ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

ELECTRONICS & COMMUNICATION ENGINEERING

B.Tech - Four Year Degree Course

(Applicable for the Batches Admitted from 2019 - 2020)

R-19

(Choice Based Credit System)

NEC
NARASARAOPETA
ENGINEERING COLLEGE
(AUTONOMOUS)

Kotappakonda Road, Yellamanda (P),
Narasaraopet - 522 601, Guntur Dist.,
Andhra Pradesh, INDIA.

R19
Academic Regulations, Course Structure and Syllabus

B. TECH.
Electronics & Communication Engineering
(4 Year Program)

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NARASARAOPETA
ENGINEERING COLLEGE
(AUTONOMOUS)

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(AUTONOMOUS)

Kotappakonda Road, Yellamanda (Post), Narasaraopet – 522601, Guntur District, AP
Approved by AICTE, New Delhi & Permanently affiliated to JNTUK, Kakinada, Code: 47,
Accredited by NBA & NAAC, RTA Approved Pollution test Centre, ISO 9001: 2008 Certified Institution
Phone: 08647-239905 **Website: www.nrtec.in**

Vision and Mission of the Institute

Vision:

To emerge as a **Centre of excellence** in technical education with a blend of effective **student centric teaching learning** practices as well as **research** for the transformation of **lives and community**.

Mission:

M1: Provide the best class infrastructure to explore the field of engineering and research

M2: Build a passionate and a determined team of faculty with student centric teaching, imbibing experiential, innovative skills

M3: Imbibe lifelong learning skills, entrepreneurial skills and ethical values in students for addressing societal problems

Vision and Mission of the Department

Vision:

To emerge as a **centre of excellence** in Electronics and Communication Engineering through **student centric education** and **research focus** to cater the current and future needs of **society**.

Mission:

M1: To provide best infrastructure for empowering the students with quality education to motivate them towards higher studies and **research**

M2: To provide qualified and experienced faculty for **student centric teaching** in order to mould the students as successful professionals in modern Electronics industry

M3: To inculcate leadership qualities, professional etiquette, **ethical values** and **social** responsibilities

Programme Educational Objectives (PEOs):

The graduates of the programme are able to

PEO1: Demonstrate successful professional careers with strong fundamental knowledge in mathematics, science and engineering to meet real time requirements of industry.

PEO2: Learn continuously with a focus on advanced emerging trends in the field of ECE and allied to meet the societal needs.

PEO3: Pursue higher education leading to masters and research programmes for knowledge dissemination in profession.

Program Specific Outcomes (PSOs):

PSO1: Design and develop IoT applications using Raspberry Pi, Arduino and other advanced processors.

PSO2: Design and synthesize various circuits using latest hardware and EDA tools.

PSO3: Design and analyse modern communication systems to meet the present and future needs of industry with cost effective solutions.

ACADEMIC REGULATIONS R-19 FOR B.TECH

(Applicable for the students of B.Tech admitted from the academic year 2019-20)

1. PREAMBLE

The rapid transformation in every sphere of life is augmenting the need to prepare the present fast-paced generation to adapt to the changing knowledge & skill requirement on a life-long basis, in the fields of science, engineering, technology and humanities to influence society positively. The future looks up to multi-disciplinary, competent leaders who are Information and Communication Technology ready and driven by strong ethical values.

NEC envisions to nurture knowledge, skills, attitude and values of the aspiring youth to enable them to become global citizens and towards that process, the institution has evolved a flexible integrated academic curriculum.

NEC introduced Outcome Based Education (OBE) and Choice Based Credit System (CBCS), which emphasized on honing the skills and knowledge of the graduates.

NEC is ambitious to develop a new academic regulation, curricular framework and syllabi for its UG programmes. This effort is undertaken to address the present challenges in the educational system and also to be ahead of the curve with respect to innovative practices.

2. PROGRAMS OFFERED BY THE COLLEGE

Narasaraopeta Engineering College (NEC) offers a 4-year (8 semesters) **Bachelor of Technology** (B.Tech.) degree programme, under Choice Based Credit System (CBCS) for the following branches of Engineering.

S. No.	Name of the Program	Program Code
1.	Civil Engineering (CE)	01
2.	Electrical and Electronics Engineering (EEE)	02
3.	Mechanical Engineering (ME)	03
4.	Electronics and Communication Engineering (ECE)	04
5.	Computer Science and Engineering (CSE)	05
6.	Information Technology (IT)	12

3. ELIGIBILITY FOR ADMISSION

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 reservation policy.

a. Under Category A: 70% of the seats are filled through EAMCET counselling.
b. Under Category B: 30% seats are filled based on 10+2 merits in compliance with guidelines of APSCHE

Admission eligibility - Under Lateral Entry Scheme

Students with diploma qualification have an option of direct admission into 2nd year B. Tech. (Lateral entry scheme). Under this scheme 10% seats of sanctioned intake will be available in each course as supernumerary seats. Admissions to this three-year B Tech later entry Programme will be through ECET. The maximum period to complete B. Tech. under lateral entry scheme is six consecutive academic years from the date of joining.

Academic Calendar

For all the eight semesters a common academic calendar shall be followed in each semester by having 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 the planner.

4. AWARD OF B.TECH. DEGREE

A student will be declared eligible for the award of the B.Tech. degree if he/she fulfils the following academic regulations:

i) Pursue a course of study for not less than four academic years and not more than eight academic years.
ii) Registers for 160 credits and secures all 160 credits.

Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall **forfeit** their seat in B.Tech. course and their admission stands cancelled.

The medium of instruction for the entire undergraduate programme in Engineering and Technology will be in English only.

5. ABOUT PROGRAM RELATED TERMS

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

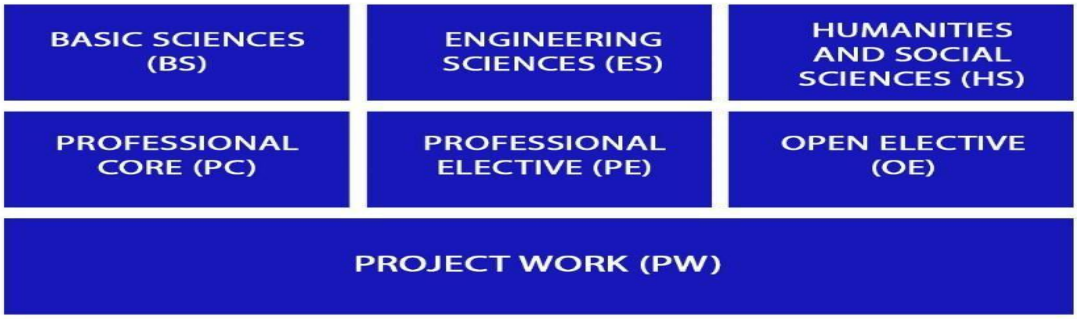
ii. **Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year.

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

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

	Semester	
	Periods / Week	Credits
Theory (Lecture/Tutorial)	02	02
	03	03
	04	04
Practical	02	01
	03	1.5
	04	02
Project	14	07
MOOCs	-	01

v. Every B. Tech. Programme will have a curriculum consisting of theory, practical, project courses that shall be included in any of the following categories. The typical curriculum structure for UG degree programmes are based on AICTE and University norms and is given below.



5.1 SUBJECT / COURSE CLASSIFICATION

All subjects/ courses offered for the under graduate programme in B.Tech. degree are broadly classified as follows. NEC has followed almost all the guidelines issued by JNTUK/AICTE/UGC

S.No.	Broad Course Classification	Course Group/Category	Course Description	No. of Credits
1	FOUNDATION COURSES	BS – Basic Sciences	Includes Mathematics, Physics and Chemistry Subjects	25
2		ES – Engineering Sciences	Includes fundamental engineering subjects like Engineering Practices, Engineering Graphics, Basics of Electrical / Electronics / Mechanical / Computer Engineering, etc.	24
3		HS – Humanities and Social Sciences	Includes subjects related to Humanities, Social Sciences and Management Courses like English, Professional Ethics and Human Values, Communication skills and Environmental Science and Engineering	12
4	Core Courses	PC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Engineering.	48
5	Electives	PE – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.	18
6		OE – Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering	18
7	Project Work	PR-Project Work	B.Tech. Project or UG Project or UG Major Project	14
8		Industrial training/ Internship	Industrial training/ Summer Internship	
9		Mini- project	Industrial Oriented Mini-project/ Mini-project	
10	Mandatory Courses (MC)	Mandatory Courses (non-credit)		0
11	MOOCS	PE – Professional Elective	Subjects related to the parent discipline/ department/ branch of Engineering.	1
Total				160

5.2. Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

A two-week induction program for first year B.Tech students is to be held in zero semester. Regular classes will start after the induction program.

The objectives of the program are as follows:
1. Assimilation in the ethos and culture of the institution
2. Exposure to a larger vision of life
3. Bonding among students and teachers
4. Learning a creative skill in arts
5. Regular lifestyle and professional discipline
6. Special assistance for needy students for improving proficiency in English and Mathematics

The above objectives will be achieved through the following activities:
1. Physical activity: Yoga, Mild Exercise, Games and sports etc.
2. Creative arts: Painting, Photography, music, dance etc.
3. Literary activity: General reading, writing summaries, debating, enacting a play etc.
4. Human Values: Discussion/Lectures in small groups of students with a faculty member
5. Lectures by eminent people: From industry, entrepreneurs, public life, social activists, alumni
6. Exposure to department/branch, Innovation, Exploring Engineering.

6. DISTRIBUTION AND WEIGHTAGE OF MARKS

The performance of a student in each semester shall be evaluated subject – wise with

a maximum of 100 marks for Theory, 50 marks for Practical Subject / Mini Project and 50 marks for Practical Training / Internship. The Project Work shall be evaluated for 200 marks.

6.1. THEORY

For all theory subjects consisting of 5 units in each subject, the assessment shall be for 40 marks through internal evaluation and 60 marks through external end semester examination of 3 hours duration.

6. 1.a. INTERNAL EVALUATION

The internal evaluation will be based on two cycle tests conducted in each semester. The 40 internal marks will be awarded as sum of 75% of the best cycle and 25% of the least cycle examinations, where each cycle of examination contains

Descriptive test - 20 Marks

Objective test - 10 Marks

Assignment test - 10 Marks

Syllabus is framed for 5 Units. **First descriptive** test question paper contains 3 questions from 50% of the syllabus i.e. 1st, 2nd and half of 3rd unit. **Second descriptive** test in remaining half of 3rd Unit, 4th Unit and 5th Units of each subject in a semester. The student has to answer all the 3 questions (10 marks questions from 1st and 2nd units and 5 marks question from half of the 3rd unit totalling to 25 marks). These 25 marks will be scaled down to 20 marks. The descriptive examination will be conducted in 1½ hour duration.

Each Objective type test 1 question paper (Online examination) contains 20 objective Multiple-choice questions for 10 marks covering the syllabus of 1st ,2nd and half of 3rd unit. The Objective Examination (online) will be conducted for a duration of the 20 minutes on the day of descriptive exam. Objective test 2 shall contains 20 Multiple choice questions for 10 marks covering the syllabus from the remaining half of the 3rd unit, 4th and 5th Units.

Two assignments will be conducted for each cycle. In first cycle first assignment will be from 1st unit for 10 marks. 5 or 6 questions will be given in the classroom at least one week in advance. Student must answer two questions in classroom which are given at random as per the schedule given by exam cell. Second assignment test for 10 marks of first cycle will be conducted from 2nd unit. 5 or 6 questions will be declared in the class room at least one week in advance. Student has to answer two questions in class room which are given at random as per the schedule given by exam cell.

First cycle assignment marks (10 marks) is calculated from the two assignments (1&2) i.e. 75% of best assignment and 25% of the least assignment.

Similarly, for second cycle assignment test 3 for 10 marks will be conducted from remaining half of the 3rd unit (after first mid syllabus) and half of the 4th unit. 5 or 6 questions will be given in the classroom at least one week in advance. Student must answer two questions in classroom which are given at random as per the schedule given by exam cell.

Assignment test 4 will be from remaining half the fourth unit and half of the 5th unit for 10 marks. 5 or 6 questions will be declared in the classroom at least one week in advance. Student has to answer two questions in class room which are given at random as per the schedule given by exam.

Second cycle assignment marks (10 marks) is calculated from the two assignments (3 &4) i.e. 75% of best assignment and 25% of the least assignment

First cycle (Descriptive, objective and assignment) is conducted for 1st ,2nd and half of 3rd Unit and second cycle is remaining half of 3rd unit, 4th & 5 units of each subject in semester.

Final internal semester marks shall be arrived at by considering the marks secured by the student in both the cycle examinations with 75% weightage given to the best cycle exam and 25% to the other.

Final internal marks = 75% of best cycle and 25% of the least cycle.
=(0.75 x best cycle) + (0.25 x least cycle)

If the student is absent for any one internal examination, the final internal semester marks shall be arrived at by considering 75% weightage to the marks secured by the student in the appeared examination and zero to the other.

