B. TECH FOUR YEAR DEGREE COURSE

SR-21, ACADEMIC REGULATIONS,

COURSE STRUCTURE & SYLLABUS

(Applicable for the batches admitted from 2021-22)

SRINIVASA INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous Institution**)**

Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada
Accredited by NAAC with 'A' grade, Recognised by UGC under sections 2(f) & 12(B)
Cheyyeru (V), Amalapuram, East Godavari District – 533216
Andhra Pradesh, India

VISION

To develop the institution into a world class destination fortechnological education and research

MISSION

- To impart high quality, industry relevant, career oriented , engineering education to rural students , to translate our vision into areality
- To provide the best of instructional and institutional infrastructurefacilities
- To have strategic linkages with industry and otherinstitutions
- To mould students to meet the challenges of life with ethics , courage and conviction

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VISION

Ignite the young minds to make them intellectuals with ultimate objective of promoting technology across the globe in the area of Electronics and Communication Engineering.

MISSION

M1: Offer a well-balanced programme of instruction, lab practices, research & development activities.

M2: Emphasis on Competitive learning through professional societies

M3: Providing Industry and department interactions to develop overall skills.

1. PRELIMINARY DEFINITIONS ANDNOMENCLATURES

AcademicCouncil:TheAcademicCouncilisthehighestacademicbodyoftheinstituteandis responsible for the maintenance of standards of the instruction, education and examination within the institute. Academic Council is an authority as per UGC regulations and it has the right totakedecisionsonallacademicmattersincludingacademicresearch.

Academic Autonomy: Means freedom to aninstitute in all aspects of conducting its academic programs, granted by UGC for PromotingExcellence.

Academic Year: Itistheperiodnecessarytocompleteanactualcourseofstudywithina year. It comprises two semesters i.e., (one odd + oneeven).

AICTE: Means All India Council for Technical Education, New Delhi.

Autonomous Institute: Means an institute designated as autonomous by University Grants Commission (UGC), New Delhi in concurrence with affiliating University (Jawaharlal Nehru Technological University Kakinada, Kakinada) and State Government.

Backlog Course: A course is considered to be a backlog course if the student has obtained a failure grade (F) in that course.

Basic Sciences: The courses offered in the areas of Mathematics, Physics, Chemistry, English etc., are considered to be foundational in nature.

Betterment: Betterment is a way that contributes towards improvement of the student's grade in any course(s). It can be done by either (a) re-appearing or (b) re-registering for the course.

Board of Studies (BoS): BoS is an authority as defined in UGC regulations, constituted by HeadoftheDepartmentforallthedepartmentsseparately.Theyareresponsibleforcurriculum design and updation of all the programs offered by thedepartment.

Branch: Means specialization in a program like B.Tech degree program in Mechanical Engineering, B.Tech degree program in Computer Science and Engineering etc.

Choice Based Credit System: The credit based semester system is one which provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching along with provision of choice for the student in the course selection.

CoE: Controller of Examinations

Compulsory course: Course required to be undertaken for the award of the degree as per the program.

Continuous Internal Assessment (CIA): It is an examination conducted towards internal assessment.

Course: A course is a subject offered by a department for learning in a particular semester.

Course Outcomes: The essential skills that need to be acquired by every student through a course.

Credit: A credit is a unit that gives a weightage to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its credit value. One credit is equivalent to one lecture hour per week.

Credit point: It is the product of grade point and number of credits for a course.

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

Curriculum: Curriculum incorporates the planned interaction of students with instructional content, materials, resources, and processes for evaluating the attainment of Program Educational Objectives.

Department: An academic entity that conducts relevant curricular and co-curricular activities and extra-curricular activities involving both teaching and non-teaching staff and other resources in the process of study for a degree.

Dropping of the Semester: A student who doesn't want to register for any semester, can apply in writing in the prescribed format before commencement of that semester.

Core Courses: The courses that are essential constituents of each engineering discipline are categorized as professional core courses for that discipline.

Professional Elective: It indicates a course that is discipline centric. An appropriate choice of minimum number of such electives as specified in the program will lead to a degree with specialization.

Elective Course: A course that can be chosen from a set of courses. An elective can be Professional Elective or Open Elective.

Massive Open Online Course (MOOC): MOOC courses inculcate the habit of self learning. MOOC courses would be additional choices in all the elective group courses.

Evaluation: Evaluation is the process of judging the academic performance of the student in her/his courses. It is done through a combination of continuous internal assessment and semester end examinations.

Grade: It is an index of the performance of the students in a said course. Grades are indicated by alphabets.

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

Institute: Means SRINIVASA INSTITUTE OF ENGINEERING AND TECHNOLOGY, Cheyyeru, East Godavari Dist, Andhra Pradesh unless indicated otherwise by the context.

Pre-requisite: A course, the knowledge of which is required for registration into higher level course.

Program: Means, Bachelor of Technology (B.Tech) degree
program PG degree program: Master of Technology (M.Tech)

Program Educational Objectives: The broad career, professional and personal goals that every student will achieve through a strategic and sequential action plan.

Project work: It is a design or research based work to be taken up by a student during his/her final year to achieve a particular aim. It is a credit based course and is to be planned carefully by the student.

Re-Appearing: A student can reappear only in the semester end examination for the theory component of a course, subject to the regulations contained herein.

Registration: Process of enrolling into a set of courses in a semester of a Program.

Regulations: The regulations, common to all B.Tech programs offered by Institute are designated as "SR21 Academic Regulations" and are binding on all the stakeholders.

Semester: It is a period of study consisting of 15 to 18 weeks of academic work equivalent to normally 90 working days. The odd Semester usually starts in July and even semester in December month.

Semester End Examinations (SEE): It is an examination conducted for all the courses offered in a semester after completion of that semester class work.

Student Outcomes: The essential skill sets that need to be acquired by every student during her/his program of study. These skill sets are in the areas of employability, entrepreneurial, social and behavioral.

University: Means the Jawaharlal Nehru Technological University Kakinada, Kakinada.

2. ACADEMICREGULATIONS

B.Tech. Regular Four Year Degree Programme
(For the batches admitted from the academic year 2021-22) &
(B.Tech. Lateral Entry Scheme For the batches admitted from the academic year 2022 – 23)

For pursuing four year undergraduate Bachelor Degree Programme of study in Engineering (B.Tech) offered by SRINIVASA INSTITUTE OF ENGINEERING AND TECHNOLOGY
under autonomous status and herein after referred to as SIET

3.CHOICE BASED CREDIT SYSTEM

The Indian Higher Education Institutions (HEI's) are changing from the conventional course structure to Choice Based Credit System (CBCS) along with introduction to semester systematfirstyearitself.Thesemestersystemhelpsinacceleratingtheteaching-learningprocess and enables vertical and horizontal mobility inlearning.

Thecredit basedsemestersystemprovidesflexibilityindesigningcurriculumandassigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach tolearning.

Choice Based Credit System (CBCS) is a flexible system of learning and provides choice for students to select from the prescribed elective courses. A course defines learning objectives and learning outcomes and comprises of lectures / tutorials / laboratory work / field work / project work / comprehensive Examination /seminars/assignments/alternative assessment tools/presentations / self-study etc. or a combination of some of these.

Under the CBCS, the requirement for awarding a degree is prescribed in terms of number of credits to be completed by the students.

The CBCS permits students to:

- Choose electives from a wide range of elective courses offered by thedepartments.
- Undergo additional courses ofinterest.
- Adopt an interdisciplinary approach inlearning.
- Makethebestuseofexpertiseoftheavailablefaculty.

4. ELIGIBILITY FORADMISSION

Admission to the B. Tech Programme shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or on the basis of any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

The total seats available as per the approved intake are grouped into two categories viz. category A and Category B with a ratio of 70:30 as per the state government guidelines vide G.O No.52.

- The admissions for category A and B seats shall be as per the guidelines of Andhra Pradesh State Council for Higher Education (APSCHE) in consonance with government reservationpolicy.
- Under Category A: 70% of the seats are filled through EAPCETcounseling.
- Under Category B: 30% seats are filled based on 10+2 merits in compliance with guidelines ofAPSCHE.

Admission eligibility-Under Lateral Entry Scheme Students with diploma qualification have an option of direct admission into II year B. Tech. (Lateral entry scheme). Under this scheme 10% seats of sanctioned intake will be available in each course as supernumeraryseats. AdmissionstothisthreeyearB.TechlaterentryProgrammewillbethrough ECET. The maximum period to complete B. Tech. under lateral entry scheme is six consecutive academic years from the date ofjoining.

5. DURATION OF PROGRAMME

The course duration for the award of the Degree in **Bachelor of Technology** will be four academic years, with two semesters in each year. However, if a student is unable to complete the course within 4 academic years, student can do so by giving more attempts but within 8 consecutive academic years from the date of admission.

AcademicCalendar

Forallthe eightsemestersacommonacademiccalendarshallbefollowedineachsemester by having an average of sixteen weeks of instruction, one week for the conduct of practical exams and with three weeks for theory examinations and evaluation. Dates for registration, sessional and end semester examinations shall be notified in the academic calendar of every semester. The schedule for the conduct of all the curricular and co-curricular activities shall be notified in theplanner.

6. MEDIUM OFINSTRUCTION

The medium of instruction shall be English for all courses, examinations, seminar presentationsandprojectwork.Thecurriculumwillcomprisecoursesofstudyasgivenincourse structure, in accordance with the prescribedsyllabi.

7. BRANCHES OFSTUDY

- Civil Engineering(CE)
- Electrical & Electronics Engineering(EEE)
- Mechanical Engineering(ME)
- Electronics & Communication Engineering(ECE)
- Computer Science & Engineering(CSE)
- Artificial Intelligence and Machine Learning(AI&ML)

8. TYPES OFCOURSES

a. Basic ScienceCourse:

Basic Science courses are the courses based upon the content leads to enhancement of skill and knowledge as well as value based and are aimed at man making education. Skill subjects are those areas in which one needs to develop a set of skills to learn anything at all levels. They are basics to learning any subject.

b. Professional CoreCourse:

Professional Core Course is the course which is to be compulsorily studied by a student as a core requirement to complete the requirement of a programme in a said discipline of study.

c. Professional ElectiveCourse:

Professional Electives provide breadth of experience in respective branch and application areas. Professional Elective course is a course which can be chosen from a pool of courses. It may be:

- Supportive to the discipline ofstudy
- Providing an expandedscope
- Enabling an exposure to some otherdiscipline/domain
- Nurturing student'sproficiency/skill.

An elective may be discipline centric (Professional Elective) focusing on those courseswhichaddgeneric proficiencytothestudentsormaybechosenfromanunrelated discipline called as "OpenElective".

There are four professional elective groups; students can choose not more than two courses from each group. Overall, students can opt for four professional elective

courses which suit their project work in consultation with the faculty advisor/mentor. Nevertheless, one course from each of the two open electives is to be selected.

d. Open ElectiveCourse:

Open elective course by other department students will have learning awareness and job-oriented benefits. Students require the opportunity to choose any open elective course from different departments to acquire knowledge in that field of course. Learning and employment benefits are not only through their own course subjects but also through open elective courses.

e. MandatoryCourse:

For mandatory courses like Induction Training, Environmental Sciences, Indian Constitution, Essence of Indian Traditional Knowledge, a student has to secure 25 marks out of 50 marks (i.e 50% of the marks allotted) in the end examination for passing the subject/course. For **Mandatory** courses "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

No marks or letter grade shall be allotted for all mandatory/non-credit courses.

f. NCC / NSSActivities:

NSS/NCC training is optional to the Undergraduate students. The activities shall be beyond class hours. The student participation shall be for a minimum period of 45 hours for certification in case of NSS.

9. SEMESTERSTRUCTURE

Eachacademicyearisdividedintotwosemesters,TWObeingMAINSEMESTERS(one odd + one even). Main Semesters are for regular class work. However, the following cases areexempted:

a. Students admitted on transfer from JNTUK affiliated institutes, Universities and other institutes in the subjects in which they are required to earn credits so as to be on par with regular students as prescribed by concerned 'Board ofStudies'.
b. Each semester shall be of 21 weeks (Table 1) duration and this period includes time for registration of courses, course work, examination preparation and conduct of examinations.
c. Each semester shall have a minimum of 90 working days, out of which number ofcontact days for theory / practical are 75 and 15 days for conduct of examinations and preparation.
d. The academic calendar shown in **Table 1** is declared at the beginning of the academic year.

Table 1: Academic Calendar

FIRST SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation and Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Semester Break and Supplementary Examinations			2 weeks
SECOND SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation & Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Summer Vacation/Summer Internship			10weeks

10. REGISTRATION

Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the Academic Calendar. It is absolutely compulsory for the student to register for courses in time. The registration will be organized department wise under the supervision of the Head of the Department.

IN ABSENTIA registration will not be permitted under any circumstances.

At the time of registration, students should have cleared all the dues of Institute and Hostel in the previous semesters, paid the prescribed fee for the current semester and not been debarred from the institute for a specified period on disciplinary or any other ground.

11. UNIQUE COURSE IDENTIFICATIONCODE

Every course of the B.Tech program will be placed in one of the four groups of courses as listed in the Table 2. The various courses and their two-letter codes are given below;

Table 2: Courses and their codes

S. No	Branch	Code
1	Civil Engineering	01
2	Electrical & Electronics Engineering	02
2	Mechanical Engineering	03
3	Electronics & Communication Engineering	04
4	Computer Science & Engineering	05
5	Artificial Intelligence & Machine Learning	61

12. CURRICULUM AND COURSESTRUCTURE

The curriculum shall comprise Foundation/ Skill Courses, Core Courses, Elective Courses, Open Electives, Laboratory Courses, Technical Seminar, Communication Skills Practice, Soft Skills Practice, Professional Society Activities, Community Service Project, Summer Internship and Major Project. The list of elective courses may include subjects from allied disciplines also.

Contact Periods: Depending on the complexity and content of the course, the number of contact periods per week will be assigned. Each Theory and Laboratory course carries credits based on the number of hours/weeks as follows:

- Contactclasses(Theory/Tutorial):1creditperlecturehourperweek.
- LaboratoryHours(Practical):0.5creditfor1Practicalhourperweek.
- Summer Internship:2credits
- Project Work and Full Semester Summer Internship (6 Months): 12Credits
- MOOCS: 2 Credits percourse
- Comprehensive Viva Voce: 1Credit
- Mandatory Courses(MC):**Non-Credit**
- Induction Program:**Non-Credit**

Credit distribution for courses offered is shown in Table3.

Table 3: Credit distribution

S. No	Course	Hours	Credits
1	Theory Course (Core/Foundation/Elective)	3	3
2	Professional Core Courses	3	3
3	Professional Elective Courses	3	3
4	Open Elective Courses	3	3
5	Engineering Science courses (Engineering Graphics/Engineering Workshop)	1L+4P	3
6	Engineering Science courses	3	3
7	Laboratory Courses	3	1.5
8	MOOC Courses	0	2
9	Skill Oriented Course / Certification Course	1L+2P	2
10	Skill Advanced Course / Certification Course	1L+2P	2
11	Soft Skill Course / Certification Course	1L+2P	2
12	Summer Internship (8 Weeks)	-	2
13	Community Service Project	-	4
13	Seminar	-	1
14	Project Work	-	10
15	Mandatory Courses	2	0
16	Minor Degree Courses	4	4

Course Structure

Every program of study shall be designed to have **36** theory courses, **5** Skill Oriented / Certification Courses, Summer Internship, Community Service Project, **5** Mandatory Courses and **17** laboratory courses. Every course of the B.Tech program will be placed in one of the 10 categories with minimum credits as listed in the **Table 4**. In addition,astudenthastocarryoutaProjectWork.

Table 4: Category Wise Distribution of Credits

S. No	Category	Subject Area and % of Credits	Average No. of Credits
1	Humanities and Social Sciences (HS), including Management.	HS (05% to 10%)	**10**
2	Basic Sciences (BSC) including Mathematics, Physics and Chemistry.	BSC (10% to 15%)	**21**
3	Engineering Sciences (ESC), including Workshop, Drawing, Basics of Electrical / Electronics / Mechanical / Computer Engineering.	ESC (10% to 15%)	**24**
4	Professional – Core Courses (PCC), relevant to the chosen specialization/ branch.	PCC (30% to 40%)	**51**
5	Professional Electives Courses (PEC), relevant to the chosen specialization/ branch.	PE (5% to 10%)	**15**
6	Open Electives Subjects / MOOCs -(OEC), from other technical and/oremerging subject areas.	OEC (5% to 10%)	**12**
7	Project Work through full Semester Summer Internship and Summer Internships (PW)	PW 5% to 10%	**17**
8	Skill Oriented Courses/Certification Courses project	SC (5% to 7%)	**10**
9	Mandatory Courses(Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge, Social Values and Professional Ethics)	MC (0%)	**0**
TOTAL CREDITS			**160**

For Four-Year Regular Programme:

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
B.Tech I Semester	2 Basic Science+ 1 Humanities andSocial Science + 2Engineering Science	1 Humanities and Social Science Lab + 1 Basic Science Lab + 1 Engineering Science Lab + Induction Training	19.5
B.Tech IISemester	2 Basic Science + 3 Engineering Sciences	2 Engineering Science Lab + 1 Basic Science Lab+ Environmental Science (MC)	19.5
B.Tech IIISemester	1 Basic Science + 4 Professional Core subjects	3 Professional Core Lab + Skill Oriented Course + Essence of Indian Traditional Knowledge (MC)	21.5
B.Tech IV Semester	1 Basic Science + 2 Professional Core + 1 Engineering Science / Professional Core (Interdisciplinary) + Humanities and Social Science	Engineering Science / Professional Core (Interdisciplinary) Lab + 2 Professional Core Lab + Skill Oriented Course+ Basics of IndianConstitution (MC)	21.5
B.Tech VSemester	3 Professional Core + 1 Open Elective/ Job Oriented Elective - I+ Professional Elective – I	2 Professional Core Lab + 1 Skill Advanced Course / Soft Skill Course + Summer Summer Internship 2 Months afterSecond Year (To be Evaluatedduring V Semester) + Professional Ethics and Human Values (MC)	24
B.Tech VI Semester	3 Professional Core+ Professional Elective - II+ Open Elective/ Job Oriented Elective – II	3 Professional Core Lab + 1 Skill Advanced Course / Soft Skill Course +IPR & Patents (MC)	21.5
B.Tech VII Semester	3 Professional Elective-III,IV&V + Open Elective/ Job Oriented Elective –III, IV+ Humanities and Social Science Elective	Industry Oriented Mini Project+ Comprehensive Viva Voce+ 1 Skill Advanced Course / Soft Skill Course.	21.5
B.Tech VIII Semester	Project Work Seminar		11

Total	6 Basic Science + 3 Humanities and Social Sciences + 5 Engineering Science+ 12 Professional Core + 1 Professional InterdisciplinaryCore+ 5 Professional Electives + 4 Open Electives / Job Oriented Electives + Project Work	1 Humanities and Social Sciences Lab + 2 Basic Science Lab + 3 Engineering Science Lab + 1 Engineering Science / Professional Core(Interdisciplinary) Lab + 10 Professional Core Lab + 2 Professional Elective Lab + 2 Skill Oriented Course + 3 Skill Advanced Course / Soft Skill Course + Summer Internship + +Community Service Project + Mandatory Courses (Non-Credit)	160

For Three year lateral entry programme :

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
B.Tech IIISemester	1 Basic Science + 4 Professional Core subjects	3 Professional Core Lab + Skill Oriented Course + Essence of Indian Traditional Knowledge (MC)	21.5
B.Tech IV Semester	1 Basic Science + 2 Professional Core + 1 Engineering Science / Professional Core (Interdisciplinary) + Humanities and Social Science	Engineering Science / Professional Core (Interdisciplinary) Lab + 2 Professional Core Lab + Skill Oriented Course+ Basics of Indian Constitution (MC)	21.5
B.Tech VSemester	3 Professional Core + 1 Open Elective/ Job Oriented Elective - I+ Professional Elective – I	2ProfessionalCoreLab+1 Skill Advanced Course / Soft Skill Course + Summer Internship 2 Months after Second Year (To be Evaluatedduring V Semester) + Professional Ethics and Human Values (MC)	21.5
B.Tech VI Semester	3 Professional Core+ Professional Elective - II+ Open Elective/ Job Oriented Elective – II	3ProfessionalCoreLab+1 Skill Advanced Course / Soft Skill Course +IPR& Patents (MC)	24
B.Tech VII Semester	3 Professional Elective-III,IV&V + Open Elective/ Job Oriented Elective –III, IV+ Humanities and Social Science Elective	Industry Oriented Mini Project+ Comprehensive Viva Voce+ 1 Skill Advanced Course / Soft Skill Course.	21.5
B.Tech VIII Semester	Project Work Seminar		11

Total	2 Basic Science + 2 Humanities and Social Sciences + 12 Professional Core + 1 Professional Core (Interdisciplinary)+ 5 Professional Electives + 4 Open Electives / Job Oriented Electives + Project Work through Summer Internship (6 Months)	1 Engineering Science / Professional Core (Interdisciplinary) Lab + 10 Professional Core Lab + 2 Professional Elective Lab + 2 Skill Oriented Course + 3 Skill Advanced Course / Soft Skill Course + Summer Internship +Industry Oriented Mini Project+ Comprehensive Viva Voce + Basics of Indian Constitution (MC) + Professional Ethics and Human Values (MC) + Essence of Indian Traditional Knowledge (MC) +IPR & Patents (MC)	121

Course wise break-up for Regular Program:

Total Theory Courses - 36 (6 Basic Science + 3 Humanities and Social Sciences + 5 Engineering Science + 12 Professional Core + 1ProfessionalCore(Interdisciplinary)+5ProfessionalElectives+4 Open Electives / Job Oriented Electives)	36@3credits each	108
Laboratory Courses –17 (2 Basic Science Lab +1 Humanity Science Lab+ 3 Engineering Science Lab + 1 Engineering Science / Professional Core(Interdisciplinary) Lab + 10 Professional Core Lab	17 @ 1.5 credits each	25.5
Summer Internship	1@1.5credit	1.5
Community Service Project	1 @4 credit	04
Seminar	1 @ 1 credit	01
Skill Oriented Courses / Certification Courses-2	2 @2credits each	04
Skill Advanced Courses / Soft Skill Courses / Certification Courses-3	3 @2 credit	06
Project Work	1 @10credits	10
Mandatory Courses	5 @ 0 credits	0
Total Credits		**160**

Course wise break-up for three years lateral entry program:

Total Theory Courses - 26 (2 Basic Science +2 Humanities and Social Sciences + 12 Professional Core + 1 Professional Core(Interdisciplinary) + 5 Professional Electives + 4 Open Electives / Job Oriented Electives)	26 @3credits each	78
Laboratory Courses –11 (1 Engineering Science / Professional Core(Interdisciplinary) Lab + 10 Professional Core Lab)	11 @ 1.5 credits each	16.5
Summer Internship	1 @1.5 credit	1.5
Community Service Project	1 @4 credit	04
Seminar	1 @ 1 credit	01
Skill Oriented Courses / Certification Courses - 2	2 @2credits each	04
Skill Advanced Courses / Soft Skill Courses / Certification Courses – 3	3 @2 credit	06
Project Work	1 @10credits	10
Mandatory Course	4 @ 0 credits	0
Total Credits		**121**

13. EVALUATIONMETHODOLOGY

The performance of a student in each semester shall be evaluated through Continuous Internal Assessment (CIA) and /or Semester End Examination (SEE) conducted semester wise.

S. No	Course	Marks	Examination and Evaluation		Scheme of Examination
1	Theory	70	Semester end examination of 3 hours duration (External Evaluation)		Shall be evaluated as given in 13.2
		30	Internal Examination		Shall be evaluated as given in 13.3
2	Laboratory	35	Semester end Laboratory Examination for 3 hours duration (External Evaluation)		Shall be evaluated as given in 13.5
		15	10	Day to Day Evaluation for performance in Laboratory experiments	Shall be evaluated as given in 13.6
			05	Practical Test (Internal Evaluation)	
3	i. Summer Internship ii. Community Service Project	100 100	Internal Evaluation Internal Evaluation		The evaluation shall be done by the Department Evaluation Committee (DEC) as given in 13.7
4	Skill Oriented Courses/ Skill Advanced Courses / Soft Skill Courses	30	Internal Evaluation		Shall be evaluated as given in 13.8
		70	End Semester Evaluation		
5	MOOCs	100	Semester End Evaluation		Shall be evaluated as given in 13.9
6	Project Work	60	Internal Evaluation		Continuous evaluation shall be done by the Project Evaluation Committee (PEC)as given in 13.10
		140	Semester End Evaluation		Project Work Viva-Voce Examination shall be conducted by a Committee at the end of the semester as given in 13.11
7	Mandatory Course	-	-		Shall be evaluated as given in 13.12

13.1Theory Course:

The performance of a student in every theory course shall be evaluated for total of 100 marks each, of which the relative weightage for Continuous Internal Assessment and Semester End Examination shall be 30 marks and 70 marks respectively.

13.2 External Evaluation for Theory Course - Semester End Examination:

TheSemesterEndExamination(SEE)ineachtheorysubjectshallbeconductedfor3hours duration at the end of the semester for 70marks.

Pattern of the Semester End Examination question paper is as follows:

The semester end examinations will be conducted institute examination section for 70 marks consists of five questions carrying 14 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept
30 %	To test the analytical skill of the concept
20 %	To test the application skill of the concept

13.3 Internal Evaluation for Theory Course:

a) For theory subjects, during a semester, there shall be two mid-termexaminations.

Each mid-term examination consists of

(i) Oneobjectiveexamination(20multiplechoicequestions)for10marksfora duration of 20minutes

(ii) Onedescriptiveexamination(3fullquestionsfor10markseach)which will be reduced to 15 marks for a duration of 90 minutesand

(iii) One assignment for 5marks.

(iv) All the internal exams shall be conducted as per institute norms from 50% of thesyllabi.

b) The total marks secured by the student in each mid-term examination are evaluated for 30 marks. Which consists of marks of objective examination, descriptive examination and assignment shall be submitted to the Institute examination section within one week after completion of the mid-termexaminations.

c) Internal marks can be calculated with 80% weightage for better of the two mids and 20% Weightage for other midexam.

Example:

Mid-1marks=Markssecuredin(objectiveexamination-1+descriptive examination-1 +oneassignment-1)

Mid-2marks=Markssecuredin(objectiveexamination-2+descriptive examination-2 +oneassignment-2)

Final internal Marks = (Best of (Mid-1/Mid-2) marks x 0.8 + Least of (Mid-1/Mid-2) marks x 0.2)

If a student scores 23 marks and 24 marks in the first and second mid-term examinations respectively, then Weighted Average Marks = 24 x 0.8 + 23 x 0.2 = 23.8, rounded to 24 Marks.

d) With the above criteria, institute examination section shall be displayed in the concerned college notice boards. If any discrepancy found, it shall be brought to the notice of institute examination section through proper channel within one week with all proofs. Discrepancies brought after the given deadline will not be entertained under anycircumstances.

