotpy and Scipy and explore their functionalities.
17. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8C591**	**Summer Industry Internship-I**	**0**	**0**	**1**	**1**

Course Objective:

The students undergo industrial training so that he/she become industry-ready.

Course Outcomes:

At the end of the training, the student is able to

1. Select the real-time problem in the industry.
2. Analyze the requirements with respect to the problem statement
3. Design the optimal solution for the problem.
4. Implement the solution using the appropriate modern tools.
5. Present and submit the report

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3							3	3	3	3	2		3
CO2	3	3		3					3	3	3	3	3		3
CO3	3	3	3	3					3	3	3	3	3		3
CO4	3	3			3				3	3	3	3	3	3	3
CO5									3	3	3	3			3
Overall		3	1	1	1				3	3	3	3	3	1	3

Student shall carryout the project in industry during summer vacation for 3-6 weeks. There is internal and external Evaluation. Internal Evaluation carries 30 marks and external Evaluation carries 70 marks, Total 100 marks.

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8FC24**	**Cyber Security**	**2**	**0**	**0**	**0**

Course Objectives:

- To familiarize with network security, network security threats, security services, and countermeasures.
- To be aware of computer security and Internet security.
- To study the defensive techniques against these attacks.
- To familiarize with cyber forensics.
- To be aware of cyber crime related to mobile and laptop etc.
- To acquire knowledge relating to Cyberspace laws and Cyber crimes.
- To understand ethical laws of computer for different countries, Offences under the Cyberspace and Internet in India.

Course Outcomes:

At the end of this course the student will be able to

1. The students will be able to understand cyber-attacks, types of cybercrimes.
2. Realize the importance of cyber security and various forms of cyber attacks and countermeasures.
3. Get familiar of cyber forensics.
4. Get familiar with obscenity and pornography in cyber space and understand the violation of Right of privacy on Internet.
5. Cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.
6. Elucidate the various chapters of the IT Act 2008, power of Central and State Government to make rules under IT Act 2008.

UNIT-I: Introduction to cyber Security

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc.,

UNIT-II: Cyber Forensics:

Introduction to cyber forensic, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT-III: Cybercrime: Mobile and Wireless Devices:
Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops and desktop.

UNIT-IV: Cyber Security: Organizational Implications:
Introduction cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.
Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT-V: Privacy Issues:
Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

UNIT-VI: Cyberspace and the Law &Miscellaneous provisions of IT Act.
Introduction to Cyber Security Regulations, International Law. The INDIAN Cyberspace, National Cyber Security Policy. Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threats.
Other offences under the Information Technology Act in India, The role of Electronic Evidence and miscellaneous provisions of the IT Act.2008.

Cybercrime: Examples and Mini-Cases
Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:
1. Nina Godbole and SunitBelpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCE BOOKS:
1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.
3. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2ndEdition, O' Reilly Media, 2006.

4. Wenbo Mao, “Modern Cryptography – Theory and Practice”, Pearson Education, New Delhi, 2006.
5. Cyberspace and Cybersecurity, George Kostopoulos, Auerbach Publications, 2012.
6. Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes, Second Edition, Albert Marcella, Jr., Doug Menendez, Auerbach Publications, 2007.
7. Cyber Laws and IT Protection, Harish Chander, PHI, 2013

III – II

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8EC47**	**Computer Networks**	**2**	**0**	**0**	**2**

Course Objective:

1. The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
2. Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols and functions of the various layers.

Course Outcomes:

At the end of this course, the student will be able to

1 Classify network topologies and apply the same to different networks with the knowledge acquired from the network reference models and fundamentals of computer networks
2 Illustrate the design issues of data link layer and detect the transmission errors and flow control problems
3 Categorize the Channel allocation issues, MAC protocols such as ALOHA, CSMA and CSMA/CD and MAC addresses with IEEE 802.X and wireless LAN.
4 Distinguish the knowledge of the several routing algorithms and Internetworking concepts.
5 Obtain and use the skills of subnetting and routing mechanisms
6 Distinguish the knowledge of the functions of transport and application layer

UNIT I

Introduction: Uses of Computer Networks, Types of networks: WAN, LAN, MAN, Network Topologies, Reference models: OSI, TCP/IP.

Physical Layer: Transmission media: magnetic media, twisted pair, coaxial cable, fiber optics, wireless transmission.

UNIT II

Data link layer: Design issues in data link layer: framing, flow control, error control, Error Detection and Correction: Parity, CRC checksum, Hamming code, Flow Control: Sliding Window Protocols, Applications: Data link layer protocols HDLC, PPP.

UNIT III

Medium Access sub layer: Channel allocation problem, MAC Protocols: ALOHA, CSMA, CSMA/CD, MAC addresses, IEEE 802.X, Standard Ethernet, Wireless LANS. Bridges, Types of Bridges.

UNIT IV

Network Layer: Design issues in Network Layer, Virtual circuit and Datagram subnets-Routing algorithm: Shortest path routing, Flooding, distance vector routing, Link state routing, Hierarchical routing, Broad casting, Multi casting, Routing for mobile hosts.

Internetworking: Concatenated Virtual Circuits, Connectionless internetworking, Tunneling, Internetwork routing, Fragmentation

UNIT V

Network layer in internet: IPv4, IP addresses, Sub netting, Super netting, NAT.Internet control protocols: ICMP, ARP, RARP, DHCP**.**
Congestion Control: Principles of Congestion, Congestion Prevention Policies.
Congestion Control in datagram Subnet: Choke packet, load shedding, jitter control.
Quality of Service: Leaky Bucket algorithm and token bucket algorithm.

UNIT VI
Transport Layer: Transport Services, Connection establishment, Connection release and TCP and UDP protocols.
Application Layer: Domain name system, FTP, HTTP, SMTP, WWW.

Textbook & Course Materials

Required Textbooks

1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI
2. Data Communications and Networking – Behrouz A. Forouzan.Third Edition TMH.
3.Data Communication and Networks-Bhushan Trivedi-OXFORD Publications.

Recommended Textbooks & Other Readings

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C613**	**Microwave and Optical Communications**	**3**	**0**	**0**	**3**

Prerequisites: *EMWTL, AWP*

Course Objectives:

The objectives of this course are

- *To have fundamental understanding of microwave components and circuits in terms of scattering parameters, electrical characteristics of waveguides and transmission lines through electromagnetic field analysis*
- *To expose the students to the basics of signal propagation through optical fibers, optical sources and detectors.*

Course Objectives*: After studying this course, the students will be able to*

CO1	*Distinguish microwave frequencies and analyze Rectangular and circular wave guides.*
CO2	*Formulate various passive components with the help of scattering matrix*
CO3	*Explore different linear beam tubes*
CO4	*Analyze Cross field tubes and slow wave structures.*
CO5	*Analyze the propagation of light in optical fibers and to characterize various optical sources.*
CO6	*Understand the principle of various Losses, Dispersion and to characterize various Optical Detectors.*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
CO6		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

UNIT-I

Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, Cut-off Frequencies, Dominant Modes, Mode Characteristics – Phase and Group Velocities, Wavelength and Impedance Relations; Dominant and evanescent modes; Power Transmission and Power Losses in Rectangular Wave Guide, Related Problems.

UNIT-II

Introduction to micro strip lines, losses, Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide irises, Tuning Screws and Posts. Matched Load, Waveguide Attenuators, Phase Shifters. Waveguide Multiport Junctions – E and H plane Tees, Magic Tee, Hybrid Ring; Directional Couplers. Scattering Matrix– Significance, Formulation and Properties, Directional Coupler, Magic Tee, Circulator and Isolator. Related Problems.

Ferrite Components: Ferrite Characteristics, Faraday rotation, Gyrator, Isolator, and Circulator

UNIT-III

Limitations and Losses of conventional tubes at microwave frequencies. Microwave tubes – O type and M type classifications. O-type tubes: 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process. O/P Power and Efficiency, Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Bunching process, Power Output, Efficiency Electronic Admittance; Oscillating Modes and o/p Characteristics, Related Problems.

UNIT-IV

Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations. four propagation constants.

M-TYPE TUBES: Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron operations and o/p characteristics. PI mode and its significance. – Hull Cut-off Condition.

UNIT-V

Introduction, Ray Theory Transmission, Total Internal Reflection, Acceptance Angle, Numerical Aperture, Skew Rays. Fibers- Modes, V Number, Mode Coupling, Step Index Fibers, Graded Index Fibers. Single Mode Fibers- Cut off Wavelength, Mode Field Diameter, Effective Refractive Index.

Optical Sources: Construction and working principles of LED and LASER diaodes.

UNIT-VI

Transmission Characteristics Of Optical Fiber -Attenuation - Material Losses absorption in silica glass fiber - Linear and Non Linear Scattering Losses - Intra and Inter-Modal Dispersion - All Over Fiber Dispersion - Optical fiber connectors, fiber alignment and Joint Losses - Fiber Splicer - Fiber Connectors - Expanded Beam Connectors - Fiber Couplers.

Optical Detectors: Physical principles of PIN and APD, Comparison of Photo detectors.

TEXT BOOKS

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition, 1994.
2. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004.
3. Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition, 3rd Edition, 2000.
4. Micro Wave and Radar Engineering – M. Kulkarni, Umesh Publications, 1998

REFERENCES

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Circuits and Passive Devices – M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd., 1995.
3. Microwave Engineering, RaghuvanshiG.S. , 1st edition, Cengage Learning
4. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.

5. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th ed., 1955.
6. Elements of Microwave Engineering – R. Chatterjee, Affiliated East-West Press Pvt. Ltd., New Delhi, 1988.
7. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8EC45**	**Artificial Intelligence**	**2**	**0**	**0**	**0**

Course objective:

To learn the distinction between optimal reasoning Vs. human like reasoning. To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities. To learn different knowledge representation techniques. To understand the applications of AI, namely game playing, theorem proving, and machine learning.

COURSE OUTCOMES:

At the end of this course the student will be able to

1. Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
2. Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
3. Learn different knowledge representation techniques.
4. Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and spacecomplexities.
5. Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
6. Analyze Supervised Learning Vs. Learning DecisionTrees

UNIT - I

Introduction to AI, Intelligent Agents, Problem-Solving Agents, Searching for Solutions, Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces.

UNIT-II

Games, Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

UNIT-III

Representation, Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution. **Knowledge Representation:** Ontological Engineering, Categories and Objects, Events.

UNIT-IV

Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

UNIT-V

Acting under Uncertainty, Basic Probability Notation Bayes' Rule and Its Use, Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The

Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

Unit-VI

Learning: Forms of Learning, Supervised Learning, Learning Decision Trees.

TEXT BOOKS:

1. Artificial Intelligence A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

REFERENCES:

1. Artificial Intelligence, 3rd Edn., E. Rich and K. Knight(TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, PearsonEducation.
3. Artificial Intelligence, ShivaniGoel, PearsonEducation.
4. Artificial Intelligence and Expert systems – Patterson, PearsonEducation.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8AC07**	**Linear Control system**	**3**	**0**	**0**	**3**

Course Objective: Students learn about fundamental concepts of time and frequency domain analysis of a given system.

Course Outcomes: Students

1. Learn basic concepts of control systems.
2. Study about time response analysis.
3. Learn basic concepts of stability and root locus method.
4. Study about frequency response analysis.
5. Learn basic concepts stability analysis in frequency domain.
6. Learn fundamentals of state space analysis.

UNIT – I INTRODUCTION:

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

Transfer function representation:

Transfer Function of Synchro transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT-II TIME RESPONSE ANALYSIS:

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

UNIT – III STABILITY ANALYSIS IN S-DOMAIN:

The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability.

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

UNIT – IV FREQUENCY RESPONSE ANALYSIS:

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots.

UNIT – V STABILITY ANALYSIS IN FREQUENCY DOMAIN:

Polar Plots-Nyquist Plots-Stability Analysis.

CLASSICAL CONTROL DESIGN TECHNIQUES: Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain.

UNIT – VI STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS:

Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and its Properties.

TEXT BOOKS:

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

REFERENCES:

1. Modern Control Engineering – Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
2. Control Systems – N.K. Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998.
3. Control Systems Engg. – NISE 3rd Edition – John wiley.
4. "Modeling & Control of Dynamic Systems" – Narciso F. Macia George J. Thaler, Thomson Publishers.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C623**	**Analog and Mixed Signal Design (PE-II)**	**3**	**0**	**0**	**3**

Course Objectives:

This course will introduce design and analysis of mixed-signal integrated circuits. Apply principles of hierarchical mixed signal CMOS VLSI, from the transistor up to the system level, to the understanding of CMOS circuits and systems

Course Outcomes*: After studying this course, the students will be able to*

CO1	*Understand the concepts of Switched capacitors Circuits*
CO2	*know the concepts of PLLS*
CO3	*study concepts of Data Converter Fundamentals*
CO4	*Explore the concepts of Nyquist Rate A/D Converters and develop its applications*
CO5	*Understand concepts of the Oversampling Converters and Continuous-Time Filters*
CO6	*Understand concepts of concepts of Continuous-Time Filters, CMOS Trans conductors*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2	3	3	3	3	3				3			3	3	3	3
CO3															
CO4	3	3	3	3	3				3			3	3	3	3
CO5	3	3	3	3	3				3			3	3	3	3
C06	3	3	3	3	3				3			3	3	3	3
Overall	2	2	2	2	2				2			2	2	2	2

UNIT I

Switched Capacitor Circuits: Introduction to Switched Capacitor circuits basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing, Biquad filters.

UNIT II

Phased Lock Loop (PLL): Basic PLL topology, Dynamics of simple PLL, Charge pump PLLs Lock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs-PFD/CP non idealities, Jitter in PLLs, Delay locked loops, applications.

UNIT III

Data Converter Fundamentals: DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters.

UNIT IV

Nyquist Rate A/D Converters: Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time-interleaved converters.

UNIT V

Oversampling Converters: Noise shaping modulators, Decimating filters and Interpolating filters, Higher order modulators, Delta sigma modulators with multi-bit quantizers, Delta sigma D/A.

UNIT VI

Continuous-Time Filters: Introduction to Gm-C Filters, Bipolar Trans conductors, CMOS Trans conductors Using Triode and Active Transistors, Bi CMOS Tran conductors, MOSFET-C Filters.

Text Books:

1. Design of Analog CMOS Integrated Circuits- BehzadRazavi, TMH Edition, 2002

2. Analog Integrated Circuit Design- David A. Johns,Ken Martin, Wiley Student Edition, 2013

Reference Books:

1. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009.