Final internal marks = 75% of best cycle and 25% of the least cycle.
= (0.75 x best cycle) + (0.25 x 0)

6.1.b. EXTERNAL EVALUATION

End semester examinations will be conducted for 60 marks. The Question paper consists of five questions and each question carries 12 marks from all the five units. Each of the question is from one unit and may contain sub-questions. There will be two questions from each unit and student should answer any one of the two questions. The examination duration is 3 hours

6.2. PRACTICALS

For practical subjects there shall be continuous evaluation during the semester.

6.2.a. INTERNAL EVALUATION

There shall be continuous evaluation during the semester for 20 internal marks.
The internal marks shall be awarded as follows:

i) Day to day performance: Record (4M) +Experiment (4M) + Viva (2M) - 10Marks
ii) Internal Lab Test : 10 Marks

Total =i +ii =10+10 = 20 Marks.

6.2.b. EXTERNAL EVALUATION

For practical subjects there shall be an external examination at the end of the semester for 30 marks in the presence of an external examiner. The examination duration is 3 hours.

6.3. DRAWING SUBJECTS

For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, etc.,) and estimation, the distribution shall be 40 marks for Internal Evaluation and 60 marks for End Examination.
The 40 internal marks will be evaluated as follows:
Internal Tests : 20 marks. (1½ hour duration)
Day – to – day work: 20 marks (evaluation of charts)

In the internal test, 3 questions will be given to the student and he has to answer all the three questions (2 x10 =20 marks from 1st and 2nd units and 5 marks from half of the 3rd unit totalling 25 marks scaled down to 20 marks)

There shall be two internal tests in a semester. The sum of 75% of the best and 25% of the least of two internal tests shall be considered for the award of internal marks.

The syllabus for the subject "**Machine drawing and CAD Lab**" consists of two major portions:

1. Unit 1, 2 –Conventional drawing pattern.
2. Unit 3 and 4 - CAD lab using drafting packages

The distribution of internal and external marks is 40 and 60 marks respectively.

Internal Evaluation: Max Marks: 40

The total internal evaluation marks are distributed in the following two components:

1. Day-to-day work : 20 Marks (Evaluation of Charts)
2. Descriptive Test : 20 Marks

Cycle–I Examination – Conventional drawing pattern

In Cycle-I examination the 40 marks will be awarded as follows:

Day-to-day evaluation - 20 Marks
Internal Test - 20 Marks

In the Descriptive Test of duration 2 hours, one question for 20 marks will be given to the student.

Cycle–II Examination – Computer lab pattern using any drafting packages for duration of 2 hours.

In Cycle-II examination the 40 marks will be awarded as follows:

Day-to-day evaluation - 20 Marks
Internal Test - 20 Marks

Of two cycle examinations conducted during the semester, sum of 75% of the best and 25% of the least of two cycle examinations shall be considered for the award of internal marks.

End Examination (Total Duration: 4 hours, Max, marks: 60) in the presence of external examiner

Conventional drawing pattern (Duration: 2 Hours, Marks: 30)

Computer lab pattern using any drafting packages (Duration: 2 Hours, Max:30)

(Note: Both Conventional drawing pattern and Computer lab pattern using any drafting packages are compulsory and are to be conducted in separate sessions)

6.4. MANDATORY NON-CREDIT COURSES

A student is required to take up Non-Credit / Mandatory courses (zero credit), viz. Environmental Science, Constitution of India, Community service, Advanced Communication Skills (ACS), Quantitative Aptitude and Reasoning (QAR), MOOCs (Massive Open Online Courses) etc., as and when the courses are offered. The B.Tech degree shall only be awarded only if a student gets satisfactory grade in each of the mandatory non-credit courses besides acquiring 160 credits.

A student has to repeat the course if he does not get satisfactory grade in each non- credit course for getting the degree awarded.

Advanced Communication Skills (ACS) & Quantitative Aptitude & Reasoning (QAR) :
There will be two online internal examinations of 40 marks of each and another 20 marks will be awarded based on day to day evaluation. The student has to secure a minimum of 40 marks out of the above mentioned 100 marks to secure satisfactory report.

Community Service:
Community service gives an opportunity to explore the leadership skills, Team work and develop empathy in real world. Students have to spend time in hospitals, temples, at traffic signals, old age homes, orphanage homes at least 24 hours during that semester.

Old age homes: The students will go to old age homes and fulfil the special needs and requirements that are unique to senior citizens. They help the old people by taking them to hospitals.

Hospitals: in hospitals the students help them to maintain hygiene, help the people who cannot understand the medical terms, give directions to the old people who are unable to read the signs, serve them by distributing food.

Traffic clearance: Help the people understand the traffic rules, help the disabled persons, Children and old people to cross the roads.

Temple services: During the festivals the students give the directions to pilgrims, distribute the food and help the old and disabled people to get their darshan in the temple.

6.5 PRACTICAL TRAINING / INTERNSHIP

As a part of curriculum in all branches of Engineering, it is mandatory for all students to undergo summer internship Programme at industries (core or allied) / R & D organization to get practical insight of their subject domain during summer break after the 6^{th} semester. This internship Programme shall be availed by the students in a duration of minimum 2 weeks or maximum of 4 weeks and the assessment shall be carried out by internal experts.

After the completion of internship, the student shall submit a certificate, a technical report and presentation to the concerned departmental committee constituted by the HOD for evaluation. 50 marks shall be awarded for the submission of certificate, technical report, presentation and Viva-Voce examination.
Students are advised to take up Industrial Internship. In case, the student is unable to obtain the internship, they can opt for Practical Training at College.

Assessment for Practical Training:
The practical training gained by student shall be assessed for 50 marks. The time duration for Practical Training shall be 2 to 4 weeks during the inter-semester break. The training shall be evaluated through continuous assessment. After the completion of Practical Training the student shall submit a report and presentation to the Departmental Committee constituted by HOD for evaluation. A total of 50 marks shall be awarded for day to day performance, submission of report, presentation and Viva-Voce examination.

6.6. MINI PROJECT

Mini Project shall be evaluated for a total of 50 marks. Out of a total of 50 marks, 20 marks shall be awarded for internal evaluation consisting of day-to-day work, reviews, the assessment of the project report and 30 marks will be awarded for the external evaluation. The external evaluation shall be conducted by the committee. The committee consists of an External Examiner, Head of the Department and Supervisor of the Project. The evaluation of mini project work shall be conducted as and when offered.

Mini Project:

Continuous Assessment (Internal Evaluation): 20 Marks

Distribution

Literature Survey	: 04 Marks
Innovativeness of the Project	: 04 Marks
Review 1	: 04 Marks
Review 2	: 04 Marks
Marks Final Presentation	: 04 Marks

6.7. PROJECT WORK

Out of a total of 200 marks for the project work, 80 marks shall be awarded for Internal Evaluation consisting of day-to-day work, reviews, the assessment of the project report and 120 marks are for the external evaluation. The external evaluation shall be conducted by the committee. The committee consists of an External Examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the IV year II semester.

Continuous Assessment (Internal Evaluation): 80 Marks

Distribution

Innovativeness of the Project	: 05 Marks
Literature Survey	: 05 Marks
Experimentation / Simulation	: 10 Marks
Result Analysis	: 05 Marks
Review 1	: 15 Marks
Review II	: 20 Marks
Final Presentation	: 10 Marks
Project Report	: 10 Marks

6.8. MOOCS:

Meeting with the global requirements, to inculcate the habit of self-learning and in compliance with AICTE/ UGC guidelines, MOOC (Massive Open Online Course) have been introduced, Student has to complete an on-line course to fulfil the academic requirement of B.Tech course. He/she can start doing the course from II Year I semester and submit the MOOCs certificate before the commencement of the end examinations wherever the MOOCs course is offered. The student shall register on-line Course offered by any reputed organization like NPTEL, SWYAM, JNTUK MOOCS, COURSERA, edX, Udacity, etc., approved by Departmental Committee constituted by HOD. Student has to submit the progress of the MOOC's course (such as assignment submission etc.,) to the mentor or departmental committee. B.Tech. degree shall be awarded only upon submission of MOOC's certificate.

7. PASS MARK CRITERIA

A student shall be deemed to have satisfied the pass mark, if he secures not less than 35% of marks in the end examinations and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together as detailed below.

On passing a course of a program, the student shall earn the credits as assigned to that course.

S.No	Category of Subject	Max. Marks	Internal Marks	External Marks	External pass %	External pass mark	Over all pass %	Over all pass mark
1	Theory/ Drawing	100	40	60	35	21	40	40
2	Practical	50	20	30	35	11	40	20
3	Mini Project	50	20	30	35	11	40	20
4	Project work	200	80	120	35	42	40	80
5	Practical Training/ Internship	50	50	-	-	-	40	20
6	MOOCS	Certificate must be submitted before the end semester examinations of that semester in which MOOCS course is offered.						

8. PROMOTION POLICY

8.1. ATTENDANCE REQUIREMENTS

(1) A student shall be eligible to appear for the end examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

(2) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester for genuine medical reasons shall be approved by a committee duly appointed by the college. A fee stipulated by the college shall be payable towards condonation of shortage of attendance. However, the number of condonations is restricted to **four** for the entire course.

(3) A student who is short of attendance in a semester may seek re-admission into that semester when offered next time within 4 weeks from the date of commencement of class work.

(4) If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for re-admission into the same semester.

8.2. CREDIT REQUIREMENTS

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned above.

(1) A student shall be promoted from I to II year, if he puts up the minimum attendance requirement in I year II semester, irrespective of credits earned.

(2) A student shall be promoted from II year to III year, only if he fulfils the academic requirement of 40% of the credits up to II year II semester from all the examinations, irrespective of whether the candidate takes the examination or not.

(3) A student shall be promoted from III to IV year, only if he fulfils the academic requirements of 40% of the credits up to III year II semester from all the examinations, irrespective of whether the candidate takes the examination or not.

(4) A candidate, who is not promoted either to III year or IV year due to lack of required credits can seek admission into III / IV year in subsequent years after obtaining the required credits as stipulated above.

(5) A student registers for all 160 credits and earns all 160 credits. Marks obtained in the all the courses shall be considered for the calculation of grade points/division.

(6) The registrations in mandatory courses i.e. CI, ES, MOOCS, CS is compulsory and student should get a satisfactory report.

8.3. COURSE PATTERN

(1) The entire course of study is of FOUR academic years and each year will have TWO Semesters (Total EIGHT Semesters).

(2) A student is eligible to appear for the end examination in a subject, but absent for it or has failed in the end examinations may appear for that subject in supplementary examinations, when conducted next.

(3) When a student is detained due to lack of credits / shortage of attendance, he may be re-admitted in to the same semester / year in which he has been detained.

Re-admission Criteria:

i) A candidate, who is detained in a semester due to lack of attendance has to obtain written permission from the Principal for readmission into the same semester after duly fulfilling the required norms stipulated by the college and by paying the required tuition fee .

ii) A candidate, who is not promoted either to III year or IV year due to lack of required credits can seek admission into III / IV year in subsequent years after obtaining the required credits as stipulated in regulation by paying the required tuition fee.

9. METHOD FOR AWARDING OF GRADE POINTS FOR A SUBJECT:

After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Theory/ Drawing / Laboratory / Practical Training / Internship / Mini Project / Project (% of marks in a subject)	Corresponding Grade Points	Letter Grade
91 – 100	10	O (Outstanding)
81 – 90	9	A (Excellent)
71 – 80	8	B (Very Good)
61 – 70	7	C (Good)
51 – 60	6	D (Satisfactory)
40 – 50	5	E (Pass)
<40	0	F (Fail)

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

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 Student who involved in malpractice during the examination will be marked as MP in that subject grade.

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

10. CRITERIA FOR AWARD OF GRADES/DIVISION

10.1.Calculation of Semester Grade Point Average (SGPA)* for semester

The performance of each student at the end of each semester is indicated in terms of SGPA. The SGPA is calculated by dividing the sum of credit points secured from all subjects registered in a semester by the total no.of credits of that semester.

The SGPA is calculated as given below:

$$SGPA = \frac{\sum(CR \times GP)}{\sum CR} = \frac{\sum(CR \times GP)}{\sum CR}$$

Where CR = Credits of a subject
GP = Grade Points awarded for a subject
*SGPA is calculated for a candidate who passed all the subjects in that semester.

10.2. Calculation of Cumulative Grade Point Average (CGPA) for Entire Program:

The CGPA is a measure of the overall cumulative performance of a student in all semesters considered for a registration. CGPA is the ratio of the total credit points secured by a student in all registered courses in all semesters and the total no.of credits in all semesters.