13.4 Laboratory Course:

The performance of a student in every practical course shall be evaluated for total of 50 marks each, of which the relative weightage for Continuous Internal Assessment and Semester End Examination shall be 15 marks and 35 marks respectively.

13.5 External Evaluation for Practical Course:

Out of **35** marks **30** marks are allocated for experiment (procedure for conducting the experiment carries 15 marks. Readings, calculations & results-10 marks and Records – 5 marks) and **5** marks for viva-voce examination.

EachSemesterExternalLabExaminationshallbeevaluatedbyanInternalExamineralong with an External Examiner appointed by thePrincipal.

Astudenthastosecurenotlessthana minimumof35%ofmarks(17marks)exclusivelyat theSemesterEndExaminationsineachofthepracticalsubjectsinwhichthecandidatehad appeared.A candidate shall be declared to have passed in individual lab course if he secures a minimum of 40% aggregate marks (20 marks out of 50 marks) (Internal & Semester External Examination marks put together).

13.6 Internal Evaluation for Laboratory Course:

For practical subjects there shall be a Continuous Internal Evaluation during the semester for15internalmarks.Outofthe15 marksforinternalevaluation,day-to-dayassessmentin the laboratory shall be evaluated for 10 marks and internal practical examination shall be evaluated for 05 marks conducted by the laboratory teacherconcerned.

13.7 Summer Internship and Community Service Project

Summer Internship each of 8 weeks / 2 Months duration at the end of II B.Tech (i.e., IV Semester) are Mandatory with 1.5 credits.

The Summer Internship after II year shall be in the form of community service project as mentioned below,

- Community Service Project is an experiential learning strategy that integrates meaningful communityservicewithinstruction,participation,learningandcommunitydevelopment.
- Community Service Project involves students in community development andservice activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsibleinstitution.

Objective:

CommunityServiceProjectshouldbeanintegralpartofthecurriculum,asanalternativeto the2 monthsofSummer Internships/Apprenticeships/OnJobTraining,whenever thereis an exigency when students cannot pursue their Summer Internships. The specific objectives are;

- Tosensitizethestudentstothelivingconditionsofthepeoplewhoarearoundthem.
- Tohelpstudentstorealizethestark realitiesofthesociety.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility andaccountability.
- To make students aware of their inner strength and help them to find new /out of box solutions to the socialproblems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantagedsections.
- To help students to initiate developmental activities in the community in coordination with public and governmentauthorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different socialsystems.

ImplementationofCommunityServiceProject:

- Every student should put in a minimum of **180 hours** for the Community Service Project during the summervacation.
- Each class/section should be assigned with amentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. Of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives,etc.
- A log book has to be maintained by each of the student, where the activities undertaken/involved to berecorded.
- Thelogbookhastobecountersignedbytheconcernedmentor/facultyin-charge.
- Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/facultymember.
- The final evaluation to be reflected in the grade memo of thestudent.
- TheCommunityServiceProjectshouldbedifferentfromtheregularprogrammesof NSS/NCC/Green Corps/Red Ribbon Club,etc.
- Minor project report should be submitted by each student. An internal Viva shall alsobe conducted by a committee constituted by the principal of the college.
- AwardofmarksshallbemadeasperttheguidelinesofSummer Internship/apprentice/onthejob training.

Procedure:

- A group of students or even a single student could be assigned for a particular habitation or villageormunicipalward,asfaraspossible,inthenearvicinityoftheirplaceofstay,soas to enable them to commute from their residence and return back by evening orso.

  The Community Service Project is a twofold one–First; the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers; rather, it could b e another primary source of data.
- Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like–

  Agriculture, Health, Marketing and Cooperation, Animal Husbandry, Horticulture, Fisheries, Sericulture, Revenue and Survey, Natural Disaster Management, Irrigation, Law & Order, Excise and Prohibition, Mines and Geology, Energy, Internet, Free Electricity, Drinking Water

Suggestive List of Programmes under Community Service Project:

The following the recommended list of projects for engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentorsofagroupofstudentsshouldtaketheresponsibility ofmotivating,facilitating,and guiding the students. They have to interact with local leadership and people and appraise theobjectivesandbenefitsofthiskindofprojects.Theprojectreportsshallbeplacedinthe collegewebsiteforreference.Systematic,Factual,methodicalandhonestreportingshallbe ensured.

For Engineering Students

- Water facilities and drinking water availability
- Health and hygiene
- Stress levels and copingmechanisms
- Health interventionprogrammes
- Horticulture
- Herbalplants
- Botanical survey
- 8Zoologicalsurvey
- Marine products
- Aqua culture
- Inland fisheries
- Animals and species
- Nutrition

- Traditional health caremethods
- Food habits
- Air pollution
- Waterpollution
- Plantation
- Soilprotection
- Renewable energy
- Plant diseases
- Yoga awareness andpractice
- Healthcareawarenessprogrammesandtheirimpact
- Use of chemicals on fruits and vegetables
- Organicfarming
- Crop rotation
- Floury culture
- Access to safe drinking water
- Geological survey
- Sericulture
- Study of species
- Food adulteration
- Incidence of Diabetes and other chronic diseases
- Human genetics
- Blood groups and blood levels
- Internet Usage in Villages
- Android Phone usage by different people
- Utilisation of free electricity to farmers and related issues
- Gender ration in schooling level- observation.

Complimenting the community service project, the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programmes are;

Programmes for School Children:

1. Reading Skill Programme (ReadingCompetition)
2. Preparation of Study Materials for the nextclass.
3. Personality / LeadershipDevelopment
4. Career Guidance for X classstudents
5. Screening Documentary and other educationalfilms
6. AwarenessProgrammeonGoodTouchandBadTouch(Sexualabuse)
7. Awareness Programme on Socially relevantthemes.

Programmes for Women Empowerment:

1. Government Guidelines and PolicyGuidelines
2. Women'sRights

3. Domestic Violence
4. Prevention and Control ofCancer
5. Promotion of SocialEntrepreneurship

General Camps:

1. General Medicalcamps
2. EyeCamps
3. DentalCamps
4. Importance of protected drinkingwater
5. ODF awarenesscamp
6. SwatchBharath
7. AIDS awarenesscamp
8. Anti PlasticAwareness
9. Programmes onEnvironment
10. Health andHygiene
11. Hand washprogrammes
12. Commemoration and Celebration of importantdays.

Programmes for Youth Empowerment:

1. Leadership
2. Anti-alcoholism and Drugaddiction
3. Anti-tobacco
4. Awareness on CompetitiveExaminations
5. PersonalityDevelopment

Common Programmes:

1. Awareness onRTI
2. Health interventionprogrammes
3. Yoga
4. Treeplantation
5. Programmes in consonance with the Govt. Departmentslike
   Agriculture, Health, Marketing and Cooperation, Animal Husbandry, Horticulture, Fisheries, Sericulture, Revenue and Survey, Natural Disaster Management, Irrigation, Law & Order, Excise and Prohibition, Mines and Geology, Energy, Natural Disaster Management, Irrigation

Role of Students:

- Studentsmaynothavetheexpertisetoconductalltheprogrammesontheirown. The students then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmentalagencies.
- AsandwhenrequiredtheCollegefacultythemselvesactasResourcePersons.
- Students can work in close association with Non-Governmental Organizations like LionsClub,RotaryClub,etcorwithanyNGOactivelyworkinginthathabitation.
- AndalsowiththeGovernmentalDepartments.Iftheprogrammeisrolledout,the District Administration could be roped in for the successful deployment of the

programme.

- An in-house training and induction programme could be arranged for the faculty and participatingstudents,toexposethemtothemethodologyofServiceLearning.

TimelinefortheCommunityServiceProjectActivity

Duration: 8weeks

1. **Preliminary Survey (OneWeek)**
   - A preliminary survey including the socio-economic conditions of the allotted habitation to beconducted.
   - A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations,rural/urban.
   - The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats could be aligned for thesurvey.
2. **Community Awareness Campaigns (TwoWeeks)**
   - Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time.Thelistofactivitiessuggestedcouldbetakenintoconsideration.
3. **Community Immersion Programme (FourWeeks)**

   Along with the Community Awareness Programmes, the student batch can also work with any one of the below listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to the experiential learning about the community and its dynamics. Programmes could be in consonance with theGovt. Departments.
4. **Community Exit Report (OneWeek)**

   During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks work to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that particular habitation. The same report submitted to the teacher- mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to theUniversity. Throughout the Community Service Project, a daily log-book need to be maintained by the student's batch, which should be countersigned by the governmental agency representative and the teacher mentor, who is required to periodically visit the students and guidethem.

Evaluation of Summer Internship

Evaluation of the Summer Internship / Community Service Project shall be through the departmentalcommittee.Astudent willberequiredtosubmitadetailedprojectreportto the concerned department and appear for an oral presentation before the departmental committee.

- Day to day assessment log book - 20Marks
- Summer Internship / Project Report -40Marks
- Presentation and Viva-Voce - 40Marks

Aminimumof50%ofmaximummarksshallbeobtainedtoearnthecorresponding

credits.

13.8 Skill Oriented / Skill Advanced / Soft Skill Courses:

- For skill oriented/skill advanced /Soft skill Courses, one theory and 2 practical hours may be allotted or two theory hours may be adopted as per the decision of concerned BoS.
- From the five skill courses two shall be skill-oriented programs related to the domain and shall be completed in 2nd year. The remaining 3 skill courses, one shall be necessarily a soft skill course and the remaining 2 skill-advanced courses can be in the same domain or Job oriented skills which can be interdisciplinary.

Skill, Job Oriented Tracks for Mechanical Engineering

1. **Design/Analysis/Simulation**-CAD,UGNX,SolidWorks,ANSYS,FEA,CATIA, CREOetc
2. **Production/Manufacturing-** CAM, Piping, A/QC,CNC
3. **Thermal/Computational-** Computational Fluid Dynamics, MATLABetc
4. **Service Sector-** Industrial Safetyand Management, Operation Research, Oil &Gassafety.

Skill, Job Oriented Tracks for Civil Engineering

1. **Structural Design**- AutoCAD 2D 3D, ANSYS Civil, ETABS, PRO Steel,etc.
2. **Building Design-** Revit Architecture, ANSYS Civil, STAAD.PRO, AECOsimetc.
3. **LandsurveyandTransportationDesign-**Surveying,2DDrafting,3DModeling, Analysis, Road & Transport Designetc.

Skill, Job Oriented Tracks for Computer Science &Engineering

1. **Animation course**- VFX, CARTOONING, ANIMATION DESIGNetc
2. **Mobile app development-** App design for IOS and Androidetc.
3. **Data Science-** Natural language processing, sentiment analysis, fore casting, regression models etc
4. **Python programming-** Deep learning, IOT natural language processing, Game Graphics Programmingetc..

- A pool of interdisciplinary job-oriented skill courses shall be prepared by joint Board of studies and the syllabus along with the pre requisites shall be prepared for each of the requirements of laboratory infrastructure. The list of such courses shall be included in the curriculum of each branch of Engineering, so as to enable the student to choose from the list.
- Thestudentshallbegivenanoptiontochoosebetweentheskilladvancedcoursesbeing offered by the college or to choose a certificate course being offered by industries/Professional bodies/APSSDC or any other accreditedbodies.
- The Board of studies of the concerned discipline of Engineering shall review the skill advancedcoursesbeingoffered byeligibleexternalagenciesandprepareafreshlistevery year incorporating latest skills based on industrial demand.
- The credits assigned to the skill advanced course shall be awarded to the student upon producingthecertificateofskillfromtheagency/professionalbodiesasapprovedbythe Board

ofstudies.

- If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the concerned board of studies, the student is deemed to have fulfilled the attendance requirement of the course and acquire the credits assigned to thecourse.

Evaluation Procedure

Evaluation of the Skill oriented / Skill advanced / Soft skills / Certificate course shall be through the departmental committee. A student will be registered for the courses being offered by the department or interdisciplinary. The evaluation procedure is,

Internal Examination - 30 Marks (CIA Mode) External Examination - 70 Marks (SEE Mode)

A student will be registered for the course being offered by industries / Professional bodies / APSSDC or any other accredited bodies. The Merit / Pass certificate obtained from the course are considered for **2** credits.

13.9 Massive Open Online Courses (MOOCs):

Meeting with the global requirements, to inculcate the habit of self learning and incompliance with UGC guidelines, MOOCs (Massive Open Online Courses) have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers

Regulations for MOOCs

- The respective departments shall give a list of courses from NPTEL or any other standard providers, whose credentials are endorsed by theHOD.
- Each department shall appoint Coordinators/Mentors and allot the students to them who shallberesponsibletoguidestudentsinselectingonlinecoursesandprovideguidancefor theregistration,progressandcompletionofthesame.
- Astudentshallchooseanonlinecourse(relevanttohis/herprogrammeofstudy)fromthe given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of theHOD.
- The details of MOOCs shall be displayed in Grade card of a student, provided student submits the proof of completion of it to the department concerned through the Coordinator/Mentor.
- Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than **8**weeks.

Two credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.

Internal Evaluation for Design/ Drawing Courses:

For the subject having design and/or drawing, (such as engineering graphics, engineering

drawing, machine drawing, production drawing and building drawing) the internal marks distribution shall be 15 marks for day-to-day performance and 15 marks for Mid-Term Examinations.

External Evaluation for Design/ Drawing Courses:

The Semester End Examination in Design / Drawing Course shall be conducted for 3 hours duration at the end of the semester for 70 marks.

Pattern of the Semester End Examination question paper is as follows:

- A total of two Sections (Section-I &Section-II)
- Section-I contains five two mark questions. One question from each unit and a student hastobeansweredallthefivequestionscompulsory(5x2=10Marks)
- Section-II contains ten questions are to be designed taking two questions from eachunit (Unit Wise-Eitherortype)ofthetotalfiveunits. (5x12=60Marks)

A student has to secure not less than a minimum of 40% of marks (24 marks) exclusively at the Semester End Examinations in each of the theory subjects in which thecandidatehasappeared.However,thecandidateshallhavetosecurea minimumof 40% of marks (40 marks) in both external and internal components put together to become eligible for passing in thesubject.

Project Work

13.10 Internal Evaluation for Project Work and Full Semester Summer Internship at Industry:

The object of Project Work and Summer Internship is to enable the student to take up investigative study in the broad field of his branch of Engineering/Interdisciplinary, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the department on an individual basis or three/four students in a group under the guidance of a supervisor/ guide. This is expected to provide a good initiation for the student(s) in R&D work.

The total internal weightage for Project work, Summer Internship course is 60 marks and will be evaluated as follows,

- Submission of Abstract (Identification of Problem & Literature Survey)Profile and Abstract–Studenthastosubmittheindustry profileandabstractoftheprojectwithinfour weeks from date ofcommencementofSummer Internshipthroughmailorpost–15Marks
- Review-1 – at 6thweek from date of commencement of Summer Internship - 10Marks
- Review-2 – at 12thweek from date of commencement of Summer Internship- 15 Marks
- Review-3–at18thweekfromdateofcommencementofSummer Internship-20Marks

13.11External Evaluation for Project Work and Full Semester Summer Internship at Industry:

The external evaluation based on the report submitted and viva-voce exam for 140 marks shall be conducted by a Project Review Committee (PRC). The committee comprises of an External Examiner appointed by the Principal, Head of the Department and Project Guide/Supervisor. The evaluation of project work shall be based on the report submitted and a viva-voce exam for 140 marks by a committee comprising the Head of the Department, the project supervisor and an external examiner. A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits.

Project Work through full Semester Summer Internship in the Industry carry 12 credits. During Full semester Summer Internship, student has to spend one full semester (6 Months) in an identified industry /firm / organization and has to carry out the Summer Internship as per the stipulated guidelines of that industry / firm / organization and the institute.

Distribution of Project Work &Full Semester Summer Internship Marks

- Summer Internship Certificate isMandatory
- Project Report - 30 Marks
- Seminar on Summer Internship - 50 Marks
- Project Viva Voce - 60 Marks

13.12 Mandatory Courses:

Mandatory courses carry **"ZERO"**credits. There shall be **NO Semester-end** examination. However, ATTENDANCE in Mandatory courses shall be considered while calculatingaggregateattendanceinasemester.Theinternalexaminationshallbeconducted and evaluated similar to the THEORY courses for 50 Marks. The student shall be declared to have passed the mandatory courses only when Student secures **40% marks in the internal examination.** If the student FAILS, a re-examination shall be conducted for FAILED candidates in the Consecutive semester. The performance of the student shall be indicated in the grade sheets "**COMPLETED" (or) "NOT COMPLETED"**as givenin

12.1. Thestudentshouldpassallthemandatorycourses,fortheawardofB.Techdegree.

For the Mandatory Courses, if the student obtained 40% or more marks, then his performance shall be indicated as COMPLETED, otherwise the performance shall be indicated as NOT COMPLETED in the grade sheet.

14. GRADING PROCEDURE

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	A+ (Outstanding)	10
80 and less than 90%	A(Excellent)	9
70 and less than 80%	B (Very Good)	8
60 and less than 70%	C (Good)	7
50 and less than 60%	D (Fair)	6
40 and less than 50%	E (Pass)	5
Absent	AB	0
For Mandatory & Audit Courses		
Greater than or equal to 40%	Completed	-
Below 40%	Not Completed	-

Grades will be awarded to indicate the performance of students in each theory subject, laboratory / practical's, Skill oriented Course / Skill Advanced course / Soft Skill course, Summer Internships, Project Work and Full Semester Summer Internship in Industry (6 Months). Based on the percentage of marks obtained (Continuous Internal Evaluation plus

Semester EndExamination,bothtakentogether)asspecifiedinitem11above,acorrespondingletter grade shall begiven.Asa measureoftheperformanceofastudent,a10-pointabsolutegradingsystemusingthe following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks for theory & practical shall be followed as mentioned in the table.

A student who has 'failed' in any subject 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.

To a student who has not appeared for an examination in any subject, 'AB' grade will be allocated in that subject, and he is deemed to have 'failed'. A student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.

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.

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

A student passes the subject/ course onlywhenGP ('E' grade orabove)

- A student to obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examinationoffered.
- For Mandatory courses "Completed" or "Not Completed shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.**Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):**

i. The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the numberofcredits withthegradepointsscoredbya studentinallthecoursestakenby a student and the sum of the number of credits of all the courses undergone by a student,i.e.,

$$SGPA = \sum_{i=1}^{n} (C_i\, G_i) / \sum_{i=1}^{n} C_i$$

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

ii. The Cumulative Grade Point Average (CGPA) will be computed in the manner taking intoaccountallthecoursesundergonebyastudentoverallthesemestersofaprogram, i.e.,

$$CGPA = \Sigma (C_{ui} \times S_i) / \Sigma C_{ui}$$

Where, "S_i" is the SGPA of the i^{th} semester and C_{ui} is the total number of credits in that semester.

iii. BothSGPAandCGPAshallberoundedofftotwodecimalpointsandreportedinthe

transcripts.

iv. WhilecomputingtheSGPAthesubjectsinwhichthestudentisawardedZerograde points will also be included.

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

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

Example: Computation of SGPA and CGPA Illustration for SGPA

Course	Credit (C_i)	Grade Letter	Grade Point(G_i)	Credit Point ($C_i x G_i$)
Course-I	3	A+	10	3x10=30
Course-II	3	A	9	3x9=27
Course-III	3	B	8	3x8=24
Course-IV	3	D	6	3x6=18
Course-V	2	B	8	2x8=16
Course-VI	1	C	7	1x7=7
	15			122

Thus SGPA = $\frac{122}{15}$ **=8.13**

Illustration for CGPA

I Semester	II Semester	III Semester	IV Semester
Credit: 19 SGPA: 8.13	Credit: 19.5 SGPA: 6.9	Credit: 21.5 SGPA: 7.3	Credit: 21.5 SGPA: 6.8
V Semester	**VISemester**	**VII Semester**	**VIII Semester**
Credit:22 SGPA:8.2	Credit: 21.5 SGPA: 7.4	Credit: 21 SGPA: 7.2	Credit: 14 SGPA: 7.8

Thus, CGPA = $\frac{(19\times8.13)+(19.5\times6.9)+(21.5\times7.3)+(21.5\times6.8)+(22\times8.2)+(21.5\times7.4)+(21\times7.2)+(14.\times7.8)}{160}$ **=7.45**

15. AWARD OFCLASS

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

CGPA ≥ 7.5	CGPA ≥ 6.5 and < 7.5	CGPA ≥ 5.0 and < 6.5	CGPA ≥ 4.0 and < 5.0	CGPA < 4.0
FirstClass with Distinction	**First Class**	**Second Class**	**Pass Class**	**Fail**

A student with final CGPA is < 4.00 will not be eligible for the Award of the Degree.

16. CONDUCTOFSEMESTERENDEXAMINATIONSANDEVALUATION

Semester end examination shall be conducted by the Controller of Examinations (CoE) by

inviting Question Papers from the External Examiners

Question papers may be moderated for the coverage of syllabus, pattern of questions by a Semester End Examination Committee chaired by CoE and senior subject expert beforethe commencement of semester end examinations. Internal Examiner shall prepare a detailed scheme ofvaluation.

The answer papers of semester end examination should be evaluated by the examiner immediately after the completion of exam and the award sheet should be submitted to CoE in a sealed cover.

CoE shall invite required number of external examiners to evaluate all the end-semester answer scripts on a prescribed date(s). Practical laboratory exams are conducted involving external examiners.

Examinations Control Committee shall consolidate the marks awarded by the examiners and award grades.

17. SUPPLEMENTARYEXAMINATIONS

part from the regular End Examinations the institute may also schedule and conduct supplementary examinations for all subjects for the benefit of students with backlogs. Such students writing supplementary examinations as supplementary candidates may have to write more than one examination per day.

18. ATTENDANCE REQUIREMENTS AND DETENTIONPOLICY

A candidate shall put in a minimum required attendance of 75 % in that semester. Otherwise, The student shall be declared detained and has to repeat semester. For cases of medical issues, deficiency of attendance in a semester to the extent of 10% may be condoned by the College Academic Committee (CAC) on the recommendation of Head of the department if their attendance is between 75% and 65% in a semester, subjected to submission of medical certificates and other needful documents to the concerned departments. The condonation is permitted maximum of two times during the entire course ofstudy.

A prescribed fee shall be payable towards condonation of shortage of attendance. A student shall not be promoted to the next semester unless student satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, student shall not be eligible for readmission into the same class.

Any student against whom any disciplinary action by the institute is pending shall not be permitted to attend any SEE in that semester.

19. PROMOTIONPOLICIES

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned for promotion to higher classes

a) A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement as per Universitynorm.

b) AstudentwillbepromotedfromIItoIIIyearifhe fulfillstheacademicrequirementof40% of credits up to either II year I-Semester or II year II-Semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.

c) A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to either III year I semester or III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year IIsemester.

A student shall register and put-up minimum attendance in all 160 credits and earns all 160 credits.Marksobtainedinall160creditsshallbeconsideredforthecalculationofaggregate percentage of marks obtained. In the course structure within eight academic years from the yearoftheiradmission.Coureandtheiradmissionshall standcancelled

A lateral entry student shall register and put-up minimum attendance in all 121credits and earn all the 121credits. Marks obtained in all 121credits shall be considered for the calculationofaggregatepercentageofmarksobtained.Ifthestudentdidnotcompletethe course within six academic years from the year of admission, their seat shall surrender in B.Tech. Course and their admission shall stands cancelled.

20. MAJOR DEGREE WITH AMINOR:

1. Students, whoaredesirousofpursuingtheirspecialinterestareasotherthanthechosen discipline of Engineering, may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme; student will get Major degree of Mechanical Engineering with minor degree of CivilEngineering.

   Student can opt the Industry relevant tracks of any branch to obtain the Major degree with Minor, for example, a B.Tech Mechanical Engineering student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.
2. A student shall be permitted to register for Minors program at the beginning of 4thsemester provided that the student must have acquired 7.5 SGPA (Semester Grade point average) upto the end of 2ndsemester without any history of backlogs. It is expectedthatthe3rdsemesterresultsmaybeannouncedafterthecommencementofthe 4thsemester, if a student fails to acquire 7.5 SGPA upto 3rdsemester or failed in any course, his registration for Minors program shall stand cancelled. An SGPA of 7.5 has to be maintained in the subsequent semesters without any backlog in order to keep the Minor registrationactive.
3. Minor degree will cumulatively require additional **20** credits in the specified area in addition to the credits essential for obtaining the under graduate degree in Major discipline (i.e., 160credits).
4. The BoS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / Demand, for example the minor tracks can be the fundamental courses in CSE, CSE(AI), CSE(DS), ECE, EEE,CE,ME etc. or

industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science(DS), Robotics, Electric vehicles, VLSI etc. The list of disciplines/ branches eligible to opt for an industry relevant minor specialisation shall be clearly mentioned in the respectiveBOS.

5. Student must complete 4 courses each of 4 credits by choosing from six courses mentioned in the course structure of thedepartment.
6. Inadditiontoacquiring16creditsfromcourses,studentsshallhaveto pursueatleast2 courses for two credits each through MOOCS/NPTEL. The concerned BOS shall list the MOOCS/NPTEL courses to be pursued by the student. Attendance will not be monitored for this MOOCS course. A student has to acquire a certificate of MOOCS/NPTEL course from the agencies approved by the BOS in order to earn the requiredcredits,andthat shouldbeevaluatedbyDepartmentcommitteeforthecredits.
7. Student can opt the Industry relevant minor specializations as approved by the concerned departmental BoS or student can opt the courses from skilldevelopment corporation (APSSDC) or student can opt the courses from an external agency recommendedandapprovedbyconcernedBOSandshouldproducecoursecompletion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skill based on industrialdemand.
8. A committee should be formed at the level of College/Universities/department to evaluate the grades/ marks given by external agencies to a student which are approved by concerned BoS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.
9. If a student prefers to take test from an external agency, student must take a comprehensive viva-voce conducted at University level and the marks assigned for the Viva-voce will be assigned to that course. However, if students wish to take the courses from the department, student should take examination conducted by the University only. Also, if a student completes courses from external agency without taking test are also eligible to get minor degree after fulfilling all the formalities assigned by the departmentalcommittee.
10. It is the responsibility of the student to acquire prerequisite knowledge of the minor program domain before taking the course. The University/Institution BoS concerned shallprepare thelistofsubjectsandprerequisitesforeachminortrack.
11. If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or “Pass (P)” grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in thetranscript.

12. Incaseastudentfailsto meettheCGPArequirementforB.TechDegreewithMinorat anypointafterregistration, studentwillbedroppedfromthelistofstudentseligiblefor Degree with Minors and they will receive B. Tech Degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed bythem.