2. CMOS Analog Circuit Design –Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C624**	**Embedded C Programming (PE-II)**	**3**	**0**	**0**	**3**

Course Objectives:

The objectives of this course are

- *To provide basic knowledge in embedded system design using Embedded C.*
- *To make the learners understand concept and applications of Embedded C Programming in various fields including industrial automation..*

Course Outcomes*: After studying this course, the students will be able to*

CO1	*Demonstrate the use of development software for a particular application and choosing appropriate OS.*
CO2	*Understanding and building basic embedded system using 8051.Understanding its design*
CO3	*Design of embedded systems and implementation of switch reading.*
CO4	*Demonstrate the concepts of OOP's theory inheritance and functions in embedded C to support modular programming.*
CO5	*Learning the need for realtime implementation in Embedded C..*
CO6	*Case study of 'Intruder Alarm" toachihve real time hands on.*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

Syllabus Content

UNIT – I:

Programming Embedded Systems in C

Introduction ,What is an embedded system, Which processor should you use, Which programming language should you use, Which operating system should you use, How do you develop embedded software, Conclusions

UNIT – II:

Introducing the 8051 Microcontroller Family

Introduction, What's in a name, The external interface of the Standard 8051, Reset requirements ,Clock frequency and performance, Memory issues, I/O pins, Timers, Interrupts, Serial interface, Power consumption ,Conclusions

UNIT – III:

Reading Switches

Introduction, Basic techniques for reading from port pins, Example: Reading and writing bytes, Example: Reading and writing bits (simple version), Example: Reading and writing bits (generic version), The need for pull-up resistors, Dealing with switch bounce, Example: Reading switch inputs (basic code), Example: Counting goats, Conclusions

UNIT – IV:

Adding Structure to the Code

Introduction, Object-oriented programming with C, The Project Header (MAIN.H), The Port Header (PORT.H), Example: Restructuring the 'Hello Embedded World' example, Example: Restructuring the goat-counting example, Further examples, Conclusions

UNIT – V:

Meeting Real-Time Constraints

Introduction, Creating 'hardware delays' using Timer 0 and Timer 1, Example: Generating a precise 50 ms delay, Example: Creating a portable hardware delay, Why not use Timer 2?, The need for 'timeout' mechanisms, Creating loop timeouts, Example: Testing loop timeouts, Example: A more reliable switch interface, Creating hardware timeouts, Example: Testing a hardware timeout, Conclusions

UNIT – VI:

Case Study: Intruder Alarm System

Introduction, The software architecture, Key software components used in this example, running the program, the software, Conclusions

TEXT BOOKS:

1. Embedded C - Michael J. Pont, 2nd Ed., Pearson Education, 2008

REFERENCE BOOKS:

1. PICmicro MCU C-An introduction to programming, The Microchip PIC in CCS C - Nigel Gardner

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C625**	**Transform Techniques (PE-II)**	**3**	**0**	**0**	**3**

Course Objectives

1. To learn basics of two-dimensional transform.
2. Understand the various two-dimensional transform definition, properties and applications.
3. Understand the design of filter Bank structure.
4. To learn the fundamentals of wavelet, transform and special wavelets.

Course Outcomes: On completion of this course student will be able to:

1. The student will learn basics of two-dimensional transforms.
2. Understand the definition, properties and applications of various two-dimensional transform.
3. Understand the basic concepts of wavelet transform.
4. Understand the special topics such as wavelet packets, Bi-orthogonal wavelets e.t.c.

UNIT –I

Review of Signals, classification of signals, Vector Analogy and Signal Analogy, Vector space, Hilbert spaces, Need of Transform techniques

UNIT -II

Fourier Analysis: Fourier basis, FT- Limitations of Fourier Analysis, Need for time-frequency analysis, DFT, 2D-DFT: Definition, Properties and Applications, IDFT, Hilbert Transform, STFT.

UNIT -III

Transforms: Walsh, Hadamard, Haar and Slant Transforms, DCT, DST, KLT, – definition, properties and applications

UNIT -IV

Continuous Wavelet Transform (CWT): Short comings of STFT, Need for wavelets, Wavelet Basis- Concept of Scale and its relation with frequency, Continuous time wavelet Transform Equation- Series Expansion using Wavelets- CWT- Tiling of time scale plane for CWT. Important Wavelets: Haar, Mexican Hat, Meyer, Shannon, Daubechies.

UNIT -V

Multi Rate Analysis and DWT: Need for Scaling function – Multi Resolution Analysis, Two-Channel Filter Banks, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet Basis, DWT, Structure of DWT Filter Banks, Daubechies Wavelet Function, Applications of DWT.

UNIT -VI

Special Topics: Wavelet Packet Transform, Multidimensional Wavelets, Bi-orthogonal basis- BSplines, Lifting Scheme of Wavelet Generation, Multi Wavelets

TEXT BOOKS:

1. Wavelet Transforms-Introduction theory and applications -RaghuveerM.Rao and Ajit S. Bopardikar, Pearson Edu, Asia, New Delhi, 2003.
2. “Insight into Wavelets from Theory to practice “, Soman. K. P, Ramachandran. K.I, Printice Hall India, First Edition, 2004.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C626**	**Software Defined Radio(PE-II)**	**3**	**0**	**0**	**3**

Course Objectives

1. This course describes the fundamental radio components and how these components are implemented in software.
2. The principles of software architecture to support the SDR will be developed. Policy and cooperation mechanisms that enable SDR to interoperate will be developed.
3. Basic principles of Cognitive Radio (CR) which is an extended form of SDR will be introduced.
4. In this course you will study SDR & CR and investigate their role in future communication systems.

Course Outcomes

Students who successfully complete this course will have

1. *An ability to make system-level decisions for software-defined radio technology and products*
2. *An ability to implement smart antenna algorithms*
3. *Knowledge of digital hardware architectures and understanding of development methods*
4. *An understanding of middleware in SDR*
5. *Understanding of analog RF components&Understand the basic principles of Cognitive Radio*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

UNIT I

Introduction to SDR

What is a Software Radio? The need for Software Radios, Characteristics and benefits of a Software Radio, Design principles of Software Radio

UNIT-II

Radio frequency implementation issues

The purpose of the RF Front-End, Dynamic range: The principal challenge of receiver design. RF receiver front-end topologies, Enhanced flexibility of the RF Chain with Software Radios, Importance of the components to overall performance, Transmitter architectures and their Issues, noise anddistortion in the RF Chain, ADC and DAC distortion

UNIT-III

Digital hardware choices

Key hardware elements, DSP Processors, Field Programmable Gate Arrays, Trade-offs in using DSPs, FPGAs and ASICs, Power management issues, Combination of DSPs, FPGAs, and ASICs.

UNIT-IV

Digital generation of signals

Comparison of direct digital synthesis with analog signal synthesis, Approaches to direct digital synthesis, Analysis of spurious signals, Spurious components due to periodic jitter, Band pass signal generation, Performance of direct digital synthesis systems, Hybrid DDS-PLL Systems, Applications of Direct Digital Synthesis, Generation of random sequences.

UNIT-V

Analog to digital and digital to analog conversion

Parameters of ideal data converters, Parameters of practical data converters, Techniques to improve data converter performance, Common ADC and DAC architectures

UNIT-VI

Introduction to Cognitive Radio

Motivation of Cognitive Radio, Dynamic Spectrum Access, User hierarchy in cognitive radio networks, Usage scenarios for cognitive radio, Cognitive Cycle, Spectrum Management: spectrum sensing, spectrum decision, spectrum mobility, spectrum sharing, Classification of spectrum sensing techniques..

Text Books:

1. J.H. Reed, '*Software-Radio, A Modern Approach to Radio Engineering* ', Prentice-Hall, 2002
2. EzioBiglieri, Andrea. J. Goldsmith, Larry J. Greenstein, Narayan B. Mandayam,H. Vincent Poor, '*Principles of Cognitive Radio'*, Cambridge University Press.

References:

1. Joseph Mitola*'Software Radio Architecture: Object-Oriented Approaches to Wireless Systems Engineering*' Wiley-Interscience; 1st edition2000
2. Yong Soo Cho,Jaekwon Kim, Won YoungYang, Chung G. Kang '*MIMO-OFDM Wireless Communications with MATLAB*' John Wiley & Sons (2010).
3. Mohamed Ibnkahla' Cooperative Cognitive Radio Networks, The Complete Spectrum Cycle', CRC Press.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C627**	**Artificial Neural Networks (PE-II)**	**3**	**0**	**0**	**3**

Course Objectives:

The objectives of this course are

- *To study the concepts of Artificail intelligence and computer vision and also the applications of Neural networks*

Course Outcomes*: After studying this course, the students will be able to*

CO1	*Understand the concepts of Artificial Intelligence*
CO2	*Illustrate the concepts of Artificial Neural system*
CO3	*I*llustrate *computer vision*
CO4	*Explain Probabilistic models and neural networks*
CO5	*Illustrate concept Neural language*
CO6	*Explain applications of Neural networks*

CO	**Artificial Neural Networks (**7C725 **)**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	*Understand the concepts of Artificial Intelligence*	3	2	2	2									3		
CO2	*Illustrate the concepts of Artificial Neural system*	2	2	3	2									3		
CO3	*I*llustrate *computer vision*	2	2	2	3								2	3		
CO4	*Explain Probabilistic models and neural networks*	2	2	2	2								2	3		
CO5	*Illustrate concept Neural language*	2	2	2	2								2	3		
CO6	*Explain applications of Neural networks*	2	2	3	3								2	3		
Overall PO mapping		2	2	2	3								2	3		

UNIT - I

Artificial Intelligence: Definition, Study of AI techniques, problems and Problems space, AI characteristics, Heuristics. Problem solving Methods: Forward and backward reasoning, problem trees, problem graph, hill climbing, search method, problem reduction, constraint satisfaction, means and analysis, game playing, mini max algorithms, alphabetic heuristics.

UNIT - II:

Introduction:

Introduction to ANS (Artificial Neural systems) Technology, ANS simulation, Types of Neural Networks: Hopfield, perceptron and related models, Adaline and Madaline: Adaline and the Adaptive Linear Combiner, the Madaline and simulating the Adaline. Essential vector operations, Lateral Inhibition and Sensory Processing.

UNIT - III

Computer Vision:

Perception, early processing, representation and recognition of scenes, Guzman‟s algorithms of spurting objects in a scene, Waltz algorithm.

UNIT - IV:

Probabilistic Models, Fuzzy ARTMAP and Recurrent Networks:-Probabilistic Neural Networks, General Regression Neural Networks, Fuzzy ARTMAP, Recurrent Back propagation Neural Networks, Hybrid Learning Neural Networks:-Counter propagation Network, Radial basis Function Networks.

UNIT - V

Neural Language understanding problems, syntactic analysis, semantic analysis, augmented transition networks.

UNIT - VI

Application of Neural Networks:- Design and optimization of Systems: Non-Linear optimization, Inverse design

problems, Pattern Recognition Applications: Control Chart pattern Recognition, Recognition of Machine-Cells in a group technology layout. Complex pattern Recognition tasks: Pattern mapping, Temporal patters, pattern variability, Neocognitron, Addition of lateral inhibition and Feedback to the Neocognitron.

SUGGESTED READING:

1. Elaine Rich, Artificial Intelligence, Mc Graw Hill, 1985. 2. Nilson, Principles of Artificial Intelligence. 3. Winston, The Psychology of Computer.
2. Nilson, Principles of Artificial Intelligence. 3. Winston, The Psychology of Computer.
3. James A. Freeman and David M. Skapura,Neural Networks; Algorithms Applications and Programming Techniques, Pearson Education, India,2008.
4. James A. Anderson ,An introduction to Neural Networks ,PHI,2003.
5. B.Yegnanarayana,Artificial Neural Networks, PHI Publications India,2006.
6. M.Ananda Rao and J.Srinivas, Neural Networks: Algorithms and Applications, Narosa Publications 2009.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C628**	**Satellite Communications(PE-II)**	**3**	**0**	**0**	**3**

Prerequisites: *MWOC*

Course objectives*:*

The course objectives of this course are

- *To introduce the working principles and various design aspects of satellite sub-systems.*
- *To get acquinted with the multiple access techniques and the working principle of GPS systems.*

Course Objectives*: After studying this course, the students will be able to*

CO1	*Demonstrate the orbital mechanics.*
CO2	*Design the satellite subsystem.*
CO3	*Estimate the C/N and able to measure the relevant values.*
CO4	*Evaluate the satellite link.*
CO5	*Recall Multiple access concepts and discuss earth station technology*
CO6	*Apply the knowledge of GPS in real time applications.*

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Over		3	3	3	3				2			3	3	3	3

all															

Syllabus Content

UNIT-I

INTRODUCTION

Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Kepler's laws of orbital motion. Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

ORBITAL MECHANICS AND LAUNCHERS

Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems' performance

UNIT-II

SATELLITE SUBSYSTEMS

Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification.

UNIT-III

SATELLITE LINK DESIGN

Basic transmission theory, system noise temperature and G/T ratio, Design of down link and up link.

UNIT-IV

MULTIPLE ACCESS

Frequency division multiple access (FDMA) Intermediation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, Examples. Satellite Switched TDMA. Onboard processing, DAMA, Code Division Multiple access (CDMA),Spread Spectrum transmission and reception.

Applications: Design of a Remote sensing satellite in IRS-4.

UNIT-V

EARTH STATION TECHNOLOGY

Introduction, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods.

Low Earth Orbit And Geo-Stationary Satellite Systems: Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations.

UNIT VI

SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM

Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS.

TEXT BOOKS

1. Timothy Pratt, Charles Bostian and Jeremy Allnutt, *Satellite Communications* – WSE, Wiley Publications, 2nd Edition, 2003.
2. Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, *Satellite Communications Engineering* –2nd Edition, Pearson Publications, 2003.

REFERENCES

1. M. Richharia, *Satellite Communications Design Principles* – BS Publications, 2nd Edition, 2003.
2. D.C Agarwal, *Satellite Communication* - Khanna Publications, 5th Ed.
3. 3K.N. Raja Rao, . *Fundamentals of Satellite Communications* – PHI, 2004
4. Dennis Roddy, *Satellite Communications* – McGraw Hill, 2nd Edition.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C678**	**Antenna Simulation Lab**	**0**	**0**	**4**	**2**

Prerequisites:

AWP, EMTL

Course Objectives:

The objectives of this lab is

- *To perform laboratory experiments on designing of various antennas and measure the performance parameters.*

Course Outcomes*: After studying this laboratory course, the students will be able to*

CO1	*Understand the design of dipole antenna for various frequencies.*
CO2	*Understand the design of monopole antenna for variation in radius of the wire*
CO3	*Design of Microstrip patch antenna in different shapes*
CO4	*Understand the design of standard horn antenna*
CO5	*Analyze the characteristics of yagi-uda antenna*
CO6	*Verify the radiation pattern of different types of antenna*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
CO6		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

Syllabus content:

1. Dipole antenna
2. Dipole antenna with lambda variation
3. Monopole antenna
4. Monopole antenna with wire radius variation
5. Microstrip rectangular patch antenna
6. Microstrip circular patch antenna
7. Horn antenna
8. Yagi-uda antenna
9. Radiation pattern measurement of dipole antenna
10. Radiation pattern measurement of patch antenna

11. Radiation pattern measurement of yagi-uda antenna
12. Radiation pattern of broad side antenna array
13. Radiation pattern of End fire antenna array

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8EC65**	**Computer Networks Lab**	**0**	**0**	**2**	**1**

Course Objectives:

To provide an understanding of the design concepts of framing Error Detection & correction, Routing, Congestion concepts and Network tools.