The CGPA is calculated as given below:

$$CGPA = \frac{\sum(CR \times GP)}{\sum CR} = \frac{\sum(CR \times GP)}{\sum CR}$$

Where CR= Credits of a subject
GP = Grade Points awarded for a subject

- The SGPA and CGPA shall be rounded off to 2 decimal point and reported in the transcripts.
- Equivalent percentage = (CGPA – 0.75) x 10

CGPA is calculated for a candidate who passed all the subjects of all previous and current semester.

10.3 Award of Division:

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

CGPA	Class	From the CGPA secured from 160 credits
≥ 7.75	First Class with Distinction *(with no subject failures)	
≥ 6.75	First Class (with subject failures)	
≥ 5.75 & < 6.75	Second Class	
≥ 4.75 to < 5.75	Pass Class	

***First Class with Distinction:** A candidate who qualifies for the award of the Degree having passed all the courses of study of all the eight semesters (six semesters for lateral entry candidates) at the first attempt, within eight consecutive semesters (six consecutive semesters for lateral entry candidates) after the commencement of his /her study and securing a CGPA of 7.75 and above shall be declared to have passed in First Class with Distinction.

10.4. CONSOLIDATED GRADE MEMO

A Consolidated Grade Memo containing credits and grades obtained by the candidate will be issued after the completion of the four year B.Tech program.

11. REVALUATION

1. Student can submit the application for revaluation, along with the prescribed fee for revaluation of his answer script(s) of theory subject(s) as per the notification issued by the Controller of Examinations.
2. The Controller of Examinations shall arrange for revaluation of such answer script(s).
3. An External evaluator, other than the first evaluator shall revaluate the answer script(s).

12. MINIMUM INSTRUCTION DAYS

The minimum instruction days for each semester shall be **90 working days.**

13. There shall be **no branch transfer** after the completion of admission process.

14. WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the college or if any case of indiscipline/malpractice is pending against him, the result of such student will be kept withheld. His degree will be withheld in such cases.

15. TRANSITORY REGULATIONS

Discontinued or detained candidates are eligible for readmission as and when next offered.

A candidate, who is detained or discontinued in a semester, on readmission shall be required to do all the subjects 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 subjects in the earlier semester(s) 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.

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

15.2 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 first 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 subjects 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 subjects of the semester(s) of the batch which he had passed earlier and substitute subjects will be offered in place of them as decided by the Board of Studies. The student has to clear all his backlog subjects up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the award of 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 stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

15.3 Transfer candidates (from non-autonomous college affiliated to JNTUK)

A student who is following JNTUK curriculum, transferred from other college to this college in second year first semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the subjects 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 subjects 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 student has to clear all his backlog subjects up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the award of degree. 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 under JNTUK regulations and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

15.4 Transfer candidates (from an autonomous college affiliated to JNTUK)

A student who has secured the required credits up to previous semester as per the regulations of other autonomous institutions shall also be permitted to be transferred to this college.

A student who is transferred from the other autonomous colleges to this college in second year first semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the subjects 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 subjects 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 has transferred and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

16. Scope

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

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

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

ACADEMIC REGULATIONS (R-19) FOR B. TECH. (LATERAL ENTRY SCHEME)

(Effective for the students getting admitted into II year from the Academic Year 2020- 21 and onwards)

1. AWARD OF B. TECH. DEGREE

A student will be declared eligible for the award of the B. Tech. Degree if he fulfils the following academic regulations.

(a) Pursue a course of study for not less than three academic years and not more than six academic years counted from the academic year of admission.

(b) The candidate registers for 120 credits and secures all the 120 credits.

CGPA	Class	
≥ 7.75	First Class with Distinction *(with no subject failures)	From the CGPA secured from 120 credits from 2nd year to 4th year
≥ 6.75	First Class (with subject failures)	
≥ 5.75 & < 6.75	Second Class	
≥ 4.75 to < 5.75	Pass Class	

2. The attendance regulations of B.Tech (Regular) shall be applicable to B.Tech (LES), whereas the number of condonations are restricted to 3.

3. PROMOTION RULE:

(a) Attendance requirement is same as regular course.

(b) A lateral entry student will be promoted from II to III year if he puts up the minimum required attendance in II year II semester irrespective of credits earned.

(c) A student shall be promoted from III to IV year only if he fulfils the academic requirements of 40% of the credits up to III Year II semester from all the examinations, whether the candidate takes the examinations or not.

4. TRANSITORY REGULATIONS:

4.1 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 second year first semester. Such students shall study all the subjects 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.

4.2 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 subjects 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 subjects of the semester(s) of the batch of them as decided by the Board of Studies.

The student has to clear all his backlog subjects up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the award of degree. The total number of credits to be secured for 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 stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

5. All the other regulations as applicable for B. Tech. Four- year degree course (Regular) will be applicable for B. Tech. (Lateral Entry Scheme).

MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT INEXAMINATIONS

- The Principal shall refer the cases of Malpractices in Internal Assessment Test and Semester end examinations to a malpractice prevention committee constituted by him for the purpose. Such committee shall follow the approved levels of punishment. The Principal shall take necessary action against the students based on the recommendations of the committee.
- Any action by the candidate trying to get undue advantage in the performance or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder:

	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.
1(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators,	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already

	palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	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 college.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and to be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent /any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s)has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If 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	Student of the college 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

	6to 8.	also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the college for further action to award suitable punishment.	

OTHER MATTERS:

1. Physically challenged candidates who have availed additional examination time and a scribe during their intermediate / EAMCET examinations will be given similar concessions on production of relevant proof / documents.
2. The Principal shall deal in an appropriate manner with any academic problem which is not covered under these rules and regulations, in consultation with the Heads of the departments and subsequently such actions shall be placed before the Academic Council for ratification. Any emergency modification of regulation, approved in the meetings of the Heads of the departments shall be reported to the Academic Council for ratification.

GENERAL:

1. The academic council may, from time to time, revise, amend or change the regulations, schemes of examinations and / or syllabi.
2. Where ever the words ‘’he’’ ‘’him’’ ‘’his’’, occur in the regulations, they include ‘’she’’, ’’her’’, ’’hers’’.
3. The academic regulation should be read as a whole for the purpose of any interpretation.
4. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.

R19 COURSE STRUCTURE

I B.TECH - I SEMESTER

S.No	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	Communicative English-I	HS	40	60	100	2	-	-	2
2	Engineering Physics	BS	40	60	100	3	-	-	3
3	Linear Algebra & Calculus	BS	40	60	100	3	-	-	3
4	Engineering Graphics	ES	40	60	100	3	-	-	3
5	Problem Solving with Python	ES	40	60	100	3	-	-	3
6	English Communication Skills Lab – I	HS	20	30	50	-	-	3	1.5
7	Engineering Physics Lab	BS	20	30	50	-	-	3	1.5
8	Problem Solving with Python Lab	ES	20	30	50	-	-	3	1.5
9	Environmental Studies	MC	-	-	-	3	-	-	-
Total			**260**	**390**	**650**	**17**	**-**	**9**	**18.5**

I B.TECH. – II SEMESTER

S.No.	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	Communicative English-II	HS	40	60	100	2	-	-	2
2	Engineering Chemistry	BS	40	60	100	3	-	-	3
3	Differential Equations & Vector Calculus	BS	40	60	100	3	-	-	3
4	Network Analysis	ES	40	60	100	3	-	-	3
5	Business Management Concepts for Engineers	HS	40	60	100	3	-	-	3
6	C Programming	ES	40	60	100	3	-	-	3
7	Engineering Chemistry Lab	BS	20	30	50	-	-	3	1.5
8	C Programming Lab	ES	20	30	50	-	-	3	1.5
9	Electronic Workshop & IT Workshop	ES	20	30	50	-	-	3	1.5
10	Constitution of India	MC	-	-	-	3	-	-	-
Total			**300**	**450**	**750**	**20**	**-**	**9**	**21.5**

II B.TECH. – I SEMESTER

S.No.	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	Numerical Methods & Complex Variables	BS	40	60	100	3	-	-	3
2	Electronic Devices and Circuits	PC	40	60	100	3	-	-	3
3	Signals and Systems	PC	40	60	100	3	-	-	3
4	Internet of Things	ES	40	60	100	3	-	-	3
5	Data Structures	ES	40	60	100	3	-	-	3
6	Electronic Devices and Circuits Lab	PC	20	30	50	-	-	3	1.5
7	Signals and Systems Lab	PC	20	30	50	-	-	3	1.5
8	IOT Lab	ES	20	30	50		-	3	1.5
9	Data Structures Lab	ES	20	30	50	-	-	3	1.5
10	Quantitative Aptitude and Reasoning	MC	-	-	-	3	-	-	-
Total			**280**	**420**	**700**	**18**	**-**	**12**	**21**

II B.TECH. – II SEMESTER

S.No.	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	Electronic Circuit Analysis	PC	40	60	100	3	-	-	3
2	Switching Theory and Logic Design	PC	40	60	100	3	-	-	3
3	Random Variables and Stochastic Processes	BS	40	60	100	3	-	-	3
4	Communication Systems	PC	40	60	100	3	-	-	3
5	Electromagnetic Waves and Transmission Lines	PC	40	60	100	3	-	-	3
6	**Open Elective - I:** i. Principles of Signals, Systems & Communications (Other than ECE) ii. Medical Electronics	OE	40	60	100	3	-	-	3
7	English Communication Skills Lab – II	BS	20	30	50	-	-	3	1.5
8	Communication Systems Lab	PC	20	30	50	-	-	3	1.5
9	Community Services	MC	-	-	-	-	-	-	-
Total			**280**	**420**	**700**	**18**	**-**	**6**	**21**

III B.TECH. – I SEMESTER

S.No.	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	Linear & Digital IC Applications	PC	40	60	100	3	-	-	3
2	Entrepreneurship and Innovation	HS	40	60	100	2	-	-	2
3	Pulse and Digital Circuits	PC	40	60	100	3	-	-	3
4	Control Systems	PC	40	60	100	3	-	-	3
5	Computer Organization and Microprocessors	PC	40	60	100	3	-	-	3
6	**Open Elective – II** i. Fundamentals of Image Processing (Other than ECE) ii. Consumer Electronics	OE	40	60	100	3	-	-	3
7	LDICA Lab	PC	20	30	50	-	-	3	1.5
8	EC & PDC Lab	PC	20	30	50	-	-	3	1.5
9	Skill Lab	OE	20	30	50	-	-	3	1.5
Total			**300**	**450**	**750**	**17**	**-**	**9**	**21.5**

III B.TECH. – II SEMESTER

S. No.	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	Antennas and Wave Propagation	PC	40	60	100	3	-	-	3
2	Digital Signal Processing	PC	40	60	100	3	-	-	3
3	Microcontrollers and Embedded Systems	PC	40	60	100	3	-	-	3
4	Object Oriented Programming through Java	ES	40	60	100	3	-	-	3
5	**Open Elective – III** i. Introduction to Embedded Systems (Other than ECE) ii. Global Positioning System(GPS)	OE	40	60	100	3	-	-	3
6	**Professional Elective–I:** i. Electronic Measurements and Instrumentation ii. Data Communication and Computer Networks iii. Embedded System Design with Advanced Processors iv. Statistical Methods in AI	PE	40	60	100	3	-	-	3
7	MP & MC Lab	PC	20	30	50	-	-	3	1.5
8	Object Oriented Programming through Java Lab	ES	20	30	50	-	-	3	1.5
9	Mini Project	PR	20	30	50	-	-	2	1
10	Advanced Communication Skills	MC	-	-	-	-	-	3	-
Total			**300**	**450**	**750**	**18**	**-**	**11**	**22**

IV B.TECH. – I SEMESTER

S.No.	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	Microwave Engineering	PC	40	60	100	3	-	-	3
2	VLSI Design	PC	40	60	100	3	-	-	3
3	**Professional Elective - II:** i. Data Acquisition and Transmission ii. Satellite Communications iii. Embedded and Real time Operating System iv. Soft Computing Techniques	PE	40	60	100	3	-	-	3
4	**Professional Elective - III:** i. Bio Medical Instrumentation ii. Optical Communications iii. Introduction to Deep Learning iv. Image Processing	PE	40	60	100	3	-	-	3
5	**Open Elective – IV** i. Introduction to Micro Processors & Micro Controllers(Other than ECE) ii. Automotive Electronics	OE	40	60	100	3	-	-	3
6	Digital Signal Processing Lab	PC	20	30	50	-	-	3	1.5
7	MW & OC Lab	PC	20	30	50	-	-	3	1.5
8	VLSI & Embedded Systems Lab	PC	20	30	50	-	-	3	1.5
9	MOOCS	PE	-	-	-	-	-	-	1
10	Internship/Practical Training	PR	50	-	50	-	-	-	1
Total			**360**	**390**	**750**	**15**	**-**	**11**	**21.5**

IV B.TECH. – II SEMESTER

S.No.	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	**Professional Elective - IV:** i. Analytical Instrumentation ii. Cellular and Mobile Communication iii. System-On-Chip iv. DSP Architectures	PE	40	60	100	3	-	-	3
2	**Professional Elective - V:** i. PC based Instrumentation ii. Radar Systems iii. Low Power VLSI design iv. Speech Processing	PE	40	60	100	3	-	-	3
3	Project Work	PR	80	120	200	-	-	14	7
Total			**160**	**240**	**400**	**6**	**-**	**-**	**13**

Open Elective Course: At any semester, student can choose an open elective course offered by any department provided that he/she has not studied it.