21. HONORSPROGRAM:

1. Students from same department are eligible for Honourprogram.
2. A student shall be permitted to register for Honours program at the beginning of 4th semester provided that the student must have acquired 7.5 SGPA upto the end of 2nd semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4th semester, if a student fails to acquire 7.5 SGPA upto 3rdsemester or failed in any course, his/her registration for Honours program shall standcancelled.
3. Students can select advanced subjects from their respective branch in which they are pursuing the degree. E.g. If Mechanical Engineering student completes the selected advanced subjects from the same branch under this scheme, student will be awarded B.Tech (Honours) in MechanicalEngineering.
4. Student must complete 4 courses @ 4 credits from each pool and 2 MOOC/NPTEL courses @ 2 credits (Total 20credits)
5. The student who has registered for Honours shall choose one course from each pool. There shall be 4 pools with 5 courses each as mentioned in course structure of Honours program. The board of studies concerned will decide the courses under each pool for Honoursprograms.
6. For Honours program, all the courses offered in each pool shall be domain specific courses and advancedcourses.
7. In addition to the 4 courses chosen, one from each pool, students shall have to pursue at least 2 courses through MOOCS/NPTEL. The concerned BoS shall list the MOOCS/NPTEL courses to be pursued by the student. Attendance will not be monitored for this MOOCS course. Student has to acquire a certificate of MOOCS/NPTEL course from the agencies approved by the BoS in order to earn 2 credits. BoS concerned shall prepare the list of advanced courses for each pool taking into consideration the core courses offered in the curriculum. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall provide pre requisites to take the specific course by the student. It is the responsibilityofthestudenttoacquire/completeprerequisitebeforetakingthecourse.
8. If a student drops (or terminated) from the Honours program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or “Pass” grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Honours will be shown in the transcript. None of the courses done under the dropped Honours will be shown in thetranscript.

9. In case a student fails to meet the CGPA requirement for Degree with Honours at any point after registration, student will be dropped from the list of students eligible for DegreewithHonoursandtheywillreceiveB.TechDegreeonly.However,suchstudents will receive a separate grade sheet mentioning the additional courses completed by them.

22. GRADUATIONREQUIREMENTS

The following academic requirements shall be met for the award of the B.Tech degree.

- Student shall register and acquire minimum attendance in all courses and secure 160 credits for regular program and 121 credits for lateral entryprogram.
- A student of a regular program, who fails to earn 160 credits within eight consecutive academic years from the year of their admission with a minimum CGPA of 4.0, is not eligible to getdegree.
- Astudentofa lateralentryprogram,who failstoearn121creditswithin six consecutive academicyearsfromtheyearoftheiradmissionwithaminimumCGPAof4.0,shallnot get their degree and the admission standscancelled.

23. REVALUATION

A student, who seeks the re-evaluation of the answer script, is directed to apply for the photocopy of their semester examination answer paper(s) in the theory course(s), within 5 working days from the declaration of results in the prescribed format with prescribed fee to the Controller of Examinations through the Head of the department. On receiving the photocopy, the student can consult with a competent member of faculty and seek the opinion for revaluation. Based on the recommendations, the student can register for the revaluation with prescribed fee. The Controller of Examinations shall arrange for the revaluation and declare the results. If COE found the difference between the evaluation and reevaluation is more than 10 marks, then the COE shall arrange another evaluation. Revaluation is not permitted to the courses other than theory courses.

24. TERMINATION FROM THEPROGRAMME

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

- The student fails to satisfy the requirements of the program within the stipulated maximum period for thatprogram.
- A student shall not be permitted to study any semester more than three times during the entire Program ofstudy.
- The student fails to satisfy the norms of discipline specified by the institute from time totime.

25. WITH-HOLDING OF RESULTS

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

26. TEMPORARY BREAK OF STUDY FROM THEPROGRAMME

A candidate is normally not permitted to break the study. However, if a candidate intends to

temporarily discontinue the program in the middle for valid reasons (such as accident or hospitalization duetoprolongedillhealth)andtorejointheprogramafterthebreak fromthe commencement of the respective semester as and when it is offered , she/he shall apply to the Principal in advance. Such application shall be submitted before the of the semester in question commencement and forwarded through the Head documents and endorsement of his / her parent / guardian.

a) The institute shall examine such type of applications, and if it finds the case to be genuine, it may permit the student to rejoin. Such permissions are accorded only to those who do not have any outstanding dues like tuition feeetc.

b) The total period for completion of the program reckonedfrom the commencement of the semester to which the candidate was first admitted shall not exceed the maximum period of 8 years for regular and 6 years for lateral entry students. The maximum period includes the break period.

27. STUDENTTRANSFERS

StudenttransfersshallbeasperttheguidelinesissuedbytheGovernmentofAndhraPradesh, University and Institute from time totime.

28. GRADUATIONDAY

The institute shall have its own annual Graduation Day for the award of Degrees to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute. The college shall institute prizes and medals to meritorious students and award them annually at the Graduation Day. This will greatly encourage the students to strive for excellence in their academic work.

29. CONDUCT ANDDISCIPLINE

- Students shall have a good conduct within and outside the premises of the Institute in a decent and dignified manner befitting the students of Srinivasa Institute of Engineering &Technology.
- As per the order of the Honorable Supreme Court of India, ragging in any form is considered a criminal offence and is totally banned. Any form of ragging will be severely dealt with the following acts of omission and / or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard toragging.

(i) Lack of courtesy and decorum, indecent behavior anywhere within or outsidethe collegecampus.

(ii) Damage of college property or Possession, consumption and distribution of Alcoholic drinks or any kind of narcotics to fellow students /citizens.

- Mutilation or unauthorized possession of librarybooks.
- Noisy and unruly behavior, disturbing studies of fellowstudents.
- Hacking in computer systems (such as entering into other person's areas without prior permission, manipulation and / or damage of computer hardware and software or any other cyber crimeetc.
- Usage of camera /cell phones in thecampus.
- Plagiarism of anynature.

- Any other act of gross indiscipline as decided by the college academic council from time totime.
- Commensurate with the severity of offense, the punishment may be reprimand, fine, expulsionfromtheinstitute/hostel,debarringfromexamination,disallowingtheuseof certain facilities of the Institute, rustication for a specified period or even outright expulsion from the Institute, or even handing over the case to appropriate law enforcement authorities or the judiciary, asrequired by the circumstances.
- For an offence committed in (i) the hostel (ii) department or in a class roomand (iii) Else where, the chief Warden, the concern Head of the Department andthe Principal respectively, shall have the authority to reprimand or impose fine.
- Cases of adoption of unfair means and/ or any malpractice in an examination shall be reported to the principal for taking appropriate correctiveaction.
- All cases of serious offence, possibly requiring punishment other than reprimand,shall be reported to the Academic council of thecollege.
- The Institute Level Standing Disciplinary Action Committee constituted by the academic council shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.
- The Principal shall deal with any problem, which is not covered under these rules and regulations.

30. GRIEVANCE REDRESSALCOMMITTEE

Grievance and Redressal Committee constituted by the Principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters. All the students must abide by the code and conduct rules prescribed by the college from time to time.

31. TRANSITORYREGULATIONS

Required to do all the courses in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those candidates who have already passed such courses in the earlier semesters she/he was originally admitted into and substitute subjects are offered in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

c) Four Year B.Tech Regularcourse:

A student who is under Jawaharlal Nehru Technological University Kakinada (JNTUK) curriculum and detained due to shortage of attendance at the end of the first semester shall join the autonomous batch of first semester. Such students shall study all the courses prescribed for the batch in which the student joined and considered on par with regular candidates of Autonomous stream and will be governed by the autonomous regulations.

A student who is following JNTUK curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester or at the subsequent semesters shall join withtheautonomousbatchintheappropriatesemester.Suchcandidatesshallberequiredto passinallthecoursesintheprogram prescribed by theBoard ofStudiesconcernedforthat batch of students from that semester onwards to be eligible for the award of degree. However,

exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute courses will be offered in place of them as decided by the Board of Studies. The student has to clear all his backlog courses up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the award of degree.Thetotalnumberofcreditsto besecuredfortheawardofthedegreewillbesumof the credits up to previous semester under JNTUK regulations and the credits prescribed for the semester in which a candidateseeks readmission and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

d) Three Year B.Tech program under Lateral EntryScheme:

A student who is following JNTUK curriculum and detained due to shortage of attendance at the end of the first semester of second year shall join the autonomous batch of third semester. Such students shall study all the courses prescribed for the batch in which the student joins and considered on par with Lateral Entry regular candidates of Autonomous stream and will be governed by the autonomous regulations.

A student who is following JNTUK curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester of second year or at the subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute courses are offered in place of them as decided by the Board of Studies. The student has to clear all his backlog courses up to previous semester by appearing for the supplementary examinations conductedbyJNTUKfortheawardofdegree.Thetotalnumberofcreditstobesecuredfor the award of the degree will be sum of the credits up to previous semester under JNTUK regulations and the credits prescribed for the semester in which a candidate seeks readmission and subsequent semesters under the autonomous status. The class will be awardedbasedontheacademicperformanceofastudentintheautonomouspattern.

e) Transfer candidates (from non-autonomous college affiliated toJNTUK):

A student who is following JNTUK curriculum, transferred from other college to this institute in third semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will begiven in the courses of the semester(s) of the batch which he had passed earlier and substitute courses are offered in their place as decided by the Board of Studies. The student has to clear all his backlog courses up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the award of degree. The total number of credits to besecuredfortheawardofthedegreewillbethesumofthecreditsup topreviussemester under JNTUK regulations and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous status. The class will

beawardedbasedontheacademicperformanceofastudentintheautonomouspattern.

f) Transfer candidates (from an autonomous college affiliated toJNTUK):

A student who has secured the required credits up to previous semesters as per the regulations of other autonomous institutions shall also be permitted to be transferred to this institute. A student who is transferred from the other autonomous colleges to this institute in third semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute subjects are offered in their place as decided by the Board of Studies. The total number of credits to be secured for the award of the degree will be the sum of the credits up to previous semester as per the regulations of the college from which he is transferred and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

32. REVISION OF REGULATIONS ANDCURRICULUM

The Institute from time to time may revise, amend or change the regulations, scheme of examinations and syllabi if found necessary and on approval by the Academic Council and the Governing Body shall come into force and shall be binding on the students, faculty, staff, all authorities of the Institute and others concerned.

33. B.TECH - PROGRAM OUTCOMES(POS)

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

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

PO-3 : 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 **(Design/Development of Solutions).**

PO-4 : 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 **(Conduct Investigations of Complex Problems).**

PO-5: Create,select,andapplyappropriatetechniques,resources,andmodernengineeringand IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations **(Modern ToolUsage).**

PO-6 : 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 **(The Engineer and Society).**

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

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

PO-9 : Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings **(Individual and Team Work).**

PO-10 : Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effectivereportsanddesigndocumentation, makeeffectivepresentations,andgiveand receive clear instructions**(Communication).**

PO-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.

PO-12 : 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 **(Life-long learning).**

34. FREQUENTLY ASKED QUESTIONS AND ANSWERS ABOUTAUTONOMY

1. Who grants Autonomy? UGC, Govt., AICTE or University

In case of Colleges affiliated to a university and where statutes for grant of autonomy are ready, it is the respective University that finally grants autonomy but only after concurrence from the respective state Government as well as UGC. The State Government has its own powers to grant autonomy directly to Govt. and Govt. aided Colleges.

2 ShallSrinivasaInstituteofEngineering&TechnologyawarditsownDegree?

No.DegreewillbeawardedbyJawaharlalNehruTechnological UniversityKakinada,with a mention of the name Srinivasa Institute of Engineering & Technology on the Degree Certificate.

3 What is the difference between a Deemed to be University and an Autonomy College?A Deemed to be University is fully autonomous to the extent of awarding its own Degree. A Deemed to be University is usually a Non-Affiliating version of a University and has similar responsibilities like any University. An Autonomous College enjoys Academic Autonomy alone. The University to which an autonomous college is affiliated will have checks on the performance of the autonomouscollege.

4 How will the Foreign Universities or other stake – holders know that we are an AutonomousCollege?

Autonomous status, once declared, shall be accepted by all the stake holders. The Govt. of Andhra Pradesh mentions autonomous status during the First Year admission procedure. Foreign Universities and Indian Industries will know our status through our website.

5 What is the change of Status for Students and Teachers if we become Autonomous?

Anautonomouscollegecarriesaprestigiousimage.Autonomyisactuallyearnedoutofour continued past efforts on academic performances, our capability of self- governance and the kind of quality education weoffer.

6 Who will check whether the academic standard is maintained / improved after Autonomy? How will it bechecked?

There is a built in mechanism in the autonomous working for this purpose. An Internal Committee called Academic Programme Evaluation Committee, which will keep a watch on the academics and keep its reports and recommendations every year. In addition the highest academic council also supervises the academic matters. The standards of our question papers,

the regularity of academic calendar, attendance of students, speed and transparency of result declaration and such other parameters are involved in this process.

7 Will the students of Srinivasa Institute of Engineering & Technology as an Autonomous College qualify for University Medals and Prizes for academic excellence?

No. Srinivasa Institute of Engineering &Technology has instituted its own awards, medals, etc. for the academic performance of the students. However for all other events like sports, cultural on co-curricular organized by the University the students shall qualify.

8 CanSrinivasaInstituteofEngineering&TechnologyhaveitsownConvocation?

No. Since the University awards the Degree the Convocation will be that of theUniversity, buttherewillbeGraduationDayatSrinivasaInstituteofEngineering&Technology.

9 Can Srinivasa Institute of Engineering& Technology give a provisional degree certificate?

Since the examinations are conducted by Srinivasa Institute of Engineering & Technology and the results are also declared Srinivasa Institute of Engineering & Technology, the college sends a list of successful candidates with their final Grades and Grade Point Averages including CGPA to the University. Therefore with the prior permission of the University the college will be entitled to give the provisional certificate.

10 Will Academic Autonomy make a positive impact on the Placements or Employability?

Certainly, the number of students qualifying for placement interviews is expected to improve, due to rigorous and repetitive classroom teaching and continuous assessment. Also the autonomous status is more responsive to the needs of the industry. As a result therefore, there will be a lot of scope for industry oriented skill development built-in into the system. The graduates from an autonomous college will therefore represent better employability.

11 What is the proportion of Internal and External Assessment as an Autonomous College?

Presently, it is 60 % external and 40% internal. As the autonomy matures the internalassessmentcomponentshallbeincreasedatthecostof externalassessment.

12 IsitpossibletohavecompleteInternalAssessmentforTheoryorPracticals?

Yesindeed.Wedefineourownsystem.Wehavethefreedomtokeeptheproportionof external and internal assessment component tochoose.

13 Why Credit based GradeSystem?

The credit based grade system is an accepted standard of academic performance the world overinallUniversities.Theacceptabilityofourgraduatesintheworldmarketshall improve.

14 What exactly is a Credit based GradeSystem?

The credit based grade system defines a much better statistical way of judging the academic performance. One Lecture Hour per week of Teaching Learning process is assigned One Credit. One hour of laboratory work is assigned half credit. Letter Grades like S,A+,A, B+,B,C,F etc. are assigned for a Range of Marks. (e.g. 90% and above is S, 80 to 89 % could be A+ etc.) in Absolute Grading System while grades are awarded by statistical analysis in relative grading system. We thus dispense with sharp numerical boundaries. Secondly, the grades are associated with defined Grade Points in the scale of 1 to 10. Weighted Average of Grade Points is also defined Grade Points are weighted by Credits and averaged over total credits in a Semester. This process is repeated for all Semesters and a CGPA defines the Final Academic Performance

15 WhatarethenormsforthenumberofCreditsperSemesterandtotalnumberof Credits for UG/PGprogramme?

These norms are usually defined by UGC or AICTE. Usually around 28 Credits per semester is the accepted norm.

16 What is a Semester Grade Point Average(SGPA)?

The performance of a student in a semester is indicated by a number called SGPA. The SGPA is the weighted average of the grade points obtained in all the courses registered by the student during the semester.

$$SGPA = \sum_{n} (C_i\, G_i) / \sum_{n} C_i$$

Where, $C_i$is the number of credits of the i^{th}course and $G_i$is the grade point scored by the studentinthei^{th}courseand"i"representthecoursenumberinwhichastudentregisteredin the concerned semester. SGPA is rounded to two decimalplaces.

17 What is a Cumulative Grade Point Average(CGPA)?

An up-to-date assessment of overall performance of a student from the time of his first registration is obtained by calculating a number called CGPA, which is weighted average of the grade points obtained in all the courses registered by the students since he entered the Institute.

$$CGPA = \Sigma\, (C_{ui} \times S_i) / \Sigma\, C_{ui}$$

Where, $S_i$is the SGPA of the i^{th}semester and $C_{ui}$is the total number of credits upto the that semester CGPA is rounded to two decimal places.

18 Is there any Software available for calculating Gradepoint averages and converting the same intoGrades?

Yes, the institute has its own MIS software for calculation of SGPA, CGPA, etc.

19 Will the teacher be required to do the job of calculating SGPAs etc. and convertthe same into Grades?

No. The teacher has to give marks obtained out of whatever maximum marks as it is. Rest is all done by the computer.

20 Will there be any Revaluation or Re-ExaminationSystem?

No. There will double valuation of answer scripts. There will be a makeup Examination after a reasonable preparation time after the End Semester Examination for specific cases mentioned in the Rules and Regulations. In addition to this, there shall be a 'summer term' (compressed term) followed by the End Semester Exam, to save the precious time of students.

21 How fast Syllabi can be and should bechanged?

Autonomy allows us the freedom to change the syllabi as often as we need.

22 Will theDegreebeawardedonthebasisofonlyfinalyearperformance?

No. The CGPA will reflect the average performance of all the semester taken together.

23 What are Statutory AcademicBodies?

GoverningBody,AcademicCouncil,ExaminationCommitteeandBoardofStudiesarethe different statutory bodies. The participation of external members in everybody is compulsory. The institute has nominated professors from IIT, NIT, University (the officers of the rank of Pro-vice Chancellor, Deans and Controller of Examinations) and also the reputed industrialist and industry experts on thesebodies.

24 Who takes Decisions on Academicmatters?

The Governing Body of institute is the top academic body and is responsible for all the academic decisions. Many decisions are also taken at the lower level like Boards of Studies. Decisions taken at the Board of Studies level are to be ratified at the Academic Council and Governing Body.

25 What is the role of Examinationcommittee?

The Examinations Committee is responsible for the smooth conduct of internal, End Semester and makeup Examinations. All matters involving the conduct of examinations, spot valuations, tabulations, preparation of Grade Cards etc, fall within the duties of the Examination Committee.

26 Is there any mechanism for GrievanceRedressal?

Theinstitutehasgrievanceredressalcommittee,headedbyDean-StudentaffairsandDean- IQAC.

27 How many attempts are permitted for obtaining aDegree?

All such matters are defined in Rules & Regulation

28 Who declares theresult?

The result declaration process is also defined. After tabulation work wherein the SGPA, CGPA and final Grades are ready, the entire result is reviewed by the Moderation Committee. Any unusual deviations or gross level discrepancies are deliberated and removed. The entire result is discussed in the Examinations and Result Committee for its approval. The result is then declared on the institute notice boards as well put on the web site and Students Corner. It is eventually sent to the University.

29 Who will keep the Student Academic Records, University or Srinivasa Instituteof

Engineering& Technology?

It is the responsibility of the Dean, Academics of the Autonomous College to keep and preserve all the records.

30 What is our relationship with the JNTUniversity?

We remain an affiliated college of the JNT University. The University has the right to nominate its members on the academic bodies of the college.

31 Shall we require University approval if we want to start any NewCourses?

Yes, the approval from the university is required.

32 Shall we get autonomy for PG and Doctoral Programmesalso?

Yes, presently our PG programmes also enjoying autonomous status.

35. MALPRACTICESRULES

DISCIPLINARY ACTION FOR MISCONDUCT IN DURING EXAMINATIONS

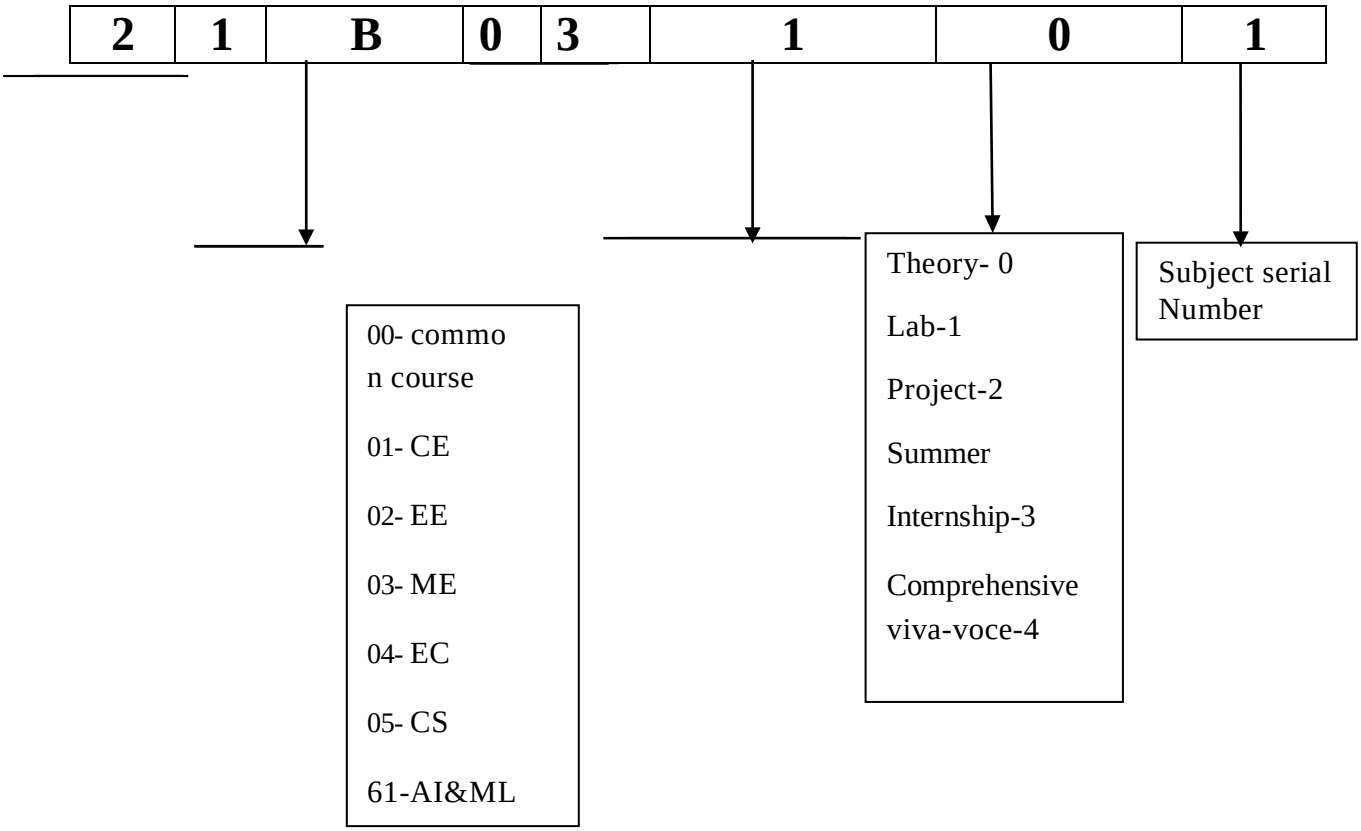
S.No	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hallin respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.

2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Controller of Examinations.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is alsodebarred fortwo consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registeredagainst him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture ofseat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examinersor writes to the examinerrequesting him to award pass marks.	Cancellation of the performance in that subject.

6.	Refuses to obey the orders of the Controller of Examinations /Additional Controller of Examinations/any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the COE or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the COE or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage toordestruction of property in the examination hall or any part of the Institute premises or engages in any otheractwhich in the opinion of the officer on duty Amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	They shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and give up their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examinationhall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture ofseat.

8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and gives up the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and gives up the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered againstthem.
10.	Comes in a drunken condition	Expulsion from the examination hall and cancellation of the performance in that subject andall other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of thatsemester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/yearexaminations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Director/Principal for further action toawards suitable punishment.	