Course Outcomes:

At the end of this course, the student will be able to

1. Implement and analyze framing methods of data link layer.
2. Implement and analyze framing methods of data link layer.
3. Illustrate and implement error detection & correction techniques.
4. Implement different Routing Algorithm.
5. Understand basic Network Commands.
6. Use of Wireshark and NS-2 tools

Computer Networks Lab Exercises:

1. Implement the data link layer framing methods such as

   a) Character / Byte stuffing

   b) Bit stuffing.

2. Implement on a data set of characters the three CRC polynomials

   a) CRC 12

   b) CRC 16

   c) CRC CCITT.

3. Implement Hamming code for error detection and error correction

4. Implement Dijkstra's algorithm to compute the shortest path through a graph.

5. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table for each node using distance vector routing algorithm.

6. Implement Congestion control using Leaky-Bucket Algorithm

7. Execute the basic Networking Commands

   i. Arp ii. Hostname

   iii. ipconfig iv. ipconfig/all

   v. Ipconfig/renew vi. Ipconfig/release

   Vii. Ipconfig/flushdns viii. Pathping

ix. Ping x. Route

xi. tracert

Beyond Syllabus

1. Installation of NS-2

2. Demonstration of NS-2

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8CC79**	**Digital Signal Processing Lab**	**0**	**0**	**4**	**2**

Prerequisites:*SS,PTSP, Basic Simulation Lab*

Course Objectives*: After completing this course, the students will have demonstrated*

CO1	*To Understand the frequency response of a given systems*
CO2	*Design of FIR & Butterworth and chebyshev approximations and converting them to IIR filters*
CO3	*Transforming an analog filter to its digital equivalent*
CO4	*Sampling rate conversion Interpolation and decimation*
CO5	*An ability to use TMS320c6713 for different algorithms*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

Syllabus Content

Tools to be used: MATLAB, CC Studio, TMS320C6713

1. Impulse response of first order and second order systems.
2. Program to find frequency response of LP/HP filters (difference equation/ transfer function).
3. To find Circular convolution of given sequence with and without built in function.
4. To find the DFT/IDFT, FFT of given DT signals with and without built in functions.
5. To find Power Spectral Density of a sequence.
6. To implement IIR filter (LP/HP/BP)
   a) Butterworth filter
   b) Chebyshev Type-I and Type-II filters
7. To design FIR filter (LP/HP) using windowing technique
   a) Using rectangular window
   b) Using triangular window
   c) Using Kaiser Window
8. Down sampling and up sampling of given sequence by specified factor.
9. Conversion of Analog filter to Digital Filter.
   a) impulse invariant transformation

b) bilinear transformation

10. Generation of DTMF signals
11. Noise removal: Add noise above 3 KHz and then remove, interference suppression using 400 Hz tone.

The following experiments are to be implemented using CCS

1. Study the architecture of DSP chips-TMS 320C 5X/6X Instructions
2. To find Linear convolution of given sequence.
3. To find Circular convolution of given sequence
4. To find the DFT & FFT of given sequence
5. Generation of DTMF Signals
6. Implementation of Decimation Process & Interpolation Process.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C692**	**Group Project**	**0**	**0**	**2**	**1**

Pre-Requisites: All Courses till this semester

*After studying this course, the students will be able to***:**

i. use the concepts, in conceptualizing, designing and executing the modules of the projects.

ii. exhibit the interest in learning the modern tools and technologies.

iii. inculcate an enthusiasm to use the creative ideas to build the innovative projects

iv. improve communicative skills and team working skills

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
Overall		3	3	3	3				2			3	3	3	3

A group project shall be carried out by a group of students consisting of 2 to 3 in number in third year 2nd semester. This work shall be carried out under the guidance of the teacher and shall involve design, fabrication, software development or any other significant activity. This can be of interdisciplinary nature also.

There will be 100 marks in total with 30 marks of internal evaluation and 70 marks of external

The **internal evaluation** shall consist of:

Day to day work	:	15 marks
Report	:	05 marks
Demonstration / presentation	:	10 marks
		30 marks
End examination	:	70 Marks.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The end examination will be carried out by a committee consisting of an external examiner, head of the department, a senior faculty member and the supervisor.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8C668**	**Comprehensive Viva Voce**	**1**	**0**	**0**	**1**

Pre-Requisites: All Courses till this semester

*On completion**:***

1. Comprehend the concepts in the core and elective courses.
2. Exhibit technical knowledge to face interviews.
3. Exhibit lifelong Learning skills for higher education and to pursue Professional practice.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3									3		3	1		3
CO2	3									3		3	1		3
CO3	3									3		3	1		3
Overall	3									3		3	1		3

Comprehensive Viva Voce will be conducted in second year second semester for 100 marks. Out of 100 marks 30 marks are evaluated internally and 70 marks for external evaluation.

Internal:

Comprehensive Viva Voce is conducted twice in a semester and evaluated for 30 marks each and average will be considered for internal.

Internal Examination : 30 Marks
End examination : 70 Marks.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The end examination will be carried out by a committee consisting of an external examiner, head of the department, and subject experts.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II		**Summer Industry Internship - II: Evaluation will be done along with 4-1 courses**				

Course Objective:

The students undergo industrial training so that he/she become industry-ready.

Course Outcomes:

At the end of the training, the student is able to

1. Select the real-time problem in the industry.
2. Analyze the requirements with respect to the problem statement
3. Design the optimal solution for the problem.
4. Implement the solution using the appropriate modern tools.
5. Present and submit the report

Mapping of Course Outcomes with Program Outcomes

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3							3	3	3	3	2		3
CO2	3	3		3					3	3	3	3	3		3
CO3	3	3	3	3					3	3	3	3	3		3
CO4	3	3			3				3	3	3	3	3	3	3
CO5									3	3	3	3			3
Overall		3	1	1	1				3	3	3	3	3	1	3

Student shall carryout the project in industry during summer vacation for 3-6 weeks. There is internal and external Evaluation. Internal Evaluation carries 30 marks and external Evaluation carries 70 marks, Total 100 marks. Evaluation is carried out in B.Tech IV year I semester (7^{th} Semester).

IV– I

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C714**	**Internet of Things and Applications**	**2**	**1**	**0**	**3**

Course Objectives: The student will learn about

1. *Terminology, technology and applications of IoT*
2. *Sensors and Actuators required to build an IoT system*
3. *Necessary Wireless Networks and protocols*
4. *Raspberry PI3 as a hardware platform for IoT sensor interfacing and*
5. *Various IoT application as case studies*

Course Outcomes: After completing this course, student shall be able to

1. *Build a simple IoT System for a given application*
2. *Describe and utilize necessary protocols for communication and management of an IoT system*
3. *Design, Develop and Illustrate IoT applications using Raspberry PI platform and Python Scripting*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	2	3				3			2	2	3	2
CO2	1	2	3	2	3				3			2	2	3	2
CO3	1	2	3	2	3				3			2	2	3	2
Overall	1	2	3	2	3				3			2	2	3	2

Unit – 1- Introduction to IoT

Part A - Introduction

IoT terms and basic definitions, IoT vs M2M, Characteristics of IoT, IoT Eco-System, IoT applications and marketplace and IoT Reference Model

Part B – Sensor and Actuators

Introduction to transducers, sensors and actuators, Sensor – classification and types, Actuators – Classification and types.

Unit 2–Embedded Platform for IoT – Rpi 3

Embedded Platform brief introduction - Ardiuno, Raspberry Pi 3 and Intel Galileo

RPI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

Unit 3 – IoT Wireless Networks

Introduction to WSN and its architecture – Network topologies, Issues, Challenges and Security, WSN Technologies and its application - WiFi, Bluetooth, Zigbee, LoRa.

Unit 4 – IoT Protocol
Characteristics and Architecture of MQTT, XMP, DDS, AMQP, COAP and REST and their comparison

Unit 5 - IoT Design Methodology
Process and requirement, Level Specification, Domain model and service specification, IoT application Development

Unit 6: Case Studies Illustrating IoT Application
Home Automation – Smart Lighting, Home intrusion detection, Cities – Smart parking, Environment – Weather monitoring system, Weather reporting bot, Air pollution monitoring, Forest fire detection, Agriculture – Smart irrigation,

Text Books

1. Internet of Things, Author(s): Srinivasa K.G. | Siddesh G.M. | HanumanthaRaju R, ISBN: 9789386858955, Cengage Publications, 2018
2. Internet of Things A Hands on Approach by ArshdeepBahga, Vijay Madisetti Publisher Universities Press. ISBN – 978 81 7371 954 7

Reference books

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1 st Edition, Academic Press, 2014.
2. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI
3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
4. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118- 47347-4, Willy Publications

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C715**	**Advanced Communications and Networks**	**3**	**0**	**0**	**3**

Prerequisites: Signals and Systems, Communication Theory or equivalent

After studying this course, the students will be able to

1. Describe and determine.
2. Describe.
3. Describes.
4. Describes.
5. Describes.
6. Describe and.

Unit-I:

Spread Spectrum Communications:–Spreading sequences- Properties of Spreading Sequences,Pseudo- noise sequence, Gold sequences, Kasami sequences, Walsh Sequences, Orthogonal Variable Spreading Factor Sequences, Barker Sequence, Complementary Codes

Digital Modulation DQPSK ,8PSK, 16PSK, 8QAM, 16QAM,

Direct sequence spread spectrum:

DS-CDMA Model, Conventional receiver, Rake Receiver ,Synchronization in CDMA, Power Control, Soft handoff, Multiuser detection – Optimum multiuser,detector, Liner multiuser detection.

Unit-II:

Wireless Networking: Introduction, Differences between wireless and fixed telephone networks,Development of wireless networks, Traffic routing in wireless networks, Wireless data services, Common channel signalling, ISDN, SS7.
Applications: Ethernet

Unit-III

Mobile IP And Wireless Access Protocol: Mobile IP: IP Packet Delivery, Agent Discovery, Tunneling And Encapsulation, IPV6-Network Layer In The Internet- Mobile IP Session Initiation Protocol WAP Architecture-overview, WML scripts, WAP service, WAP session protocol, Wireless transaction, Wireless datagram protocol.

Unit-IV:.
Wireless LANs: Introduction, Fundamentals of WLANs, Network Architecture, IEEE802.11standards, WiFi Protocols – 802.11b, 802.11g, 802.11a, 802.11n, 802.11ac; Frequency allocation - 802.11b, 802.11g, 802.11a; Modulation and coding schemes - 802.11b, 802.11g, 802.11a, 802.11n; Security, Hot spots, Virtual private networks, HIPERLAN standard.

Unit-V:

Wireless PANs/IEEE 802.15x: Introduction to IEEE 802.15x Technologies: Wireless PAN Applications and Architecture, IEEE 802.15.1 Physical Layer Details, Bluetooth Link Controllers Basics, Bluetooth Link.

Broad Band Wireless MANs/IEEE 802.16x: Introduction to WMAN/IEEE 802.16x Technology, IEEE 802.16Wireless MANs, IEEE 802.16 MAC Layer Details

Unit-VI: Orthogonal Frequency Division Multiplexing and MIMO System

Basic Principles of Orthogonality, Single vs Multicarrier Systems, OFDM Block Diagram and Its Explanation, FDM Signal Mathematical Representation, Selection parameter for ModulationPulse shaping in OFDM, Space Diversityand System,MIMO Based System Architecture, Long-Term Evolution:, LTE Architecture, Enhanced Node B, Core network, Radio channel components, TD-LTE,VoLTE.

TEXT BOOKS:

1. Data Communication and Computer Networking - B. A.Forouzan, 3rd ed., 2008, TMH.
2. Advanced Electronic Communication Systems - W. Tomasi, 5 ed., 2008, PEI.

3.Wireless Communications by S.Rappaport.
4.Wireless Networks by Clint Smith and Daniel Collins

REFERENCES:

1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
2. Data and Computer Communications - William Stallings, 8th ed., 2007, PHI.
3. Data Communication and Tele Processing Systems - T. Housely, 2nd Edition, 2008, BSP.
4. Data Communications and Computer Networks- Brijendra Singh, 2nd ed., 2005, PHI.

5.Telecommunication System Engineering – Roger L. Freeman, 4/ed., Wiley-Interscience, John Wiley & Sons, 2004.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C716**	**Intellectual Property Rights**	**1**	**0**	**0**	**1**

Course Objective:

This course is intended to impart awareness on intellectual property rights and various regulatory issues related to IPR

Course Outcomes:

CO1	Demonstrate a breadth of knowledge in Intellectual property
CO2	Overview of Patents, Searching ,filling and drafting of Patents
CO3	Overview of copyright & GI .
CO4	Overview of Trade Mark & Trade Secret,
CO5	Overview of Integrated Circuit and Industrial Design.
CO6	Knowledge about different national and international : Conventions and Treaties Governing the IPRs

CO	**Intellectual Property Rights(6GC49)**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	Demonstrate a breadth of knowledge in Intellectual property						3		3							
CO2	Overview of Patents, Searching ,filling and drafting of Patents						3									
CO3	Overview of copyright & GI .						2		3							
CO4	Overview of Trade Mark & Trade Secret,						3		3							
CO5	Overview of Integrated Circuit and Industrial Design						3		3							
CO6	Knowledge about different national and international : Conventions and Treaties Governing the IPRs						3		2							
CO	Overall						3		3							

Unit I: Introduction to IPR: Discovery, Invention, Creativity, Innovation, History & Significance of IPR, Overview of IPR -Patent, Copyright, Trade Mark, Trade Secret , GI, Industrial Design & Integrated Circuit, Non-patentable criteria

Unit II: Patents: Patents- Patentability Criteria, Types of Patents-Process, Product & Utility Models, Software Patenting and protection, Patent infringement- Case studies- Apple Vs Samsung, Enfish LLC Vs Microsoft, Overview of Patent search-Types of Searching, Public & Private Searching Databases, Basics of Patent Filing & Drafting, Indian Patents Law

Unit III: Copyrights and Geographical Indications: Types of Copyrights, Procedure for filing, copyright infringement, Copyright Law, Geographical Indications -Tirupati Laddu , Darjeeling Tea, Basmati rice

Unit IV: Trademark and Trade secrets: Trade Marks –Commercial importance, protection, registration, Case Studies- Sabena and Subena, Castrol Vs Pentagon, Trade Secrets- Case Studies- Kentucky Fried Chicken (KFC), Coca-Cola

Unit V: Protection of Industrial Designs & Integrated Circuits: Industrial Designs – Scope, protection, filing, infringement; Integrated Circuits & Layout design, Semiconductors, Unfair competition, Designs Act.