List of open Electives offered by all Departments

OPEN ELECTIVE-I

S.No.	Open Elective-I Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Public Health Engineering	CE	19BCC4OE01	3	0	0	3
2	Geographical Information Systems	CE	19BCC4OE02	3	0	0	3
3	Micro Electro Mechanical System	EEE	19BCC4OE03	3	0	0	3
4	Energy Audit Conservation and Management	EEE	19BCC4OE04	3	0	0	3
5	RPT &3D Printing (Other than ME)	ME	19BCC4OE05	3	0	0	3
6	Operations Research	ME	19BCC4OE06	3	0	0	3
7	Principles of Signals, Systems & Communications (Other than ECE)	ECE	19BCC4OE07	3	0	0	3
8	Medical Electronics	ECE	19BCC4OE08	3	0	0	3
9	DBMS (Other Than CSE)	CSE	19BCC4OE09	3	0	0	3
10	Web Development Using Mean Stack Tech	CSE	19BCC4OE10	3	0	0	3
11	Front End UI and Frame Work	IT	19BCC4OE11	3	0	0	3
12	Front End Web Technologies	IT	19BCC4OE12	3	0	0	3
13	Financial Institutions, Markets and Services	MBA	19BCC4OE13	3	0	0	3
14	Human Resource Practices	MBA	19BCC4OE14	3	0	0	3

OPEN ELECTIVE-II

S.No.	Open Elective-II Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Disaster Management	CE	19BCC5OE01	3	0	0	3
2	Green Building & Sustainability	CE	19BCC5OE02	3	0	0	3
3	Non-Conventional Energy Resources	EEE	19BCC5OE03	3	0	0	3
4	Basics in Electrical and Electronics Engineering (Other than EEE)	EEE	19BCC5OE04	3	0	0	3
5	Work study	ME	19BCC5OE05	3	0	0	3
6	Mechatronics	ME	19BCC5OE06	3	0	0	3
7	Fundamentals of Image Processing (Other than ECE)	ECE	19BCC5OE07	3	0	0	3
8	Consumer Electronics	ECE	19BCC5OE08	3	0	0	3
9	Artificial Intelligence	CSE	19BCC5OE09	3	0	0	3
10	OOPS through JAVA	CSE	19BCC5OE10	3	0	0	3
11	Object Oriented Programming through C++	IT	19BCC5OE11	3	0	0	3
12	Cloud Computing	IT	19BCC5OE12	3	0	0	3
13	Digital Marketing	MBA	19BCC5OE13	3	0	0	3
14	Personal Finance Planning	MBA	19BCC5OE14	3	0	0	3

OPEN ELECTIVE-III

S.No.	Open Elective-III Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Solid and hazardous waste management	CE	19BCC6OE01	3	0	0	3
2	Ground Water Development and Management	CE	19BCC6OE02	3	0	0	3
3	Soft Computing	EEE	19BCC6OE03	3	0	0	3
4	Industrial Electronics	EEE	19BCC6OE04	3	0	0	3
5	Automotive Vehicles	ME	19BCC6OE05	3	0	0	3
6	Nano Technology	ME	19BCC6OE06	3	0	0	3
7	Introduction to Embedded Systems (Other than ECE)	ECE	19BCC6OE07	3	0	0	3
8	Global Positioning System(GPS)	ECE	19BCC6OE08	3	0	0	3
9	Cloud Computing	CSE	19BCC6OE09	3	0	0	3
10	Block Chain Technologies	CSE	19BCC6OE10	3	0	0	3
11	Digital Marketing	IT	19BCC6OE11	3	0	0	3
12	DevOps	IT	19BCC6OE12	3	0	0	3
13	Performance Management	MBA	19BCC6OE13	3	0	0	3
14	Services Marketing	MBA	19BCC6OE14	3	0	0	3

OPEN ELECTIVE-IV

S.No.	Open Elective-IV Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Water shed management	CE	19BCC7OE01	3	0	0	3
2	Modern Construction Material	CE	19BCC7OE02	3	0	0	3
3	Control System	EEE	19BCC7OE03	3	0	0	3
4	Embedded Control of Electric Drives	EEE	19BCC7OE04	3	0	0	3
5	Pneumatics & Hydraulic Automation	ME	19BCC7OE05	3	0	0	3
6	Industrial Robotics	ME	19BCC7OE06	3	0	0	3
7	Introduction to Micro Processors & Micro Controllers(Other than ECE)	ECE	19BCC7OE07	3	0	0	3
8	Automotive Electronics	ECE	19BCC7OE08	3	0	0	3
9	Cyber Security	CSE	19BCC7OE09	3	0	0	3
10	Ethical Hacking	CSE	19BCC7OE10	3	0	0	3
11	Human Computer Interaction	IT	19BCC7OE11	3	0	0	3
12	E-Commerce	IT	19BCC7OE12	3	0	0	3
13	Quality Management	MBA	19BCC7OE13	3	0	0	3
14	Logistics and Supply Chain Management	MBA	19BCC7OE14	3	0	0	3

Distribution of Credits

S.No.	Year/Sem	HS	BS	ES	PC	PE	OE	PRC	TOTAL
1	I-I	3.5	7.5	7.5					**18.5**
2	I-II	5	7.5	9					**21.5**
3	II-I		3	9	9				**21**
4	II-II		4.5		13.5		3		**21**
5	III-I	2			15		4.5		**21.5**
6	III-II				15	3	3	1	**22**
7	IV-I			4.5	6	7	3	1	**21.5**
8	IV-II					6		7	**13**
9	TOTAL(Actual)	10.5	22.5	30	58.5	16	13.5	9	**160**

S.No.	Course Work-Subject areas	Credits (as per AICTE)	Credits (as per NEC-ECE)
1	Humanities and Social Sciences (HS)	12	10.5
2	Basic Sciences (BS)	25	22.5
3	Engineering Sciences (ES)	24	30
4	Professional Core (PC)	48	58.5
5	Professional Elective (PE)	18	16
6	Open Elective (OE)	18	13.5
7	Project/Practical Training/Internship (PRC)	15	9
	Total Credits	**160**	**160**

I B.TECH - I SEMESTER

S.No	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	Communicative English-I	HS	40	60	100	2	-	-	2
2	Engineering Physics	BS	40	60	100	3	-	-	3
3	Linear Algebra & Calculus	BS	40	60	100	3	-	-	3
4	Engineering Graphics	ES	40	60	100	3	-	-	3
5	Problem Solving with Python	ES	40	60	100	3	-	-	3
6	English Communication Skills Lab - I	HS	20	30	50	-	-	3	1.5
7	Engineering Physics Lab	BS	20	30	50	-	-	3	1.5
8	Problem Solving with Python Lab	ES	20	30	50	-	-	3	1.5
9	Environmental Studies	MC	-	-	-	3	-	-	-
Total			**260**	**390**	**650**	**17**	**-**	**9**	**18.5**

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	-	-	40	60	100	2
CODE:19BCC1TH01	COMMUNICATIVE ENGLISH - I (Common to All Branches)						

COURSE OBJECTIVES:

1. To equip the students with appropriate oral and written communication skills.
2. To inculcate the skills of listening, reading and critical thinking.
3. To enhance the students' proficiency in reading skills enabling them meet the academic needs of their course.
4. To enable the engineering students develop their basic communication skills in English for academic and social purposes.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Read for explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it. **(Applying-3)**

CO 2: Compose paragraphs, essays as creative writing**.(Creating-5)**

CO 3: Build grammatically correct sentences using a variety of sentence structures. **(Applying-3)**

CO 4: Enhance word power and usage of lexicons.**(Applying-3)**

CO 5: Compile emails, letters, reports, resume and information transfer.**(Creating-5)**

SYLLABUS

UNIT– I

Akio Morita

a) **Speaking**: Introducing self and others.
b) **Reading**: Skimming for main idea, scanning for specific piece of information.
c) **Writing**: Note – making flowed by paragraph writing, effective opening sentences, introducing the topic, key words, main idea, summarize the main idea.
d) **Grammar and Vocabulary**: Content words and function words, verbs, nouns, adjectives and adverbs. Basic sentence structure and simple question form, framing jargon, technical vocabulary (15 words)

UNIT–II

Dhirubhai Ambani

a) **Speaking**: Discussions on specific topic
b) **Reading**: Identifying the sequence of ideas and recognizing verbal techniques to link the ideas in a paragraph.
c) **Writing**: Paragraph writing, using key words/phrases and organizing points in a coherent manner.
d) **Grammar and Vocabulary**: Linkers, articles and prepositions.

UNIT–III

Louis Braille

a) **Speaking**: Discussions on specific topic
b) **Reading**: Sequencing of ideas and recognizing verbal techniques to link the ideas in a paragraph.

c) **Writing**: Paragraph writing, using key words/phrases and organizing points in a coherent manner.
d) **Grammar and Vocabulary**: Cohesive devices, articles and prepositions

UNIT-IV

Mallika Srinivasan

a) **Speaking:** Role plays, asking for and giving information/directions/instructions
b) **Reading**: Understand and interpret graphic elements used in texts.
c) **Writing**: Information transfer.
d) **Grammar and Vocabulary**: Adjectives, adverbs and antonyms.

UNIT-V

Muhammad Yunus

a) **Speaking**: Oral presentations
b) **Reading:** Reading for comprehension.
c) **Writing**: Essay writing
d) **Grammar and Vocabulary**: Articles, prepositions, tenses, subject verb agreement and technical jargon (15 words)

TEXT BOOKS:

1. **"**Modern Trail Blazers", Orient Black Swan Pvt.Ltd.Publisher, 1ST edition. 2013
2. English All Round -I (Communication skills for Under Graduate Learners)– Orient Black Swan Pvt.Ltd.Publisher, 1st edition,2019

REFERENCE BOOKS:

1. Raymond Murphy, Murphy's English Grammar, Cambridge University Press 2004
2. Meenakshi Raman, Sangeeta Sharma, Technical Communication: English Skills for Engineers, Oxford University Press, 2009
3. Michael Swan, Practical English Usage, Oxford University Press, 1996

WEB REFERENCES:

1. https://app.grammarly.com/
2. https://www.grammarly.com/blog
3. https://www.englishclub.com/
4. https://www.nonstopenglish.com/
5. https://www.fluentu.com/blog/english/
6. https://www.fluentu.com/blog/english/
7. http://freerice.com soon migrating to https://beta.freerice.com/

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code:19BCC1TH02	ENGINEERING PHYSICS (Common to All branches)						

COURSE OBJECTIVES:

1. To impart knowledge in basic concepts of wave optics, fiber optics, properties of solid crystal materials and magnetic materials, acoustics, superconductors.
2. To familiarize the applications of materials relevant to engineering field.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Recognize the experimental evidence of wave nature of light and interference in thin films, Diffraction grating and Polarisation in various fields.
CO2: Analyse various types of lasers & optical fibers.
CO3: Learn the crystal structures and XRD techniques.
CO4: Knows the applications of magnetic materials in engineering field.
CO5: Realize about the various applications of semiconductors in engineering field.

UNIT–I

Interference & Diffraction: Introduction -Interference in thin films by reflection – Newton's rings, introduction to diffraction – difference between Fresnel's and Fraunhofer diffraction - Fraunhofer diffraction at single slit (qualitative) - Diffraction grating.
Polarization: Introduction – Types of Polarization – Double refraction – Nicol's prism-Quarter wave plate and Half Wave plate

UNIT–II

Lasers: Introduction – Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Population inversion – Ruby laser – Helium Neon laser-Applications.
Fiber Optics: Introduction- Principle of optical fiber - Acceptance angle – cone - Numerical Aperture-Applications.

UNIT–III

Crystallography : Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC,BCC and FCC.
X-Ray Diffraction: Directions and planes in crystals – Miller indices – Separation between successive (h k l) planes – Bragg's law.

UNIT-IV

Electromagnetic Fields: Gauss and stokes theorems (qualitative) – Fundamental laws of electromagnetism – Maxwell's Electromagnetic Equations.
Magnetic materials: Magnetic Susceptibility-Magnetic permeability –Classification of Magnetic materials – Dia, Para, Ferro – Soft and Hard magnetic materials - Applications

UNIT-V

Quantum Mechanics: Introduction –de-Broglie's concept of Matter waves – Physical significance of wave function - Schrodinger Time Independent wave equations – Particle in a one dimensional potential box.