COURSE CODING STRACTURE



B	BASIC SCIENCES
E	ENGNEERINGSCIENCES
H	HUMANITIES & SOCIAL SCIENCES
P	PROFFESSIONAL CORE
S	SKILL ORIENTED COURSE
M	MANDATARY COURSE
L	PROFESSIONAL ELECTIVE
N	OPEN ELECTIVE
U	HONOUR
R	MINOR

COURSE STRUCTURE

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE – B.Tech 2021-2025

I B.Tech I Semester – Electronics and Communication Engineering

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	21B00101	Mathematics-I	4	1	0	30	70	100	3
2	21B00104	Applied Physics	3	0	0	30	70	100	3
3	21H00101	Communicative English	3	0	0	30	70	100	3
4	21E05101	Programming in C	3	1	0	30	70	100	3
5	21E02101	Network Analysis	4	1	0	30	70	100	3
6	21H00111	Communicative English Laboratory	0	0	3	30	70	100	1.5
7	21B00114	Applied Physics Laboratory	0	0	3	15	35	50	1.5
8	21E05111	Programming in C Laboratory	0	0	3	15	35	50	1.5
9	21M00131	Environmental Science	2	0	0	50	0	0	0
Total			**19**	**3**	**9**	**260**	**490**	**750**	**19.5**

I B.Tech II Semester – Electronics and Communication Engineering

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	21B00201	Mathematics-II	4	1	0	30	70	100	3
2	21B00203	Applied Chemistry	3	0	0	30	70	100	3
3	21E04201	Electronics Devices & Circuit	3	1	0	30	70	100	3
4	21E05202	Python Programming	3	1	0	30	70	100	3
5	21E04202	Digital Electronics	3	1	0	30	70	100	3
6	21E04211	Networks Analysis Laboratory	0	0	3	15	35	50	1.5
7	21E04212	Digital System Design Laboratory	0	0	3	15	35	50	1.5
8	21B00213	Applied Chemistry Laboratory	0	0	3	15	35	50	1.5
Total			**16**	**4**	**9**	**195**	**455**	**650**	**19.5**

II B.Tech I Semester – Electronics and Communication Engineering

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	21B00301	Mathematics – III	3	1	0	30	70	100	3
2	21P04301	Electronic Circuit Analysis	3	1	0	30	70	100	3
3	21P04302	Linear Integrated Circuits Applications	3	1	0	30	70	100	3
4	21P04303	Electromagnetic Field Theory	3	1	0	30	70	100	3
5	21P04304	Signals and Systems	3	1	0	30	70	100	3
6	21P04311	Electronic Devices and Circuits Laboratory	0	0	3	15	35	50	1.5
7	21P04312	Electronic Circuit Analysis Laboratory	0	0	3	15	35	50	1.5
8	21P04313	Integrated Circuits Laboratory	0	0	3	15	35	50	1.5
9	21S04301	Python programming Lab	1	0	2	30	70	100	2
10	21M00301	Basics of Indian Constitution	2	0	0	50	-	50	0
Total			**18**	**5**	**11**	**275**	**525**	**800**	**21.5**

II B.Tech II Semester – Electronics and Communication Engineering

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	21B00403	Random Variables and Scholastic Processes	3	1	0	30	70	100	3
2	21P04401	Analog and Digital Communication	3	1	0	30	70	100	3
3	21P04402	Pulse and Digital Circuits	3	1	0	30	70	100	3
4	21E04403	Control Systems	3	1	0	30	70	100	3
5	21H00402	Industrial Management	3	1	0	30	70	100	3
6	21P04411	Pulse and Digital Circuits Laboratory	0	0	3	15	35	50	1.5
7	21P04412	Analog and Digital Communications Laboratory	0	0	3	15	35	50	1.5
8	21P02413	Control system simulation lab	0	0	3	15	35	50	1.5
9	21S04401	MATLAB Fundamentals	1	0	2	30	70	100	2
Total			**16**	**5**	**11**	**225**	**525**	**750**	**21.5**

Community Service Project (To be evaluated in III B.Tech - I semester)

III B.Tech I Semester- Electronics and communication Engineering

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	21P04501	Digital Signal Processing	3	1	0	30	70	100	3
2	21P04502	Digital IC Applications	3	1	0	30	70	100	3
3	21P04503	Antennas and Wave Propagations	3	1	0	30	70	100	3
4	21N04501	**Open Elective I**	3	1	0	30	70	100	3
5	**Professional Elective I**		3	1	0	30	70	100	3
	21L04501	Biomedical Engineering							
	21L04502	Computer Architecture and Organization							
	21L04503	Computer Networks							
6	21P04511	Digital Signal Processing Laboratory	0	0	3	15	35	50	1.5
7	21P04512	Digital IC Applications Laboratory	0	0	3	15	35	50	1.5
8	21S04501	Employability Skills -I	1	0	2	30	70	100	2
9	21P04531	Community Service Project	0	0	0	100	-	100	4
10	21M00501	Intellectual property rights and Patents	2	0	0	50	-	50	0
Total			**18**	**5**	**8**	**360**	**490**	**850**	**24**

III B.Tech II Semester- Electronics and communication Engineering

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	21P04601	Microwave and Optical Communications	3	1	0	30	70	100	3
2	21P04602	VLSI Design	3	1	0	30	70	100	3
3	21P04603	Microprocessors and Micro controllers	3	1	0	30	70	100	3
4	**Professional Elective II**		3	0	0	30	70	100	3
	21L04601	Real Time Operating System							
	21L04602	Satellite Communications							
	21L04603	Soft Computing Techniques							
5	21N04601	**Open Elective II**	3	0	0	30	70	100	3
6	21P04611	Microwave and Optical Laboratory	0	0	3	15	35	50	1.5
7	21P04612	VLSI Laboratory	0	0	3	15	35	50	1.5
8	21P04613	Microprocessors and Micro controllers Laboratory	0	0	3	15	35	50	1.5
9	21S04631	Employability Skills -II	1	0	2	30	70	100	2
10	21M04601	Professional Ethics and Human Values	3	0	0	50	-	50	0
Total			**19**	**3**	**11**	**275**	**525**	**800**	**21.5**

Internship 2 Months during summer Vacation (To be evaluated in IV B.Tech - I semester)

IV B.Tech I Semester- Electronics and communication Engineering

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	**Professional Elective- III**		3	1	0	30	70	100	3
	21L04701	Cellular & Mobile Communication							
	21L04702	Introduction to Web Technologies							
	21L04703	Speech Processing							
2	**Professional Elective IV**		3	1	0	30	70	100	3
	21L04704	Embedded systems							
	21L04705	CMOS Analog IC Design							
	21L04706	Low power VLSI Design							
3	**Professional Elective V**		3	1	0	30	70	100	3
	21L04707	Adhoc and Wireless Sensor Networks							
	21L04708	5G Mobile and Wireless Technology							
	21L04709	Digital Image Processing							
4	21N04701	**Open Elective III**	3	0	0	30	70	100	3
5	21N04702	**Open Elective IV**	3	0	0	30	70	100	3
6	**Humanities and Social Science Elective**		0	0	3	30	70	100	3
	21H04701	Sociology & Elements of Indian History for Engineers							
	21H04702	Law for Engineers							
	21H04703	Business communication and presentation skills							
7	21P04721	Summer Internship	0	0	0	100	0	100	1.5
8	21S04701	Embedded C and Linux	1	0	2	30	70	100	2
Total			**16**	**3**	**5**	**310**	**490**	**800**	**21.5**

IV B.Tech II Semester- Electronics and communication Engineering

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	21P04831	Seminar	0	0	0	100	-	100	1
2	21P04821	Project Work	0	0	18	40	160	200	10
Total			**0**	**0**	**18**	**140**	**160**	**300**	**11**

Mandatory Courses

S. No.	Course	Category	L	T	P	Credits
1	Environmental Science	MC	2	0	0	0
2	Basics of Indian Constitution	MC	2	0	0	0
3	Intellectual Property rights and Patents	MC	2	0	0	0
4	Professional Ethics and Human Values	MC	2	0	0	0

List of Humanities and Social Science Electives – Proposed – for VII Semester

(Any one to be selected)

1. Sociology & Elements of Indian History for Engineers
2. Law for Engineers
3. Business Communication and Presentation Skills

List of the Open Electives

Open Elective I

S.No.	Course	Course Title
1	CE	Basic of Civil Engineering
2	EEE	Fundamentals of Utilization of Electrical Energy
3	MECH	Non-Conventional Energy Resources
4	CSE	Operating Systems

Open Elective II

S.No.	Course	Course Title
1	CE	Sustainability Concepts in Civil Engineering
2	EEE	Fundamentals of Electrical Machines
3	MECH	Fundamentals of Manufacturing Processes
4	CSE	Data Science

Open Elective III

S.No.	Course	Course Title
1	CE	Air Pollution and Control
2	EEE	Fundamentals of Power System Engineering
3	MECH	Fundamentals of Automobile Engineering
4	CSE	Machine Learning

Open Elective IV

S.No.	Course	Course Title
1	CE	Green Buildings
2	EEE	Electrical Measurements and Instrumentation
3	MECH	Introduction To Additive Manufacturing
4	CSE	Cyber Security

Minor Degree Program Courses

List of Minor Courses offered by Civil Engineering Department

Surveying & geomatics
Construction technology
Fundamentals of transportation Engineering
Basic soil mechanics
Environmental engineering and management
Smart Cities

List of Minor Courses offered by Mechanical Engineering Department

Fundamentals of Manufacturing Processes
Fundamentals of Automobile Engineering
Non-Conventional Energy Resources
Introduction to Additive Manufacturing
Engineering Materials
Product Lifecycle Management

List of Minor Courses offered by Computer Science and Engineering Department

Cloud Computing
Mobile Computing
Software Engineering
Data Base Management Systems
Fundamentals of Artificial Intelligence and Machine Learning
Cyber security Forensics

List of Minor Courses offered by Electrical and Electronics Engineering Department

Electrical Power Generation, Transmission & Economic Aspects
Electrical Safety Course
Principles Of Electric Power Conversion
Renewable Energy Sources
Electric Vehicles
Power Systems For Data Centres

I-B.TECH.-I-SEMESTER SYLLABUS

MATHEMATICS – I
(Linear Algebra and Calculus)

	L	T	P	C
I-B.Tech-I-Sem.				
Subject Code: 21B00101	**4**	**1**	**0**	**3**
Pre Requisite: Nil				

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

1. develop the use of matrix algebra techniques that is needed by engineers for solving system of linear equations in practical applications
2. verify Cayley – Hamilton theorem and reduce quadratic forms to canonical form by orthogonal transformation
3. test the convergence of an infinite series and verify mean value theorems for a continuous function
4. apply the techniques of multi variable differential calculus to determine extrema and series expansions
5. apply double integration techniques in evaluating areas bounded by region and triple integration techniques in evaluating volumes of solids

Unit-I: Solving systems of linear equations, Eigen values and Eigen vectors **12 hours**

Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous linear equations – Gauss Elimination method - Eigen values and Eigen vectors and problems on properties (without proofs) of Eigen values

Unit-II: Cayley–Hamilton theorem and Quadratic forms: **12 hours**

Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form –Quadratic forms - rank, index, signature and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation.

Unit-III: Sequences, Series and Mean value theorems **12 hours**

Sequences and Series:Convergences and divergence – Ratio test – Comparison tests –Integral test – Cauchy's root test – Alternate series– Leibnitz's rule.Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem– Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders,Problems and applications on the above theorem.

Unit-IV: Partial differentiation **10 hours**

Introduction – Homogeneous function – Euler's theorem– Total derivative– Chain rule– Jacobian – Functional dependence –Taylor's and MacLaurin's series expansion of functionsof two variables. Applications: Maxima and Minima of functions of twovariables without constraints and Lagrange's method of undetermined multiplier.

Unit-V: Multiple integrals **10hours**

Double and Triple integrals – Change of order of integration in double integrals – Change of variables to polar, cylindrical and spherical coordinates. Applications: Finding Areas and Volume

Textbooks:

1. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers, 36th Edition,2010
2. Advanced Engineering Mathematics by Erwin kreyszig, 9th Edition, John Wiley & Sons, 2006.

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley & Sons, 2011
2. V. Ravindranath and P. Vijayalaxmi, Mathematical Methods, Himalaya Publishing House.
3. Lawrence Turyn, Advanced Engineering Mathematics, CRC Press.
4. N.P.Bali & Manish Goyal, Engineering Mathematics, Lakshmi Publications.

APPLIED PHYSICS

I-B.Tech-I-Sem. **L T P C**
Subject Code : 21B00104 **3 0 0 3**
Pre Requisite: Nil

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

1. apply concepts of Interference and diffraction and Polarization
2. devise laser mechanism and fiber optics for the communications systems.
3. calculate free quantum particle energies and phenomenon of electrical & thermal conductivities sub microscopic particles
4. illustrate band formation, electrical conductivities in semiconductors and their dependence on temperature and frequency response.
5 identify the type of semiconductor using Hall effect& Classify superconductors based on meissner's effect .

Unit-I: Wave Optics **9 hours**

Interference :Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index

Diffraction: Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating(Qualitative

Polarization: Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plate.

Unit-II: Lasers and Fiber optics **11 hours**

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers

Fiber optics: Introduction –Principle of optical fiber- Acceptance Angle - Numerical Aperture - Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers – Applications.

Unit-III: Quantum Mechanics, Free Electron Theory and Band theory **10 hours**

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of states (3D) - Fermi energy.

Band theory of Solids: Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative) - E vs K diagram - v vs K diagram - effective mass of electron – Classification of crystalline solids– concept of hole.

Unit-IV: Dielectric and Magnetic Materials **9 hours**

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius-Mossotti equation- Piezoelectricity.

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Origin of permanent magnetic moment - Classification of magnetic materials: Dia, para, Ferro, antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials-

Engineering applications

Unit-V: Semiconductors and Superconductors **9 hours**

Semiconductors: Introduction- Intrinsic semiconductors – Density of charge carriers – Electrical conductivity – Fermi level – extrinsic semiconductors – density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation- Hall effect – Hall coefficient –Applications of Hall effect.

Superconductors: Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory (Qualitative) – Josephson effects (AC and DC) – SQUIDs – High Tc superconductors – Applications of superconductors

Textbooks:

1. M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S.Chand Publications, 11th Edition 2019.
2. Applied Physics by P.K.Palanisamy SciTech publications

References:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. Engineering Physics by M.R.Srinivasan, New Age international publishers (2009).
3. Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)
4. Ch. Srinivas, Ch. Seshubabu, Engineering Physics, Cengage learning publications

COMMUNICATIVE ENGLISH

I-B.Tech-I-Sem. **L T P C**
Subject Code : 21H00101 **3 0 0 3**
Pre Requisite: Nil

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

1. identify The Context, Topic, And Pieces Of Specific Information.
2. apply The Concepts Of Communication In Various Channels To Introduce One/Other.
3. benchmark With Standards To Comprehend Effective Communication.
4. quantify Expression By Using Adjectives, Adverbs And Antonyms.
5. write Technical/Academic Proposals Through Appropriate Glossary Of Words.

Unit-I: **10 hours**

Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications
Lesson-2: Deliverance by Premchand from "**The Individual Society",**Pearson Publications. (Non-detailed)
Listening: Listening to short audio texts and identifying the topic. Listening to prose, prose andconversation.
Speaking: Asking and answering general questions on familiar topics such as home, family, work,studies and interests. Self introductions and introducing others.
Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.
Writing: Paragraph writing (specific topics) using suitable cohesive devices;linkers,sign posts and transition signals; mechanics of writing - punctuation, capital letters.
Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.
Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs;
Nouns: countable and uncountable; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.

Unit-II: **10 hours**

Sesson-1: Nehru's letter to his daughter Indira on her birthday from "InfoTech English", Maruthi Publications
Lesson-2: Bosom Friendby Hira Bansode from "The Individual Society", PearsonPublications.(Non-detailed)
Listening: Answering a series of questions about main idea and supporting ideas after listening toaudio texts, both in speaking and writing.
Speaking: Discussion in pairs / small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Reading: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.
Writing: preparing posters, slides and presentation papers.
Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)
Grammar: Use of articles and zero article; prepositions.

Unit-III: **8 hours**

Lesson-1:Stephen Hawking-Positivity 'Benchmark' from"InfoTech English", Maruthi Publications.

Lesson-2: Shakespeare's Sister by Virginia Woolf from "The Individual Society",Pearson Publications.(Non-detailed)

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.

Functional English: Complaining and Apologizing.

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting

specific context clues; strategies to use text clues for comprehension. Critical reading.

Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing-mail etiquette, Writing CV's.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Unit-IV **10 hours**

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "InfoTech English", Maruthi Publications

Lesson-2: Telephone Conversation-Wole Soyinka from "The Individual Society", Pearson Publications.(Non-detailed)

Listening: Making predictions while listening to conversations/ transactional dialogues without video(only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: Permissions, Requesting,and Inviting.

Reading: Studying the use of graphic elements in texts to convey information, revealtrends/patterns/relationships, communicative process or display complicated data.

Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees ofcomparison; use of antonyms

Unit-V **8 hours**

Lesson-1: The Chief Software Architect from "English Encounters", Maruthi Publications

Lesson-2. Still I Rise by Maya Angelou from "The Individual Society", Pearson **Publications**.(Non-detailed)

Lesson-3: G.D.Naidu 'Trail Blazers' by Orient Black Swan Pvt. Ltd. Publishers

Listening: Identifying key terms, understanding concepts and interpreting the concepts both inspeaking and writing.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPTslides. Functional English: Suggesting/Opinion giving.

Reading: Reading for comprehension. RAP Strategy Intensive reading and Extensive readingtechniques.
Writing: Writing academic proposals- writing research articles: format and style.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE **Vocabular**y (20words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.
Grammar: Editing short texts – identifying and correcting common errors in grammar and usage(articles, prepositions, tenses, subject verb agreement)

Textbooks:

1. "**Infotech English**", Maruthi Publications. (Detailed)
2. "**The Individual Society",** Pearson Publications.(Non-detailed)

References:

1. **Text Book English Encounters"**, Maruthi Publications
2. **Text Book** : 'Trail Blazers' by Orient Black Swan Pvt. Ltd. Publishers
3. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
4. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2ndEdition, 2018.

PROGRAMMING IN C

I-B.Tech-I-Sem. **L T P C**
Subject Code : 21E05101 **3 1 0 3**
Pre Requisite: Nil

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

1. write algorithms and to draw flowcharts for solving problems.
2. use different operators, data types and write programs that use two-way/ multi way selection.
3. select the best loop construct for a given problem.
4. make use of Arrays in solving complex problems.
5. solve problems using concept of structures, unions and File I/O operations.

Unit-I: **10 hours**

Introduction to Computers: Computer Systems, Computer software and hardware, Computing Environments, Computer Languages.

Introduction to the C Language: Algorithm and Flow chart, Structure of C Program, Creating and running programs, Identifiers, Types, Variables, Constants, Input / Output, Operators (Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associatively, Expression Evaluation, Type conversions.

Unit-II: **10 hours**

Control Structures: Selection Statements (making decisions) – Two Way Selection (if-else), Multi way Selection (nested if and switch) statements, Repetition statements (loops)-while, for, do-while statements, Loop examples, Jump statements related to looping – break, continue, go to. Simple C Program examples.

Unit-III: **10 hours**

Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Example Programs
Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String, Example Programs.

Unit-IV: **10 hours**

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter Function Communication, Standard Functions, Storage Classes, Scope and lifetime, Passing Array to Functions, Command Line Arguments and Recursion.
Pointers: Concept of pointer, declaring and initializing pointer variables, pointer expressions and address arithmetic, null pointers, generic pointers, pointers as function arguments, pointers and arrays, pointer and strings, pointer to pointer, dynamic memory allocation, dangling pointer.

Unit-V: **10hours**

Structures &Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Example Programs.
Data Files: Introduction to Files, Using files In C, Reading from Text Files, Writing to Text files, Random Access File.

Textbooks:

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE.
2. Programming in C, Reema Thareja, and OXFORD University press.

References:

1. Computer Fundamentals and Programming, Sumithabha Das, McGraw Hill.
2. Programming in C, Ashok N. Kamthane, AmitKamthane, and Pearson.
3. C Programming – Balaguruswamy, McGraw Hill

NETWORK ANALYSIS

I-B.Tech-I-Sem. **L T P C**
Subject Code : 21E02101 **4 1 0 3**
Pre Requisite: Nil

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

1. apply basic concepts of circuits and elements, different circuit solving methods
2. illustrate series and parallel circuits with Network theorems
3. apply the concepts of alternating current, phasors, series and parallel circuits
4. illustrate two port networks and their interconnections
5. design filter circuits and understand the resonance concept

Unit-I: Introduction **9 hours**

Introduction to Electrical Circuits: Network elements and their classification. Ohm‘s law, Kirchhoff‘s law, Seriesand parallel combinations of R, L and C. Energy sources: Ideal, Non-ideal, Independent and dependent sources, Source transformation, star & delta transformation. Mesh and Nodal analysis. Simple problems solving withresistances, dependent and independent sources
.

Unit-II: Network Theorems **9 hours**

Superposition, Reciprocity, Thevenin‘s, Norton‘s and Compensation theorems. Problem solving with resistancesand independent sources. Max. Power Transfer theorem with complex load

Unit-III: AC Circuits **9 hours**

Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor - problem solving, Phase angle, Phasor representation, Addition and subtraction of phasors, Mathematical representation of sinusoidal quantities. Steady State Analysis of A.C Circuits: Response to sinusoidal excitation to Series and parallel RL, RC, RLC circuits. Concept of impedance and phaseangle..

Unit-IV: Two-Port Networks **8 hours**

Significance and applications of one port and two port networks. Two port network analysis using Admittance (Y)parameters, Impedance (Z) parameters and Hybrid (h) parameters. Interconnection of Two port networks.

Unit-V:Principles of Filters, Attenuators And Equalizers **8hours**

Concept of filtering. Filter types: Low pass, High pass, Band pass and Band stop and their Characteristics. Design ofT-type π-type, Lattice and Bridged-T attenuator, Equalizers.

Textbooks:

1. Hayt Jack Kemmerly, Steven Durbin, "Engineering Circuit Analysis",Mc Graw Hill education, 9th Edition, 2018.
2. Robert.L. Boylestead, "Introductory Circuit Analysis", Pearson Education India, 12th Edition, 2014.

References:

1. Charles K. Alexander & Mathew N.O.Sadiku, "Fundamentals of Electric Circuits", McGraw-Hill, 2nd Edition,2003.
2. A.Chakrabarthi, Dhanaparth rao co pvt lmd educational & technical publishers,2010
3. Charles.K.Alexander, Mathew N.O.Sadiku," Fundamentals of Electric Circuits", McGraw Hill, 5th Edition, 2012.
John O Mallay, Schaum’s Outlines "Basic Circuit Analysis", The Mc Graw Hill companies, 2nd Edition, 2011.

COMMUNICATIVE ENGLISH LABORATORY

	L	T	P	C
I-B.Tech-I-Sem.				
Subject Code : 21H00111	**0**	**0**	**3**	**1.5**

Pre Requisite: Nil

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

1. demonstrate nuances of language through audio-visual experience and Group activities.
2. identify accent for intelligibility.
3. demonstrate in conversation, jams and public speaking. Make use of the concepts to communicate confidently and competently in English Language in all spheres.

List of Experiments

PRACTICE 1: Greeting, Introducing, and taking leave ---Pure Vowel

PRACTICE 2: Giving Information and Asking for Information –Diphthongs

PRACTICE 3: Inviting, Accepting and Declining Invitations –Consonants

PRACTICE 4: Commands, Instructions and Requests--Accent and Rhythm

PRACTICE 5: Suggestions and Opinions –Intonation

APPLIED PHYSICS LABORATORY

	L	T	P	C
I-B.Tech-I-Sem.				
Subject Code : 21B00114	**0**	**0**	**3**	**1.5**

Pre Requisite: Nil

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

1. acquire knowledge on the optical Experiments like Newton rings, wedge method etc
2. determine hotoelectric effect, Hall effect experiments etc
3. determine resistance of semiconductor, resistivity on semiconductors

List of Experiments

(Any 10 of the following listed experiments)

1. Determination of thickness of thin object by wedge method.
2. Determination of radius of curvature of a given plano convex lens by Newton's rings.
3. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
4. Determination of dispersive power of the prism.
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Determination of numerical aperture and acceptance angle of an optical fiber.
8. Determination of wavelength of Laser light using diffraction grating.
9. Estimation of Planck's constant using photoelectric effect.
10. Determination of the resistivity of semiconductor by four probe method.
11. To determine the energy gap of a semiconductor using p-n junction diode.
12. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect
14. Measurement of resistance of a semiconductor with varying temperature.
15. Resistivity of a Superconductor using four probe method & Meissner effect.

PROGRAMMING IN C LABORATORY

I-B.Tech-I-Sem. **L T P C**
Subject Code : 21E05111 **0 0 3 1.5**
Pre Requisite: Nil

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

1. illustrate various concepts of C language and generate programs
2. draw flowcharts and write algorithms.
3. design and develop solving skills through C.

List of Experiments

Exercise - 1 Basics I
a) Write a simple program using printf ( ), scanf ( )
b) C Program to Perform Adding, Subtraction, Multiplication and Division of two numbers
Exercise - 2 Basics II
a) Write a C Program to Simulate 3 Laws at Motion (v=u+at,s=ut+1/2at 2 , v2-u 2=2as)
b) Write a C Program to convert Celsius to Fahrenheit and vice versa
Exercise - 3 Control Flow - I
a) Write a C Program to Find Whether the Given Year is a Leap Year or not.
b) Write a C Program to Add Digits & Multiplication of a number
Exercise - 4 Control Flow - II
a) i) Write a C Program to Find Whether the Given Number is Prime Number or Not
ii) Write a C Program to Find Whether the Given Number is Armstrong Number or not
b) Write a C program to print Floyd Triangle
Exercise - 5 Control Flow - III
a) Write a C Program to print Pascal Triangle
b) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using Switch-case statement.
Exercise – 6 Arrays
a) Write a program in C for multiplication of two square Matrices.
b) Write a program in C to find transpose of a given matrix.
Exercise – 7 Functions
a) Write a C Program demonstrating of parameter passing in Functions and returning values.
b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion
Exercise – 8 Functions
a) Write a program in C to add numbers using call by reference.
b) Write a program in C to swap elements using call by reference
Exercise – 9 Arrays and Pointers
a) Write a C Program to Access Elements of an Array Using Pointer
b) Write a C Program to find the sum of numbers with arrays and pointers.
Exercise – 10Strings
a) Implementation of string manipulation operations with library function.
i) copy ii) concatenate iii) length iv) compare
b) Implementation of string manipulation operations without library function.
i) copy ii) concatenate iii) length iv) compare
Exercise – 11 Structures
a) Write a C program to find sum of n elements entered by user. To perform this program, Allocate memory dynamically using malloc () function
b) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function
Exercise -12 Files
a) Write a C programming code to open a file and to print it contents on screen.
b) Write a C program to copy files.

ENVIRONMENTAL SCIENCE

I-B.Tech-I-Sem. **L T P C**
Subject Code : 21M00131 **2 0 0 0**
Pre Requisite: Nil

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

1. articulate the interconnected and interdisciplinary nature of environmental studies.
2. demonstrate an integrative approach to environmental issues with a focus on sustainability.
3. use critical thinking, problem-solving, and the methodological approaches of the social sciences, natural sciences, and humanities in environmental problem solving.
4. adopt sustainability as a practice in life, society and industry through rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
5. outline the effect of value education and welfare programmes.

Unit-I: Multidisciplinary nature of environmental studies **8 hours**

Multidisciplinary nature of Environmental Studies – Definition, Scope and Importance – Need for Public Awareness.
Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide
problems, water logging, salinity, case studies. – Energy resources:

Unit-II: Ecosystems & Biodiversity and Its Conservation **12 hours**

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
Biodiversity And Its Conservation :Introduction, Definition: genetic, species and ecosystem diversity–Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega- diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.
Land resources: Land as a resource, land degradation,

Unit-III: Environmental pollution & solid waste management **8 hours**

Environmental Pollution: Definition, Cause, effects and control measures of : a. Air Pollution. b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards
Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

Unit-IV: Social Issues and the Environment **10 hours**

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – **Environmental**

ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

Unit-V: Human population and the environment 8hours

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

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

Textbooks:

1. Text book of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, "Environmental Studies", Pearson education.

References:

1. Deeksha Dave and E.Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.
2. M.Anji Reddy, "Text book of Environmental Sciences and Technology", BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice hall of India Private limited

I-B.TECH.-II-SEMESTER SYLLABUS

MATHEMATICS – II
(Differential Equations and Numerical Methods)

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21B00201 **4 1 0 3**
Pre Requisite: Nil

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

1. solve the differential equations related to various engineering fields
2. apply the concept of differential equations in L-C-R circuits and L-C circuits
3. evaluate the approximate roots of polynomial and transcendental equations by different algorithms
4. apply Newton's forward & backward interpolation for equal intervals and Lagrange's formulae for unequal intervals
5. apply numerical integral techniques to different Engineering problems and apply differentalgorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations

Unit-I: Differential Equations of First Order and First Degree **12 hours**

Linear differential equations– Bernoulli's equations –Exact equations and equations reducible to exact form. Applications : Newton's Law of cooling – Law of natural growth and decay –Orthogonal trajectories

Unit-II: Linear Differential Equations of Higher Order **12 hours**

Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients – with non-homogeneous term of the type eax, sin ax, cos ax, polynomials in x, eax V(x) and xn V(x) – Method of Variation of parameters. Applications: LCR circuit and LCcircuit

Unit-III: Iterative Methods **12 hours**

Introduction– Bisection method– Method of false position– Iteration method – Newton-Raphson method (One variable) for finding solutions of algebraic and transcendental equations– Gauss Jacobi and Gauss- Seidel methods for solving system of equations numerically.