Unit VI: International Conventions & Treaties: Overview of WTO, GATT, TRIPS, WIPO, Berne Convention, Rome convention, Paris Convention, Patent Cooperation Treaty (PCT), Madrid Protocol, Budapest Treaty, Hague agreement

Text Book:

1. Deborah E. Bouchoux, Intellectual Property for Paralegals – The law of Trademarks, Copyrights, Patents & Trade secrets, 3rd Edition, Cengage learning, 2012
2. N.S. Gopalakrishnan & T.G. Agitha, Principles of Intellectual Property, Eastern Book Company, Lucknow, 2009.

References

1. M. M. S. Karki , Intellectual Property Rights: Basic Concepts, Atlantic Publishers, 2009
2. Neeraj Pandey & Khushdeep Dharni, Intellectual Property Rights, Phi Learning Pvt. Ltd
3. Ajit Parulekar and Sarita D' Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd, 2006.
4. B. L. Wadehra. Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd., India 2000.
5. P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi, 2010.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C729**	**VLSI Physical Design (PE-III)**	**3**	**0**	**0**	**3**

This course is introduced to help VLSI career aspirants in the field of VLSI Physical Design. It coverscomplete details from VLSI design specification till VLSI IC physical design flow, helps to acquiresufficient skills as needed by Industry.
Course modules cover industry needed in depth knowledge to handle challenges in VLSI Back EndFlow. Students will learn complete knowledge from netlist to GDS2, by working on advancedlower nanometer technology nodes.
The course will benefit VLSI Engineers seeking to enter into VLSI backend design job. In this role engineers will be working for Block & full chip level Physical Design Implementation.
The main focus of the course is to make students understand physical design of IC from netlistthrough GDSII, creating physical layout representation for each logical functions within blocks toenable IC fabrication process. Through this course emphasis will be given on learning throughpractical backed by theoretical concepts taught during class room & extended lab sessions.

Prerequisite Courses - Digital Logic Design, VLSI and Digital Design Through Verilog

CAD Tool - Cadence - Innovus, Tempus, Genus, Xcelium, and Others..

Units 1 - Introduction

Overview of ASIC/SOC design flow, Digital Design Concepts and Physical Design flow setup. Review of ASIC fundamentals & fabrication methodologies. Design Strategies - a) Simulation and synthesis issues, b) RTL design strategies, c) Static timing analysis.

Units 2 - Design Standard Cell Libraries

Design of combinational circuits, Implementation and analysis of combinational circuits like, adders, comparator, multiplier etc., Design of sequential circuits (Synchronous and Asynchronus), Design of Finite State Machines (FSM).
Design data preparation, process technologies and standard cell libraries. Understanding of standard cell technology parameters, netlist generation and technology mapping. Reviewing timing constraints and IO constraints. Low power and low area design concepts
Exercises on Cadence Tool - Writing RTL for ASIC design flow, Understand ASIC Design Flow with 4-bit Counter Design

Units 3 - Static Timing Analysis

Introduction to STA, Comparison with DTA, Timing Path and Constraints, Different types of clocks,
Clock domain and Variations, Clock Distribution Networks, How to fix timing failure, Introductions
to timing static and dynamic hazards, Path delay, Gate delay, Metastability states, Sequential

timing delays like set-up time, hold time, Maximum frequency, violations, slew, slack, Delay

analysis, Sequential logic pad to set up, pad to pad, clk to next Reg, Reg to o/p and Reg to Reg. violations wrt sequential circuit.

Units 4 - Design Floor Planning - Power Planning

Design plan for hierarchical and flat design implementation, better partition techniques and flowsetup. Special cells and IO cells usage planning, congestion removal techniques and implementation constraint setup. Understanding various floor planning techniques, setting up guidelines for better floor planning and meeting design goals. IO PAD placement planning, powerplanning. Adding power rings and power mesh.

Units 5 - Clock Tree Synthesis and Routing

Implementation of clock tree in placed design, understanding various aspects of timing parameters like clock setup/hold, skew and latency issues, Adding buffers in clock tree and implementing clock tree. Analyzing timing reports after clock tree synthesis and fixing issues. Various types of routing, trial route, special route, global routing and detailed routing. Analyzing routed design checking post routed design issues, DRC checks, timing checks, optimization of routing constraints

Units 6 - Design Checks and Signoff

Doing complete path and module based timing analysis, checking timing optimizer reports, identifying failing paths, fixing issues. Extracting capacitor table values for the design. IR drop andelectro migration analysis. Perform DRC, Logical Equivalence checking, generating detailed timing/power reports, generating power reports. GDS-II generation.

Books

Physical Design Essentials: An ASIC Design Implementation Perspective by *Khosrow Golshan*, ISBN 0-387-36642-3

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C730**	**Embedded System Design using ARM(PE-III)**	**3**	**0**	**0**	**3**

On completion of this course you should be able to:

1. Understand the basic architecture of Embedded System and their classification.
2. Explore the architecture of ARM processor.
3. Understand the addressing modes and data processing instructions of ARM processor.
4. Understand the ARM thumb instruction set and its capabilities.
5. Use both assembly and C language based ARM programming and Explore the memory management techniques in ARM.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

UNIT-I

Introduction to embedded system:

Embedded system architecture, classifications of embedded systems, challenges and design issues in embedded systems, fundamentals of embedded processor and microcontrollers, CISC vs. RISC, fundamentals of VonNeuman/Harvard architectures, types of microcontrollers, selection of microcontrollers.

UNIT –II:

ARM Architecture:

ARM Design Philosophy, Registers, Program Status Register, Instruction Pipeline, Interrupts and Vector Table, Architecture Revision, ARM Processor Families.

UNIT –III:

ARM Programming Model – I:

Instruction Set: Data Processing Instructions, Addressing Modes, Branch, Load, Store Instructions, PSR Instructions, Conditional Instructions.

UNIT –IV:

ARM Programming Model – II:

Thumb Instruction Set: Register Usage, Other Branch Instructions, Data Processing Instructions, Single-Register and Multi Register Load-Store Instructions, Stack, Software Interrupt Instructions

UNIT –V:

ARM Programming:

Simple C Programs usingFunction Calls, Pointers, Structures, Integer and Floating Point Arithmetic, Assembly Code using Instruction Scheduling, Register Allocation, ConditionalExecution and Loops.

UNIT –VI:

Memory Management:

Cache Architecture, Polices, Flushing and Caches, MMU, Page Tables, Translation, Access Permissions, Context Switch.

TEXT BOOKS:

1. ARM Systems Developer's Guides- Designing & Optimizing System Software – Andrew N. Sloss, Dominic Symes, Chris Wright, 2008, Elsevier.

REFERENCE BOOKS:

Embedded Microcomputer Systems, Real Time Interfacing – Jonathan W. Valvano – Brookes / Cole, 1999, Thomas Learning.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C731**	**DSP Processors and Architectures(PE-III)**	**3**	**0**	**0**	**3**

Course Objectives:

The objectives of this course are

- To study the architecture of Digital Signal Processors and Interfacing of processor to I/O devices

Course Outcomes: After studying this course, the students will be able to

CO1	Understand the concepts of DFT,FFT digital filters
CO2	Illustrate the concepts of Computational Accuracy in DSP Implementations
CO3	Explain the Architectures for Programmable DSP Devices:
CO4	Explain Programmable Digital Signal Processors
CO5	Distinguish Analog Devices Family of DSP Devices .
CO6	Illustrate Interfacing Memory and I/O Peripherals to Programmable DSP Devices

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3		3				3			3	2	3	3
CO2	3	3	3	3	3				3			3	3	3	3
CO3															
CO4	3	3	3	3	3				3			3	3	3	3
CO5															
CO6															
Overall	2	2	2	2	2				2			2	2	2	2

UNIT I

Introduction to DSP Processors: Differences between DSP and other μp architectures, their comparison and need for special ASPs, RISC & CISC CPUs .

UNIT II

Overview of DSP processor design: fixed point DSPs– Architecture of TMS 320C 5X, C54X Processors , addressing modes, Assembly instructions, Pipelining and on-chip peripherals. Floating point DSPs: Architecture of TMS 320 – IX.

UNIT III

Data formats, F.P. operations, addressing modes, instructions, pipelining and peripherals.

UNIT IV

DSP interfacing & software development tools: I/O interfacing with A/D converters, PCs, Dual port RAMS, EPGAs,

UNIT V

DSP tools – Assembler, debugger, c-compiler, linker, editor, code composer studio.

UNIT VI

Applications using DSPs adaptive filtering, spectrum analysis, Echo cancellation modems, voice synthesis and recognition. Brief ideas of AD, Motorola DSP CPUs and their comparison with TI CPU S.

SUGGESTED READING:

1. C. Marren& G. Ewess, "A Simple Approach to Digital Signal Processing", WILEY Inter-science, 1996.
2. K. Shin, "DSP Applications with TMS 320 Family", Prentice Hall, 1987.
3. B. Ventakaramani, M. Bhaskar, "Digital Signal Processes, Architecture Processing and Applications", Tata Mc Graw Hill, 2002.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C732**	**Ad hoc and Wireless Sensor Networks(PE-III)**	**3**	**0**	**0**	**3**

Pre-requisites:

Probability & Stochastic process, Cellular mobile Communications

Course Objectives**:**

This course is intended to impart to the students the principlesof

1. To study about the basics of wireless networks
2. To understand the challenges in wired vs. wireless domain in computer networks.
3. To study about various types of wireless networks, i.e cellular networks, Bluetooth, Ad hoc networks and wireless sensor networks.
4. To study about various network security attacks and key management.

Course Outcome:

Upon completion of this module, students will be able to:

1. Understand the under lying technologies of wireless networks.
2. Specify and identify deficiencies in existing wireless protocols for MAC layer and Network layer, and then go onto formulate new and better protocols.
3. Understand the technology behind the cellular network, installation of base station, Bluetooth etc.
4. To master the concepts of ad hoc networks and the design / performance issues in wireless local area networks and wide area networks.
5. To be familiar with contemporary issues in networking technologies.

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3

Overall		3	3	3	3				2			3	3	3	3

UNIT 1: Ad Hoc Wireless Networks: Introduction, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet.

UNIT 2: MAC Protocols for Ad Hoc Wireless Networks: Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols. Contention-based protocols.

UNIT 3: Routing Protocols for Ad Hoc Wireless Networks: Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, DSDV, DSR, AODV and ZRP. Differences between Table-driven and On-demand routing protocols.

UNIT 4: Multi-cast routing in Ad Hoc Wireless Networks: Issues in Designing a Multicast Routing Protocol, Classifications of Multicast Routing Protocols, MAODV, ODMRP, Differences between Tree- and Mesh-based protocols.

UNIT 5:
Transport layer in Ad Hoc Wireless Networks: Introduction, Issues in Designing a Transport layer protocol, why does TCP not perform well in Ad-hoc wireless networks.
Security in Ad Hoc Wireless Networks: Introduction, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management.
QoS in Ad-hoc Wireless Networks: Introduction, Issues and challenges in providing QoS in Ad-hoc wireless networks, classifications of QoS solutions.

UNIT 6: 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 – DLL solutions. Transmission Power Management Schemes – DLL solutions, Network layer solutions, Higher layer solutions.

Text Books:

1. C. S. Ram Murthy, B. S. Manoj, *Ad Hoc Wireless Networks: Architectures and Protocols*, Prentice Hall of India , 2nd Edition, 2005
2. RaminHekmat, *Ad-hoc Networks: Fundamental Properties and Network Topologies*, Springer , 1st Edition, 2006
3. C. Siva Ram Murthy and B. S. Manoj, Ad hoc Wireless Networks Architecture and Protocols, 2nd edition, Pearson Edition, 2007.
4. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000.

References:

1. C. S. Ram Murthy, B. S. Manoj, *Ad Hoc Wireless Networks: Architectures and Protocols*, Prentice Hall of India , 2nd Edition, 2005

2. RaminHekmat, *Ad-hoc Networks: Fundamental Properties and Network Topologies*, Springer, 1st Edition, 2006.
3. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobile ad-hoc networking, Wiley-IEEE press, 2004.
4. Mohammad Ilyas, The handbook of ad-hoc wireless networks, CRC press, 2002.
5. T. Camp, J. Boleng, and V. Davies " A Survey of Mobility Models for Ad-hoc Network" Research, "Wireless Commun, and Mobile Comp. Special Issue on Mobile Ad-hoc Networking Research, Trends and Applications, Vol. 2, no. 5, 2002, pp. 483 – 502.
6. A survey of integrating IP mobility protocols and Mobile Ad-hoc networks, Fekri M. bduljalil and Shrikant K. Bodhe, IEEE communication Survey and tutorials, no: 12007.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C733**	**Computer Vision (PE-III)**	**3**	**0**	**0**	**3**

Prerequisites: Signals & Systems, Linear Algebra, Basics of Probability

Objectives:
Computer Vision focuses on development of algorithms and techniques to analyze and interpret the visible world around us. This requires understanding of the fundamental concepts related to multi-dimensional signal processing, feature extraction, pattern analysis visual geometric modeling, stochastic optimization etc. Knowledge of these concepts is necessary in this field, to explore and contribute to research and further developments in the field of computer vision. Applications range from Biometrics, Medical diagnosis, document processing, mining of visual content, to surveillance, advanced rendering etc.

Upon completion of this course, students should be able to:
1. Recognize and describe both the theoretical and practical aspects of computing with images. Connect issues from Computer Vision to Human Vision
2. Describe the foundation of image formation and image analysis. Understand the basics of 2D and 3D Computer Vision.
3. Become familiar with the major technical approaches involved in computer vision. Describe various methods used for registration, alignment, and matching in images.
4. Get an exposure to advanced concepts leading to object categorization and segmentation in images.
    1. Build computer vision applications.

Course Outcomes: At the end of the course the student will be able to:
CO1 -Development of algorithms and techniques to analyze and interpret the visible world.
CO2 -Apply feature extraction methods for computer processing.
CO3 -Implement pattern recognition algorithms for real world problems CO4 Design of face detectionand recognition algorithms

Detailed Syllabus:
Unit -I
Digital Image Formation and Low-level processing: Overview and State-of-the-art,Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective,etc; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, HistogramProcessing.

Unit-II
Depth estimation and Multi-camera views: Perspective, Binocular Stereopsis: Camera andEpipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstructionframework; Auto-calibration.

Unit -III

Feature Extraction : Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-SpaceAnalysis- Image Pyramids and Gaussian derivative , Gabor Filters and DWT.

Unit -IV

Image Segmentation: Region Growing, Edge Based approaches to segmentation, Graph-Cut,Mean-Shift, MRFs, Texture Segmentation; Object detection.

Unit -V

Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification:Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN.

Unit -VI

Motion Analysis: Background Subtraction and Modeling, Optical Flow, KLT, Spatio-TemporalAnalysis, Dynamic Stereo; Motion parameter estimation.
Use Cases on Finger print recognition, Face detection and recognition, medical Diagnosis etc

Text Book(s):

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
2. D. A. Forsyth, J. Ponce, Computer Vision: A Modern Approach, PHI Learning 2009.
3. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Pearson Education.