Semiconductor Physics: Origin of energy band formation in solids- classification of materials into conductors, semiconductors and insulators, Intrinsic and Extrinsic semiconductor- Hall Effect.

TEXT BOOKS:

1. A.J. Dekker, "Solid state Physics", ISBN 10: 0333918339 / ISBN 13: 9780333918333, McMillan India Ltd, First edition, 2000.
2. M.N. Avadhanulu& P.G. Kshirasagar, "A text book of Engineering Physics", ISBN 81-219-0817-5, S. Chand publications, First Edition, 2011.
3. P. K. Palanisamy, "Engineering Physics", ISBN: 9788183714464, Scitech Publishers, 4th Edition, 2014
4. M.R. Srinivasan, "Engineering Physics", ISBN978-81-224-3636-5, New Age international publishers, 2nd Edition,2014

REFERENCE BOOKS:

1. Charles Kittle, "Introduction to solid state physics" ISBN: 9788126578436, Willey IndiaPvt.Ltd, 5TH edition, 2012.
2. M.Arumugam, "Applied Physics", ISBN: 81-89638-01-7, Anuradha Agencies, 4th edition, 2013.
3. D.K.Bhattacharya, "Engineering Physics", ISBN: 0198065426, 9780198065425, Oxford University press, 2nd edition, 2010.
4. Sanjay D Jain and Girish G Sahasrabudhe "Engineering Physics", University Press ISBN: 8173716781,1st edition, 2010.
5. B.K.Pandey& S. Chaturvedi "Engineering Physics" ISBN: 8131517616, Cengage Learning, 1st edition, 2012.

Web References:

1. http://link.springer.com/physics
2. http://www.thphys.physics.ox.ac.uk
3. http://www.sciencedirect.com/science
4. http://www.e-booksdirectory.com

E-Books:

1. http://www.peaceone.net/basic/Feynman
2. http://physicsdatabase.com/free-physics-books
3. http://www.damtp.cam.ac.uk/user/tong/statphys/sp.pdf
4. http://www.freebookcentre.net/Physics/Solid-State-Physics-Books.html

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code:19BCC1TH03	LINEAR ALGEBRA & CALCULUS (Common to All Branches)						

COURSE OBJECTIVES:

1. Learn basic concepts of linear algebra (systems of linear equations, matrix calculus).
2. To become proficient in solving computational problems of linear algebra.
3. To acquire knowledge on mean value theorems in calculus.
4. Familiarization about the techniques in calculus and multivariate analysis.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to

CO1: Solve the system of linear equations.

CO2: Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors.

CO3: Relate the results of mean value theorems in calculus to Engineering problems.

CO4: Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering.

CO5: Compute the area and volume by interlinking them to appropriate double and triple integrals.

UNIT-I: LINEAR SYSTEMS OF EQUATIONS:

Rank of a matrix - Echelon form, Normal form, Solution of linear systems, Direct Methods, Gauss elimination, Gauss Jordon and Gauss Seidal Methods. Solutions of linear simultaneous equations: LU decomposition.

Application: Finding the current in a electrical circuit

UNIT – II: EIGENVALUES AND EIGENVECTORS

Eigen values, Eigenvectors, Properties, Cayley - Hamilton Theorem, Quadratic forms, Reduction of quadratic form to canonical form, Rank, Positive definite, negative definite, semi definite, index, signature.

Application: Finding powers and inverse of a square matrix using Cayley Hamilton's Theorem.

UNIT – III: MEAN VALUE THEOREMS

Review on limits and continuity, Mean Value theorems (without proofs): Rolle's theorem, Lagrange's theorem, Cauchy's theorem, Taylor's (Generalized mean value) theorem, increasing and decreasing functions, Maxima and minima of function of single variable.

UNIT- IV: PARTIAL DIFFERENTION:

Function of two or more variables, Partial derivatives, Total derivatives, change of variables, Jacobian - functional dependence, Taylor's theorem for Two variables.Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

UNIT-V: APPLICATION OF INTEGRATION AND MULTIPLE INTEGRALS:
Applications of Integration to Lengths, Volumes and Surface areas of revolution in Cartesian and Polar Coordinates. Multiple Integrals- double and triple integrals, Change of Variables, Change of order of Integration.

TEXT BOOK :

1. Dr. B.S. Grewal, "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, 2012.

REFERENCE BOOKS:

1. N.P. Bali, BhavanariSatyanarayana, IndraniPromodKelkar, "Engineering Mathematics", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.
2. Kreyszig E, "Advanced Engineering Mathematics", 8th Edition, John Wiley, Singapore, 2001.
3. Greenberg M D, "Advanced Engineering Mathematics", 2nd Edition, Pearson Education, Singapore, Indian Print, 2003.
4. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage Learning, 2011.
5. BhavanariSatyanarayana, Pradeep Kumar T.V. &Srinivasulu D, "Linear Algebra and Vector Calculus", Studera Press, New Delhi, 2017.

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	1	0	4	40	60	100	3
Code: 19BCC1TH09	ENGINEERING GRAPHICS (Common to CSE, ECE, EEE & IT)						

COURCE OBJECTIVES:

1. The students to use drawing instruments and to draw polygons, engineering Curves & engineering scales.
2. The students use to make orthographic projections, projections of points, simple lines & projections of the lines inclined to both the lines.
3. The students use to draw the projections of the plane inclined to both the plane.
4. The students use to draw the projections of solids & development of surfaces.
5. The students use to draw conversion of isometric views to orthographic views vice versa and to learn basic drawing commands in auto cad.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: **Construct** the geometrical shapes of regular polygons, Engineering Curves.
CO 2: **Develop** the orthographic projections, projections of points, and lines inclined to both the planes.
CO 3: **Construct** the projection of planes inclined to both the planes.
CO 4: **Develop** the projection of regular solids and surfaces.
CO 5: **Interpret** the conversion of isometric views to orthographic views vice versa.

UNIT– I: THE BASIC CONCEPTS IN ENGINEERING DRAWING

Introduction to engineering drawing instruments, lettering and dimensioning practice. Geometrical constructions- Constructing regular polygons by general methods.

CURVES USED IN ENGINEERING PRACTICE: Introduction to **conic** sections, construction of ellipse, parabola, hyperbola by eccentricity method. Construction of ellipse by - Arcs of circles Method, Concentric Circles Method and Oblong Method, & parallelogram methods.

UNIT–II: ORTHOGRAPHIC PROJECTIONS

Introduction to type of projections, first angle and third angle projections.
Projection of points: Principles of orthographic projection – Convention – First angle projections, projections of points.

PROJECTIONS OF STRAIGHT LINES:

Projections of straight linesparallel to both the planes, parallel to one plane and inclined to the other plane. Lines inclined to both the planes - Projections of straight lines inclined to both the planes- determination of true lengths, angle of inclination and traces.

UNIT–III: PROJECTIONS OF PLANES

Regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT-IV: PROJECTIONS OF SOLIDS

Introduction to projections of solids, types of solids: prisms, pyramids, cones and cylinders – simple positions and the axis inclined to one of the plane.

UNIT-V:

Introduction of isometric views, isometric projections & orthographic projections.Conversion of isometric views to orthographic views and orthographic views to isometric views.

INTRODUCTION TO AUTO CAD: practice on draw, edit & modify commands using auto CAD.

TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications.
2. Engineering Drawing by K.L.Narayana& P. Kannaiah, Scitech Publishers.
3. Engineering Drawing & Graphics by K.Venugopal, New age international Publishers.

REFERENCE BOOKS:

1. Engineering Graphics for Degree by K.C. John, PHI Publishers.
2. Engineering Drawing by BasantAgarwal& CM. Agarwal, Tata McGraw Hill Publishers.

Web References:

1. https://nptel.ac.in/courses/112103019/17

E-Books:

1.https://www.pdfdrive.com/textbook-of-engineering-drawing-e28918244.html

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
Code:19BCC1H05	PROBLEM SOLVING WITH PYTHON						

COURSE OBJECTIVES:

1. To teach problem solving through flow charting tool-Raptor.
2. To elucidate problem solving through python programming language.
3. To introduce function oriented programming paradigm through python.
4. To train in development of solutions using modular concepts.

COURSE OUTCOMES:

After successful completion of this course, the students should be able to

CO 1: Summarize the fundamental concepts of computer and python programming [K2].
CO 2: Solve the given problems using raptor [K3].
CO 3: Interpret object oriented and event driven programming in python [K2].
CO 4: Apply the suitable data structures to solve the real time situational problems [K3].

SYLLABUS:

UNIT-I: INTRODUCTION TO COMPUTERS

Conceptual introduction: topics in computer science, algorithms; modern computer systems: hardware architecture, data representation in computers, software and operating system.

UNIT-II: FLOWCHART DESIGN THOUGH RAPTOR

Flowchart symbols, input/output, assignment, operators, conditional if, repetition, function and sub charts, example problems-finding max.of 3 numbers, unit converters, interest calculators, multiplication tables, gcd of 2 numbers, Fibonacci generation, prime number generation, minimum, maximum and average of n numbers, linear search, binary search.

UNIT-III: INTRODUCTION TO PYTHON

Python-numbers, strings, variables, operators, expressions, statements, string operations, math function calls, Input/output statements, conditional if, while and for loops

Functions: user defined functions, parameters to functions, recursive functions, and turtle graphics.

UNIT-IV: DATA STRUCTURES

Lists- basic list operators, replacing, inserting, removing an element; searching and sorting lists; tuples, dictionaries- dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries. Strings, files and their libraries.

UNIT-V: EVENT DRIVEN PROGRAMMING

Turtle bar chart, event driven programming, key press events, mouse events, timer events.

OOP: Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects ,inheritance, polymorphism, operator overloading (_eq_, _str_, etc); abstract classes; exception handling, try block.

TEXT BOOKS:

1. Kenneth Lambert, "Fundamentals of Python: First Programs" , ISBN-13: 978-1337560092,cengage learning publishers, first edition,2012.
2. Allen B. Downey, "think python: how to think like a computer scientist",ISBN-13: 978-1491939369,O'reilly, 2nd edition, 2016.
3. ReemaThareja, "Python Programming using Problem Solving Approach", ISBN-13:978-0-19-948017-3, Oxford University Press, 2017.

REFERENCE BOOKS:

1. Vamsikurama, "Python programming : A modern approach", ISBN-978-93-325-8752-6,pearson,2018.
2. Mark Lutz , "Learning python", ISBN: 1-56592-464-9,Orielly, 4th edition, 1999 .
3. W.Chun, "Core python programming", ISBN-13: 978-0132269933, pearson, 2nd edition, 2016.

WEB RESOURCES:

1. https://raptor.martincarlisle.com/
2. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
3. https://zhanxw.com/blog/wp-content/uploads/2013/03/BeautifulCode_2.pdf
4. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
5. https://www.cse.msu.edu/~stockman/ITEC/Scratch/BGC2011Scratch-Rev1.pdf
6. https://nostarch.com/scratchplayground
7. http://fusecontent.education.vic.gov.au/9f79537a-66fc-4070-a5ce-e3aa315888a1/scratchreferenceguide14.pdf

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
Code: 19BCC1LB01	ENGLISH COMMUNICATION SKILLS LAB-I (Common to All Branches)						

COURSE OBJECTIVES:

1. To build confidence in the students to communicate effectively in English.
2. To strengthen the oral communication skills to enable them to interact with the people in various social situations.
3. To enable the learners improve pronunciation through emphasis on word accent, intonation and rhythm

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Develop various conversations skills /discourses using formal and informal expressions. **(Apply-3)**

CO 2: Apply phonological knowledge to speak English with good pronunciation, overcoming mother tongue influence. **(Apply-3)**

CO 3: Identify and comprehend several accents of English Language by listening to audio clips. **(Apply-3)**

CO 4: Utilize basic communication skills in JAMS and Role plays. **(Apply-3)**

UNIT– I

a. Greeting, Introducing and Taking leave
b. Pure Vowels
c. Listening - TEDx Talks (https://www.ted.com/talks/ashweetha_shetty_how-education-helped-me-rewrite-my-life?language-en#t-623369)
d. Self-Introduction

UNIT–II

a. Giving information and Asking for information
b. Diphthongs
c. Listening -TEDx Talks (https://www.youtube.com/watch?v=Dk20-E0yx_s)
d. Role Play

UNIT–III

a. Inviting, Accepting and Declining Invitations
b. Consonants
c. Listening - TEDx Talks (https://www.youtube.com/watch?v=IgAnj6r1O48)
d. JAM

UNIT-IV

a. Commands, Instructions and Requests
b. Accent and Rhythm
c. Listening -TEDx Talks(https://youtu.be/SKvMxZ284AA)

d. Tables Turned

UNIT-V

a. Suggestions and Opinions
b. Intonation
c. Listening -TEDx Talks(https://youtu.be/ov6pEGXRYZo)
d. Impromptu

TEXT BOOK:

1."Strengthen Your Communication Skills", Maruthi Publications, 2013.