Unit-IV: Interpolation and Numerical Differentiation **12 hours**

Introduction– Errors in polynomial interpolation – Finite differences– Forward differences– Backward differences –Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula – Numerical differentiation using interpolating polynomial

Unit-V: Numerical Integration and Numerical Solution of Ordinary Differential Equations With Initial Conditions **12 hours**

Numerical Integration by Trapezoidal rule– Simpson's 1/3rd and 3/8th rule - Numerical Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method –Modified Euler's method – Runge - Kutta method (fourth order).

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. R. K. Jain and S. R. K. Iyengar Advanced Engineering Mathematics, Fifth Edition Narosa Publishing House.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley & Sons, 2011
2. V. Ravindranath and P. Vijayalaxmi, Mathematical Methods, Himalaya Publishing House.
3. B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
   Engineering Mathematics, Dr.T.K.V. Iyengar, S. Chand publications.

APPLIED CHEMISTRY

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21B00203 **3 0 0 3**
Pre Requisite: Nil

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

1. develop polymer composites, synthetic polymers, plastic materials and their use in design.
2. apply the principles and applications of batteries and fuel cells.
3. identify different types of corrosion and categorize the reasons for corrosion .
4. Synthesize commonly used industrial materials and understand the principles of Green synthesis
5. design models for energy by different natural sources.

Unit-I: Polymer Technology **8 hours**

Polymerisation: Introduction, methods of polymerization (emulsion and suspension), mechanical properties.
Plastics: Thermo plastics & Thermosetting plastics, Compounding of plastics, Compounding, fabrication (compression, injection, extrusion and Transfer), preparation, properties and applications (PVC, Bakelite and polycarbonates), recycling of e-plastic waste (waste to wealth).
Elastomers: Natural rubber, Processing of natural rubber, Compounding, Vulcanisation, preparation, properties and applications (Buna-S, thiokol and Poly urethanes).
Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable polymers withexamples

Unit-II: Electrochemical Cells and Corrosion **10 hours**

Galvanic cells, Single electrode potential, Concentration cells, electrochemical series and uses of series, standard hydrogen electrode, calomelelectrode
Batteries: Dry cell, Li- ion battery, Lead-acid battery
Corrosion: Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, pitting corrosion, galvanic series, factors influencing rate of corrosion,
Corrosion Control Methods: proper designing and cathodic protection, cathodic coatings, anodic coatings, electroplating and electroless plating, Paints (constituents and functions).Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients – with non-homogeneous term of the type eax, sin ax, cos ax, polynomials in x, eax V(x) and xn V(x) – Method of Variation of parameters. Applications: LCR circuit and LCcircuit

Unit-III: Chemistry of Advanced Materials **8 hours**

Nano materials: Introduction – Carbon nanotubes and fullerenes- Sol-gel method, BET and TEM methods
Carbon nanotubes and fullerenes: Types, preparation, properties and applications
Green Synthesis: Principles, 2 methods of synthesis with examples
Liquid Crystals: Introduction-types-applications.
Super Conductors: Type –I, Type II, Characteristics and applications

Unit-IV: Non Conventional Energy Sources and Storage Devices **10 hours**

Solar Energy: Construction and working of Photovoltaic cell, applications
Non-Conventional Energy Sources:
i) Hydropower - Hydropower plant (schematicdiagram)
ii) Geothermal energy: Introduction-schematic diagram of a geothermal powerplant

iii) Tidal and wave power: Introduction- Design andworking
iv) Ocean thermal energy: Introduction, ocean thermal energy conversion (OTEC), open cycle OTEC, closed-cycle OTEC, hybrid OTEC- schematic diagram andexplanation.
v) Biomass andbiofuels

Fuel Cells: Introduction, Cell representation, Design and working, advantages and limitations. Types of fuel cells: H2-O2 Fuel cell, CH3OH-O2 Fuel cell, Phosphoric acid fuel cell, molten carbonate fuel cells

Unit-V: Material Chemistry & Computational Chemistry **8 hours**

Non-Elemental Semiconducting Materials: Stoichiometric, controlled valency & Chalcogen photo/semiconductors, Preparation of Semiconductors
Semiconductor Devices: p-n junction diode as rectifier
Magnetic Materials: Ferro and Ferri magnetic materials, Hall Effect and its applications.
Computational Chemistry: Introduction, Ab Initio studies

Text Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai PublicatingCo.
2. Applied Chemistry by Dr. Bharathi Kumari Yalamanchili; VGSPublishers

Reference Books:

1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition(second).
2. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015edition
3. Applied Chemistry by H.D. Gesser, SpringerPublishers
4. Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press,IIM

ELECTRONICS DEVICES AND CIRCUITS

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21E04201 **3 1 0 3**
Pre Requisite: Nil

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

1. understand the formation of p-n junction and its different modes of operation.
2. know the construction, working principle of rectifiers with and without filters with relevant expressions.
3. understand the construction, principle of operation of transistors, BJT with their V-I characteristics in different configurations.
4. understand the construction, principle of operation of transistors, FET with their V-I characteristics in different configurations.
5. understand the formation of various special semiconductor and its different modes of operation. Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.

Unit-I: Semiconductor Diodes **10 hours**

PN junction diode, Current equations, Energy Band diagram, Diffusion and drift current densities, forward and reverse bias characteristics, Transition and Diffusion Capacitances, Switching Characteristics, Breakdown in PN Junction Diodes.
Rectifiers and Filters: Basic Rectifier setup, half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter (Series inductor), Capacitor filter (Stunt inductor).

Unit-II: Bipolar Junction Transistors **10 hours**

Npn-pnp construction and operation –early effect,-current equations-CE,CB,CC configurations,pitchoff voltages and its signifinace –MOSFET-characteristics-thresold voltages-channel length modulation-D-MOSFET,E-MOSFET-characteristics-comparision of MOSFET with JFET.

Unit-III: Field Effect Transistors **10 hours**

FETs – CG, CS and CD configuration and Drain and Transfer characteristics,-Current equations-Pinch off voltage and its significance- MOSFET- Characteristics- Threshold voltage -Channel length modulation, D-MOSFET, E-MOSFET- Characteristics – Comparison of MOSFET with JFET

Unit-IV: Special Semiconductor Devices **8 hours**

Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Varactor Diode, Photodiode, Tunnel Diode, UJT, PN-PN Diode, SCR. Construction, operation and V-I characteristics. LASER diode, LDR.

Unit-V: Small Signal Low Frequency Transistor Amplifier Models **10 hours**

BJT: Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.
FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers

Text Books:

1. Hayt JackKemmerly, Steven Durbin, "Engineering Circuit Analysis",Mc Graw Hill education, 9th Edition, 2018.
2. Robert.L. Boylestead, "Introductory Circuit Analysis", Pearson Education India, 12th Edition, 2014.

Reference Books:

1. Charles K. Alexander & Mathew N.O.Sadiku, "Fundamentals of Electric Circuits", McGraw-Hill, 2nd Edition, 2003.
2. D.R.Cunningham, J.A. Stuller, "Basic Circuit Analysis", Jaico Publishing House, 2005.
3. David Bell, "Fundamentals of Electric Circuits", Oxford University press, 7thEdition, 2009.
4. Charles.K.Alexander, Mathew N.O.Sadiku," Fundamentals of Electric Circuits", McGraw Hill, 5th Edition, 2012.

PYTHON PROGRAMMING

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21E05202 **3 1 0 3**
Pre Requisite: Nil

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

1. develop essential programming skills in computer programming concepts like data types, containers
2. apply the basics of programming in the Python language
3. solve coding tasks related conditional execution, loops
4. solve coding tasks related to the fundamental notions and techniques used in object oriented programming
5. express proficiency in the handling of strings and functions.

Unit-I: **10 hours**

Introduction : Introduction Python, Program Development Cycle, Input, Processing and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations ,Operators, Type conversions.
Data types and Expressions: Strings, Assignment and Comments, Numeric Data Types and Character Sets.

Unit-II: **10 hours**

Control Flow- if, if –else, if-elif-else statements, Nested Decision Structures,
Repetitions structures introduction, for, while, Input Validation Loops, Nested Loops, break, continue, pass.
Data Structures: List-operations, slicing, methods; Tuples, sets, dictionaries, sequences, comprehensions

Unit-III: **10 hours**

Strings and Text Files: Accessing Characters and Substrings in a String, Strings and Number systems. Data encryption, string methods, text files
Functions: Defining Functions, calling function, passing arguments, keyword arguments, default arguments, variable length arguments, Anonymous functions, fruitful functions, scope of variables-local and global variables, Modules-modules, Standard modules, packages

Unit-IV: **10 hours**

Object-Oriented Programming: concept of class, object and instances, constructor, class attributes and destructors, Inheritance, overlapping and overloading, adding and retrieving dynamic attributes of classes, programming with OOPS support
Design with classes: Objects and classes, Data modelling examples, case study of an ATM, Structuring classes with Inheritance and Polymorphism.

Unit-V: **8 hours**

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defines Exceptions
Graphical User Interfaces: Behaviour of terminal based programs and GUI-based programs, Coding simple GUI-based programs, other useful GUI resources.
Programming: Introduction to Programming Concepts with Scratch

Text Books:

1. Kenneth A. Lambert, the Fundamentals of Python: First Programs, 2011, Cengage Learning.
2. Think Python First Edition, by Allen B. Downey, Orielly publishing

Reference Books:

1. Introduction to Python Programming, Gowrie Shankar's, Veena A, CRC Press.
2. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.
3. Python Programming using Problem Solving Approach, Reema Threja, OUP.

DIGITAL ELECTRONICS

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21E04202 **3 1 0 3**
Pre Requisite: Nil

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

1. use Boolean algebra and simplification procedures relevant to digital logic.
2. design various combinational digital circuits using logic gates.
3. analyze and design synchronous sequential circuits.
4. analyze and design asynchronous sequential circuits.
5. build logic gates and use programmable devices

Unit-I: Binary Numbers And Boolean Algebra **10 hours**

InDigital Systems, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit codes: BCD, EXCESS 3, alphanumeric codes, 9's complement, 2421, etc.. Boolean theorems, principle of complementation & duality, De-morgan theorems

Unit-II: Logic Operations And Minimization Techniques **10 hours**

Logic operations ; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX- NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations. Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables)and tabular method (Quine-mccluskey method) with only four variables and single function

Unit-III: Design Of Combinational Logic Circuits **10 hours**

Design Procedure, Binary Adder-Subtractor, Parallel Adder, Binary Multiplier, Magnitude Comparator-4 bit, Decoders, Encoders, Multiplexers, De-multiplexer, Parity Generator and Checker. Application of Multiplexers and De-multiplexers.

Unit-IV: Design Of Sequential Logic Circuits **10 hours**

Latches, Flip-Flops-SR, D, JK & T, Shift Registers-SISO, SIPO, PISO, PIPO, Design of Synchronous Sequential Circuits- State Table and State Diagrams, Design of Counters- Modulo-n, Johnson, Ring, Up/Down, Design of Mealy and Moore FSM -Sequence Detection.

Unit-V: Memory And Programmable Logic **8 hours**

RAM – Memory Decoding – Error Detection and Correction - ROM - Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices.

Text Books:

1. M. Morris R. Mano, Michael D. Ciletti, ―Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog‖, 6th Edition, Pearson Education, 2017.

Reference Books:

1. G. K. Kharate, Digital Electronics, Oxford University Press, 2010
2. John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017.
3. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Sixth Edition, CENGAGE Learning, 2013
4. Donald D. Givone, Digital Principles and Design‖, Tata Mc Graw Hill, 2003.

NETWORK ANALYSIS LABORATORY

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21E04211 **0 0 3 1.5**
Pre Requisite: Nil

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

1. apply the concepts of network theorems and design electrical circuits
2. enalyse and design series and parallel resonance circuits
3. estimate Impedance, Admittance, Hybrid and Transmission parameters of a two-port network

Any 10 of The Following Experiments Are To Be Conducted

1. Verification of Kirchhoff's circuit laws.
2. Verification of Superposition theorem
3. Verification of Thevenin's and Norton's Theorems
4. Verification of Maximum power transfer theorem
5. Verification of Compensation theorem
6. Verification of Reciprocity Theorems
7. Series and parallel resonance
8. Determination of Impedance (Z) and Admittance (Y) Parameters for a two network
9. Determination of Transmission and Hybrid parameters
10. Apply source transformation technique to determine equivalent resistance and source current
11. Verification of ohms law
12. Determination of Parameters of a choke coil.

DIGITAL SYSTEM DESIGN LABORATORY

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21E04212 **0 0 3 1.5**
Pre Requisite: Nil

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

1. an ability to construct, analyze, and troubleshoot simple combinational and sequential circuits.
2. an ability to design and troubleshoot a simple state machine.
3. an ability to measure and record the experimental data, analyze the results, and prepare a formal laboratory report.

List of experiments (Minimum of Twelve Experiments has to be performed)

1. Verification of truth tables of Logic gates
2. Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR (vi) Exclusive NOR
3. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit
4. Verification of functional table of 3 to 8 line Decoder/De-multiplexer
5. 4 variable logic function verification using 8 to1 multiplexer.
6. Design full adder circuit and verify its functional table.
7. Verification of functional tables of
   (i) JK Edge triggered Flip–Flop (ii) JK Master Slav Flip–Flop (iii) DFlip-Flop
8. Design a four bit ring counter using D Flip–Flops/JK Flip Flop and verify output
9. Design a four bit Johnson's counter using D Flip-Flops/JK Flip Flops and verify output
10. Verify the operation of 4-bit Universal Shift Register for different Modes of operation.
11. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T- Flip-Flops and Test it with a low frequency clock and Sketch the output wave forms.
12. Design MOD–8 synchronous counter using T Flip- Flop and verify the result and Sketch the output wave forms.
13. (a) Draw the circuit diagram of a single bit comparator and test the output (b) Construct 7 Segment Display Circuit Using Decoder and 7 Segment LED and test it.

ADDon Experiments:

1. Design BCD Adder Circuit and Test the Same using Relevant IC
2. Design Excess-3 to 9-Complement convertor using only four Full Adders and test the Circuit.
3. Design an Experimental model to demonstrate the operation of 74154 De-Multiplexer using LEDs for outputs.

APPLIED CHEMISTRY LABORATORY

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21B00213 **0 0 3 1.5**
Pre Requisite: Nil

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

1. execute instrumental methods of chemical analysis and measuring,
2. demonstrate operating and testing of chemical instruments for determing chemical attributes
3. demonstrate complexometric and other techniques to determine the presence of ingredients

List of experiments

Any 10 experiments will be conducted from the list given below

Introduction to Chemistry Laboratory- Molarity, Normality, Primary and Secondary standard solutions,Volumetric titrations, Quantitative analysis and Qualitative analysis

1. Determination of HCl using standard Na2CO3 solution
2. Estimation of KMnO4 by Oxalic acid
3. Estimation of Ferrous Iron by K2Cr2O7
4. Determination of total hardness of water by EDTA method.
5. Determination of Alkalinity of water sample.
6. Determination of Chlorides present in water sample.
7. Determination of pH of water and soil samples
8. Conductometric titration of strong acid Vs strong base.
9. Conductometric titration of strong acid Vs Weak base.
10. Potentiometric titration of strong acid Vs strong base.
11. Potentiometric titration of strong acid Vs weak base.
12. Preparation of Phenol formaldehyde resin.
13. Preparation of Urea formaldehyde resin.
14. Determination of Mg+2 present in Antacid
15. Determination of Zinc by complexometric method

II-B.TECH.-I-SEMESTER SYLLABUS

MATHEMATICS – III
(Transforms, Vector Calculus and PDE)

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21B00301 **3 1 0 3**
Pre Requisite: Nil

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

1. apply the Laplace transform for solving ordinary differential equations
2. find or compute the Fourier series of periodic signals and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms
3. interpret the physical meaning of different operators such as gradient, curl and divergence
4. estimate the work done against a field, circulation and flux using vector calculus
5. identify solution methods for partial differential equations that model physical processes

Unit-I: Laplace Transforms **12 hours**

Laplace transforms – Definition and Laplace transforms of some certain functions– Shifting theorems – Transforms of derivatives and integrals – Unit step function –Multiplied by t and Divided by t – Dirac's delta function – Periodic function – Inverse Laplace transforms – Partial fractions – Convolution theorem (without proof) . Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

Unit-II: Fourier series and Fourier Transforms **12 hours**

Fourier series: Introduction– Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions –Change of interval– Half-range sine and cosine series. – Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties (article-22.5 in text book-1)– inverse transforms – Finite Fourier transforms.

Unit-III: Vector calculus **12 hours**

Vector Differentiation: Gradient– Directional derivative – Divergence– Curl– Scalar Potential
Vector Integration: Line integral – Work done – Area– Surface and volume integrals – Vector integral theorems: Problems on Greens, Stokes and Gauss Divergence theorems (without proof)

Unit-IV: Partial Differential Equations of first order **10 hours**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations

Unit-V: Second order Partial Differential Equations and Applications **12 hours**

Second order PDE: Solutions of linear partial differential equations with constant coefficients –- homogeneous - term of the type e^{ax+by} , $\sin(ax + by)$, $\cos(ax + by)$, $x^m y^n$ applications of PDE : Method of separation of Variables– Solution of one dimensional Wave, Heat and two - dimensional heat equation (Cartesian form).

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. R. K. Jain and S. R. K. Iyengar Advanced Engineering Mathematics, Fifth Edition Narosa Publishing House.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley & Sons, 2011
2. V. Ravindranath and P. Vijayalaxmi, Mathematical Methods, Himalaya Publishing House.
3. B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
4. N.P.Bali & Manish Goyal, Engineering Mathematics, Lakshmi Publications.

ELECTRONIC CIRCUITS ANALYSIS

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21P04301 **3 1 0 3**
Pre Requisite: Nil

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

1. design and analysis of small signal high frequency transistor amplifier using BJT and FET.
2 design and analysis of multistage amplifiers using BJT and Differential amplifier using BJT.
3. design and analysis of Feedback amplifiers using FET.
4. derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept.
5. know the classification of the power and tuned amplifiers and their analysis with performance comparison.

Unit-I: Small Signal High Frequency Transistor Amplifier Models **10 hours**

BJT: Determination of high-frequency parameters in terms of low-frequency parameters , CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.
FET: Analysis of common Source and common drain Amplifier circuits at high frequencies.

Unit-II: Multistage Amplifiers **8 hours**

Classification of amplifiers, methods of coupling, cascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Differential amplifier using BJT.

Unit-III: Feedback Amplifiers **10 hours**

Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers

Unit-IV: Oscillators **10 hours**

Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wien bridge oscillators with BJT and FET and their analysis,Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators using BJT, Frequency and amplitude stability of oscillators.

Unit-V: Power Amplifiers **8 hours**

Classification of amplifiers(A to H), Class A power Amplifiers, Class B Push-pull amplifiers, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks.

Text Books:

1. Integrated Electronics- J.Millman and C.C.Halkias, Tata McGraw-Hill, 1972.
2. Electronic Devices and CircuitsTheory –Robert L.Boylestad and Louis Nashelsky, Pearson/PrenticeHall, TenthEdition, 2009.

Reference Books:

1. Electronic Circuit Analysis and Design –Donald A.Neaman, McGrawHill, 2010.
2. Micro electronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition, 2011.
3. Electronic Circuit Analysis-B.V.Rao, K.R.Rajeswari, P.C.R.Pantulu, K.B.R.Murthy, Pearson Publications.

LINEAR INTEGRATED CIRCUITS APPLICATIONS

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21P04302 **3 1 0 3**
Pre Requisite: Nil

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

1. design the negative feedback configuration of operational amplifier for various mathematical operations.
2. design and analyze different waveform generator circuits using operational amplifiers.
3. design and analyze various filter circuits using operational amplifiers.
4. dealize circuits containing PLL and IC 555
5. comprehend various converter circuits.

Unit-I: Operational Amplifier **10 hours**

Operational amplifier. equivalent circuits, ideal Operational amplifier, DC characteristics and AC characteristics, non-ideal characteristics. DC and AC amplifiers, summing, scaling, and averaging amplifiers, Instrumentation amplifiers, I/V and V/I converter, Integrator, Differentiator, Differential amplifiers.

Unit-II: Non Linear Applications Of Op-Amp **10 hours**

Comparator and its applications, Schmitt trigger, Free-running, One-shot Multivibrators, Sinewave ,Square, Triangular and Saw-tooth wave form generators. Phase-shift, Wein-bridge oscillators Logarithmic amplifiers, Rectifiers, Peak detection and Voltage regulation.

Unit-III: Active Filters **10 hours**

Filter classifications, frequency and impedance scaling, First and second order Low-pass and High pass filter designs, Band-pass filter, Band reject and all pass filters.

Unit-IV: PLL And Timers **8 hours**

PLL-Phase detector, comparator, VCO, PLL, 565 applications, 555 timer IC, Astable and Monostable operations and applications,

Unit-V: A/D And D/A Converters **12 hours**

Sample-and-hold circuits, DAC characteristics, D/A conversion techniques, A/D characteristics, A/D conversion techniques-integrating, successive approximation, flash converters.

Text Books:

1. J D. Roy Choudhury, Linear integrated Circuits, 2017, 5th Edition, New-Age International Publishers, Chennai.
2. Linear Integrated Circuits by Salivahan-3rd-Edition, McGrawHill,2018

Reference Books:

1. Ramakant A. Gayakwad, Op-Amps and Linear Integrated Circuits, 2015, 4th Edition, Pearson Education, Bangalore.
2. Robert F. Coughlin and Frederick F. Driscoll, Operational Amplifiers and Linear Integrated Circuits, 2015, 6th Edition, Pearson Education, Bangalore.

ELECTROMAGNETIC FIELD THEORY

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21P04303 **3 1 0 3**
Pre Requisite: Nil

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

1. derive and convert the coordinate system in space.
2. derive the electric flux density from the Gauss‟s law and define potential and potential gradient.
3. describe the current and current density from Ohm‟s law.
4. solve the capacitance problem using Poisson‟s equations and Laplace‟s equations and the boundary conditions between two different media of different dielectrics.
5. solve different problems on forces and torques on a closed circuit.

Unit-I: Vector Analysis **10 hours**

Cartesian, cylindrical, and spherical coordinate systems. Divergence, gradient, curl, Laplacian – Stokes' theorems.

Unit-II: Electrostatics **10 hours**

Coulomb's Law, Electric field intensity – Field due to the continuous line, surface, and volume charges - Electric flux density – Gauss Law – Energy expended in moving a charge in an electric field, Potential & potential gradient, Electric Dipole.

Unit-III: Static Electric Field **8 hours**

Current and Current Density, Resistance. Dipole moment – Polarization - Properties & boundary conditions of metallic conductors, semiconductors and dielectrics, Laplace and Poisson‟s equations. Capacitance – Uniqueness Theorem- Method of images.

Unit-IV: Static Magnetic Field **10 hours**

Biot-Savart‟s law Magnetic field intensity Ampere‟s circuital law Magnetic flux and flux density. Magnetic scalar and vector potentials. Force on a moving charge (Lorentz force), force on a differential current element, and force between differential current elements, Boundary conditions - Inductance and mutual inductance.

Unit-V: Time-Varying Electromagnetic Field **8 hours**

Faraday’s law Lenz’s law Displacement current Maxwell’s equations in point and integral forms. Plane waves in free space, dielectrics, and conductors, Power and Poynting vector, Wave polarization: linear, elliptic, and circular polarizations.

Text Books:

1. William Hayt and John Buck, Engineering Electromagnetics, 2012, Eighth edition, Tata McGraw Hill, New Delhi, India.
2. Mathew O Sadiku, Elements of Electromagnetics, 2014, Sixth edition, Oxford University Press, New York, USA.

Reference Books:

1. D K Cheng, Field and Wave Electromagnetics, 2013, Second edition revised, Pearson Education, Noida, India.
2. David. J. Griffiths, Introduction to Electrodynamics, 2014, Fourth edition, Pearson Education, Noida, India.
3. Constantine A. Balanis, Advanced Engineering Electromagnetics, 2012, Second edition, Wiley, New Jersey, USA.

SIGNALS AND SYSTEMS

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21P04304 **3 1 0 3**
Pre Requisite: Nil

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

1. differentiate the various classifications of signals and systems
2. analyze the frequency domain representation of signals using Fourier concepts
3. classify the systems based on their properties and determine the response of LTI Systems.
4. know the sampling process and various types of sampling techniques.
5. apply z-transforms to analyze signals and Systems

Unit-I: Fundamentals of Signals **8 hours**

Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems.

Unit-II: Fundamentals of Signaling Functions **10 hours**

Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function and ramp function. Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform, Related problems.

Unit-III: Analysis of Linear Systems **10 hours**

Introduction, Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV)system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Solution of Differential equation of a LTI system using Fourier Transform, Related problems.

Unit-IV: Sampling Theorem **10 hours**

Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling –Aliasing, Introduction to Band Pass sampling, Related problems.

Unit-V: Z–Transforms **8 hours**

Concept of Z-Transform of a discrete sequence. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms. Distinction between Laplace, Fourier and Z transforms. Solution of Differential equation of a LTI system using Z-Transform, Related problems.

Text Books:

1. Signals, Systems & Communications-B.P.Lathi, BS Publications, 2003.
2. Signals and Systems-A.V. Oppenheim, A.S. Willsky and S.H. Nawab,PHI, 2ndEdn, 1997

Reference Books:

1. Principles of Linear Systems and Signals–BPLathi,OxfordUniversityPress,2015
2. Signals and Systems–TK Rawat, Oxford University press,2011

ELECTRONIC DEVICES AND CIRCUITS LABORATORY

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21P04311 **0 0 3 1.5**
Pre Requisite: Nil

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

1. understand the formation of p-n junction , various special semiconductor and its different modes of operation.
2. know the construction, working principle of rectifiers with and without filters with relevant expressions.
3. understand the construction, principle of operation of transistors, BJT, FET with their V-I characteristics in different configurations.