Reference(s):

1. Shah M., Fundamentals of Computer Vision, 1997.
2. Szeliski R., Computer Vision: Algorithms and Applications, Springer, 2011.
3. Forsyth D. & Ponce J., Computer Vision - A Modern Approach, Prentice Hall, 2002.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C734**	**Radar Systems (PE-III)**	**3**	**0**	**0**	**3**

Prerequisites: *MWE*

Course Objectives*:*

The objectives of this course are

- *Be acquainted with the principle and working of various types of Radar Systems.*
- *To study the principles of phased arrays.*

Course Outcomes*: After studying this course, the students will be able to*

CO1	*Recognise the basics of Radar systems and its applications and its frequencies (Understand)*
CO2	*Differentiate the Radar parameters, how it affects the Range measurement. (Analyse)*
CO3	*Recall the Doppler Effect, and draw backs of CW radars. (Remember)*
CO4	*Discuss the basic concepts of Moving target indicators and evaluate the draw backs of MTI Radars.(Understand)*
CO5	*Differentiate concept of scanning and tracking. (Analyse)*
CO6	*Understand various types of displays and different phased arrays*.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

SYLLABUS CONTENT

Unit-I

Nature of Radar, Maximum Range, Radar equation. Block diagram. Radar frequencies and applications. Prediction of Range performance. MDS, Rx Noise, Modified range equation. Related problems.

Unit-II

SNR

Envelope Detectors. Integration of Radar Pulses. RCS of Targets (simple targets-sphere, cone-sphere. PRF and Range Ambiguities. System losses.

Unit-III

CW AND FMCW RADAR:

Doppler Effect. CW Radar, Block diagram, Applications of CW Radar. Rx bandwidth requirements. FM CW Radar, Block diagram and characteristics. FM- CW Altimeter.

UNIT-IV

MTI RADAR

Block diagram of MTI Radar with Power Amplifier and Power Oscillators. Non Coherent MTI Radar. Delay line Cancellers. Double Cancellation. Blind Speeds. Filter Characteristics, Limitations to MTI performance. MTI vs Pulse Doppler Radar. Staggered PRF, Range gated Doppler Filters.

UNIT – V

TRACKING RADARS

Tracking Radars: Sequential lobing. Conical Scan. Mono Pulse tracking Radars. Phase Comparison Mono Pulse.

Matched filter Receiver: MFR Response Characteristics & derivation. Correlation Functions & Cross Correlation Receiver, Efficiency of Matched Filter, Matched Filter with Non White Noise.

UNIT – VI

RADAR RECEIVERS

Noise Figure & Noise Temperature, Radar Displays, Types of Duplexers.

Phased arrays: basic concepts, Beam steering and beam width changes. Series Vs parallel feeds. Applications, Advantages & limitations. ECCM.

TEXT BOOKS

1. Merrill I. Skolnik, *Introduction to Radar Systems,*McGraw-Hill, 2nd Edition, 1981.

REFERENCES

1. Merrill I.Skolnik,*Introduction to Radar systems,McGraw-Hill,3rd* Edition ,2001.
2. Byron Edde, *Radar Principles,Technology,Applications.* Pearson Edition, 2004.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C735**	**Design Verification using System Verilog (PE-IV)**	**3**	**0**	**0**	**3**

Course Description:

This course gives a student an in-depth introduction to the main SystemVerilog enhancements to the Verilog hardware description language (HDL), discusses the benefits of the new features, and demonstrates how design and verification can be more efficient and effective when using SystemVerilog constructs.

The course is broken down into two modules: The Design module examines improvements for RTL design and synthesis; the Verification module explores verification enhancements such as object-oriented design, assertions and randomization.

Prerequisites:

- A working knowledge of Verilog HDL
- The ability to navigate a file system and use a text editor
- A basic understanding of digital hardware design and verification

Course Outcomes

CO1	*Understand the UVM concepts*
CO2	*Explore the class instances and functions*
CO3	*Comprehend the UVM Configurations*
CO4	*Analyzing UVM sequences and Modeling in UVM*
CO5	*Developing Reusable Test benches using UVM and Analyzing the Case studies of Layered test bench for SPI, APB and AXI.*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

Syllabus Contents:

Unit-1 : Introduction to Functional Verification: What is Verification?, What do we verify?, Verification Abstractions, Behavioral level, Transaction level, Functional / RTL level, Gate level, Transaction level; Importance of (Functional) Verification in Chip design life cycle, Verification goals; Overview of various Functional Verification techniques: Simulations, FPGA Prototyping, Emulation, HW/SW Co-verification, Formal Verification, Semiformal Verification, Models of Functional

Verification. Black box, White box, Gray box, Verification Hierarchy: Chip-level, Cluster / Subsystem level, IP level, Module / Unit level.

Unit- 2 : Overview of SoC Architectures and Functional Verification Environment: What is an SoC ?, Advantages of SoCs over conventional ASICs?, Typical components of an SoCs, Sample SoC Architectures, Typical SoC based Testbench environment , Stimuli Generators, Hard coded, Direct Stimuli from the environment, Stimuli from the model of the environment (BFMs), Random Stimuli Generation; Predictors: Golden/Reference Model, More Abstract (Functional, Transaction Level), Hardwired response, Response database; Transactors, Monitors , Scoreboards , Coverage Collectors - Coverpoints, Property Checkers - Assertions.

Unit-3 :SystemVerilog Language Concepts: Evolution of SystemVerilog : Differences between Verilog and System Verilog HDL, New features added in System Verilog (New Data type additions, Arrays - Fixed, Packed, Dynamic, Queues, Associated, Structures & Unions, New Operators, New additions to Subroutines, New additions to Procedural statements & Control flow, Concurrency: Fork.join, Fork..join_any, Fork..join_none, Automatic Variables, Interfaces, Program block);

Unit-4 : Object Oriented Programming Concepts-I: Classes : Encapsulating properties & methods, Object memory creation, Working with Object handles, Object copying : Shallow and Deep copy, Object cloning, Object protection, Object variables Vs Class variables: Static keyword, Object Randomization, Randomization Seed - A deep look, Randomization variables, Constraint Block, Weighted Randomization, Controlling Randomization, Solve order, Inline Constraints - with constraints, Object Inheritance, Limitations of Inheritance, Polymorphism and Methods overriding ,

Unit-5: Object Oriented Programming Concepts-II: Virtual Interfaces, Inter thread Synchronization & Communication: Events, Semaphores, Mailboxes, Packages, Assertions, Immediate assertions, Procedural assertions, Temporal operators, Boolean operators, Sequences, Properties, Functional Coverage: Cover points & Bins, Covergroups, Cross coverage, Sampling coverpoints, Calculating functional coverage, Interfacing with C - DPI, Compiler Directives.

Unit-6 : Advanced Testbench Design using SystemVerilog: Introduction to Layered testbench, architecture, Driver, Monitor, Transactor, Generator, Configurations - Device, Transaction, Scoreboard, Reference models, Bus function models.

Textbooks:

1. SystemVerilogFor Verification: A Guide to Learning the Testbench Language Features *by Chris Spear & Greg Tumbush (3rd Edition/5th Edition).*
2. A Practical Guide ForSystemVerilog Assertions by SrikanthVijayaraghavan& MeyyappanRamanathan.

Reference Books:

1. A Practical Guide ForSystemVerilog Assertions by SrikanthVijayaraghavan& MeyyappanRamanathan.
2. Logic Design and verification using System Verilog by Donald Thomas

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C736**	**Embedded Real Time Operating Systems (PE-IV)**	**3**	**0**	**0**	**3**

***Course outcomes**:*

1. Understand the Basic concepts of UNIX operating Systems and files, commands usage.

2.Understand the Real time Systems concepts and classification of Real time systems.

3. Design concepts of scheduling algorithms and its applications.

4. Understand the Interprocess communications and its applications in Real time systems.

5. Understand the Exceptional handling andInterrupts and Timers

6. Understand the case study of RTOS.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
CO6		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

UNIT – I

Introduction: Introduction to UNIX/LINUX, Overview of Commands, File I/O,(open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec).

UNIT - II

Real Time Operating Systems: Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, Tasks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use.

Unit III: Scheduling

Commonly used Approaches to Real Time Scheduling Clock Driven, Weighted Round Robin, Priority Driven, Dynamic Vs State Systems, Effective release time and Dead lines, Offline Vs Online Scheduling.

UNIT - IV

Inter-process Communication

Inter-process Communication and Synchronization of Processes, Tasks and Threads- Multiple Process. Problem of Sharing data by multiple tasks & routines, Inter-process communication

UNIT - V

Exceptions, Interrupts and Timers: Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

UNIT - VI

Case Studies of RTOS: RT Linux, Micro C/OS-II, Vx Works, Embedded Linux, and Tiny OS.

TEXT BOOK:

1. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2nd ed., 2008,TMH.
2. Real Time Systems- Jane W. S. Liu- PHI.
3. Real Time Systems- C.M.Krishna, KANG G. Shin, 1996, TMH
4. Qing Li, "Real Time Concepts for Embedded Systems", 2011, Elsevier.

REFERENCE BOOKS:

1. Rajkamal, "Embedded Systems- Architecture, Programming, and Design", 2007, TMH.
2. W. Richard Stevens, Stephan A. Rago, "Advanced UNIX Programming", 2006, 2nd Edition, Pearson.
3. Dr. Craig Hollabaugh, "Embedded Linux: Hardware, Software and Interfacing", 2008, 1st Edition, Pearson.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C737**	**Bio-Medical Signal Processing (PE-IV)**	**3**	**0**	**0**	**3**

Course Objectives:

This course aims to:

1. Provide the introduction to and insight into various biomedical signals
2. Provide the understanding of basic and advanced methods to process the biomedical signals using modern tool like MATLAB.
3. Provide the basic understanding of common biomedical instruments

Course Outcomes:

Upon completing this course, students will be able to:

1. Identify the various biomedical signals and their acquisition process
2. Demonstrate the ability to apply the signal processing techniques to analyze the biomedical signals
3. Demonstrate the ability to design the biomedical signal processing algorithm with usage of modern tools

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	3	3			2	2			3	3	
CO2	3	3	3	3	3	3			2	3	2	2	3	3	
CO3	3	3	3	3	3	3		2	2			2	3	3	3
Overall		3	3	3	3			2	2	3	2	2	3	3	3

UNIT-I

Basic understanding of biomedical signal, Physiological aspects, Biomedical signal acquisition process and related instruments, Electroencephalogram (EEG), Electrocardiogram (ECG), Electromyogram (EMG), Phonocardiogram (PCG),Photoplethysmography (PPG), Respiratory and Lung sound signals. Basic characteristics and associated pathologies. Biomedical instruments and their working principles.

Case study: Reading the biomedical signals (EEG, ECG, EMG, PCG) in MATLAB.

UNIT-II

Basics of signal processing, review of time and frequency domain signals, Characteristics of Biomedical Signals, Stationary and non-stationary, Linear and non-linear, Chaotic and random signals. Time-series analysis, statistical parameters, Higher order statistics (HOS), Types of distributions, statistical significance tests (Kruskal-Wallis).

Case study: Statistical analysis of biomedical signals in MATLAB environment.

UNIT-III

Revision of Fourier transform (FT), FFT algorithm, and short time Fourier transform (STFT). Limitations of FT and STFT. Time-Frequency (TF) analysis of Biomedical Signals, its need and tools. Basic concepts behind wavelet transform, discrete wavelet transform (DWT), types, advantages and applications.

Case study: Application of FT and STFT, and WT on EEG, ECG, and PCG signals in MATLAB environment.

UNIT-IV

Steps involved in classification of biomedical signals, Preprocessing, Revision of digital filters depending on methods and applications (IIR, FIR, Chebyshev, High pass, low pass, bandpass, notch filters). Noise removal process in biomedical signals with applications.

Case study: Application of digital filters and their effect of noisy signals like ECG (High frequency noise and baseline wander removal), EEG, EMG, PCG, and Lung sound signals in MATLAB environment.

UNIT-V

Feature extraction process, statistical and time domain features, frequency domain features, time-frequency analysis based features. Applications of STFT, DWT for biomedical signal classification. Feature selection using Kruskal-Wallis statistical test. Introduction to basic signal classification process.

Case study: Analysis and feature identification for classifying PCG signals into various heart valve disease categories in MATLAB environment.

UNIT-VI

Biomedical signal processing using signal decomposition method. Empirical mode decomposition (EMD). Introduction to Hilbert-Huang transform (HHT). Advantages, applications, and limitations of EMD method. Introduction to Empirical wavelet transform (EWT). Introduction to variational mode decomposition (VMD).

Text Book:

1. Rangaraj M Rangayyan ,"Biomedical Signal Analysis" –, IEEE Press, 2001
2. Biomedical Digital Signal Processing – Willis J Tomkins, PHI, 1993.
3. Practical Guide for Biomedical Signals Analysis Using Machine Learning Techniques A MATLAB® Based Approac, Elsevier publications • 2019

References:

1. Biomedical Digital Signal Processing Principles and Techniques-D C Reddy, TMH, 2005
2. Biomedical Signal Analysis, 2nd Edition Rangaraj M. Rangayyan ISBN: 978-0-470-91139-6 May 2015 Wiley-IEEE Press.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C738**	**MIMO OFDM System (PE-IV)**	**3**	**0**	**0**	**3**

Pre-requisites:

Probability & Stochastic process, Cellular mobile Communications

Course Objectives:

This course is intended to impart to the students the principlesof

- The fundamental concepts and design principles in "Multiple-Input Multiple-Output" (MIMO) wireless communications –channel capacity, antenna diversity, space-time coding.
- The fundamental concepts in "Orthogonal Frequency-Division Multiplexing" (OFDM) communications – transmission, synchronization, peak-to-average power ratio (PAPR) reduction.
- This fundamental concepts of massive MIMO will present a comprehensive analytical development of the various concepts in massive MIMO and mmWave MIMO technologies for 5G together with practical insights and problem solving.

Course Outcome:

After Learning this course, the student will be able to gain knowledge and understanding of:

CO1. OFDM's transceiver architecture
CO2. The problem of PAPR and how to reduce thePAPR.
CO3. To understand how the OFDM receiver performs synchronization
CO4. Channel modeling and propagation
CO5. MIMO Capacity, space-time coding
CO6. Massive MIMO and mmWave MIMO technologies for 5G

CO	**MIMO OFDM - PE-IV(6C735)**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	OFDM's transceiver architecture		2										2	2		2
CO2	The problem of PAPR and how to reduce the PAPR.		2	2									2	2		2
CO3	To understand how the		2										2	2		2

	OFDM receiver performs synchronization															
CO4	Channel modeling and propagation		2	2	2	2							2	2		2
CO5	MIMO Capacity, space-time coding		2	2	2	2							2	2	2	2
CO6	Massive MIMO and mmWave MIMO technologies for 5G												2	2	2	2
CO	Overall		2	2	2	2							2	2	2	2

UNIT 1: Fast Fading Wireless Channel Modeling ,Rayleigh/Ricean Fading Channels ,BER Performance in Fading Channels ,Diversity modeling for Wireless Communications ,BER Performance Improvement with diversity ,Types of Diversity – Frequency, Time, Space.