REFERENCE BOOKS:

1. Meenakshi Raman, Sangeeta Sharma, Technical Communication: Principles and Practice, Oxford University Press, 2015
2. J.D.O Conner, Better English Pronunciation, Cambridge University Press 1980.
3. T.Balasubramanian, "A Text Book of English Phonetics for Indian Students", Macmillan,1981
4. Penny urGrammar Practice Activities, Cambridge University Press, 2010.
5. Mark Hancock, Pronunciation in Use, Oxford University Press 2007.

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	20	30	50	1.5
Code:19BCC1LB02	ENGINEERING PHYSICS LAB (Common to All branches)						

COURSE OBJECTIVE:

1. To impart physical measurement skills and make the students understand coherence between theoretical and practical knowledge.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO1: Apply the principle of physics and interpret them in engineering field and compares the results with theoretical calculations. (Apply-3)

CO2: Utilise modern engineering physics techniques and tools in real time applications in engineering studies. (Apply-3)

CO3: Identify the characteristics and the behaviour of materials in a practical manner and gain knowledge and its usage. (Apply-3)

CO4: Apply the analytical techniques and graphical analysis to the experimental data. (Apply-3)

LIST OF EXPERIMENTS:

1. Rigidity modulus of material by wire-dynamic method (torsional pendulum)
2. Determination of wavelength of a source-Diffraction Grating-Normal incidence
3. Newton's rings –Radius of Curvature of Plano Convex Lens.
4. Determination of thickness of thin wire- Air wedge method
5. Determination of wavelength of Laser Source-single slit diffraction.
6. Determine the Numerical aperture of an optical fiber.
7. Melde's experiment – Transverse and Longitudinal modes.
8. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
9. Verification of laws of stretched string by using Sonometer.
10. Calculate the energy loss in a given ferromagnetic material by plotting B-H Curve.
11. Energy Band gap of a Semiconductor p - n junction.
12. Characteristics of Thermistor – temperature coefficient.

VIRTUAL LABS:

1. Brewster's Angle determination(Polarization angle)
2. Hall effect experiment-determination of charge carrier density

TEXT BOOKS:

1. Engineering Physics Lab Manual by Dr.Y. Aparna&Dr.K.Venkateswarao (V.G.S.Book links).
2.Physics Practical Manual, Lorven Publications
3. S. Balasubramanian , M.N. Srinivasan" A Text book of Practical Physics"- S Chand Publishers, 2017.

Web References:

1. https://www.youtube.com/watch?v=NDsSPtL9dyQ
2. https://www.youtube.com/watch?v=9agoJRCnu4w
3. https://www.youtube.com/watch?v=bv-lLJreyCU
4. http://vlab.amrita.edu/index.php

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
Code: 19BCI2LB09	PROBLEM SOLVING WITH PYTHON LAB						

COURSE OBJECTIVES:

1. To introduce programming through Visual programming tool - Scratch
2. To teach problem solving through Flow charting tool - Raptor
3. To elucidate problem solving through python programming language
4. To introduce function-oriented programming paradigm through python
5. To train in development of solutions using modular concepts
6. To teach practical Pythonic solution patterns

COURSE OUTCOMES:

After successful completion of the course, the students should be able to:

CO1: Develop interactive visual programs using Scratch [K3].
CO2: Develop flowcharts using raptor to solve the given problems [K3].
CO3: Develop Python programs for numerical and text based problems [K3].
CO4: Develop graphics and event based programming using Python [K3].

LABORATORY EXPERIMENTS

1. Design a script in Scratch to make a sprite to draw geometrical shapes such as Circle, Triangle, Square, and Pentagon.
2. Design a script in Scratch to make a sprite to ask the user to enter two different numbers and an arithmetic operator and then calculate and display the result.
3. Design a Memory Game in Scratch which allows the user to identify positions of similar objects in a 3 x 3 matrix.
4. Construct flowcharts to
   a. calculate the maximum, minimum and average of N numbers
   b. Develop a calculator to convert time, distance, area, volume and temperature from one unit to another.

Construct flowcharts with separate procedures to

. a) calculate simple and compound interest for various parameters specified by the user

b) Calculate the greatest common divisor using iteration and recursion for two numbers as specified by the user

Construct flowcharts with procedures to

. a)generate first N numbers in the Fibonacci series

b) Generate N Prime numbers

Design a flowchart to perform Linear search on list of N unsorted numbers(Iterative and recursive)

Design a flowchart to perform Binary search on list of N sorted numbers(Iterative and recursive)

Design a flowchart to determine the number of characters and lines in a text file specified by the user

Design a Python script to convert a Binary number to Decimal number and verify if it is a Perfect number.

Design a Python script to determine if a given string is a Palindrome using recursion
Design a Python script to sort numbers specified in a text file using lists.
Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.
Design a Python Script to determine the Square Root of a given number without using inbuilt functions in Python.
Design a Python Script to determine the time difference between two given times in HH:MM:SS format.(0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <= 59)
Design a Python Script to find the value of (Sine, Cosine, Log, PI, e) of a given number using infinite series of the function.
Design a Python Script to convert a given number to words
Design a Python Script to convert a given number to roman number.
Design a Python Script to generate the frequency count of words in a text file.
Design a Python Script to print a spiral pattern for a 2 dimensional matrix.
Design a Python Script to implement Gaussian Elimination method.
Design a Python script to generate statistical reports(Minimum, Maximum, Count, Average, Sum etc) on public datasets.
Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorising them into distinction, first class, second class, third class and failed.
Design a Python script on oop's concepts: Class variables and instance variable
i) Robot ii) ATM Machine
Virtual Lab: http://ps-iiith.vlabs.ac.in/
Any three programs must be submitted with result from the above link.

TEXT BOOKS:

1. Kenneth Lambert,"Fundamentals of Python: First Programs",ISBN-13: 978-1337560092,cengage learning publishers, first edition,2012.
2. Allen B. Downey, "think python: how to think like a computer scientist",ISBN-13: 978-1491939369,O'reilly, 2nd edition, 2016.
3. ReemaThareja, "Python Programming using Problem Solving Approach", ISBN-13:978-0-19-948017-3, Oxford University Press, 2017.

REFERENCE BOOKS:

1. Vamsikurama, "Python programming: A modern approach", ISBN-978-93-325-8752-6, pearson,2018.
2. Mark Lutz , "Learning python", ISBN: 1-56592-464-9,Orielly, 4th edition, 1999 .
3. W.Chun, "Core python programming", ISBN-13: 978-0132269933, pearson, 2nd edition, 2016.

WEB RESOURCES:

1. https://raptor.martincarlisle.com/
2. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
3. https://zhanxw.com/blog/wp-content/uploads/2013/03/BeautifulCode_2.pdf
4. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
5. https://www.cse.msu.edu/~stockman/ITEC/Scratch/BGC2011Scratch-Rev1.pdf
6. https://nostarch.com/scratchplayground
7. http://fusecontent.education.vic.gov.au/9f79537a-66fc-4070-a5ce-e3aa315888a1/scratchreferenceguide14.pdf

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	0	0	40+40+20		100	MC(0)
Code :19BCC1MC01	ENVIRONMENTAL STUDIES (Common to all Branches)						

COURSE OBJECTIVES:

1. To make the students aware about the environment and it's inter–disciplinary, to familiarize the concept of ecosystem and their importance, basic understanding of the ecosystem and its diversity.
2. Overall understanding of the natural resources.
3. To bring the awareness among students about the importance of biodiversity and the need for its conservation.
4. To make the students understand the adverse effects of environmental pollution, its causes and measures to control it.
5. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities. Awareness on the social issues, environmental legislation and global treaties understanding the environmental policies and regulations.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Explain the concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web.

CO2: Analyze the natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources.

CO3: Explain the biodiversity of India and the threats to biodiversity, and conservation Practices to protect the biodiversity.

CO4: Distinguish various attributes of the pollution, their impacts and measures to reduce or control the pollution along with waste management practices.

CO5: Define Environmental policy, legislation, environmental assessment and the stages involved in EIA Environmental audit.

UNIT–I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness. Institutions and people in Environment.

Ecosystems:

Definitions and concepts – Characteristics of ecosystem – Structural and functional features – Producers, consumers and decomposers and food webs – Types of ecosystems – Forests, grassland, desert, crop land, pond, lake, river and marine ecosystems – Energy flow in the ecosystem – Ecological pyramids – Ecological successions.

UNIT–II

Natural Resources: Water resources–Use and over utilization of surface and natural resourced ground water–Floods, drought, conflicts over water, dams–benefits and problems on tribal population & Environment.

Forest resources: Use and over–exploitation, deforestation.

Mineral resources: Use and exploitation, tribal & environmental effects of extracting and using mineral resources.
Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer–pesticide problems, water logging, salinity–concept of sustainable agricultural methods.
Energy Resources: Renewable (wind energy, tidal energy) and non renewable energy resources (Fossil fuels, coal).

UNIT–III
Biodiversity: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity
Conservation of biodiversity: Threats to biodiversity: habitat loss, man wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity: In-Situ conservation and Ex- situ conservation.

UNIT–IV
Environmental Pollution and Control Technologies: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, and nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Good Agricultural Practices – Drip irrigation, soil erosion and desertification
Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT–V
Environmental Policy, Legislation and Environmental Management: Environmental ethics: Issues and possible solutions. Environmental Protection Act, Legal aspects -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.
Impact Assessment and its significance - various stages of EIA, preparation of EMP and EIS, Environmental audit, Ecotourism.
Visit to some local Polluted Site: Study of an industrially Polluted area.

TEXT BOOKS:
1. AnubhaKaushik& C. P. Kaushik, Environmental Studies,NewAge International (P) Ltd., New Delhi. Fourth edition,2014.
2. P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani,Environmental Studies, Pearson Education, Chennai.ISBN 978-93-325-2052-3,Secondedition-2014.

REFERENCE BOOKS:
1. Deekshita Dave & P. UdayaBhaskar, Text Book of Environmental Studies CengageLearning.
2. ShaashiChawla, a Textbook of Environmental Studies, TMH, NewDelhi.
3. Benny Joseph Environmental Studies, Tata McGraw Hill Co, NewDelhi.
4. Dr.K.V.S.G. Murali Krishna, Environmental Studies VGS Publishers, Vijayawada, First Edition2016.

5. Bharucha, E. Text book of Environmental Studies, First edition, Universities Press (India) Pvt., Ltd., Hyderabad,2005.

Web References:

1. URL:https://www.youtube.com/watch?v=7G3eXI_DPn8
2. URL: https://www.eolss.net/sample-chapters/C09/E6-70-05-01.pdf
3. URL: https://www.youtube.com/watch?v=QuRL6NbyvEQ
4. URL: https://google/ Introduction to Environmental Studies5JM1G2
5. URL:http://www.teacherspayteachers.com/Product/Food-Chains-Trophic-Levels-and-Ecological-Pyramids-PowerPoint Click the above
6. URL:http://iadc-dredging.com/en/371/environment/ecosystem-services/ this webinar will focus on the concept of ecosystem services
7. URL: http://mocomi.com/ presents: What is Air Pollution? Air pollution is the introduction of foreign products into the atmosphere.
8. URL: https://en.wikipedia.org/wiki/green_impact_assessment

E-books:

1. .https://faculty.psau.edu.sa/.../doc-5-pdf-d78456fce3bebc84d9320fa2f9cf9e2a-original https://www.researchgate.net/.../273775623_Introduction_to_Environmental_Sciences

I B.TECH. – II SEMESTER

S.No.	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	Communicative English-II	HS	40	60	100	2	-	-	2
2	Engineering Chemistry	BS	40	60	100	3	-	-	3
3	Differential Equations & Vector Calculus	BS	40	60	100	3	-	-	3
4	Network Analysis	ES	40	60	100	3	-	-	3
5	Business Management Concepts for Engineers	HS	40	60	100	3	-	-	3
6	C Programming	ES	40	60	100	3	-	-	3
7	Engineering Chemistry Lab	BS	20	30	50	-	-	3	1.5
8	C Programming Lab	ES	20	30	50	-	-	3	1.5
9	Electronic Workshop & IT Workshop	ES	20	30	50	-	-	3	1.5
10	Constitution of India	MC	-	-	-	3	-	-	-
Total			**300**	**450**	**750**	**20**	**-**	**9**	**21.5**

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	0	0	40	60	100	2
Code: 19BCC2TH01	COMMUNICATIVE ENGLISH - II (Common to All Branches)						

COURSE OBJECTIVES:

1. To enable the engineering students develop their basic communication skills in English for academic and social purposes.
2. To equip the students with appropriate oral and written communication skills.
3. To enhance the skills of listening, reading and critical thinking.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Read for explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it. **(Applying- 3)**

CO 2: Compose paragraphs, essays as creative writing**.(Creating-5)**

CO 3: Build grammatically correct sentences using a variety of sentence structures.**(Applying-3)**

CO 4: Enhance word power and usage of lexicons.**(Applying-3)**

CO 5: Compile emails, letters, reports, resume and information transfer. **(Creating-5)**

UNIT–I

a. **Reading**: Rahul Bajaj
b. **Communication Skills -**Role and significance of communication, Features of Human Communication-
c. **Writing:** Emails and Letters
d. **Vocabulary**: Homonyms, Homophone and Homographs.