Any 10 of The Following Experiments Are To Be Conducted

1. P-N Junction Diode Characteristics
    a. Part A: Germanium Diode (Forward bias& Reverse bias)
    b. Part B: Silicon Diode (Forward Bias only)
2. Zener Diode Characteristics
    a. Part A: V-I Characteristics
    b. Part B: Zener Diode as Voltage Regulator
3. Rectifiers (without and with c-filter)
    a. Part A: Half-wave Rectifier
    b. Part B: Full-wave Rectifier
4. BJT Characteristics (CE Configuration)
    a. PartA: Input Characteristics
    b. Part B: Output Characteristics
5. FET Characteristics (CS Configuration)
    a. Part A: Drain Characteristics
    b. Part B: Transfer Characteristics
6. SCR Characteristics
7. UJT Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

ELECTRONIC CIRCUIT ANALYSIS LABORATORY

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21P04312 **0 0 3 1.5**
Pre Requisite: Nil

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

1. know Simulation software like Multisim which is used to design and implement the basic electronic circuits and amplifiers.
2. comprehend the fundaments of multistage amplifiers, feedback, power amplifiers and oscillator circuits
3. analyze the circuit design process and simulate the common base, common emitter and common collector amplifier circuits

List of experiments (Minimum of Ten Experiments has to be performed)

Part –A

Following Experiments are to be done using Multisim Software

1. Characteristics of CE Amplifier
2. Characteristics of CC Amplifier
3. Characteristics of FET
4. DC Analysis of CE amplifier
5. DC Analysis of FET amplifier

Part -B

1. High frequency analysis of CE amplifier-Gain Bandwidth product
2. High frequency analysis of FET –CS
3. Analysis of Two stage RC coupled amplifier
4. Analysis of Oscillator circuit
5. Analysis of Class AB amplifier Analysis of single tuned amplifier

INTEGRATED CIRCUITS LABORATORY

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21P04313 **0 0 3 1.5**
Pre Requisite: Nil

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

1. comprehend the ideal and practical characteristics of op-amps and design fundamental circuits based on op-amps.
2. design the negative feedback configuration of operational amplifier for various mathematical operations.
3. design and analyze different waveform generator circuits using operational amplifiers.
4. design and analyze various filter circuits using operational amplifiers.
5. realize circuits containing PLL and IC 555, Comprehend various converter circuits.

List of experiments

Any 10 experiments will be conducted from the list given below

1. Study of OP AMPs – IC 741, IC 555, IC 565, IC 566, IC 1496 – functioning, parameters and Specifications.
2. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
3. Integrator and Differentiator Circuits.
4. Waveform Generator using single OP-AMP with variable duty cycle
5. Active Filter Applications – LPF, HPF (first order)
6. Active Filter Applications – BPF, Band Reject (Wideband) and Notch Filters.
7. Oscillator Circuits – Phase Shift and Wien Bridge Oscillators using single OP-AMP
8. Function Generator using OPAMPs.
9. IC 555 Timer – Monostable Operation Circuit, Astable Operation Circuit
10. Design Schmitt Trigger Circuits – using Single OP-AMP with Reference voltage.
11. PLL Operation and Estimation of Capture and Lock range.
12. IC 566 – VCO Applications.

PYTHON PROGRAMMING LAB

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21P04313 **1 0 2 2**
Pre Requisite: Nil

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

1. develop essential programming skills in computer programming concepts like data types, containers
2. apply the basics of programming in the Python language
3. solve coding tasks related conditional execution, loops and solve coding tasks related to the fundamental notions and techniques used in objectoriented programming

List of experiments

Exercise - 1
a) Write a program that asks the user for a weight in kilograms and converts it to Pounds. There are 2.2 pounds in a kilogram.
b) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.

Exercise - 2
a) Write a program that uses a for loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
b) Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.

Exercise - 3
a) Use a for loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.
*
**
***
b) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.

Exercise - 4
a) Write a program that asks the user for two numbers and prints Close if the numbers are within .001 of each other and Not close otherwise.
b) Write a program that asks the user to enter a word and prints out whether that word Contains any vowels.
c) Write a program that asks the user to enter two strings of the same length. The Program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters abcde and ABCDE the program should print out AaBbCcDdEe.

Exercise - 5
a) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.
b) In algebraic expressions, the symbol for multiplication is often left out, as in 3x+4y or 3(x+5).

Computers prefer those expressions to include the multiplication symbol, like 3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.

Exercise - 6

Write a program that generates a list of 20 random numbers between 1 and 100.
(a) Print the list.
(b) Print the average of the elements in the list.
(c) Print the largest and smallest values in the list.
(d) Print the second largest and second smallest entries in the list
(e) Print how many even numbers are in the list.

Exercise - 7

a) Write a program that asks the user for an integer and creates a list that consists of the Factors of that integer.
b) Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,0,1,0,0] is 4.
c) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0].

Exercise - 8

a) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements,it is much shorter with lists and it is also easier to add new conversions if you use lists.
b) Write a function called sum_digits that is given an integer num and returns the sum of the digits of num.

Exercise - 9

a) Write a function called first_diff that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.
b) Write a function called number_of_factors that takes an integer and returns how many factors the number has.
c) Write a function called is_sorted that is given a list and returns True if the list is sorted and False otherwise.

Exercise - 10

a) Write a function called root that is given a number x and an integer n and returns x1/n. In the function definition, set the default value of n to 2.
b) Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be 100.

Exercise - 11

a) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.
b) Write a program that reads a list of temperatures from a file called temps.txt, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.

Exercise - 12

a) Write a class called Product. The class should have fields called name, amount, and price, holding the product's name, the number of items of that product in stock, and the regular price of the product.

There should be a method get_price that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called make_purchase that receives the number of items to be bought and decreases amount by that much.

Exercise - 13

a) Write a class called Time whose only field is a time in seconds. It should have a method called convert_to_minutes that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called convert_to_hours that returns a string of hours, minutes, and seconds formatted analogously to the previous method.

b) Write a class called Converter. The user will pass a length and a unit when declaring an object from the class—for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call c.feet() and should get 0.75 as the result.

Exercise - 14

a) Write a Python class to reverse a string word by word.

b) Write a program to demonstrate Try/except/finally.

c) Write a GUI for an Expression Calculator using tk.

BASICS OF INDIAN CONSTITUTION

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21M00301 **2 0 0 0**
Pre Requisite: Nil

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

1. to understand the structure of executive, legislature and judiciary
2. to understand philosophy of fundamental rights and duties
3. to understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
4. to understand the central and state relation financial and administrative.
5. to understand the Functions of Commissions for the welfare of SC/ST/OBC and women

Unit-I: Introduction to Indian Constitution **8 hours**

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

Unit-II: Union Government and its Administration **8 hours**

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

Unit-III: State Government and its Administration **8 hours**

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

Unit-IV: Local Administration **10 hours**

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

Unit-V: Election Commission **8 hours**

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

Text Books:

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

Reference Books:

1. J.A. Siwach, Dynamics of Indian Government & Politics
2. D.C. Gupta, Indian Government and Politics

3. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)

II-B.TECH.-II-SEMESTER SYLLABUS

RANDOM VARIABLES AND STOCHASTIC PROCESSES

II-B.Tech-II-Sem. **L T P C**
Subject Code : 21B00401 **3 1 0 3**
Pre Requisite: Nil

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

1. mathematically model the random phenomena and solve simple probabilistic problems.
2. identify different types of random variables and compute statistical averages of these random variables.
3. analyze the vector random variables, properties of various distribution functions.
4. characterize the random processes in the time and frequency domains.
5. analyze the LTI systems with random inputs.

Unit-I: The Random Variable **10 hours**

Introduction, Review of Probability Theory, Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Conditional Density, Properties.

Unit-II: Operation on One Randomvariable-Expectation **10 hours**

Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function,MomentGeneratingFunction,TransformationsofaRandomVariable:MonotonicTransformationsforaContinuousRandomVariable,Non-monotonicTransformationsofContinuousRandom Variable.

Unit-III: Operations On Multiple Random Variables **10 hours**

Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem: Unequal Distribution, Equal Distributions.
Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variables case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

Unit-IV: Random Processes –Temporal Characteristics **10 hours**

The Random Process Concept, Classification of Processes, Deterministic and Non deterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second-order and Wide-Sense Stationarity, Nth-order and Strict-Sense Stationarity, Time Averages and Ergodicity, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

Unit-V: Random Processes -Spectral Characteristics **8 hours**

The Power Density Spectrum: Properties, Relationship between Power Density Spectrum and Auto correlation Function, The Cross-Power Density Spectrum, Properties, Relationship between

Cross-Power Density Spectrum and Cross-Correlation Function.

Text Books:

1. Probability, Random Variables & Random SignalPrinciples, Peyton Z.Peebles, TMH, 4thEdition, 2001.
2. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S.Unnikrisha, PHI,4th Edition, 2002.

Reference Books:

1. Schaum's Outline of Probability, Random Variables, and Random Processes, 1997.
2. An Introduction to Random Signals and Communication Theory, B.P.Lathi, International Textbook, 1968.
3. Probability Theory and Random Processes, P. Ramesh Babu, McGrawHill,2015.

ANALOG AND DIGITAL COMMUNICATION

II-B.Tech-II-Sem. **L T P C**
Subject Code : 21P04401 **3 1 0 3**
Pre Requisite: Electronic Devices and Circuits

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

1. apply transforms for signal modulation techniques
2. develop the architectures of communication systems for analog modulation techniques
3. explore the role of random process in communication systems.
4. analyze the performance of a Digital Communication System for probability of error and are able to design a digital communication system.
5. analyze various source coding techniques and compute Block codes, cyclic codes and convolution codes.

Unit-I: Linear Modulation Techniques **8 hours**

Need for Modulation, Frequency Translation methods, AM, DSB-SC, SSB and VSB modulation techniques. Demodulators: Synchronous, and envelope detectors. AM systems in the presence of noise, AM Transmitters and AM Receivers..

Unit-II: Angle Modulation **8 hours**

Phase and Frequency Modulation techniques. Narrow Band FM and Wide Band FM, Carson‘s Rule, Indirect and direct methods of Frequency Modulation. FM systems in the presence of noise. Pre-emphasis and De-emphasis, FM demodulation using PLL, Noise considerations in AM and FM, FM Transmitters and FM Receivers.

Unit-III: Digital Modulation Systems **10 hours**

Pulse Modulation, Pulse-Code Modulation, DPCM, DM, ADM, Matched filter receivers. Shift keying schemes (ASK, PSK, FSK), AM, MSK, QPSK bandwidth consideration and probability of error calculations for these schemes

Unit-IV: Information Theory & Source Coding **10 hours**

Information Theory: Discrete messages, concept of amount of information and its properties. Average information, Entropy and its properties. Information rate, Mutual information and its properties.

Source Coding: Introductions, Advantages, Shannon’s theorem, Shanon-Fano coding, Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, capacity of a Gaussian channel, bandwidth –S/N trade off.

Unit-V: Linear Block Codes & Convolution Codes **10 hours**

Linear Block Codes: Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation, BCH Codes.

Convolution Codes: Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm.

Text Books:

1. Simon Haykin and Michael Moher, ―An Introduction to Analog & Digital Communications‖,2nd Ed., Wiley, (2007).
2. Sam Shanmugam - Digital and Analog Communication Systems, John Wiley,2005.

Reference Books:

1. B.Sklar, "Digital Communication Fundamentals and Applications", Pearson Education, 2nd Edition, 2009.
2. H P Hsu, Schaum Outline Series "Analog and Digital Communications", TMH 2006.
3. B.P.Lathi, "Modern digital and Analog Communication Systems", Oxford University Press, 3rd Edition, 2007.

PULSE AND DIGITAL CIRCUITS

II-B.Tech-II-Sem. **L T P C**
Subject Code : 21P04402 **3 1 0 3**
Pre Requisite: Electronic Devices and Circuits

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

1. design linear and non-linear wave shaping circuits.
2. ability to apply the fundamental concepts of wave shaping for various switching and signal generating circuits.
3. ability to design different multi vibrators and time base generators.
4. ability to utilize the non sinusoidal signals in many experimental research areas.
5. ability to apply general features of a time base generators.

Unit-I: Linear Waveshaping **8 hours**

High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and exponential inputs. RC network as differentiator and integrator; Attenuators , its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

Unit-II: Non Linear Waveshaping **10 hours**

Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper; Clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

Unit-III: Switching Characteristics Of Devices **10 hours**

Diode as a switch, Design and analysis of Transistor as a switch, Break down voltage consideration of transistor, saturation parameters of Transistor and their variation with temperature, Design of transistor switch, transistor-switching times. Bistable Multivibrator: Analysis And Design of Fixed Bias, Self Bias Bistable Multi Vibrator, Collector Catching Diodes, Commutating Capacitors, Triggering of Binary Circuits, Emitter Coupled Bistable Multivibrator (Schmitt Trigger).

Unit-IV: Monostable & Astable Multivibrator: **10 hours**

Monostable Multivibrator: Analysis and Design of Collector Coupled Monostable Multi vibrator, Triggering of Monostable Multivibrator, Applications of Monostable Multivibrator.
Astable Multivibrator: Analysis and Design of Collector Coupled Astable Multivibrator, Application of Astable Multivibrator as a Voltage to Frequency Converter.

Unit-V: Voltage Time Base Generators **10 hours**

General features of a time base signal, Methods of generating time base waveform Exponential Sweep Circuits, Negative Resistance Switches, basic principles in Miller and Bootstrap time base generators, Transistor Miller time base generator, Transistor Bootstrap time base generator.

Text Books:

1. Pulse, Digital and Switching Waveforms – J. Millman and H. Taub, McGraw-Hill
2. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.

Reference Books:

1. Pulse, Digital and Switching Waveforms – J. Millman and H. Taub, Mothiki S Prakash Rao McGraw-Hill, Second Edition, 2007.
2. Solid State Pulse circuits – David A. Bell, PHI, 4th Edn., 2002
3. Pulse & Digital Circuits by Venkata Rao, K, Ramasudha K, Manmadha Rao, G., Pearson, 2020.

CONTROL SYSTEM

II-B.Tech-II-Sem. **L T P C**
Subject Code : 21E04403 **3 1 0 3**
Pre Requisite: Nil

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

1. ability to comprehend and appreciate the significance and role of this course in the present contemporary world.
2. compute the transfer function of different physical systems.
3. analyse the time domain specification and calculate the steady state error.
4. illustrate the frequency response characteristics of open loop and closed loop system response.
5. analyse the stability using routh and root locus techniques. illustrate the state space model of a physical system and discuss the concepts of sampled data control system.

Unit-I: Systems Components And Their Representation **8 hours**

Control System: Terminology and Basic Structure-Feed forward and Feedback control theory-Electrical and Mechanical Transfer Function Models-Block diagram Models-Signal flow graphs Models

Unit-II: Time Response Analysis **10 hours**

Transient response-steady state response-Measures of performance of the standard first order and second order system-effect on an additional zero and an additional pole-steady error constant and system- type number-PID control-Analytical design for PD, PI,PID control systems

Unit-III: Frequency Response And System Analysis **10 hours**

Closed loop frequency response-Performance specification in frequency domain. Bode Plot - Polar Plot- Nyquist plots-Design of compensators using Bode plots-Cascade lead compensation-Cascade lag compensation-Cascade lag-lead compensation

Unit-IV: Concepts Of Stability Analysis **8 hours**

Concept of stability-Bounded - Input Bounded - Output stability-Routh stability criterion Relative stability-Root locus.

Unit-V: Control System Analysis Using State Variable Methods **8 hours**

Concept of state and state variable, Modeling of systems using state variables, Coordinate transformations and canonical realizations, Solution of state variables, Controllability and Observability.

Text Books:

1. M.Gopal,"Control System – Principles and Design", Tata McGraw Hill, 4th Edition, 2012
2. S.K.Bhattacharya, "Control System Engineering", Pearson, 3rd Edition, 2013.

Reference Books:

1. J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 5th Edition, 2007.
2. K.Ogata, "Modern Control Engineering", PHI, 5th Edition, 2012.
3. Benjamin.C.Kuo, "Automatic Control Systems", Prentice Hall of India, 7th Edition,1995.

INDUSTRIAL MANAGEMENT

II-B.Tech-II-Sem. **L T P C**
Subject Code : 21H00401 **3 1 0 3**
Pre Requisite: Nil

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

1. able to apply principles of management
2. able to design the organization structure
3. able to apply techniques for plant location, design plant layout and value analysis
4. able to carry out work study to find the best method for doing the work and establish standard time for a given method
5. able to apply various quality control techniques and sampling plans

Unit-I: Introduction to Management **8 hours**

Nature of Management, importance functions of Management, Systems approach to Management, Taylor's scientific Management theory, Fayal's principles of Management, Maslow's need hierarchy theory, McGregor's Theory X and Theory Y, Hertzberg Two Factor Theory of Motivation, Leadership Styles, Social responsibilities of Management.

Unit-II: Designing Organizational Structures **10 hours**

Organization Structures, Control charts and Marketing Management: Line Organization structure, Line and Staff organization structure, Matrix organization structure, Team Organization structure, Control charts (chart, R chart, C chart, P chart), EOQ, ABC analysis, Functions of Marketing, Marketing Mix, Marketing strategies based on PLC.

Unit-III: Human Resource Management **8 hours**

Importance of HRM, HRM Vs PMIR (Personnel Management and Industrial Relations), Functions of HR Manager: Man power planning, Recruitment, Selection, Training and Development, Wage and Salary administration, Performance Appraisal, Grievance handling and welfare administration, Job evaluation, and merit rating.

Unit-IV: Project Management (PERT and CPM) **8 hours**

Network analysis, Program Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying Critical path, Probability of completing the project within given time, Project cost analysis, Project crashing (simple problems).

Unit-V: Strategic Management **8 hours**

Vision, Mission, Goals, Objectives, Policy, Strategy, Programs, Corporate planning process, Environmental scanning, SWOT analysis, Steps in strategy formulation and implementation.

Text Books:

1. Industrial Engineering and Management/O.P. Khanna/Khanna Publishers.
2. Industrial Engineering and Management Science/T.R. Banga and S.C. Sarma/Khanna Publishers.

Reference Books:

1. Motion and Time Study by Ralph M Barnes! John Willey & Sons Work Study by lLO.

2. Human factors in Engineering & Design/Ernest J McCormick /TMH.
3. Production & Operation Management /Paneer Selvam/PHI.

PULSE AND DIGITAL CIRCUITS LABORATORY

II-B.Tech-II-Sem. **L T P C**
Subject Code : 21P04411 **0 0 3 1.5**
Pre Requisite: Nil

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

1. design linear and non-linear wave shaping circuits.
2. ability to apply the fundamental concepts of wave shaping for various switching and signal generating circuits.
3. ability to Design different multivibrators and time base generators and utilize the non sinusoidal signals in many experimental research areas.

Any 10 of the Following Experiments Are To Be Conducted

1. Linear wave Shaping
   a. RC Low Pass Circuit for different time constants
   b. RC High Pass Circuit for different time constants
2. Non-linear wave shaping
   a. Transfer characteristics and response of Clippers:
   i) Positive and Negative Clippers
   ii) Clipping at two independent levels
   b. The steady state output waveform of clampers for a square wave input
   i) Positive and Negative Clampers
   ii) Clamping at different reference voltage
3. Switching characteristics of a transistor
4. Design a Bistable Multivibrator and draw its waveforms
5. Design an Astable Multivibrator and draw its waveforms
6. Design a Monostable Multivibrator and draw its waveforms
7. Response of Schmitt Trigger circuit for loop gain less than and greater than one
8. UJT relaxation oscillator
9. The output- voltage waveform of Miller sweep circuit
10. Pulse Synchronization of An Astable circuit
11. Sampling gates
    a. Response of Unidirectional gate
    b. Response of Bidirectional gate using transistors
12. Study of logic gates

ANALOG AND DIGITAL COMMUNICATION LABORATORY

II-B.Tech-II-Sem. **L T P C**
Subject Code : 21P04412 **0 0 3 1.5**
Pre Requisite: Nil

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

1. apply transforms for signal modulation techniques
2. develop the architectures of communication systems for analog modulation techniques
3. analyze the performance of a digital communication system for probability of error and are able to design a digital communication system.

List Of Experiments (Minimum of Ten Experiments has to be performed)

1. Amplitude Modulation - Modulation & Demodulation
2. AM – DSBSC - Modulation & Demodulation
3. Spectrum Analysis of Modulated signal using Spectrum Analyzer
4. Frequency Modulation–Modulation & Demodulation
5. AGC Circuits
6. Verification of Sampling Theorem
    a. Pulse Amplitude Modulation & Demodulation
7. PWM, PPM–Modulation & Demodulation
8. Time division multiplexing.
9. Differential pulse code modulation.
10. Frequency shift keying & Phase shift keying.
11. Linear Block Code-Encoder and Decoder
12. Binary Cyclic Code - Encoder and Decoder
13. Convolution Code - Encoder and Decoder
14. BCH Codes

CONTROL SYSTEM SIMULATION LAB

II-B.Tech-II-Sem. **L T P C**
Subject Code : 21P04413 **0 0 3 1.5**
Pre Requisite: Nil

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

1. understand different toolboxes in matlab and analyze various parameters of a matrix using matlab.
2. locate poles and zeros for a given transfer function.
3. evaluate the various parameters of transient & steady state analysis of a control system and examine the stability criteria for a control system using bode and nyquist plot

List of experiments

1. Different Toolboxes in MATLAB, Introduction to Control Systems Toolbox.
2. Determine transpose, inverse values of given matrix.
3. Plot the pole-zero configuration in s-plane for the given transfer function.
4. Determine the transfer function for given closed loop system in block diagram representation.
5. Plot unit step response of given transfer function and finds delay time, rise time, peak time and peak overshoot.
6. Determine the time response of given system subjected to any arbitrary input.
7. Plot root locus of given transfer function, locate closed loop poles for different values of k.
8. Determine the steady state errors of a given transfer function.
9. Plot bode plot of given transfer function. Also determine the relative stability by measuring gain and phase margins.
10. Plot Nyquist plot for given transfer function and to discuss closed loop stability. Also determine the relative stability by measuring gain and phase margin.

MATLAB FUNDAMENTALS

II-B.Tech-II-Sem. **L T P C**
Subject Code : 21S04401 **1 0 2 2**
Pre Requisite: Nil

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

1. aware of matlab software and perform basic programs.
2. perform real time application and know about basic key features of matlab software
3. develop a program related to control system & data communications in matlab software.

List of experiments

1. Introduction to MATLAB: To define & use variables, vectors, Matrices & its functions in MATLAB.
2. Familiarize with the MATLAB environment and running some basic commands in MATLAB.
3. Generate Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc using MATLAB.
4. To perform addition, subtraction, multiplies and divides of binary number of Digital System.
5. Write a program to sort an array in descending order and execute
6. Write a MATLAB program for an addition of scalar to an array and execute
7. Write a MATLAB program to add two arrays and execute
8. Write a program to create a matrix
9. Write a MATLAB program to find transpose, determinant and inverse of a matrix
10. To generate the amplitude modulated wave using MATLAB simulation.
11. To generate frequency modulated wave using MATLAB simulation.
12. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal
13. Convolution between Signals and sequences.
14. Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.

III-B.TECH.-I-SEMESTER SYLLABUS

DIGITAL SIGNAL PROCESSING

III-B.Tech-I-Sem. **L T P C**
Subject Code : 21P04501 **3 1 0 3**
Pre Requisite: Signals and systems

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

1. classify the lti system characteristics and multirate signal processing.
2. compare the inter-relationship between dft and various transforms.
3. design a digital filter for a given specification.
4 .identify the significance of various filter structures and effects of round off errors.
5. demonstrate the key architectural

Unit-I: Introduction to Discrete Time Signals and systems **8 hours**

Continuous,discrete,linear,causal,stability,dynamic,recursive,time variance, Linear constant coefficient difference equation, frequency domain representation of discrete time signals & systems, Z-transforms-properties, Inverse Z-transforms, Difference equation-solution by Z-transform, Introduction to Digital Signal Processor, advantages and applications

Unit-II: Discrete Fourier Transform and Fast Fourier Transform **10 hours**

Digital Fourier Series- Properties, Digital Fourier Transform- Properties, Linear convolution of sequences using DFT, Computation of DFT for long sequences, Radix-2 Decimation-in-time and decimation-in-frequency FFT algorithms, Inverse FFT.

Unit-III: IIR Digital Filters **8 hours**

Analog Filter Approximations- Butterworth & Chebyshev, Design of IIR Digital Filters from Analog Filters, impulse invariant techniques, bilinear transformation method, Realization of IIR digital filters.

Unit-IV: FIR Digital Filters **8 hours**

Characteristics of FIR Digital Filters ,Frequency Response design of FIR filters: Digital filters using window techniques, Frequency sampling Techniques, Comparison of FIR and IIR Filters, Realization of FIR Digital Filters.

Unit-V: Digital Signal Processors **8 hours**

Introduction, Architecture, Features, Addressing Formats, Functional modes, Introduction to Commercial DSP, TMSC320C67XX-Data Addressing Modes, Instructions & Programming, Interrupts,PipelineOperations,On-ChipPeripherals.

Text Books:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis Dimitris G.Manolakis, Pearson Education PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI,2007

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.

DIGITAL IC APPLICATIONS

III-B.Tech-I-Sem. **L T P C**
Subject Code : 21P04502 **3 1 0 3**
Pre Requisite: Digital Electronics

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

1. demonstrate the structure of commercially available digital integrated circuit families.
2. design different types of combinational circuits.
3. outline the IEEE Standard 1076 Hardware Description Language (VHDL).
4. model complex digital systems at several levels of abstractions, behavioral, structural, and rapid system prototyping.
5. analyze and design basic digital circuits with combinatorial and sequential logic circuits using VHDL

Unit-I: Hardware Description Language **8 hours**

VHDL: Introduction to VHDL, entity declaration, architecture, data types ,data objects ,Operators and identifiers ,dataflow, behavioural and structural style of modelings

Behavioral Modeling: PROCESS, IF, CASE , LOOP, WAIT,NULL,EXIT statements, VHDL libraries.

Unit-II: Combinational Logic Design **10 hours**

Parallel binary adder, carry look ahead adder, BCD adder, Multiplexers and demultiplexers and their use in combinational logic design, digital comparators, priority encoders**. (**Qualitative approach of designing and modeling the mentioned combinational logic circuits with relevant digital ICs using VHDL)

Unit-III: Sequential Logic Design **8 hours**

latches and flipflops, Registers, applications of shift registers,universal shift register, ring counter,Johnson counter,design of mod N synchronousCounters and synchronous sequential circuits (Qualitative approach of designing and modeling the mentioned sequential logic circuits with relevant digital ICs usingVHDL)

.

Unit-IV: Combinational MOS Logic Circuits **8 hours**

Introduction, MOS logic circuits with depletion nMOS loads: two-input NOR gate, generalized NOR structure with multiple inputs, transient analysis of NOR gate, two-input NAND gate, generalized NAND structure with multiple inputs, transient analysis of NAND gate, CMOS

logic circuits: CMOS NOR2 gate, CMOS NAND2 gate, complex logic circuits, complex CMOS logic gates, AOI and OAI gates, Pseudo-nMOS gates, CMOS full-adder circuit, CMOS transmission gates (Pass Gates)

Unit-V: Sequential MOS Logic Circuits **8 hours**

Introduction, behavior bistable elements, SR latch circuit, clocked latch and flip-flop circuits: clocked SR latch, clocked JK latch, master-slave flip-flop, CMOS D-latch and Edge-triggered flip-flop

Text Books:

1. Modern Digital Electronics–R.P.Jain-Fourth Edition–Tata McGraw Hill Education Private Limited, 2010.
2. CMOS Digital Integrated Circuits-Analysis and Design – Sung-MoKang & Yusuf Leblebici-Tata McGraw Hill Publishing Company Limited, 2006.