UNIT 2: OFDM Basics I: Introduction to OFDM Effect- Multicarrier Modulation and Cyclic Prefix-Channel model and SNR performance- OFDM Issues of PAPR- Frequency and Timing Offset Issues.

UNIT 3:Bit Error Rate Analysis: BER Analysis for Space Time Coding, Transmit Beamforming , Receiver Selection Combining, Receiver Equal Combining, Receiver Maximal Ratio Combining.

UNIT 4: Introduction to MIMO, Beam forming Antennas, Diversity: Receive- antenna diversity; Transmit-antenna diversity, MIMO Diversity and applications ,MIMO Channel Capacity of ZF,LMMSE,MMSE .

UNIT 5:Introduction to MIMO: MIMO Channel Capacity-SVD and Eigen modes of the MIMO Channel-MIMO Spatial Multiplexing – BLAST-MIMO Diversity – Alamouti, OSTBC, MRT-MIMO - OFDM.

UNIT 6:Introduction to 5G Wireless Technologies: Key specs and New Techniques for 5G,Introduction to MIMO Wireless Communication Systems ,Channel Estimation for MIMO Systems, Multi-user MIMO Wireless Systems ,Introduction to Massive MIMO Wireless Systems ,Generalized Spatial Modulation, mm Wave MIMO Wireless Systems and Challenges.

Text Books:

1. MIMO-OFDM for LTE, WiFi and WiMAX Li Wang, Ming Jiang, Lajos L. Hanzo, Yosef Akhtman Weily2011
2. MIMO-OFDM Wireless Communications with MATLAB Yong Soo Cho,Jaekwon Kim, Won Young Yang, hung G. Kang John Wiley & Sons(2010)

References:

1. OFDM for Wireless Communications Systems Ramjee Prasad, Artech House Publishers(2004).
2. MIMO Wireless Communications EzioBiglieri Robert Calderbank Anthony Constantinides Andrea Goldsmith Arogya swami Paulraj H. Vincent Cambridge University Press(2007)

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C739**	**Machine Learning (PE-IV)**	**3**	**0**	**0**	**3**

Course Objectives: Learn the basic theory behind machine learning. Understand a range of machine learning algorithms along with their strengths and weaknesses; formulate machine learning techniques corresponding to various applications. Analyze the appropriate machine learning technique for a given problem.

Course Outcomes:At the end of this course the student will be able to

1. Formulate machine learning techniques corresponding to various applications.
2. Understand the concepts of Classification and regression models and their applicability
3. Learn the popular clustering algorithms and their parameters
4. Understand basic computational Learning Theory using PAC Learnability and Instance Based Learning
5. Apply machine learning algorithms for solving problems of moderate complexity using Gradient Descent Algorithm, Random Forest Algorithm for Predictive Analytics
6. Understand the Explanation based Learning and Inductive analytical approach to learning.

UNIT – I: INTRODUCTION to Learning: Forms of learning, Induction learning, Learning Decision Tree, Statistical learning methods, Learning with complex data, learning with hidden variables, Instance based learning, Reinforcement Learning, Brief Introduction to Pruning and Neural Network Concepts

UNIT II: SUPERVISED LEARNING Linear Models for Regression – Linear Basis Function Models – The Bias – Variance Decomposition – Bayesian, Linear Regression – Bayesian Model Comparison. Linear Models for Classification – Discriminant Functions – Decision Trees – Classification Trees – Regression Trees —– Feed-Forward Network Functions –BackPropagation – Regularization —– Radial Basis Function Networks – Ensemble methods – Bagging – Boosting.

UNIT III: UNSUPERVISED LEARNING Clustering – K-means – Mixtures of Gaussians –EM Algorithm in General – Model Selection for Latent Variable Models – High Dimensional Spaces – The Curse of Dimensionality – Dimensionality Reduction – Factor Analysis – Principal Component Analysis – Probabilistic PCA - Independent Components Analysis.

UNIT IV: ANALYSIS OF LEARNING TECHNIQUES Computational Learning Theory – PAC Learnability – VC Dimension – Mistake Bound model of Learning – Instance Based Learning

UNIT – V: LINEAR REGRESSION Regression Problem Analysis – Mathematical model - Gradient Descent Algorithm – Random Forest Algorithm - Machine Learning for Predictive Analytics

UNIT – VI ANALYTICAL LEARNING Learning with perfect domain theory – Explanation based Learning – Inductive analytical approach to learning – KBANN algorithm – TANGENTPROP algorithm

TEXT BOOK

1. Tom Michel, Machine Learning. Mc Graw Hill. 1997

REFERENCE BOOKS

1. Trevor Hustie, Robert Tibshirani& Jerome Friedman. The Elements of Statically Learning, Springer Verilag 2001

2. Chris Bishop, Neural Network for, Pattern Recognition, Oxford University Press. 1995

3. EthemAlpaydin, Introduction to Machine Learning", MIT Press, Prentice Hall of India, 2005

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C740**	**Microwave Integrated Circuits (PE-IV)**	**3**	**0**	**0**	**3**

UNIT- I

MIC Technology – Thick film and Thin film technology, Hybrid MICs, Monolithic MIC technology.

UNIT - II

Analysis of stripline and microstripline, Method of conformal Transformation, Characteristic parameters of strip, Microstrip lines, Microstrip Circuit Design, Impedance transformers, Filters, Lumped constant Microstrip circuits.

UNIT - III

Coupled Microstrips and Directional couplers, Even and odd mode analysis, Theory of coupled microstrip, Directional couplers, Calculations for a coupled pair of Microstrips, Branch line couplers.

UNIT - IV

Lumped Elements for MICs, Design and fabrication of lumped elements, circuits using lumped elements.

UNIT - V

Nonreciprocal components for MICs, Microstrip on Ferrimagnetic substrates, Microstrip circulators. Isolators and phase shifters, Design of microstrip circuits – high power and low power circuits.

UNIT - VI

TEXT BOOKS:

1. Gupta KC and Amarjit Singh, “Microwave Integrated circuits”, Wiley Eastern, 1974.
2. Leo Young, “Advances in Microwaves”, Academic Press.

REFERENCE BOOKS:

1. BharathiBhat,and S.K. Koul, “Strip line-like Transmission Lines for Microwave Integrated Circuits”, New Age International, 2007.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C780**	**Internet of Things and Applications Lab**	**0**	**0**	**4**	**2**

Course objectives:

Course outcomes:

CO1:

CO2:

CO3:

CO4:

CO5:

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

Sl. No.	Lab Experiment
1	Study and Configure Raspberry Pi 3 a) Installing Debian OS for Raspberry pi3 b) Flashing and Booting for the Rpi3 for the first time
2	Introduction to Linux Environment – Practice Linux commands and simple python programs on Rpi3 a) Write a Program for arithmetic operation in Python. b) Write a Program for looping statement in Python. b) Programming and Interfacing GPIOS – Blink LEDStart/Stop with Switch
3	Weather monitoring with DHT11 and data storage on cloud (ThingSpeak)
4	Write a program to store senor data in Rpi3 by creating database system.
5	Write a program to send sensor data to Cloud using Node Red service to perform Data Analytics using Rpi3

6	a) Interface and recording pictures and videos using Rpi3 b) Simple program for Colour object detector and tracker
7	Smart Home Application – Security System - Write a program to detect intruder with proximity sensor,record pictures and send alerts
8	Smart City Application – Street lighting System - Write a program to control street lights based on the ambience lighting
9	a) Writing python Code to implement of MQTT protocol on Rpi3 – Publisher b) Writing python Code to implement of MQTT protocol on Rpi3 – Subscriber
10	Writing python Code to implement of MQTT protocol on Rpi3 with multiple Publisher and Subscriber
Internet of Things Students Lab Projects	

IoT Lab Kit Content

• Raspberry Pi 3 model B (Wireless, Bluetooth)
• Micro SD memory card 8 GB • SD memory card adapter
• DHT 11 Sensor • Resistor,
• LED • Switch • Breadboard • Connecting wires
• HDMI to VGA Cable • Power Adapter and Micro USB cable

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C781**	**Advanced Communications and Networks Lab**	**0**	**0**	**4**	**2**

The objectives of this course are

- To Design and analyze.
- To Design and analyze.

Course Outcomes: After studying this course, the students will be able to

- To explore.
- To
- To understand
- To design

Mapping of Course Outcomes with Program Outcomes andProgram specific outcomes

	i	ii	Iii	iii	iv	v	vi	vii	viii	ix	x	xi	xii	PSO1	PSO2	PSO3
CO1	3	2	2	2	2								2	3	2	
CO2	3	2	2	2	2								2	3	2	
CO3	3	2	2	2	2								2	3	2	
CO4	3	2	2	2	2								2	3	2	

Syllabus Content

Syllabus Content

1. FSK Modulation and Demodulation technique
2. MSK –Modulation and Demodulation technique
3. DPSK -Modulation and Demodulation technique
4. QPSK Modulation and Demodulation technique
5. DQPSK Modulation and Demodulation technique
6. 8QAM- Modulation and Demodulation technique
7. OFDM - Modulation and Demodulation technique
8. Convolution Encoding and Decoding technique
9. Study of CDMA-DSSS Communication System with BER Measurement
10. BER performance of AWGN wireless systemusing MAT LAB software
11. Simulation of RAKE Receiver for CDMA communication using MAT LAB software.

12. Simulate and test various types of PN codes, chip rate, spreading factor and processing gain on performance of DSSS in CDMA using MAT LAB software.

13. Simulation of OFDM system using MATLAB software.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C782**	**Microwave and Optical Communications Lab**	**0**	**0**	**4**	**2**

Prerequisites: *MWOC*

Course Objectives:

The objective of this course is to provide the students an in-depth knowledge and practice about the microwave and optical components and in analyzing the microwave and optical equipments.

Course Objectives*: After studying this course, the students will be able to*

CO1	*Analyze the characteristics of RKO and GUNN diode*
CO2	*Understand the principles governing attenuation and working of DC*
CO3	*Measure the K, S, Z and f at microwave frequencies.*
CO4	*Analyse the design principles of circulator and magic Tee*
CO5	*Understand the basic characteristics of LED and LASER*
CO6	*Measure the DR,NA and Losses for Digital and Analog Links*

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
CO6		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

Part – A (Any 8 Experiments)

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. VSWR Measurement.
6. Impedance and Frequency Measurement.
7. Waveguide parameters measurement.
8. Scattering parameters of Circulator.
9. Scattering parameters of Magic Tee.

Part-B

1. Characterization of LED.
2. Characterization of Laser Diode.
3. Intensity modulation of Laser output through an optical fiber.
4. Measurement of NA

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8C793**	**Summer Break – Internship – II**	**0**	**0**	**1**	**1**

Course Objective:

The students undergo industrial training so that he/she become industry-ready.

Course Outcomes:

At the end of the training, the student is able to

1. Select the real-time problem in the industry.
2. Analyze the requirements with respect to the problem statement
3. Design the optimal solution for the problem.
4. Implement the solution using the appropriate modern tools.
5. Present and submit the report

Mapping of Course Outcomes with Program Outcomes

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3							3	3	3	3	2		3
CO2	3	3		3					3	3	3	3	3		3
CO3	3	3	3	3					3	3	3	3	3		3
CO4	3	3			3				3	3	3	3	3	3	3
CO5									3	3	3	3			3
Overall		3	1	1	1				3	3	3	3	3	1	3

Student shall carryout the project in industry during summer vacation for 3-6 weeks. There is internal and external Evaluation. Internal Evaluation carries 30 marks and external Evaluation carries 70 marks, Total 100 marks.

IV–II

Syllabus for B. Tech (E.C.E.) IV Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - II	**8C841**	**Low power VLSI design (PE-V)**	**3**	**0**	**0**	**3**

Pre-Requisites:

Course Objectives:

Course Outcomes:

By the end of the course, students will be able to

CO1. understand the
CO2. Learn
CO3. confidently apply
CO4. Differentiate

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
Overall		3	3	3	3				2			3	3	3	3

UNIT I

Introduction, Low-Power design an overview, Low-Voltage, Low-Power design limitations: Power supply voltage, Threshold voltage, Scaling and Interconnect wires.

UNIT II

BiCMOS Processes: BiCMOS process using N-Well Process, BICMOS process using P-Well Process and BICMOS process using Twin-Well Process.

BiCMOS manufacturing and Integration considerations: Process considerations for CMOS device structures, Process considerations for Bipolar Transistors.

UNIT III

Isolation in BiCMOS: Isolation in Bipolar transistors-Junction isolation in the SBC process, Collector diffusion isolation; Isolation in MOS transistors-Local oxidation of Silicon, Deep trench isolation.

UNIT IV

Low-Voltage, Low-Power Logic Circuits-I: Conventional CMOS logic gates-Power dissipation in CMOS inverter, Basic NAND and NOR gates, Conventional BiCMOS logic gates-BiCMOS inverter, Basic driver configurations. Full swing with shunting devices.

UNIT V

Low-Voltage, Low-Power Logic Circuits-II: Full swing complementary MOS/Bipolar logic circuit, Full swing complementary MOS/Bipolar logic circuit with feedback, Merged BiCMOS digital circuit, Complementary BiCMOS circuits.

UNIT VI

Low-Power Latches and Flip-Flops: Introduction, Evolution of Latches and Flip-Flops.

TEXT BOOKS

1. CMOS/BiCMOS ULSI low voltage, low power by Yeo Rofail/ Goh(3 Authors)-Pearson Education Asia 1 st Indian reprint,2002

REFERENCES

1. Digital Integrated circuits ,J.Rabaey PH. N.J 1996
2. CMOS Digital ICs , Sung-moKang and Yusuf Leblebici 3 rd edition TMH 2003 (chapter 11)
3. VLSI DSP systems ,Parhi, John Wiley & sons, 2003 (chapter 17)
4. IEEE Trans Electron Devices, IEEE J.Solid State Circuits, and other National and International Conferences and Symposia

Syllabus for B. Tech (E.C.E.) IV Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - II	**8C842**	**System on Chip Architecture (PE-V)**	**3**	**0**	**0**	**3**

OBJECTIVES

After going through this course the student will be able to

- Understand the System Architecture and Processor Architecture, approach for a SOC Design.
- Learn the, Basic concepts in Processor Micro Architecture, and Learn Different Types of Processors like VLIW Processors, Superscalar Processors etc.
- Learn about SOC external memory, Scratchpads and Cache memory and Multilevel Caches.
- Learn the SOC Design approach, Design and evaluation, Applications Like Image compression etc

After studying this course, the students will be able to

1. Know basics of System Architecture
2. Understand the various types of Processors like VLIW Processors, Superscalar Processors.
3. Distinguish Cache memory and Multilevel Caches, SOC external memory.
4. Know the Concept of Inter Connect Architectures, SOC Standard Buses and Reconfiguration Technologies.
5. Know the concepts and issues related to Interconnect Configuration.
6. Explore the SOC Design approach and develop its applications.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
CO6		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

UNIT-I: Introduction

Introduction to the System Approach: System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, an approach for SOC Design, System Architecture and Complexity.