UNIT–II

a. **Reading:** Ratan Tata
b. **Communication Skills -**Process of Communication & types of Communication, barriers to communication
c. **Writing:** General Essay
d. **Vocabulary:** Words often confused, Suffixes & Prefixes

UNIT–III

a. **Reading:** Sabeer Bhatia
b. **Communication Skills -**Importance of Listening for effective communication, Interpersonal communication-
c. **Writing:** Note making
d. **Vocabulary:** Synonyms and Antonyms (100)

UNIT-IV

a. **Reading:** Steve Jobs
b. **Communication Skills -**Persuasion techniques
c. **Writing:** Resume
d. **Vocabulary:** One word substitutes (100)

UNIT-V

a. **Reading:**Sudha Murthy
b. **Communication Skills -**Telephone and Cell phone etiquette-
c. **Writing:** Report writing; types, format, style, sample reports
d. **Vocabulary:** Frequently usedIdioms (100)

TEXT BOOKS:

1. **"**Modern Trail Blazers", Orient Black Swan Pvt.Ltd.Publisher, 1st edition. 2013
2. E Suresh Kumar," Engineering English", Orient Black Swan Pvt. Ltd. Publishers.

REFERENCE BOOKS:

1. Raman, Meenakshi and Sangeetha Sharma, "Technical Communication:Principles and Practice", Oxford University Press, New Delhi. 2015.
2. Rutherford, Andrea. J Basic Communication Skills for Technology. Pearson, New Delhi. 2001
3. Raymong Murphy, "Murphy's English Grammar", Cambridge University Press 2004.
4. Sanjay Kumar, PushpaLatha, "Language and Communication Skills for Engineerers", Oxford University Press, 2018.

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC2TH03	ENGINEERING CHEMISTRY (Common to Civil, ME and ECE)						

COURSE OBJECTIVES:

1. To analyze water for its various parameters and its significance in industrial and domestic allocations.
2. To acquire the knowledge on types of polymers, fuels and their applications.
3. To provide information on exciting advanced materials available in engineering.
4. To apply the electrochemical principles, understand the fundamentals of corrosion and development of different techniques in corrosion control.
5. To learn the importance of engineering materials used in daily life and industry.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Analyze the suitable method of water treatment depending on the quality treatment. -**Analyzing**

CO 2: Compare different types of polymers, fuels and their importance-**Analyzing**

CO 3: Utilize the advanced materials as engineering materials and apply them in domestic and industrial life-**Applying**

CO 4: Distinguish electrical energy sources and importance of corrosion science-**Analyzing**

CO 5: Identify different types of engineering materials and applications in engineering. -**Applying**

UNIT-I: WATER CHEMISTRY

Characteristics of water: Sources, Impurities–Hardness & its units–Industrial water characteristics– Softening of water by external treatment methods (Lime soda process, Zeolite and Ion exchange process)–Numerical problems on lime soda process–Desalination of brackish water (Reverse osmosis and Electrodialysis).

Water analysis techniques: Alkalinity–hardness (Complexo-metric)–Break point chlorination–Free chlorine–DO–BOD and COD.

UNIT-II: POLYMERS AND FUEL CHEMISTRY

Polymers: Introduction to polymers–Chain growth (free radical, ionic)–Step growth polymerization–Coordination polymerization–Copolymerization with specific examples–Thermoplastics and thermosets–Plastic moulding methods (Compression & Injection moulding)–Rubbers–Natural rubber–Processing–Vulcanization.

Fuels-Types of fuels–Calorific value–Numerical problems based on calorific value–Analysis of coal–Liquid fuels–Refining of petroleum–Cracking of heavy oil–Knocking and anti knocking agents–Octane and cetane values.

UNIT-III: CHEMISTRY OF ADVANCED MATERIALS

Nano materials: Introduction–Sol-gel method & Chemical reduction method of preparation – Characterization by BET method and TEM methods–Carbon nano tubes and fullerenes: Types–Preparation–Properties and Applications.

Liquid crystals: Introduction–Types–Applications.

Composite materials: Introduction–Definition–Types–Applications–Cermets.

UNIT-IV: ELECTROCHEMISTRY AND CORROSION

Electrochemistry: Galvanic cells–Single electrode potential–Reference electrodes–Electrochemical series–Batteries (primary, secondary and fuel cells)–Applications of secondary batteries in E-vehicles.

Corrosion: Causes and effects of corrosion–Theories of corrosion (chemical and electrochemical corrosion)–Factors effecting corrosion–Corrosion control methods–Cathode protection–Sacrificial anodic, Impressed current methods–Surface coatings–Methods of application on metals (Hot dipping, Galvanizing, Tinning, Cladding, Electroplating, Electroless plating)–Organic surface coatings–Paints–Constituents and their functions–Pigment Volume Concentration.

UNIT-V: CHEMISTRY OF ENGINEERING MATERIALS

Lubricants: Introduction–Mechanism of lubrication–Classification of lubricants–Properties and testing of lubricating oils.

Cement & Refractories: Manufacture–Setting and hardening of cement–Failures of cement–Slag cement–Refractory: Introduction–Classification and properties of refractories.

TEXT BOOKS:

1. ShikhaAgarwal, "**Engineering Chemistry**", ISBN 1107476410, 2nd Edition, Cambridge University Press, New Delhi, (2019).
2. O.G. Palana, "**Engineering Chemistry**", ISBN 0070146101, Tata McGraw Hill Education Private Limited, New Delhi, (2009).
3. B. Rama Devi, Ch. VenkataRamana Reddy, Prashantharath, "**Text Book of Engineering Chemistry**", ISBN 9789353500511, Cenage Learning India Pvt. Ltd, (2016).

REFERENCE BOOKS:

1. P.C. Jain and M. Jain "**Engineering Chemistry**", ISBN 8187433175, 15/e, DhanpatRai& Sons, Delhi, (2015).
2. B.S Murthy and P. Shankar, "**A Text Book of NanoScience and NanoTechnology"**, University Press (2013).
3. K. SeshaMaheshwaramma and MridulaChugh, "**Engineering Chemistry"**, Pearson India Edn services, (2016).
4. S.S. Dara, "**ATextbook of Engineering Chemistry"**, ISBN 8121932645, S.Chand Publisher, (2010)

Web References:

1. URL: https://www.youtube.com/watch?v=CWOJW4357Bg
2. URL: https://www.youtube.com/watch?v=H1Y1oxQ5eUA&t=627s
3. URL: https://www.youtube.com/watch?v=1xWBPZnEJk8
4. URL: https://www.youtube.com/watch?v=p9yPXdT0k48&t=225s
5. URL: https://www.youtube.com/watch?v=xb_xndPe4n0&t=390s

E-Books:

1. "**Engineering Chemistry**" (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan.

I B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC2TH02	DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS (Common to Civil, EEE, ME and ECE)						

COURSE OBJECTIVES:

1. To formulate and solve first order ordinary differential equations.
2. To solve second order differential equations of various kinds.
3. To find the solution of first order linear and non-linear partial differential equations.
4. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Apply first order ordinary differential equations to real life situations.
CO 2: Identify and apply suitable methods in solving the higher order differential equations.
CO 3: Solve the partial differentiation equations.
CO 4: Interpret the physical meaning of different operators as gradient, curl and divergence.
CO 5: Estimate the work done against a field, circulation and flux using vector calculus.

UNIT-I: DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE

Linear-Bernoulli's-Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling, Law of natural growth and decay, Orthogonal trajectories, Electrical circuits.

UNIT-II: LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER

Finding the complementary functions, Inverse operator, Rules for finding the particular integrals, Method of variation of parameters.Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients. Application: L-C-R Circuit problems.

UNIT–III: FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS:

Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange's) equations.

UNIT-IV: VECTOR DIFFERENTIATION:

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

UNIT-V: VECTOR INTEGRATION:

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

TEXT BOOKS:

1. Dr. B.S. Grewal, "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, 2012.
2. Bhavanari Satyanarayana, Pradeep Kumar T.V. &Srinivasulu D, "Linear Algebra and Vector Calculus", Studera Press, New Delhi, 2017.

REFERENCE BOOKS:

1. Kreyszig E, "Advanced Engineering Mathematics", 8th Edition, John Wiley, Singapore, 2001.
2. Greenberg M D, "Advanced Engineering Mathematics", 2nd Edition, Pearson Education, Singapore, Indian Print, 2003.
3. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage Learning, 2011.
4. N.P. Bali, BhavanariSatyanarayana, IndraniPromodKelkar, "Engineering Mathematics", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC2TH04	NETWORK ANALYSIS						

COURSE OBJECTIVES:

1. To make understand the concepts of Electric Circuits, Network Theorems and the transients.
2. To impart the concept of steady state and applying phasor analysis to AC circuits and analysing magnetic coupled circuits.
3. To familiarize resonant circuits, two port network parameters.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Classify the basics of electrical circuits with nodal, mesh analysis and network theorems.
CO 2: Analyze the phasor representation for ac circuits and magnetic coupled circuits.
CO 3: Demonstrate the concept of RLC circuits with sinusoidal excitation
CO 4: Describe resonance circuits, two port network parameters and their interconnections
CO 5: Apply Laplace Transform for transient analysis of RLC circuits

UNIT–I: NTRODUCTION TO ELECTRICAL CIRCUITS

Electric charge and current, Electric energy and potential, Network elements classification, Energy sources: Ideal, Non-ideal, Independent and dependent sources, Source transformation, Y to Δ & Δ to Y conversion, Problem solving using Kirchhoff‘s laws, Mesh analysis and Nodal analysis.

UNIT–II: A.C. FUNDAMENTALS

Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor, Phase angle, Phasor representation, Addition and subtraction of phasors. Concept of self, mutual inductance, co-efficient of coupling, dot convention rules and analysis of simple circuits – simple problems.

UNIT–III: STEADY STATE ANALYSIS OF A.C. CIRCUITS & THEOREMS

Response to sinusoidal excitation - pure resistance, pure inductance, pure capacitance, impedance concept, series RL, RC and RLC circuits, parallel RL, RC and RLC with complex impedance and phasor notation. Thevinin‘s, Norton‘s, Superposition, Max Power Transfer theorems, simple problems.

UNIT–IV: RESONANCE & TWO PORT NETWORKS

Series resonance, Parallel resonance, concept of band width and Q factor. Z-parameters, Y parameters, Transmission line parameters, H-parameters, Relationship between parameter sets.

UNIT–V: TRANSIENT ANALYSIS

First order differential equations, homogeneous and non-homogeneous equations, evaluating initial conditions, RL circuit, RC circuit with DC excitation, second order differential equations, applications of Laplace transform to electrical circuits, problem only on DC excitation.

TEXT BOOKS:

1. M E Van Valkenburg, “Network Analysis “, 3rd Edition, Prentice Hall of India, 2000.
2. K. Satya Prasad and S Sivanagaraju, “Network Analysis”, Cengage Learning
3. William Hayt and Jack E.Kimmarle, “Engineering Circuit Analysis”, 6 thEdition , TMH.

REFERENCE BOOKS:

1. C.L.Wadhwai, “Network Analysis and Synthesis”, 4th edition, New Age Publications, 2016.
2. Sudhakar. A. and Shyammohan, S. P., “Circuits and Network”, Tata McGraw-Hill New Delhi, 1994.

WEB REFERENCES:

1. URL: https://nptel.ac.in/courses/106105154/2
2. URL : https://nptel.ac.in/courses/117106108/

E-Books:

1. http://hguywilliams.net/images/documents/library/Elec/bec.pdf

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC2TH05	BUSINESS MANAGEMENT CONCEPTS FOR ENGINEERS						

COURSE OBJECTIVES:

1. To provide an insight into the various economic concepts which are necessary for taking decisions related to economic aspects of the organization.
2. To provide familiarity with the accounting concepts which will help in preparation of various accounting records
3. To equip the student with the basic management concepts and functions and to provide knowledge relating to recruitment, selection, training, and motivation of employees in the organization

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO1: Summarize fundamentals of Managerial economics for decision making (K2).
CO2: Apply concepts of Financial Accounting and BEP for business decisions (K3).
CO3: Evaluate fundamental concepts and principles of management (K5).
CO4: Discuss functional areas of management like HR, marketing and finance (K6).
CO5: Apply project management techniques for project planning and evaluation (K3).