Reference Books:

1. Digital Design Principles & Practices-John F.Wakerly, PHI/Pearson Education Asia, 3rd Edition, 2005.
2. Fundamentals of Digital Logic with VHDL Design - Stephen Brown, Zvonko Vranesic, McGraw Hill, 3rd Edition,2003

ANTENNAS AND WAVE PROPAGATIONS

III-B.Tech-I-Sem. **L T P C**
Subject Code : 21P04503 **3 1 0 3**
Pre Requisite: Electromagnetic magnetic Fields

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

1. explain the concepts of antenna and electromagnetic radiation through antenna and measure the antenna parameters
2. design and analyze the linear and nonlinear antenna arrays, special antennas and measure the different parameters and feeding methods of antenna
3. specify the requirements for microwave measurements and arrange a setup to carry out the antenna far zone pattern and gain measurements in the laboratory.
4. characterize the antennas based on frequency, configure the geometry and establish the radiation patterns of vhf, uhf and microwave antennas and also antenna arrays.
5. classify the different wave propagation mechanisms, determine the characteristic features of different wave propagations, and estimate the parameters involved.

Unit-I: Antenna Basics **8 hours**

Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height. Fields from Oscillating Dipole, Field Zones, Front - to-back Ratio, Antenna Theorems, Radiation, Thin Linear Wire Antennas – Radiation from Small Electric Dipole, Quarter Wave Monopole

Unit-II: Antenna Arrays & Measurements **10 hours**

Point Sources – Definition, Patterns, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays.
Antenna Measurements: Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Directivity Measurement, Gain Measurements

Unit-III: VHF, UHF and Microwave Antennas - I **8 hours**

Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna in Axial and Normal Modes, Horn Antennas – Types, Fermat‟s Principle, Optimum Horns, Design Considerations of Pyramidal Horns.

Unit-IV: VHF, UHF and Microwave Antennas - II **8 hours**

Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Reflector Antennas – Introduction, Flat Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features.

Unit-V: Wave Propagation **8 hours**

Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts, Ground Wave Propagation –Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections. Space Wave Propagation –Field Strength Variation with Distance and Height, Effect of Earth‟s Curvature, M-Curves and Duct Propagation, Scattering Phenomena, Troposphere Propagation. Sky Wave Propagation –Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Relation between MUF and Skip Distance, Multi-hop Propagation.

Text Books:

1. Antennas and Wave Propagation – J.D. Kraus, R.J. Marhefka and Ahmad S. Khan, TMH, New Delhi, 4th ed., (Special Indian Edition), 2010.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd edition.,2000.

Reference Books:

1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd edition., 2005.
2. Radio Engineering Handbook- Keith henney, 3rd edition TMH.2003
3. Antenna Engineering Handbook –John Leonidas Volakis, 3rd edition, 2007

BIOMEDICAL ENGINEERING

III-B.Tech-I-Sem. **L T P C**
Subject Code : 21L04501 **3 0 0 3**
Pre Requisite: Nil

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

1. identify significant biological variables at cellular level and ways to acquire different bio-signals.
2. identify the techniques to acquire record and primarily understand physiological activity of the human body through cell potential, ecg, eeg, bp and blood flow measurement and emg.
3. describe the working of various medical instruments and critical care equipment.
4. compare various imaging techniques including ct, pet, spect and mri used in diagnosis of various medical conditions.
5. explain the concepts of neuronal communication

Unit-I: Bio Potential Signals and Electrodes **8 hours**

Bio-signals and their characteristics, Organization of cell, Nernst equation of membrane, Resting and Action potentials, Bio-amplifiers, characteristics of medical instruments, problems encountered with measurements from living systems, Bio-potential electrodes –Body surface recording electrodes, Internal electrodes, micro electrodes, Bio-chemical transducers –reference electrode, the pH electrodes, Blood gas electrodes.

Unit-II: Cardiovascular Instrumentation **10 hours**

Heart and cardiovascular system Heart electrical activity, blood pressure and heart sounds, cardiovascular measurements electro cardiograph-electrocardiogram, ECG Amplifier, Electrodes and leads, ECG recorder principles. Types of ECG recorders. Principles of blood pressure and blood flow measurement.

Unit-III: Neurological Instrumentation **8 hours**

Neuronal communication, electro encephalogram (EEG), EEG Measurements EEG electrode-placement system, interpretation of EEG, EEG system Block diagram, pre-amplifiers and amplifiers EMG block diagram and Stimulators.

Unit-IV: Equipment's for Critical Care **8 hours**

Therapeutic equipment -Pacemaker, Defibrillator, Shortwave diathermy, Hemodialysis machine. Respiratory Instrumentation -Mechanism of respiration, Spirometry, Pneumotachograph, Ventilators.

Unit-V: Principles Of Medical Imaging **8 hours**

Radiography, computed Radiography, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Nuclear Medicine, Single Photon Emission Computed Tomography (SPECT), Positron Emission Tomography (PET), Ultrasonography, Introduction to Telemedicine.s.

Text Books:

1. Hand-book of Biomedical Instrumentation –by R.S. Khandpur, McGraw-Hill,2003.
2. Medical Instrumentation, Application and Design –by John G. Webster, JohnWiley.2005

Reference Books:

1. Biomedical Instrumentation and Measurements –by Leslie Cromwell, F.J.Weibell, E.A. Pfeiffer, PHI,2009
2. Principles of Applied Biomedical Instrumentation –by L.A. Geoddes and L.E. Baker, John Wiley and Sons.2005
3. Introduction to Biomedical equipment technology-by Joseph Carr andBrown.2009

COMPUTER ARCHITECTURE AND ORGANIZATION

III-B.Tech-I-Sem. **L T P C**
Subject Code : 21L04502 **3 0 0 3**
Pre Requisite: Nil

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

1. identify basic components and design of control unit
2. illustrate the functioning of CPU using 8086 processor
3. solve real time problems using ALP
4. analyze arithmetic operations, I/O operations and memory
5. distinguish pipelining and multiprocessors

Unit-I Digital Computers **10 hours**

Introduction, block diagram of digital computer, definition of computer organization, computer design and computer architecture. Basic Computer Organization and Design: Instruction codes, computer registers, computer instructions, timing and control, instruction cycle, memory reference instructions, input – output and interrupt, complete computer description. Micro Programmed Control: Control memory, address sequencing, micro program example, design of control unit.

Unit-II Central Processing Unit **8 hours**

The 8086 processor architecture, register organization, physical memory organization, general bus operation, instruction formats, addressing modes, 8086 instruction set and assembler directives.

Unit-III Assembly language programming with 8086 **8 hours**

Machine level programs, programming with an assembler, assembly language example programs. Stack structure of 8086, interrupts and interrupt service routines, interrupt cycle of 8086, interrupt programming, passing parameters to procedures, macros.

Unit-IV Computer Arithmetic **8 hours**

Introduction, addition and subtraction, multiplication algorithms, division algorithms, floating point algorithms. Input-Output Organization: Peripheral devices, input-output interface, asynchronous data transfer, modes of transfer, priority interrupt, direct memory access, input - output processor.

Unit-V Memory Organization **8 hours**

Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory. Pipeline Processing: Parallel processing, pipelining, arithmetic pipeline, instruction pipeline.

Text Books:

1. Computer Organization – Carl Hamacher, Zvonks Vranesic, Safea Zaky, Vth Edition, McGraw Hill.2005
2. Computer Systems Architecture – M. Moris Mano, IIIrd Edition, Pearson 2009

Reference Books:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson 2008
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI 2015
3. Fundamentals of Computer Organization and Design - Sivaraama Dandamudi Springer Int. Edition.2011

COMPUTER NETWORKS

	L	T	P	C
III-B.Tech-I-Sem.				
Subject Code : 21L04503	**3**	**0**	**0**	**3**

Pre Requisite: Nil

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

1. summarize and explore the basics of computer networks and various protocols.
2. develop the multiple access protocols
3. assume a network and flow of information
4. interpret easily the concepts of network security, mobile and ad hoc networks
5. identifythe internet transport protocols and different layers of tcp/ip protocol suite

UNIT I Introduction to Layers of TCP/IP **8 hours**

Introduction to Layers of TCP/IP Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Internet history standards and administration; Comparison of the OSI and TCP/IP reference model. Physical Layer**:** Guided transmission media, wireless transmission media. Data Link Layer – design issues, CRC Codes, Elementary Data link Layer protocols, sliding window protocol

UNIT II Multiple Access Protocols **8 hours**

ALOHA, CSMA, Collision free protocols, Ethernet- Physical Layer, Ethernet Mac Sub layer, data link layer switching & use of bridges, learning bridges, spanning tree bridges, repeaters , hubs, bridges , switches, routers and gateways.

UNIT III Network Layer **8 hours**

Network Layer Design issues, store and forward packet switching connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Count to Infinity Problem, Hierarchical Routing, Congestion control algorithms, admission control.

UNIT IV Internetworking **8 hours**

Tunneling, Internetwork Routing, Packet fragmentation, IPv4, Ipv6 Protocol, IP addresses, CIDR, IMCP, ARP, RARP, DHCP. Transport Layer: Services provided to the upper layers elements of transport protocol-addressing connection establishment, connection release,Connection Release, Crash Recovery.

UNIT V The Internet Transport Protocols **10 hours**

UDP-RPC, Real Time Transport Protocols, The Internet Transport Protocols- Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP Connection Release, The TCP Connection Management Modeling, The TCPSliding Window, The TCP Congestion Control, The future of TCP. Application Layer-Introduction ,providing services, Applications layer paradigms, Client server model, Standard client-server application-HTTP, FTP, electronic mail, TELNET, DNS, SSH

Text Books:

1. Data Communications and Networking – Behrouz A. Forouzan, Fifth Edition TMH, 2013.
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education. 2005

Reference Books:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.2009
2. Understanding communications and Networks, 3rd Edition, W.A.Shay, Cengage Learning. 2004
3. Introduction to Computer Networks and Cyber Security, Chwan-Hwa (John) Wu, J. David Irwin, CRC Press.2015

DIGITAL SIGNAL PROCESSING LABORATORY

III-B.Tech-I-Sem. **L T P C**
Subject Code : 21P04511 **0 0 3 1.5**
Pre Requisite: Nil

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

1. analyze time, frequency and Z-transform analysis on signals and systems
2. Find out various impulse, step and frequency responses and design various filter structures
3. Design a digital filter for a given specification

PART-A

List of the Experiments

Following Experiments are to be done using Using MAT LAB:

1. Generation of basic discrete time signals

2. Convolution of two finite length sequences

a) Linear convolution

b) Circular convolution

3. Find DFT/ IDFT of a given discrete time signal

4. Design of FIR Filter using windowing techniques

5. IIR Filter design using

a) Chebyshev filter

b) Butterworth filter

PART-B

Following Experiments are to be done using a TI DSP Starter Kit.

6. Generation of a sinusoidal signal.

7. Linear and circular convolution of DT sequences.

8. Compute N-point DFT of a given DT sequence.

9. Design of FIR filter LPF &HPF of a given sequence

10. Design of IIR filter LPF & HPF of a given sequence

DIGITAL IC APPLICATIONS LABORATORY

III-B.Tech-I-Sem. **L T P C**
Subject Code : 21P04512 **0 0 3 1.5**
Pre Requisite: Nil

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

1. examine the structure of commercially available digital integrated circuit families.
2. learn the ieee standard 1076 hardware description language (vhdl).
3. model complex digital systems at several levels of abstractions, behavioral, structural, and rapid system prototyping.

List of Experiments: (Minimum of Ten Experiments has to be performed)

USING VHDL

1. Realization of Gates by using Universal Building Blocks.

2. Minimization and Realization of a given function.

3. Realization of Flip-Flops.

4. Function generation by using Decoders & Multiplexers.

5. 4-bit Ripple counter.

6. Mod-8 Synchronous Counter.

7. 4-bit Shift Register.

8. 4 bit & 8-bit Binary Adders & Subtractors.

9. Seven Segment Display.

10. Priority encoding using 74LS148.

11. Arithmetic & Logic Unit (ALU).

12. Semi-Conductor Memory.

13. Applications of Multiplexer.

14. 4 – bit Comparator

III-B.TECH.-II-SEMESTER SYLLABUS

MICROWAVE AND OPTICALCOMMUNICATIONS

III-B.Tech-II-Sem. **L T P C**
Subject Code : 21P04601 **3 1 0 3**
Pre Requisite: Nil

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

1. design different modes in waveguide structures
2. calculate S-matrix for various waveguide components and splitting the microwave energy in a desired direction
3. identify optical fibers and their characteristics
4. demonstrate an understanding of optical fiber communication link, structure, propagation and transmission properties of an optical fiber.
5. measure various microwave parameters using a Microwave test bench

Unit-I Microwave Tubes **10 hours**

Cavities**,** Re-entrant Cavities, Two Cavity Klystrons-Structure, Velocity Modulation and Bunching process, Reflex Klystrons- Structure, principle of working.
M-Type Tubes: Introduction, Cross-field effects, Magnetrons – 8-Cavity Cylindrical Travelling Wave Magnetron.

Unit-II Waveguide Components and Applications- I **8 hours**

Waveguide Attenuators – Resistive Card, Rotary Vane types, Scattering matrix parameters: Definition, Properties, Salient Features -S- parameters of two port, three port, four port networks. 2 Hole, Bethe Holetypes.

Unit- III Over view of optical fiber **8 hours**

Over view of optical fiber communication, Total Internal Reflection, Numerical Aperture, Graded index fibers, Cut off wavelength.
Optical Fiber Connectors-Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing- Splicing techniques, Splicing single mode fibers, Multimode fiber joints, single mode fiber joints.

Unit-IV Optical Sources and Detectors **8 hours**

Qualitative treatment, Structures, Materials, Quantum efficiency, Physical principles and comparison of: Optical sources and detectors, Related problems.
Optical system design- Point to point links – Component Choice and considerations, Link power budget, Line coding in Optical links, WDM, Necessity, Principles, Eye pattern.

Unit–V Measurements **8 hours**

Microwave Measurements: Description Of Microwave Bench- Different Blocks, Microwave Power Measurement- Bolometer Method. Measurement of Attenuation by Reflection Method, VSWR, Impedance Measurement
Optical Measurements: OTDR, Attenuation, Detector Characteristics

Text Books:

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rdEdition,1994.
2. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley,2nd Edition,2002.

Reference Books:

1. Microwave Engineering- Annapurna Das and Sisir K.Das, Mc Graw HillEducation, 3rdEdition,2014.
2. Microwave Engineering – G S N Raju , I K International Publishing House Pvt. Limited,2008.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Ediition, 2004.

VLSI DESIGN

III-B.Tech-II Sem. **L T P C**
Subject Code : 21P04602 **3 1 0 3**
Pre Requisite: Nil

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

1. demonstrate a clear understanding of CMOS fabrication flow and technology scaling.
2. apply the design Rules and draw layout of a given logic circuit.
3. design MOSFET based logic circuit and design basic building blocks in Analog IC design.
4. analyze the behavior of amplifier circuits with various loads.
5. explain architecture and technologies Of FPGA.

Unit-I Introduction to IC technology **8 hours**

Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology.

Unit-II MOS and Bi-CMOS Circuit Design Processes **8 hours**

MOS Layers, Stick Diagrams, Design Rules and Layout, General observations on the Design rules, 2μm Double Metal, Double Poly, CMOS/BiCMOS rules, 1.2μm Double Metal, Double Poly CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter, Symbolic Diagrams

Unit-III Basic Circuit Concepts **10 hours**

Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, Some area Capacitance Calculations, The Delay Unit, Inverter Delays, Driving large capacitive loads
Scaling of MOS Circuits: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density. Switch logic, Gate logic.

Unit-IV Basic Building Blocks of Analog Ic Design **8 hours**

Regions of operation of MOSFET, Modelling of transistor, body bias effect, biasing styles, single stage amplifier with resistive load, single stage amplifier with diode connected load, Common Source amplifier, Common Drain amplifier, Common Gate amplifier, current sources and sinks

Unit-V Introduction To FPGA **8 hours**

FPGA design flow, Basic FPGA architecture, FPGA Technologies, Introduction to FPGA Families.
Introduction To Advanced Technologies: Giga-scale dilemma, Short channel effects, High–k, Metal Gate Technology, FinFET, TFET.

Text Books:

1. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas and A. Pucknell and SholehEshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. Design of Analog CMOS Integrated Circuits by BehzadRazavi , McGraw Hill, 2003

Reference Books:

1. "Introduction to VLSI Circuits and Systems", John P. Uyemura, John Wiley & Sons, reprint 2009.
2. Integrated Nanoelectronics: Nanoscale CMOS, Post-CMOS and Allied Nanotechnologies Vinod Kumar Khanna, Springer India, 1st edition, 2016.
3. FinFETs and other multi-gate transistors, ColingeJP, Editor New York, Springer, 2008.

MICROPROCESSORS AND MICROCONTROLLERS

	L	T	P	C
III-B.Tech-II-Sem.				
Subject Code : 21P04603	**3**	**0**	**0**	**3**

Pre Requisite: Nil

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

1. explain the architecture of microprocessor and their operation.
2. explain the architecture of microcontroller and their operation
3. demonstrate programming skills in assembly language for processors and Controllers.
4. analyze various interfacing techniques and apply them for the design of processor/controller based systems.
5. demonstrate programming skills 8051 Assembly Language Programming for interfacing

Unit-I 8086 Architecture **8 hours**

Main features, pin diagram/description, 8086 microprocessor family, 8086 internal architecture, bus interfacing unit, execution unit, interrupts and interrupt responses, 8086 system timing, minimum mode and maximum mode configuration.

Unit-II 8086 Programming **8 hours**

Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

Unit-III 8086 Interfacing **10 hours**

Semiconductor memories interfacing (RAM,ROM), Intel 8259 programmable interrupt controller,8257 DMA controller, Intel 8255 programmable peripheral interface, keyboard interfacing, alphanumeric displays (LED,7-segment display, multiplexed 7-segment display, LCD), stepper motor, A/D and D/A converters.

Unit-IV Intel 8051 Microcontroller **8 hours**

Architecture, hardware concepts, input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts.

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Unit-V 8051 Interfacing and Advanced Microprocessors **8 hours**

Instructions, addressing modes, simple programs. Interfacing: keyboard, displays (LED, 7-segment display unit), A/D and D/A converters. ARM family of processors
Overview of ARM architecture, Android-ARM hardware-software interface, Introduction to arduino and raspberry pi

Text Books:

1. Microprocessors and Interfacing – Programming and Hard ware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition.2009
2. The 8051 Microcontroller & Embedded Systems Using Assembly and C by Kenneth J.Ayala, Dhananjay V.Gadre,Cengage Learninbg , India Edition.2005

Reference Books:

1. The Intel Microprocessors-Architecture, Programming, and Interfacing by Barry B.Brey, Pearson,

Eighth Edition-2012.
2. Microprocessors and Microcontrollers-Architecture, Programming and System Design by Krishna Kant, PHI Learning Private Limited, Second Edition, 2014.
3. Microprocessors and Microcontrollers by N.Senthil Kumar, M.Saravanan and S.Jeevananthan, Oxford University Press, Seventh Impression 2013

REAL TIME OPERATING SYSTEMS

	L	T	P	C
III-B.Tech-II-Sem.				
Subject Code : 21L04601	**3**	**1**	**0**	**3**

Pre Requisite: Nil

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

1. explain the concepts of Real-Time systems and modeling
2. recognize the characteristics of a real-time system
3. demonstrate the document on an architectural design of a real-time system
4. develop and document Task scheduling, resource management, real-time operating systems
5. develop and document fault tolerant applications of Real-Time Systems.

Unit-I Introduction to Operating systems **8 hours**

Operating system objectives and functions, Virtual Computers,Interaction of O. S. & hardware architecture, Evolution ofoperating systems Architecture of OS (Monolithic, Microkernel, Layered, Exo- kernel and Hybrid kernel structures) Batch, Multi programming, Multitasking, Multiuser, parallel,distributed & real –time O.S.

Unit-II Uniprocessor Scheduling **8 hours**

Uniprocessor Scheduling: Types of scheduling, Scheduling algorithms: FCFS, SJF, Priority, Round Robin UNIX Multi-level feedback queue scheduling, Thread, Scheduling, Multiprocessor Scheduling concept

Unit-III Concurrency and Synchronization **10 hours**

Concurrency: Principles of Concurrency, Mutual Exclusion, H/W Support, software approaches, Semaphores and Mutex, Message, Passing technique
Classical Problems of Synchronization: Readers-Writers Problem, Producer Consumer Problem, Dining Philosopher problem.
Deadlock: Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, An Integrated Deadlock Strategies.

Unit-IV Memory Management **8 hours**

Memory Management requirements, Memory partitioning:Fixed, dynamic, partitioning Memory allocation Strategies (First Fit, Best Fit, Worst Fit,Next Fit), Fragmentation, Swapping, Segmentation, Paging,Virtual Memory, Demand paging,Page Replacement Policies (FIFO, LRU, Optimal, clock)Thrashing, Working Set Model
.

Unit-V I/O Management and Disk Scheduling: **8 hours**

I/O Devices,Organization of I/O functions, Operating System Design issues, I/O Buffering, Disk,Scheduling (FCFS, SCAN, C-SCAN, SSTF), Disk Caches

Text Books:

1. C.M. Krishna and G.Shin, Real Time Systems, McGraw-Hill International Edition, 1997.
2. Jean J Labrosse, Embedded Systems Building Blocks Complete and Ready-to-use Modules in C, CMP books, 2nd edition, 1999.

Reference Books:

1. Jean J Labrosse , Micro C/OS-II, The Real Time Kernel, CMP Books, 2011
2. Sam Siewert, V, Real-Time Embedded Components and Systems: With Linux and RTOS (Engineering), 2015
3. Tanenbaum, Modern Operating Systems, 3/e, Pearson Edition, 2007.

SATELLITE COMMUNICATIONS

III-B.Tech-II-Sem. **L T P C**
Subject Code : 21L04602 **3 1 0 3**
Pre Requisite: Nil

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

1. illustrate the basic concepts of satellite communication and different Frequency allocations for satellite services
2. analyze the satellite orbits and link design for transmission & reception of signals
3. illustrate the basic concepts of Earth Station Technology
4. analyze various satellite subsystems and its functionality.
5. choose appropriate multiple access technique for a given satellite communication application

Unit-I Communication Satellite **8 hours**

Orbit and Description: A brief History of Satellite Communication, Satellite Frequency bands, Satellite Systems, Applications, Orbital Period and Velocity, Effects of Orbital inclination, Azimuth and Elevation, Coverage and Slant range, Eclipse, Orbital perturbations , Placement of a Satellite in a Geo-Stationary Orbit.

Unit-II Satellite Sub-Systems **8 hours**

Satellite Sub-Systems: Altitude and orbit control system, TT&C Sub-System, Altitude control Sub-System, Power Systems, Communication Subsystems, Satellite antenna Equipment. Satellite Link: Basic transmission theory, system noise temperature and G/T ratio, Basic Link Analysis, Interference Analysis, Design of satellite links for specified C/N, (with and without frequency Re-use), Link Budget.

Unit-III Propagation effects and Multiple Access **10 hours**

Introduction, Atmospheric Absorption, Cloud Attenuation, Tropospheric and Ionospheric Scintillation and Low angle fading, Rain Induced attenuation, rain induced cross polarization interference.
Multiple Access: Frequency Division Multiple Access(FDMA), Intermodulation, Calculation of C/N. Time Division Multiple Access(TDMA), Frame structure, Burst structure, Satellite Switched TDMA Onboard processing, Demand Assignment Multiple Access (DAMA) – Types of Demand Assignment, Characteristics, CDMA Spread Spectrum Transmission and Reception

Unit-IV Earth Station Technology **8 hours**

Earth Station Technology: Transmitters, Receivers, Antennas, Tracking systems, Terrestrial Interface, Power Test methods, Lower Orbit Considerations. Satellite Navigation & Global Positioning Systems: Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers, GPS C/A code accuracy, Differential GPS.

Unit-V Satellite Packet Communications: **8 hours**

Message Transmission by FDMA: M/G/1 Queue,Message Transmission by TDMA, PURE ALOHA-Satellite Packet Switching, Slotted Aloha, Packet Reservation, Tree Algorithm.

Text Books:

1. Satellite Communications- Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, , John Wiley & Sons 2nd Edition, 2003.

2. Satellite Communication Engineering- Wilbur L. Pritchand, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2009.

Reference Books:

1. Satellite Communications- Dennis Roddy, 2nd Edition, McGraw Hill, 1996.
2. Satellite Communications: Design Principles- M. Richharia, 2nd Edition, BS Publications, 2003.
3. Fundamental of Satellite Communications- K. N Raja Rao, PHI, 2004

SOFT COMPUTING TECHNIQUES

III-B.Tech-II-Sem. **L T P C**
Subject Code : 21L04603 **3 1 0 3**
Pre Requisite: Nil

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

1. illustrate the concepts of ANN, different features of fuzzy logic and their modelling, control aspects and different hybrid control schemes.
2. summarise the basics of artificial neural network.
3. classify the modelling and control of neural.
4. classify the modelling and control of fuzzy control schemes.
5. analyze hybrid control schemes concepts of Adaptive Resonance Theory

Unit-I Artificial Neural Network **8 hours**

Review of fundamentals – Biological neuron, artificial neuron, activation function, single layer perceptron – Limitation – Multi layer perceptron – Back Propagation Algorithm (BPA) – Recurrent Neural Network (RNN) – Adaptive Resonance Theory (ART) based network – Radial basis function network – online learning algorithms, BP through time – RTRL algorithms – Reinforcement learning.

Unit-II Neural Networks For Modeling and Control **8 hours**

Modelling of non-linear systems using ANN – Generation of training data – Optimal architecture– Model validation – Control of non-linear systems using ANN – Direct and indirect neuro control schemes – Adaptive neuro controller – Familiarization with neural network toolbox.

Unit-III Fuzzy Set Theory **10 hours**

Fuzzy set theory – Fuzzy sets – Operation on fuzzy sets – Scalar cardinality, fuzzy cardinality, union and intersection, complement (Yager and Sugeno), equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation – Fuzzy membership functions.

Unit-IV Fuzzy Logic For Modeling And Control **8 hours**

Modelling of non-linear systems using fuzzy models – TSK model – Fuzzy logic controller – Fuzzification – Knowledge base – Decision making logic – Defuzzification – Adaptive fuzzy systems – Familiarization with fuzzy logic toolbox.

Unit-V Hybrid Control Schemes **8 hours**

Fuzzification and rule base using ANN – Neuro fuzzy systems – ANFIS – Fuzzy neuron– GA – Optimization of membership function and rule base using Genetic Algorithm – Introduction to other evolutionary optimization techniques, support vector machine– Case study – Familiarization with ANFIS toolbox.