UNIT-II: Processors :

Introduction , Processor Selection for SOC, Basic concepts in Processor Architecture, Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust

Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT-III: Memory Design for SOC:
Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation , SOC Memory System, Models of Simple Processor – memory interaction.

UNIT-IV: Interconnect Customization and Configuration:
Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses, Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization: An overview, Customizing Instruction Processor.

UNIT-V: Interconnect Configuration:
Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration – overhead analysis and trade-off analysis on reconfigurable Parallelism.

UNIT-VI: Application Studies / Case Studies:
SOC Design approach, AES algorithms, Design and evaluation, Image compression – JPEG compression.

Text Books

- Computer System Design System-on-Chip – Michael J. Flynn and Wayne Luk, Wiely India Pvt. Ltd.
- Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer

Reference Books

- ARM System on Chip Architecture – Steve Furber –2nd Ed., 2000, Addison Wesley Professional.
- System on Chip Verification – Methodologies and Techniques – Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers.

Syllabus for B. Tech (E.C.E.) IV Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - II	**8C843**	**Radar Signal Processing (PE-V)**	**3**	**0**	**0**	**3**

Course Objectives:

Course Outcomes:

CO1:

CO2:

CO3:

CO4:

UNIT I

BASICS OF RADAR AND RADAR SIGNAL POCESSING

Nature of Radar, Maximum Range, Radar Equation. Block Diagram. RadarFrequencies and Applications. Prediction of Range Performance.. Rx Noise.Modified Range Equation.Basic Radar Signal Processing, , Signal Models, components of a RadarSignal, Amplitude Models, clutter, Noise Model and Signal -to –NoiseRatio, Jamming,Frequency Models

UNIT-II

CW AND FMCW RADAR

Doppler Effect. CW Radar, Block diagram, Applications of CW Radar. Rxbandwidth requirements. FM CW Radar, Block diagram and characteristics.FM- CW Altimeter. The Doppler Shift, Spatial Models, Spectral Model

UNIT-III

MTI and Tracking RADAR

Block diagram of MTI Radar with Power Amplifier and Power Oscillators. NonCoherent MTI Radar. Delay line Cancellers. Double Cancellation. BlindSpeeds. Filter Characteristics. MTI vs Pulse Doppler Radar. Staggered PRF,Range gated Doppler Filters.

TRACKING RADARS

Tracking Radars: Sequential lobing. Conical Scan. Mono Pulse trackingRadars. Phase Comparison Mono Pulse.

UNIT-V

Sampling and Quantization of Pulsed Radar Signals, Domains andCriteria for Sampling, Radar Signals, Sampling in the Fast TimeDimension, Sampling in Slow Time – Selecting the Pulse

RepetitionInterval, Sampling the Doppler Spectrum, Sampling in the Spatial andAngle Dimensions, Quantization, I/Q Imbalance and Digital I/Q

UNIT-VI

Doppler Processing, Alternate Forms of the Doppler Spectrum, MovingTarget Indication (MTI), Pulse Doppler Processing, Pulse PairProcessing, Additional Doppler Processing Issues, Clutter Mapping andthe Moving Target Detector, MTI for moving plat forms

Text Books

1. Merrill I. Skolnik, Introduction to Radar Systems, McGraw-Hill, 2 nd Edition,1981.
2. Mark A. Richards, “Fundamentals of Radar Signal Processing”, McGraw Hill
3. Fred E. Nathanson, “Radar Design Principles: Signal Processing and TheEnvironment”,2ndEdition, 1999, PHI.

References

1. Merrill I.Skolnik,Introduction to Radar systems,McGraw-Hill,3 rd Edition,2001.
2. Byron Edde, Radar Principles,Technology,Applications. PearsonEdition,2004.
3. Peyton Z. Peebles, Jr., “Radar Principles”, 2004, John Wiley.
4. R. Nitzberg, “Radar Signal Processing and Adaptive Systems”, 1999, ArtechHouse.
5. F.E. Nathanson, “Radar Design Principles”, 1st Edition, 1969, McGraw Hill.

Syllabus for B. Tech (E.C.E.) IV Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - II	**8C844**	**5G Communications (PE-V)**	**3**	**0**	**0**	**3**

Pre-requisites:

Probability & Stochastic process, Cellular mobile Communications

Course Objectives:

This course is intended to impart to the students the principlesof

- The fundamental concepts and design principles in "Multiple-Input Multiple-Output" (MIMO) wireless communications –channel capacity, antenna diversity, space-time coding.
- The fundamental concepts in "Orthogonal Frequency-Division Multiplexing" (OFDM) communications – transmission, synchronization, peak-to-average power ratio (PAPR) reduction.
- This fundamental concepts of massive MIMO will present a comprehensive analytical development of the various concepts in massive MIMO and mmWave MIMO technologies for 5G together with practical insights and problem solving.

Course Outcome: After Learning this course, the student will be able to gain knowledge and understanding of:-

CO1	Learn 5G Technology advances and their benefits
CO2	Learn the key RF, PHY, MAC and air interface changes required to support 5G, OFDM's transceiverarchitecture
CO3	MIMO Capacity, space-timecoding
CO4	The problem of PAPR and how to reduce thePAPR. To understand how the OFDM receiver performssynchronization
CO5	Implementation options for 5G. Channel modeling and propagation
CO6	Learn Device to device communication and millimeter wave communication. Massive MIMO and mmWave MIMO technologies for 5G.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
CO5		3	3	3	3				2			2	3	3	3
Overall		3	3	3	3				2			3	3	3	3

UNIT 1:

Overview of 5G Broadband Wireless Communications: Evaluation of mobile technologies 1G to 4G (LTE, LTEA, LTEA Pro), An Overview of 5G requirements, Regulations for 5G, Spectrum Analysis and Sharing for 5G. Introduction to Massive MIMO Wireless Systems, Generalized Spatial Modulation,mmWave MIMO Wireless Systems and Challenges.

UNIT 2:

Introduction to OFDM Effect- Multicarrier Modulation and Cyclic Prefix- Channel model and SNR performance- OFDM Issues of PAPR- Frequency and Timing Offset Issues. Fast Fading Wireless Channel Modeling, Rayleigh/Ricean Fading Channels, BER Performance in Fading Channels, Diversity modeling for Wireless Communications, BER Performance Improvement with diversity.
BER Analysis for Space Time Coding, Transmit Beam forming, Receiver Selection Combining, Receiver Equal Combining, Receiver Maximal Ratio Combining.

UNIT 3: Introduction to MIMO, Beam forming Antennas, Diversity: Receive- antenna diversity; Transmit-antenna diversity, MIMO Diversity and applications, MIMO Channel Capacity of ZF, LMMSE, MMSE. MIMO Channel Capacity-SVD and Eigen modes of the MIMO Channel-MIMO Spatial Multiplexing – BLAST-MIMO Diversity – Alamouti, OSTBC, MRT-MIMO - OFDM.

UNIT 4: Millimeter-wave Communications – spectrum regulations, deployment scenarios, beam-forming, physical layer techniques, interference and mobility management, Massive MIMO propagation channel models, Channel Estimation in Massive MIMO, Massive MIMO with Imperfect CSI, Multi-Cell Massive MIMO, Pilot Contamination, Spatial Modulation (SM)

UNIT 5: Transmission and Design Techniques for 5G: Basic requirements of transmission over 5G, Modulation Techniques – Orthogonal frequency division multiplexing (OFDM), generalized frequency division multiplexing (GFDM), filter bank multi-carriers (FBMC) and universal filtered multi-carrier (UFMC), Multiple Accesses Techniques – orthogonal frequency division multiple accesses (OFDMA), generalized frequency division multiple accesses (GFDMA), non-orthogonal multiple accesses (NOMA).

UNIT 6: The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling, Channel Models for mmWave MIMO Systems.
Device-to-device (D2D) and machine-to-machine (M2M) type communications – Extension of 4G D2D standardization to 5G, radio resource management for mobile broadband D2D, multi-hop and multi-operator D2D communications.

Text Books:

1. Principles of Modern Wireless Communication Systems – Aditya K Jagannatham
2. MIMO-OFDM for LTE, WiFi and WiMAX Li Wang, Ming Jiang, Lajos L. Hanzo, YosefAkhtmanWeily2011
3. MIMO-OFDM Wireless Communications with MATLAB Yong Soo Cho,Jaekwon Kim, Won YoungYang, hung G. Kang John Wiley & Sons(2010)
4. Martin Sauter “From GSM From GSM to LTE–Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband”, Wiley-Blackwell.
5. AfifOsseiran, Jose.F.Monserrat, Patrick Marsch, “Fundamentals of 5G Mobile Networks” , Cambridge University Press.
6. Athanasios G.Kanatos, Konstantina S.Nikita, Panagiotis Mathiopoulos, “New Directions in Wireless Communication Systems from Mobile to 5G”, CRC Press.
7. Theodore S.Rappaport, Robert W.Heath, Robert C.Danials, James N.Murdock “Millimeter Wave Wireless Communications”, Prentice Hall Communications.

References**:**

2. OFDM for Wireless Communications Systems Ramjee Prasad, Artech House Publishers(2004).

3. MIMO Wireless Communications EzioBiglieri Robert Calderbank Anthony Constantinides Andrea Goldsmith ArogyaswamiPaulraj H. Vincent Cambridge University Press(2007).
4. Jonathan Rodriguez, “Fundamentals of 5G Mobile Networks”, John Wiley & Sons.
5. Amitabha Ghosh and RapeepatRatasuk “Essentials of LTE and LTE-A”, Cambridge University Press.

Syllabus for B. Tech (E.C.E.) IV Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - II	**8C845**	**Deep Learning (PE-V)**	**3**	**0**	**0**	**3**

Pre-Requisites: Signals & Systems, Basics of Probability Theory, Linear Algebra & Calculus, Statistics and Machine Learning

Course Objectives:

The objective of this course is to provide the learners with a comprehensive understanding of Deep Learning Methods, Recurrent Neural Netwok and their applications.

Course Outcomes:

By the end of the course, students will be able to

CO1. understand the basics and complexity of Deep Learning algorithms and their limitations

CO2. Learn modern notions in data analysis oriented computing

CO3. confidently apply common Deep Learning algorithms in practice and implementing their own and

CO4. Differentiate various algorithms for sequence of data

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	3	3	3				2			3	3	3	
CO2		3	3	3	3				2			2	3	3	
CO3		3	3	3	3				2			2	3	3	
CO4		3	3	3	3				2			2	3	3	
Overall		3	3	3	3				2			3	3	3	3

Syllabus

UNIT – I Basics to Deep Learning

Introduction, History, Perceptron, MLP, review of Neural Network- Feedforward Neural Networks and Back Propagation- Gradient Decent and varients, Batch-normalization.

Activation Functions : Sigmoid,ReLU, Hyperbolic Tangent Functions, Softmax

UNIT – II Introduction to TensorFlow (Python will be used for understanding)

Computational Graph, Creating a Graph, Regression example, Handwritten digit classification using TensorFlow, TensorBoard, Keras Library

UNIT – III Deep Learning

Deep Feed Forward network, Training Deep Neural Networks using Back Propagation-Setup and initialization issues, vanishing and exploding Gradientproblems, Gradient- Descent Strategies, Overfitting and Generalizaton, Cross Validation, Feature Selection,Regularizations, Dropouts, Hyperparameters.

UNIT – IV :CNN (Convolutional Neural Networks)

Basic structure of Convolutional Network, Shortcomings of Feature Selection - Full Description of the Convolutional Layer - Max Pooling-Full Architectural Description of Convolution Networks, Backpropagation in CNNs, Evolution of CNN Architectures for Image Classification, Fine tuning in CNN.

UNIT – III Auto-encoders

Auto-encoders Neural Networks, Training, Undercomplete and Overcompleteautoencoders, Convolutional auto-encoders, De-convolution layer, Transposed convolution, Sparsely Regulated auto-encoders, Denoisingauto-encoders, Stacked auto-encoders, Variational auto-encoders.

UNIT – VI Recurrent Neural Networks

Introduction to RNN, Unfolding Computational Graph, Recurrent hidden units and Training Loss, Recurrence through output only, Forward Propagation, Teacher Forcing, Seq2Seq RNN, LSTM, GRU – Comparison of LSTM and GRUs, RNN applications.

BOOKS

1. Nikhil Buduma, Nicholas Locascio, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly Media, 2017.
2. Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning (Adaptive omputation and Machine Learning series", MIT Press, 2017.
3. CharuC.Aggarwal "Neural Networks and Deep learning" Springer International Publishing, 2018

Reference Books

1. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Educatio2004.

Syllabus for B. Tech (E.C.E.) IV Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - II	**8C846**	**EMI/EMC (PE-V)**	**3**	**0**	**0**	**3**

UNIT - I

Introduction, Natural and Nuclear Sources of EMI / EMC: Electromagnetic environment, History, Concepts, Practical experiences and concerns, frequency spectrum conservations, An overview of EMI / EMC, Natural and Nuclear sources of EMI.

UNIT - II

EMI from Apparatus, Circuits and Open Area Test Sites: Electromagnetic emissions, Noise from relays and switches, Non-linearity in circuits, passive intermodulation, Cross talk in transmission lines, Transients in power supply lines, Electromagnetic interference (EMI), Open area test sites and measurements.

UNIT - III

Radiated and Conducted Interference Measurements: Anechoic chamber, TEM cell, GH TEM Cell, Characterization of conduction currents / voltages, Conducted EM noise on power lines, Conducted EMI from equipment, Immunity to conducted EMI detectors and measurements, ESD,

UNIT - IV

ESD, Electrical fast transients / bursts, Electrical surges.

UNIT - V

Grounding, Shielding, Bonding, and EMI filters: Principles and types of grounding, Shielding, and bonding, Characterization of filters, Power lines filter design.

UNIT - VI

Cables, Connectors, Components and EMC Standards: EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, optoisolators, National / International EMC standards.

TEXT BOOKS:

1. Dr. V.P. Kodali, IEEE Publication, “Engineering Electromagnetic Compatibility”, Printed in India by S. Chand & Co. Ltd., New Delhi, 2000.
3. IIT – Delhi, “Electromagnetic Interference and Compatibility IMPACT series”, Modules 1 – 9.

REFERENCE BOOK:

1. C.R. Pal., “Introduction to Electromagnetic Compatibility”, Ny John Wiley, 1992.

Syllabus for B. Tech (E.C.E.) IV Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - II	**8C894**	**Major Project**	**0**	**0**	**10**	**5**

Prerequisite : All Courses till this semester

Course Objectives: To enhance the knowledge on selecting a project, learn related tools and enhance programming and communication skills for employability.

Course Outcomes:

At the end of this course the student will be able to

1. Develop plans with relevant people to achieve the project's goals
2. Break work down into tasks and determine handover procedures
3. Identify links and dependencies, and schedule to achieve deliverables
4. Estimate the human and physical resources required, and make plans to obtain the necessary resources
5. Allocate roles with clear lines of responsibility and accountability with team spirit.
6. Design and develop the software or prototype to meet societal needs

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3	3	3		2				3	2	2
CO2		3	3	3		2				3	2	2
CO3		3	3	3		2				3	2	2
CO4		3	3	3		2				3	2	2
CO5		3	3	3		2				3	2	2
CO6	2	3	3	3		2				3	2	2
Overall	2	3	3	3		2				3	2	2

A project shall be carried out by a group of students consisting of 2 to 3 in number in fourth year second semester. This work shall be carried out under the guidance of the faculty assigned as internal guide and shall involve design, fabrication, software development or any other significant activity. This can be of interdisciplinary nature also.

Out of total 100 marks for project work (in the final year second semester), 30 marks shall be for Internal Evaluation and 70 marks for the External Evaluation at the end of the Semester.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The committee consists of an external examiner, HOD, a Senior Faculty Member, Project Coordinator and Internal Guide.

Division of marks for internal assessment – 30 marks

Sl.No	Description	Marks
1	Progress of Project work and the corresponding interim report as evaluated by Project Review Committee at the end of 6 weeks	5 marks
2	Seminar at the end of 6 weeks	5 marks
3	Progress of Project work as evaluated by Project Review Committee at the end of 11 weeks	5 marks
4	Seminar at the end of 11 weeks	5 marks
5	Evaluation by Project Review Committee at the end of 15 weeks and Final Project Report	5 marks
6	Final presentation and defence of project	5 marks
	Total	**30 marks**

Division of Marks for External Evaluation – 70 Marks

Sl.No	Description	Marks
1	Final Project Report	10 marks
2	Presentation	20 marks
3	Demonstration / Defense of Project	40 marks
4	**TOTAL**	**70 marks**

ECE Stream
Open Electives

Syllabus for B. Tech (E.C.E.) III Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - I	**8CC51**	**Electronics and Instrumentation(OE-I)**	**2**	**0**	**0**	**2**

Prerequisite: Fundamental concepts of Network Theory and Electronic Circuits.

Course Objectives:

This course aims to:

1. Explain basic concepts, definitions and error analysis in measurement.
2. Identify the details of instrumentation and devices intended for a particular application.
3. Elaborate discussion about the importance of signal display devices and analyzers in measurement and

describe the various bridge configurations and their applications.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Define the characteristics and analyze the errors of measurement systems.
2. Select the appropriate passive or active transducers for measurement of physical phenomenon.
3. Relate and apply the appropriate measuring techniques to real time applications.
4. Interpret the usage of DVM, Spectrum Analyzer and DSO instruments for appropriate measurements.
5. Develop an understanding of construction and working of different AC and DC bridges and their applications.

UNIT– I

Error - Absolute error, Relative error and Accuracy, Precision - conformity and significant figures, limiting errors, Propagation of errors, Errors in measurement-gross, systematic and random errors,

UNIT – II

Loading effect, Statistical analysis ofmeasurement data and probable error, Resolution, Sensitivity, Calibration. Classification of transducers, Strain gauges - gauge factor, bonded, un-bonded and semiconductor stain gauges

UNIT – III

LVDT - principle, construction and displacement measurement, Capacitive transducer - principle andthicknessmeasurement, Piezo-electric transducer and different modes of operation, Photo-electric transducers.

UNIT – IV

Characteristics, pressure, power and intensity levels of sound, Microphones, Temperature measurement - resistance wire thermometers, semiconductor thermometers and thermocouples.

UNIT – V

DVMs- ramp, dual-slope integration, integrating and successive-approximation types, digit, resolution, sensitivity and general specifications, Spectrum analyzers, Digital storage oscilloscope, Introduction to Virtual Instrumentation

UNIT – VI

Introduction to Bridges, DC Bridges - Wheatstone's bridge, Kelvin's bridge, AC bridges - introduction, general balance equation for four arm bridge, capacitance comparison bridge, inductance comparison bridge, Maxwell's bridge, Wien'sbridge, Wagner's earth connection.

Text Books:

1. Albert D. Helfric, and William D. Cooper, "Modern Electronic Instrumentation and Measurement
Techniques", PHI, 2010.
2. D V S Murthy, "Transducers and Instrumentation", 2nd Edition, PHI, 2013.
3. Nakra B.C, and Chaudhry K.K., "Instrumentation, Measurement and Analysis", 3rdEdition, TMH, 2013.

Reference Books:

1. David A. Bell, "Electronic Instrumentation and Measurements", 2nd Edition, PHI, 2003.
2. H S Kalsi, "Electronic Instrumentation", 3rdEdition, TMH, 2011.
3. A.K.Sawhney, "Electrical & Electronic Measurement and Instruments", DhanpatRai& Co. Publications, 2005.

Year/Sem	Sub. Code	Subject Name	L	T	P/D	C
III-II	**8CC52**	**Fundamentals of digital circuits & Microprocessors**	**2**	**0**	**0**	**2**

Course objectives: To develop the skills for understanding the design of digital circuits, learn programming skills for 8086 Microprocessor and interfacing peripherals to it.

Course outcomes*:*

1. *To understand number systems and apply the rules of Boolean algebra to simplify Boolean expressions using theorems and K-maps.*
2. *To design combinational circuits such as full adders, multiplexers, decoders, encoders. Code converters etc.*
3. *To design basic memory units (latches and flip-flops) and sequential circuits*
4. *To understand Architecture of 8086 and analyzing in single mode and in multi processor mode.*
5. *To understand instructions of 8086 and to write Assembly Language Programs*
6. *To interface I/0 devices with 8086.*

CO	**Fundamentals of digital circuits & Microprocessors(7CC37)**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	*To understand number systems and apply the rules of Boolean algebra to simplify Boolean expressions using theorems and K-maps.*	3	2	2	2	2								2	2	
CO2	*To design combinational circuits such as full adders, multiplexers, decoders, encoders.*	3	2	2	2	2								2	2	

	Code converters etc															
CO3	*To design basic memory units (latches and flip-flops) and sequential circuits*	3	2	2	2	2							2	2		
CO4	*To understand Architecture of 8086 and analyzing in single mode and in multi processor mode.*	3	2	2	2	2							2	2		
CO5	*To understand instructions of 8086 and to write Assembly Language Programs .*	3	2	2	2	2							2	2		
CO6	*To understand instructions of 8086 and to write Assembly Language Programs*	3	2	2	2	2							2	2		
CO	Overall	3	2	2	2	2							2	2		

UNIT – I

Number System and Boolean Algebra: Binary, decimal, octal, hexa decimal, weighted and un-weighted codes. Axiomatic definition of Boolean algebra, Binary operators, postulates of and theorems. Boolean

addition, subtraction, 1's complement, 2's complement. Switching functions, Canonical forms and Standard forms, Simplification of switching functions using theorems. K-map representation, simplification of logic functions using K-map.

UNIT - II

Combinational Logic Design: Single output and multiple output combinational logic circuit design, Binary adders/subtractors, Encoder, Decoder, Multiplexer, Demultiplexer, Parity bit generator, Code-converters.

UNIT - III

Sequential circuits: Classification of sequential circuits, the clocked SR flip flop, J- K, T and D-types flip flops, triggering mechanism of flip-flops, flip-flop conversion, introduction to counters and registers

UNIT - IV

Architecture of 8086 Microprocessor: Memory segmentation, BIU and E.U General Purpose registers, 8086 flag register and function of 8086 Flags, Pin diagram of 8086-Minimum mode and maximum mode of operation.

UNIT – V

Instruction set of 8086: Addressing modes of 8086, Assembly directives, Simple programs. Assembly language programs: involving logical, Branch & Call instructions, sorting.

UNIT - VI

Interfacing with 8086: Interfacing with RAM, ROM, 8255 PPI – Interfacing with key board, ADC and DAC Stepper Motor.

Text Books:

2. Morris Mano-,Digital design –PHI, 2nd Edition.
3. ZviKohavi and Niraj K Jha -Switching & Finite Automata theory – Cambridge, 3rd Edition.
4. Microprocessors and interfacing – Douglas V. Hall, TMH, 2nd Edition, 1999.
5. Advanced microprocessor & Peripherals - A.K.Ray & K.M.Bhurchandi, TMH, 2000.

References:

1. Fletcher -An Engineering Approach to Digital Design – PHI.
2. Fundamentals of Logic Design, Roth, Kenny, Seventh Edition, Cengage Learning
3. R.P.Jain-Switching Theory and Logic Design- TMH Edition,2003.
4. CVS Rao -Switching Theory and Logic Design –Pearson Education, 2005
5. Micro computer systems, The 8086/8088 Family Architecture, Programming and Design – Y.Liu and G.A. Gibson, PHI, 2nd Edition.

Syllabus for B. Tech (E.C.E.) III Year II semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
III - II	**8CC53**	**Fundamentals of Communication(OE-II)**	**2**	**0**	**0**	**2**

Course Objectives:
The objective of this subject is to:
1.Introduce the students to communication systems, frequency spectrum ,need for modulation , antenna and measurable parameters.
2. Introduce to various analog and digital modulation schemes.
3. Introduce Radio system, Antenna and Wave propagation.
4. Knowledge in telecommunication systems and Networking
5. Knowledge of satellite communication and Optical communication
6. Cellular and mobile communication, knowledge in wireless technologies.

Course Outcomes: By completing this subject, the student can
- Work on various types of modulations.
- Should be able to use these communication modules in implementation.
- Will have a basic understanding of various wireless and cellular, mobile and telephone communication systems.

UNIT - I
Introduction: Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels. Fundamentals of antenna and wave propogation.

UNIT - II
Simple description on Modulation: Analog Modulation-AM, FM, Pulse Modulation-PAM, PWM, PCM, Digital Modulation Techniques-ASK, FSK, PSK, QPSK modulation and demodulation schemes.

UNIT - III
Radio System:
Transmitter fundamentals, Power amplifier, and Typical transmitter circuit.
Super heterodyne receiver, Typical receiver circuit and Noise.
Antenna and Wave Propagation :
Antenna fundamentals, commonly usedantenna ,wave propagation and transmission line.

UNIT - IV
Telecommunication Systems: Telephones Telephone system, Paging systems, Internet Telephony.
Networking and Local Area Networks: Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

UNIT - V
Satellite Communication: Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems.
Optical Communication: Optical Principles, Optical Communication Systems, Fiber –Optic

Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

UNIT - VI

Cellular and Mobile Communications: Cellular telephone systems, AMPS, GSM, CDMA, and WCDMA.

Wireless Technologies: Wireless LAN, PANs and Bluetooth, Zig Bee and Mesh Wireless networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

Text Books:

1. Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hill publications,4th edition, 2016.
2. Electronic Communications systems, Kennedy, Davis 4e, MC GRAW HILL EDUCATION, 1999

Reference Books:

1. Theodore Rapp port, Wireless Communications - Principles and practice, Prentice Hall, 2002.
2. Roger L. Freeman, Fundamentals of Telecommunications, 2e, Wiley publications.
3. Introduction to data communications and networking, Wayne Tomasi, Pearson Education, 2005.

Syllabus for B. Tech (E.C.E.) IV Year I semester						
Year/Sem	**Sub. Code**	**Subject Name**	**L**	**T**	**P/D**	**C**
IV - I	**8CC54**	**Electronic Circuit Design and Analysis (OE-III)**	**2**	**0**	**0**	**2**

Course outcomes:After studying this course, the students will be able to

1. understand the concept of feedback and analyze its effect in input and output impedances of feedback amplifiers
2. Distinguish between small and large signal amplifier and able to compare the conversion efficiency levels
3. able to design linear and non-linear wave shaping circuits
4. Demonstrate the concepts of Differential Amplifier and Operational Amplifier and their characteristics anddesign of the basic circuits using IC741.
5. Explore, design and analysis of Filters, 555 Timers and data converters.
6. Classify and characterize the various Logic Families.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3		2			2				3	2	
CO2	2	3	3	3		2			2				3	2	
CO3	2	3	3	3		2			2				3	2	
CO4	2	3	3	3		2			2				3	2	
CO5	2	3	3	3		2			2				3	2	
CO6	2	3	3	3		2			2				3	2	
Overall	2	3	3	3		2			2				3	2	

Unit-I

FEED BACK AMPLIFIERS

Fundamentals of feedback-classification- Characteristics of feedback Amplifier, effect of feedback in voltage series, voltage shunt, current series and current shunt amplifiers.

Unit-II

POWER AMPLIFIERS

Classification of Power Amplifiers - Class A, B, AB & C power amplifiers –push pull configuration, complementary symmetry circuits, Distortion in Amplifiers, Harmonic distortion and Crossover Distortion in Power Amplifiers– Conversion efficiency and relative performance.

Unit-III

WAVE SHAPING – Linear and Non-linear

RC high pass, low pass circuit response for sinusoidal, step, pulse, square, ramp inputs-Differentiator –Integrator.

Diode clippers- Transistor clipper- clipping at two independent levels – Emitter coupled clipper Clamping operation – clamping with source, diode resistances- clamping circuits theorem.

Unit-IV

OPAMP CHARACTERISTICS and Applications

Differential Amplifiers and its Characteristics. Op-Amp Block Diagram, Ideal OP-AMP Characteristics,DC and AC Characteristics. 741 Op-Amp and its Features and Characteristics. Op-amp asAdder/Subtractor, Difference Amplifier, Instrumentation Amplifier, Differentiator, Integrator,Comparators.

Unit-V

FILTERs, TIMERs

Filters: Introduction, Butterworth Filters- First and Second Order Active Filters- LPF, HPF, BPF, BRF.Introduction to 555 Timer, Functional Block, 555 timers as Monostable and AstableMultivibrators andApplications, Introduction to A/D and D/A converters, R-2R ladder type DAC, Successive ApproximationRegister type ADC.

Unit-VI

LOGIC FAMILIES

Classification of IC Logic Families. Standard TTL NAND & NOR Gate-Analysis, CMOS Logic family-NAND & NOR Gate-Analysis , ECL family. Comparison of Various Logic Families.

Text Books -

D. Roy Chowdhary, Linear Integrated Circuits , New Age Publications (P) Ltd, 2nd Edition, 2003

John F. Wakerly, Digital Design Principles & Practices, PHI/ Pearson Education Asia, 3rd Ed., 2005.

References -

Ramakanth A. Gayakwad, Op-Amps & Linear ICs, PHI,1987.