Text Books:

1. Laurence Fausett, “Fundamentals of Neural Networks”, Prentice Hall, Englewood Cliffs, N.J., 1992
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, McGraw Hill Inc., 2000.

Reference Books:

1. Goldberg, “Genetic Algorithm in Search, Optimization and Machine learning”, Addison Wesley

Publishing Company Inc. 1989
2. Millon W.T., Sutton R.S. and Webrose P.J., “Neural Networks for Control”, MIT press, 1992
3. Ethem Alpaydin, “Introduction to Machine learning (Adaptive Computation and Machine Learning series)’, MIT Press, Second Edition, 2010.

MICROWAVE AND OPTICAL LABORATORY

III-B.Tech-II-Sem. **L T P C**
Subject Code : 21P04611 **0 0 3 1.5**
Pre Requisite: Nil

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

1. verify characteristics of Reflex Klystron and analyze various parameters of Waveguide components.
2. estimate the power measurements of RF Components such as directional Couplers.
3. demonstrate characteristics of various optical sources and measure data Rate, Numerical Aperture and Losses in Optical Link.

Minimum Twelve Experiments to be conducted:

Part-A (Any 7 Experiments)

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. Impedance and Frequency Measurement.
6. Scattering parameters of Circulator.
7. Scattering parameters of Magic Tee.
8. Radiation Pattern of Horn and Parabolic Antennas.

Part – B (Any 5 Experiments) :

10. Characterization of LED.
11. Characterization of Laser Diode.
12. Intensity modulation of Laser output through an optical fiber.
13. Measurement of Data rate for Digital Optical link.
14. Measurement of NA.
15. Measurement of losses for Analog Optical link.

VLSI LABORATORY

	L	T	P	C
III-B.Tech-II-Sem.				
Subject Code : 21P04612	**0**	**0**	**3**	**1.5**

Pre Requisite: Nil

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

1. design and implement digital logics by using Tanner Tools / Mentor Graphics.
2. study and analyze the performance of CMOS logic circuits and also verify the functionality.

List of Experiments

Back-end Level Design and Implementation

Note: The students need to design the following experiments at schematic level using CMOS logic and verify the functionality. Further students need to draw the corresponding layout and verify the functionality including parasites. Available state of the art technology libraries can be used while simulating the designs using Industry standard EDA Tools.

Design and Implementation of the following:

1. CMOS Inverter
2. Universal Gates
3 Full Adder
4. Full Subtractor
5. SR Latch
6. D-Latch
7. D-Flip-flop
8. 2 to 4 Decoder
9. To design layout of NMOS and CMOS inverter.
10. To design the layout of 2-input NAND gate
11. To design the layout of 2-input NOR gate.
12. Design and Implementation of static RAM cell

EDA Tools/Hardware Required:

Mentor Graphics Software / Cadence/Synopsys/Tanner or Equivalent Industry Standard/CAD Tool.
Desktop computer with appropriate Operating System that supports the EDA tools.

MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

III-B.Tech-I-Sem. **L T P C**
Subject Code : 21P04613 **0 0 3 1.5**
Pre Requisite: Nil

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

1. show the addressing modes of microprocessors
2. explain the microcontroller capability
3. compare microprocessor and microcontroller with other electronic devices

PART- A:

8086 Assembly Language Programming and Interfacing

1. Programs for 16 -bit arithmetic operations (using Various Addressing Modes).
a. Multi byte Addition and subtraction.
b. Multi byte Multiplication and Division operations.
2. Program for sorting an array.
3. Program for Factorial of given n-numbers.
4. Program for sum of squares.
5. Interfacing DAC to8086.

PART-B:

8051 Assembly Language Programming and Interfacing

6. Finding number of 1's and number of 0's in a given 8-bit number
7. Average of n-numbers.
8. Program and verify Timer/ Counter in8051.
9. Interfacing Traffic Light Controller to8051.
10. Interfacing LCD to8051.

PART-C

Conduct the following experiments using

ARM CORTEX M3 PROCESSOR USING KEIL MDK ARM

11. Write an assembly program to multiply of 2 16-bit binary numbers.
12. Write an assembly program to find the sum of first 10 integers numbers.

IV-B.TECH.-I-SEMESTER SYLLABUS

CELLULAR AND MOBILE COMMUNICATION

IV-B.Tech-I-Sem. **L T P C**
Subject Code : 21L04701 **3 0 0 3**
Pre Requisite: Nil

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

1. demonstrate cellular mobile system design concepts in wireless mobile communication networks.
2. design of Antenna system, Antenna parameters and their effects, diversity receiver, non co-channel Interference different.
3. summarize the concepts of Handoff, dropped calls and cell splitting, Intersystem handoff.
4. distinguish about Wireless Systems And Standards GSM channels, multiplex access scheme, TDMA, CDMA.
5. identify the intelligent Network For Wireless Communications SS7 network and ISDN for AIN, AIN for mobile communication.

Unit-I Cellular Mobile Radio Systems **08 hours**

Introduction to cellular mobile System, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, hexagonal shaped cells, analog and digital Cellular systems, General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni directional Antenna system, Cell splitting, consideration of the components of Cellular system.

Unit-II Interference and Cell Coverage for Signal And Traffic **08 hours**

Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, design of Antenna system, Antenna parameters and their effects, diversity receiver, non-co channel interferencedifferent types, 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 antenna height gain, form of a point to point model.

Unit-III Cell Site and Mobile Antennas **10 hours**

Sum and difference patterns and their synthesis, omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas, 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 and cell splitting, types of handoff, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff. Intersystem handoff, cell splitting, micro cells, vehicle locating methods, dropped call rates and their evaluation.

Unit-IV Wireless Systems and Standards **08 hours**

Second generation and Third generation Wireless Networks and Standards, WLL, Bluetooth, GSM, IS95, DECT, GSM architecture, GSM channels, multiplex access scheme, TDMA, CDM.

Unit-V Intelligent Network For Wireless Communications **08 hours**

Intelligent cell concept, advanced intelligent network, SS7 network and ISDN for AIN, AIN for mobile communication, asynchronous transfer mode technology, future public land mobile telecommunication system, wireless information superhighway.

Textbooks:

1. Theodore .S. Rapport, ―Wireless Communications‖, Pearson Education, 2nd Edition, 2010.
2. Upen Dalal, "Wireless communication", oxford University press, 2010.

Reference Books:

1. Theodore. S. Rapport, "Wireless Communications", 3rd Edition, Pearson Education, 2003.
2. Lee, "Wireless and Mobile Communications", McGraw Hill, 3rd Edition, 2006.
3. Jon W. Mark and Weihua Zhqung, "Wireless Communication and Networking", PHI, 1st Edition, 2005.

INTRODUCTION TO WEB TECHNOLOGIES

IV-B.Tech-I-Sem. **L T P C**
Subject Code : 21L04702 **3 0 0 3**
Pre Requisite: Nil

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

1. create web pages using php
2. identify the difference between the html php and xml documents.
3. analyze the difference between and php and xml and understand the concept of java scripts.
4. identify the difference between the jsp and servlet and design web application using mvc architecture
5. explain the jsp and servlet concepts and apply jdbc and odbc technologies to create database connectivity

Unit-I Introduction to PHP **08 hours**

Declaring variables, data types, arrays, strings, operations, expressions, control structures, functions, Reading data from web form controls like Text Boxes, radio buttons, lists etc., Handling File Uploads, Connecting to database (My SQL as reference), executing simple queries, handling results, Handling sessions and cookies. File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

Unit-II Client side Scripting **07 hours**

Introduction to JavaScript: JavaScript language – declaring variables, scope of variables functions, event handlers (on click, on submit etc.), Document Object Model, Form validations. Simple AJAX applications.

Unit-III Introduction to XML **09 hours**

XML: Introduction to XML, Defining XML tags, their attributes and values, Document type definition, XML Schemas, Document Object model, XHTML Parsing XML Data - DOM and SAX parsers in java

Unit-IVIntroduction to Servlets **08 hours**

Introduction to Servlets: Common Gateway Interface (CGI), Lifecycle of a Servlets, deploying a Servlets, The Servlets API, Reading Servlets parameters, Reading initialization parameters, Handling Http Request & Responses, Using Cookies and sessions, connecting to a database using JDBC.

Unit-V Introduction to JSP **06 hours**

The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session tracking, connecting to database in JSP.

Textbooks:

1. Web Technologies, Uttam K Roy, Oxford University Press, 2005
2. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill,2009

Reference Books:

1. Web Programming, building internet applications, Chris Bates 2nd edition, Wiley Dremtech, 2015.
2. Java Server Pages – Hans Bergsten, SPD O'Reilly,2015
3. Java Script, D.Flanagan, O'Reilly, SPD,2018.

SPEECH PROCESSING

IV-B.Tech-I-Sem. **L T P C**
Subject Code : 21L04703 **3 0 0 3**
Pre Requisite: Nil

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

1. summarize the mechanism of human speech production and articulation
2. identify the time domain speech signal parameters
3. differentiate time and frequency domain methods of speech processing
4. attribute linear predictive analysis for speech signals
5. explain the solutions for LPC equations & Implement the different algorithms and models involved for speaker and speech Recognition systems

Unit-1Introduction **08 hours**

Fundamentals of Digital speech processing,Ambiguity,Models & Algorithms,The process of speech production,Digital Models for Speech Signals,words &Transducers.

Unit-2 Time Domain Models For Speech Processing **08 hours**

Introduction,window Considerations,short time Energy & Average magnitude, Short time Average zero Crossing rate , Speech VS Silence discrimination using Energy and Zero crossing, Pitch period estimation using a parallel processing approach, the short time auto-correlation function , the short time average magnitude difference function,pitch period estimation using the auto correlation function.

Unit-3 Linear Predictive Coding(Lpc) Analysis **08 hours**

Basics of linear predictive analysis: The auto correlation method, The covariance method,solution of LPCequations:Cholesky Decomposition solution for covariance method,Durbin's Recursivesolution for auto correlation equations, Comparison between the methods of solution of the LPC analysis equations,applications of LPC Parameters: Pitch detection and format analysis using LPC parameters.

Unit-4 Speech Identification **08 hours**

Speech synthesis, text normalisation, phonetic analysis, prosodic analysis, diaphone wave form synthesis, unit selection wave form synthesis, evaluation.

Unit-5 Automatic Speech and Speaker Recognition **08 hours**

Basic pattern recognition approaches, parametric representation of speech, evaluating the similarity of speech pattern, isolated digit recognition system, continuous digit recognition system.
Hidden Markov model (HMM) forspeech: HMM for speech recognition, viterbialgorithm, training and testing using HMMS speech recognition: Recognitiontechniques, features that distinguish speakers.

Text Books:

1. Lawrence Rabinerand Biing-Hwang Juang, "Fundamentals of Speech Recognition", Pearson Education, 2003.

2. Daniel Jurafsky and James H Martin, “Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson Education, 2010.

Reference Books:

1. Steven W. Smith, “The Scientist and Engineer’s Guide to Digital Signal Processing”, California Technical Publishing, 2011.
2. Thomas F Quarter, “Discrete-Time Speech Signal Processing – Principles and Practice”, Pearson Education, 2005.
3. Ben gold and Nelson Morgan, “Speech and audio signal processing”, processing and perception of speech and music, Wiley- India Edition, 2006 Edition.

EMBEDDED SYSTEMS

IV-B.Tech-I-Sem. **L T P C**
Subject Code : 21L04704 **3 0 0 3**
Pre Requisite: Nil

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

1. classify the basic concepts of an embedded systems
2. build an embedded system design approach to perform a specific function.
3. analyze the hardware components required for an embedded system and the design approach of an embedded hardware.
4. construct various embedded firmware design approaches on embedded environment.
5. integrate hardware and firmware of an embedded system using real time operating system.

Unit-I Introduction **08 hours**

Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

Unit-II Embedded Hardware Design: **08 hours**

Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

Unit-III Embedded Firmware Design **08 hours**

Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

Unit-IV Real Time Operating System **08 hours**

Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronisation, Device Drivers.

Unit-V Embedded System Development: **10 hours**

The integrated development environment, Types of files generated on cross-compilation, Deassembler/Decompiler, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools.
Embedded System Implementation And Testing: The main software utility tool, CAD and the hardware, Translation tools-Pre-processors, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools.

Textbooks:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications, 2013.
2. Embedded Systems-By Shibu.K.V-Tata McGraw Hill Education Private Limited, 2013.

Reference Books:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications, 2013.

CMOS ANALOG IC DESIGN

IV-B.Tech-I-Sem. **L T P C**
Subject Code: 21L04705 **3 0 0 3**
Pre Requisite: VLSI DESIGN

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

1. recall the students to know the fundamentals of VLSI signal processing and expose them to examples of applications.
2. design and optimize VLSI architectures for basic DSP algorithms.
3. design and optimize VLSI architectures for basic DSP algorithms.
4. design of Fast Convolution Algorithm
5. design of low-voltage low-power memories

Unit-I Basic MOS Device Physics **08 hours**

General Considerations, MOS I/V Characteristics, Second Order effects, MOS Device models. Short Channel Effects and Device Models, Single Stage Amplifiers –Basic Concepts, Common Source Stage, Source Follower, Common Gate Stage, Cascode Stage

Unit-II Differential Amplifiers **08 hours**

Single Ended and Differential Operation, Basic Differential Pair, Common Mode Response, Differential Pair with MOS loads, Gilbert Cell. Passive and Active Current Mirrors– Basic Current Mirrors, Cascode Current Mirrors, Active Current Mirrors

Unit-III Frequency Response of Amplifiers **08 hours**

General Considerations, Common Source Stage, Source Followers, Common Gate Stage, Cascode Stage, Differential Pair, Noise – Types of Noise, Representation of Noise in circuits, Noise in single stage amplifiers, Noise in Differential Pairs

Unit-IV Feedback Amplifiers **09 hours**

General Considerations, Feedback Topologies, Effect of Loading, Operational Amplifiers – General Considerations, One Stage Op Amps, Two Stage Op Amps, Gain Boosting, Common – Mode Feedback, Input Range limitations, Slew Rate, Power Supply Rejection, Noise in Op Amps. Stability and Frequency Compensation

Unit-V Characterization of Comparator **08 hours**

Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators

Textbooks:

1. Keshab k. Parhi," VLSI Digital Signal Processing Systems: Design and Implementation", Wiley, inter science, 2009..
2. Mohammed Ismail, Terri, Fiez, Analog VLSI Signal and Information Processing, McGraw Hill, 2015.

Reference Books:

1. S.Y.kung, H.J.White house, T. Kailath," VLSI and Modern Signal Processing", Prentice hall, 2005.
2. Kung. S.Y., H.J. While house T.Kailath, VLSI and Modern singal processing, Prentice Hall, 1985.

3. Jose E. France, YannisTsividls, Design of Analog Digital VLSI Circuits for Telecommunications and Signal Processing' Prentice Hall, 1994.

LOW POWER VLSI DESIGN

IV-B.Tech-I-Sem. **L T P C**
Subject Code: 21L04706 **3 1 0 3**
Pre Requisite: VLSI DESIGN

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

1. recall the student will get to know the basics and advanced techniques in low power design which is a hot topic in today‟s market where the power plays major role.
2. tell the need of low power circuit design.
3. attain the knowledge of architectural approaches.
4. analyze and design low-voltage low-power combinational circuits.
5. design of low-voltage low-power memories

Unit-I Power Dissipation In Cmos **8 hours**

Physics of power dissipation in CMOS FET devices – Hierarchy of limits of power – Sources of power consumption – Static Power Dissipation, Active Power Dissipation - Designing for Low Power, Circuit Techniques For Leakage Power Reduction - Basic principle of low power design.

Unit-II Power Optimization **08 hours**

Logic level power optimization – Circuit level low power design – Standard Adder Cells, CMOS Adders Architectures-BiCMOS adders - Low Voltage Low Power Design Techniques, Current Mode Adders -Types Of Multiplier Architectures, Braun, Booth and Wallace Tree Multipliers and their performance comparison

Unit-III Design Of Low Power Cmos Circuits **09 hours**

Computer arithmetic techniques for low power system – low voltage low power static Random access and dynamic Random access memories – low power clock, Inter connect and layout design – Advanced techniques – Special techniques.

Unit-IV Power Estimation **08 hours**

Power Estimation techniques – logic power estimation – Simulation power analysis –Probabilistic power analysis.

Unit-V Synthesis And Software Design For Low Power **07hours**

Synthesis for low power – Behavioral level transform – software design for low power.

Textbooks:

1. AbdelatifBelaouar, Mohamed.I.Elmasry, “Low power digital VLSI design”, Kluwer, 1995.
2. A.P.Chandrasekaran and R.W.Broadersen, “Low power digital CMOS design”, Kluwer,1995.

Reference Books:

1. DimitriosSoudris, C.Pignet, Costas Goutis,“Designing CMOS Circuits for Low Power”Kluwer,2002.
2. Gary Yeap, “Practical low power digital VLSI design”, Kluwer, 1998.
3. James B.Kulo, Shih-Chia Lin, “Low voltage SOI CMOS VLSI devices and Circuits”, John Wiley and sons, inc. 2001.

ADHOC AND WIRELESS SENSOR NETWORKS

IV-B.Tech-I-Sem. **L T P C**
Subject Code : 21L04707 **3 0 0 3**
Pre Requisite: Nil

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

1. relate the importance of adhoc and sensor networks for applications like environment monitoring, habitat monitoring, health care and data acquisition systems.
2. illustrate of data transmission technologies of the adhoc and sensor devices with focus on channel access routing and security.
3. appreciate the need and importance of converged networks, ubiquitous environment and 'internet of things in the context of adhoc and sensor networks.
4. create the model building ,new protocol design sand strategies.
5. develop the simulation of the systems that include the above.

Unit-I Ad Hoc Networks – Introduction And Routing Protocols **09 hours**

Elements of Ad hoc Wireless Networks, Issues in Ad hoc wireless networks, Example commercial applications of Ad hoc networking, Ad hoc wireless Internet, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table Driven Routing Protocols – Destination Sequenced Distance Vector (DSDV), On–Demand Routing protocols –Ad hoc On–Demand Distance Vector Routing (AODV).

Unit-II Sensor Networks – Introduction & Architectures **08 hours**

Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks, WSN application examples, Single-Node Architecture – Hardware Components, Energy Consumption of Sensor Nodes, Network Architecture – Sensor Network Scenarios, Transceiver Design Considerations, Optimization Goals and Figures of Merit.

Unit-III Wsn Networking Concepts and Protocols **09 hours**

MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts – S-MAC, The Mediation Device Protocol, Contention based protocols – PAMAS, Schedule based protocols – LEACH, IEEE 802.15.4 MAC protocol, Routing Protocols- Energy Efficient Routing, Challenges and Issues in Transport layer protocol.

Unit-IV Sensor Network Security **08 hours**

Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Layer wise attacks in wireless sensor networks, possible solutions for jamming, tampering, black hole attack, flooding attack. Key Distribution and Management, Secure Routing – SPINS, reliability requirements in sensor networks.

Unit-V Sensor Network Platforms and Tools **08 hours**

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms – TinyOS, nesC, CONTIKIOS, Node-level Simulators – NS2 and its extension to sensor networks, COOJA, TOSSIM, Programming beyond individual nodes – State centric programming.

Textbooks:

1. Carlos Cordeiro and Dharma P Agarwal, Ad hoc sensor networks-Theory and Applications by World Scientific publications March 2006

2. C. Siva Ram Murthy, and B. S. Manoj, Ad Hoc Wireless Networks: Architectures and Protocols , Prentice Hall Professional Technical Reference, 2008.

Reference Books:

1. Feng Zhao and Leonides Guibas, Wireless Sensor Networks, Elsevier Publication 2002.
2.Holger Karl and Andreas Willig Protocols and Architectures for Wireless Sensor Networks, Wiley, 2005
3. Kazem Sohraby, Daniel Minoli, & Taieb Znati, Wireless Sensor Networks-Technology, Protocols, and Applications, John Wiley, 2007.

5G MOBILE AND WIRELESS TECHNOLOGY

IV-B.Tech-I-Sem. **L T P C**
Subject Code : 21L04708 **3 0 0 3**
Pre Requisite: Nil

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

1. distinguish and understand the major cellular communication standards (1g/2g/3g/4g/5g/6g systems) and wireless communications networks.
2. describe different technologies of 5g and beyond 5g communications.
3. apply the basic understanding to solve the existing problems of next-generation communications.
4. analyze the performance of various communications systems from a physical layer perspective.
5. identify the state-of-the-art problems and apply the basic knowledge for finding out the required solutions.

Unit-I Introduction to 5G **08 hours**

3G and 4G(LTE) overview- Introduction to 5G – Use Cases - Evolving LTE to 5G Capability- 5G NR and 5G core network (5GCN) - 5G Standardization - 3GPP and IMT2020 - Spectrum for 5G – 5G deployment - Options, Challenges and Applications.

Unit-II 5G Channel Access Methods **08 hours**

OFDM and OFDMA – MIMO OFDM – Generalized Frequency Division Multiplexing (GFDM) – Non-Orthogonal Multiple Access (NOMA) - Universal Filtered OFDM –Filter bank multicarrier (FBMC)- Sparse Code Multiple Access (SCMA) –Comparison of multiple access methods

Unit-III Radio Access Network for 5G NR **09 hours**

5G NR requirements - 5G Core Network Architecture - Radio-Access Network (RAN)-Radio Protocol Architecture -User Plane Protocols-Radio Link Control - Medium-Access Control – Physical Layer functions -Control Plane Protocols - Network Slicing- RAN virtualization-Spectrum Management in 5G

Unit-IV Channel Models for 5G NR **08 hours**

Channel Hierarchy in 5G NR – Logical Channels and Transport Channels in 5G NR - Physical Layer Data Channels in 5G NR - Downlink Physical Channel and Uplink Physical Channels - Propagation Channel models for 5G

Unit-V Enabling Technologies for 5G **06 hours**

Device-to-Device (D2D) Communication - 5G for Massive Machine Type Communication and Massive IoT- V2X Communication - Full Duplex and Green Communication - mmWave Communications -Massive MIMO and Beam forming Techniques . Introduction to beyond 5G

Textbooks:

1. Jonathan Rodriguez, “Fundamentals 5G Mobile Networks”, John Wiley & Sons, 1st Edition, 2015.
2. Long Zhao, Hui Zhao, Kan Zheng, Wei Xiang, “Massive MIMO in 5G Networks: Selected Applications”, Springer, 1st Edition, 2018.

Reference Books:

1. Saad Z. Asif, "5G Mobile Communications Concepts and Technologies, CRC Press, 1st Edition, 2019.
2. Erik Dahlman, Stefan Parkvall, Johan Skold "5G NR: The Next Generation Wireless Access Technology", Academic Press, 1st Edition, 2018.
3. Long Zhao, Hui Zhao, Kan Zheng, Wei Xiang, "Massive MIMO in 5G Networks: Selected Applications", Springer, 1st Edition, 2018.

DIGITAL IMAGE PROCESSING

	L	T	P	C
IV-B.Tech-I-Sem.				
Subject Code : 21L04709	**3**	**1**	**0**	**3**

Pre Requisite: Nil

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

1. explore the fundamental relations between pixels and utility of 2-d transforms in image processer.
2. understand the enhancement, segmentation and restoration processes on an image.
3. know how an image can be enhanced by using histogram techniques, filtering techniques etc
4. understand image degradation, image restoration techniques using spatial filters and frequency domain
5. show the redundancy in images, various image compression techniques

Unit-I Digital Image Fundamentals **08 hours**

Fundamentals of digital image, components and uses of digital image, relationship between pixels, introduction to mathematical tools used in digital image processing ,image format types.

Image Transforms: Need of image transforms ,introduction to Fourier transform , discrete Fourier transform, fast Fourier transform ,discrete cosine transform , 2D Fourier transform, properties , Walsh transform , Hadamard transform , Haar transform , Slant transform , KL transform.

Unit-II Image Enhancement (Spatial Domain) **08 hours**

Introduction, image enhancement in spatial domain, histogram processing, fundamentals of spatial filters, smooth filtering, spatial filtering, median filter.

Image enhancement (Frequency Domain): Filtering in frequency domain, low pass (smoothing filter) and high pass (sharpening) filter in frequency domains.

Unit-III Image restoration **10 hours**

Noise models, restoration in presence of noise, inverse filter, least mean square filter, constrained least square filter ,Weiner filtering.

Morphological Image Processing: Dilation and erosion: Dilation structuring element decomposition, erosion, combining dilation and erosion, opening and closing, Hit or Miss transform.

Unit-IV Image Segmentation **08 hours**

Fundamentals of point, line, edge detection, threshold and edge based segmentation, use of motion in segments, wavelets.

Unit-V Image Compression **08 hours**

Image compression models, redundancies and their removal methods, run length coding, Huffman and arithmetic coding, lossy and lossless predictive coding, symbol based coding, JPEG standards.

Textbooks:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.

2. Jayaraman, S. Esakkirajan, and T. Veerakumar," Digital Image Processing", Tata McGraw-Hill Education, 2011.

Reference Books:

1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009.

EMBEDDED C AND LINUX

IV-B.Tech-I-Sem. **L T P C**
Subject Code : 21S04701 **1 0 2 2**
Pre Requisite: Nil

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

1. demonstrate basic knowledge about fundamentals of microcontrollers and develop programming skills in embedded systems for various applications.
2. explain the basic commands of linux operating system and can write shell scripts.
3. create file systems and directories and operate those using programs.

PART- A:

1. Write a program to toggle all the led to port and with some time delay using ARM7
2. Write a program to interface LCD with ARM7
3. Write a program to interface 4*4 matrix keypad with ARM7
4. Write a program for interfacing LED and PWM and to verify the output in the ARM7
5. Write a program to interface Stepper motor with ARM7
6. Write a program for interfacing of DC motor with ARM7
7. Write a Program realization of low pass, high pass and band pass filters and their characteristics
8. Write a program to verify Timer operation in different modes

PART- B:

1. a) To Install Ubuntu Linux and LINUX Commands(File Handling utilities, Text processing utilities, Network utilities, Disk utilities, Backup utilities and Filters)
b) Write a Shell Script that accepts a file name, starting and ending line numbers as arguments and displays all lines between the given line numbers.
c) Write a shell script that deletes all lines containing the specified word in one or more files supplied as arguments to it.
d) Write a shell script that displays a list of all files in the current directory to which the user has read, write and execute permissions.
2. a) Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or directory and reports accordingly. whenever the argument is a file it reports no of lines present in it
b) Write a shell script that accepts a list of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.
3.a) Write a shell script to list all of the directory files in a directory
b) Write a shell script to find factorial of a given number.
4.a) write an awk script to count number of lines in a file that does not contain vowels
b) write an awk script to find the no of characters ,words and lines in a file
Implement in c language the following Unix commands using system calls a) cat b) ls c) mv
5. Write a C program that takes one or more file/directory names as command line input and reports following information a) File Type b) Number Of Links c) Time of last Access d) Read ,write and execute permissions.