UNIT-I: INTRODUCTION TO MANAGERIAL ECONOMICS

Definitions, - Nature And Scope- Relation With Other Subjects- Demand Definition- Determinants- Law of Demand and Its Exceptions- Concept of Elasticity of Demand- Cost Concepts- CVP Analysis (With Simple Problems), Significance- Limitations.

UNIT-II: MARKET STRUCTURES AND FINANCIAL ACCOUNTING

Introduction to Markets – Features of various markets-Perfect competition, Monopoly and Oligopoly. Definition – Importance, limitations and basic books of financial accounting, Preparation of basic books of accounting: journal, ledger and trail balance.

UNIT-III: INTRODUCTION TO MANAGEMENT

Concept, Nature, Importance- Functions of Management- Henry Fayols Principles of Management- F.W.Taylors Scientific Management- Douglas McGregors Theory X and Y.

UNIT-IV: FUNCTIONAL AREAS OF MANAGEMENT

Concept of HRM, Functions of HR Manager- Marketing Management- Functions of Marketing Manager- Production Management-Functions of Production Management – Financial Management and functions of Financial Management.

UNIT-V: PROJECT MANAGEMENT: (PERT/CPM)

Development of Network – Difference between PERT and CPM- Problems on Critical Path- Problems on PERT Analysis.

TEXT BOOKS:

1. Dr. N. Apparao and Dr. P. Vijay Kumar: "Managerial economics and financial analysis" Cengage publication's, New Delhi-2011.
2. Dr. A. R. Aryasri- Managerial Economics and Financial Analysis, TMH2011.
3. V. Maheswari: Managerial Economies, Sultan Chand.
4. Suma Damodaran: Managerial Economics, Oxford 2011.
5. Koontz &Weihrich: Essentials of Management" TMH 2011.

REFERENCE BOOKS:

1. Managerial economics theory & applications, DM Mithani, Himalaya Publishing House, 2013. - **Unit-1, 2**
2. Accounting For Managers, G. Prasad, Jaibharath Publishers, 2016. - **Unit-3**
3. Dr. P. Vijaya Kumar &Dr. N. AppaRao," Management Science" cengage. Delhi, 2012. - **Unit-4, 5**
4. ProjectPlanning & Control with PERT & CPM, BC Punmia& KK Khandelwal, Lakshmi Publications, New Delhi, 4th Edition – 2016. - **Unit-5**

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	-	40	60	100	3
Code: 19BEC2TH06	C PROGRAMMING						

COURSE OBJECTIVES:

1. To know the basic problem solving process using Flow Charts and algorithms.
2. To understand the basic concepts of control structures in C.
3. To learn concepts of arrays, functions, pointers and Dynamic memory allocation in C.
4. To use the concepts of structures, unions, files and command line arguments in C.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1: Develop algorithms and flow charts for simple problems [K3].
CO2: Utilize suitable control structures for developing code in C [K3].
CO3: Make use of functions and arrays in developing modular programs [K3].
CO4: Make use of structures and pointers to write well-structured programs [K3].
CO5: Make use of file Operations in C programming for a given application [K3].

SYLLABUS

UNIT I: INTRODUCTION TO ALGORITHMS AND PROGRAMMING LANGUAGES

Algorithm – Key features of Algorithms – Some more Algorithms – Flow Charts – Pseudo code – Programming Languages – Generation of Programming Languages – Structured Programming Language **Introduction to C:** Introduction – Structure of C Program – Writing the first C Program -Compiling and Executing C Programs - Using Comments – Keywords – Identifiers – Basic Data Types in C – Variables – Constants – I/O Statements in C - Operators in C - Programming Examples – Type Conversion and Type Casting.

UNIT II: DECISION CONTROL AND LOOPING STATEMENTS

Introduction to Decision Control Statements – Conditional Branching Statements – Iterative Statements – Nested Loops – Break and Continue Statement – Goto Statement.

Functions: Introduction – using functions – Function declaration/ prototype – Function Definition – function call – return statement – Passing parameters – Scope of variables – Storage Classes – Recursive functions – Recursion vs Iteration.

UNIT III: ARRAYS

Introduction – Declaration of Arrays – Accessing elements of the Array – Storing Values in Array – Calculating the length of the Array – Operations on Array — Two Dimensional Arrays –Operations on Two Dimensional Arrays.

Strings: Introduction – Reading Strings – Writing Strings – String Manipulation functions - Array of Strings.

UNIT IV: POINTERS

Introduction to Pointers – declaring Pointer Variables – Pointer Expressions and Pointer Arithmetic – Null Pointers – Passing Arguments to Functions using Pointer, Dynamic Memory Allocation.

Structure, Union, and Enumerated Data Types: Introduction – Nested Structures –Arrays of Structures – Structures and Functions – Self-referential Structures – Union –Enumerated Data Types.

UNIT V: FILES

Introduction to Files – Using Files in C – Reading Data from Files – Writing Data To Files – Detecting the End-of-file – Error Handling during File Operations – Accepting Command Line Arguments – Functions for Selecting a Record Randomly - Remove () –Renaming a File – Creating a Temporary File

TEXT BOOKS:

1. ReemaThareja**, "**Programming in C**"**, First **edition,** OXFORDUniversity Press 2018.

REFERENCE BOOKS

1. ReemaThareja, "Introduction to C programming" OXFORD UNIVERSITY PRESS
2. Rachhpal Singh, "Programming in C", kalyani publishers
3. E Balagurusamy, "computing fundamentals & c programming", isbn 978-0-07- 066909-3, Tata McGraw-Hill, Second Reprint, 2008,
4. Ashok N Kamthane, "Programming with ANSI and Turbo C", Pearson Edition Publications, 2002.
5. Dennis Richie and Brian Kernighan, "The C programming Language", 2nd edition.

WEB REFERENCES:

1. http://cprogramminglanguage.net/
2. http://lectures-c.blogspot.com/
3. http://www.coronadoenterprises.com/tutorials/c/c_intro.htm
4. http://vfu.bg/en/e-Learning/Computer-Basics--computer_basics2.pdf

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
Code:19BCC2LB03	ENGINEERING CHEMISTRY LAB (Common to Civil, ME and ECE)						

COURSE OBJECTIVES:

1. To provide the students with a solid foundation in chemistry laboratory required to solve the engineering problems.
2. To expose the students in practical aspects of the theoretical concepts.
3. To train the students on how to handle the instruments.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Develop and perform analytical chemistry techniques to address the water related problems (hardness, alkalinity, Chlorine, DO)-**Creating**

CO 2: Explain the functioning of different analytical instruments-**Applying**

CO 3: Compare viscosity and surface tension of different oils-**Analyzing**

CO 4: Measure molecular/system properties such as strength of solutions, conductance of solutions and acid number of lubricating oils, etc-**Evaluating**

List of Experiments

Introduction to chemistry laboratory–Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis etc.

1. Estimation of NaOH using standard HCl solution
2. Determination of hardness of water sample by EDTA method
3. Determination of alkalinity of water sample
4. Determination of Dissolved Oxygen content of water sample by Winkler's method
5. Determination of Dissolved Chlorine by Mohr's method
6. Estimation of Fe^{+2} by using $KMnO_4$
7. Preparation of phenol formaldehyde resin/Urea formaldehyde
8. Conductometric titration between strong acid and strong base
9. Determination of viscosity of a liquid by Ostwald's viscometer
10. Determination of surface tension of a liquid by Stalagnometer
11. Determination of moisture content present in given coal sample
12. Determination of acid value of an oil

VIRTUAL LABS:

1. Soil Analysis- Determination of pH of soil
2. Water analysis - Determination of Physical parameters

TEXT BOOKS:

1. N.K Bhasin and Sudha Rani "**Laboratory Manual on Engineering Chemistry**" 3/e, DhanpatRai Publishing Company (2007).
2. Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B "**Vogel's Quantitative Chemical Analysis**" 6/e, Pearson publishers (2000).
3. Sudharani, "**Lab manual on Engineering Chemistry**" DhanpatRai Publications, Co., New Delhi. (2009).

Web Reference:

1. URL: https://vlab.amrita.edu

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
Code:19BEC2LB04	C PROGRAMMING LAB						

COURSE OBJECTIVE:

1. The purpose of this course is to introduce to students to the field of language. The students will be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.

COURSE OUTCOMES:

After completion of the course, students should be able to:

CO1: Analyze logical structure of computer programming and different constructs to develop programs in C Language [K4].

CO2: Compare and contrast various data types and operator precedence [K2].

CO3: Analyze the use of conditional and looping statements to solve problems associated with conditions and repetitions [K4].

CO4: Analyze simple data structures, use of pointers and dynamic memory allocation techniques [K4].

CO5: Make use of functions and file I/O operations in developing C Programs [K3].

Exercise l

Construct Flowcharts for the following through Raptor:

i) Develop a calculator to convert time, distance, area, volume and temperature from one unit to another.

ii) Calculate simple and compound interest for various parameters specified by the user.

iii) Calculate the average of n numbers.

Exercise 2

a) Write a C Program to calculate the area of triangle using the formula Area $=(s*(s-a)*(s-b)*(s-c))^{1/2}$ where s= (a+b+c)/2.

b) Write a C Program to find the largest of three numbers using ternaryoperator.

c) Write a C Program to swap two numbers without using a temporaryvariable.

Exercise 3

a) Write a C program to find the roots of a quadraticequation.

b) Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Exercise 4

a) Write a C program to find the sum of individual digits of a positive integer and find the reverse of the givennumber.

b) Draw a flow chart using Raptor and write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by theuser.

Exercise 5

a) Draw a flow chart using Raptor and write a C Program to print the multiplication table of a given number n up to a given value, where n is entered by theuser.
b) Write a C Program to enter a decimal number, and calculate and display the binary equivalent of thatnumber.
c) Write a C Program to check whether the given number is Armstrong number ornot.

Exercise 6

a) Write a C program to interchange the largest and smallest numbers in thearray.
b) Write a C program to input two m x n matrices, check the compatibility and perform addition and multiplication ofthem.

Exercise 7

a) Draw a flow chart using Raptor and write a C Program to find both the largest and smallest number of an array ofintegers
b) Write a C Program to find transpose of amatrix.

Exercise 8

Draw a flow chart using Raptor and write C programs that use both recursive and non-recursive
Functions for the following
i) To find the factorial of a giveninteger.
ii) To find the GCD (greatest common divisor) of two givenintegers.

Exercise 9

a) Draw a flow chart using Raptor and write a C Program for the following To find Fibonaccisequence
b) Write C programs illustrating call by value and call by referenceconcepts.

Exercise 10

Write C Programs for the following string operations without using the built in functions - to concatenate two strings
a) To append a string to anotherstring
b) To compare twostrings

Exercise 11

Write C Programs for the following string operations without using the built in functions
a) To find whether a given string is palindrome ornot

Exercise 12

Write a C program that uses functions to perform the following operations:
i. To insert a sub-string in to given main string from a givenposition.
ii. To delete n Characters from a given position in a givenstring.

iii. To replace a character of string either from beginning or ending or at a specifiedlocation

Exercise 13

a) Write a C Program to Implement Taylor series method
b) Write a C Program to Implement Euler's method
c) Write a C Program to Implement RungeKutta method

Exercise 14

a) Draw a flow chart using Raptor and write a C program to implement a linearsearch.
b) Draw a flow chart using Raptor and write a C program to implement binarysearch
c) Write a C program to implement sorting of an array ofelements.

Exercise 15

a) Write C Program to reverse a string usingpointers
b) Write a C Program to compare two arrays usingpointers
c) Write a C program to swap two numbers usingpointers

Exercise 16

Examples which explores the use of structures, union and other user defined variables

Exercise 17

a) Write a C program which copies one file toanother.
b) Write a C program to count the number of characters and number of lines in afile.
c) Write a C Program to merge two files into a third file. The names of the files must be entered using command linearguments.

Exercise 18

Virtual Lab: http://cse02-iiith.vlabs.ac.in//
Any three programs must be submitted with result from the above link.

*** At the end of the semester the student has to submit a Mini-Project on Computer Programming. The list of Mini-Projects is available in the department.**

TEXT BOOKS:

1. ReemaThareja, " Programming in C", Oxford.
2. The C programming Language by Dennis Richie and Brian Kernighan 2nd ed.

EFERENCE BOOKS:

1. Dr.E.Balaguruswamy, "Programming in ANSI C", Tata McGraw-HillEducation.
2. Hanly, "Problem Solving and Program Design in C", Koffman, 7th ed,Pearson.
3. Forouzan, Gilberg, Prasad ,"C Programming, A Problem Solving Approach",Cengage.
4. Programming in C, Second Edition by Ashok N.Kamthane,Pearson.

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
Code: 19BEC2LB05	ELECTRONIC WORKSHOP & IT WORKSHOP						

COURSE OBJECTIVES:

1. Enabling the student to understand basic electronic components, measuring instruments, and computer hardware and software tools through practical exposure.
2. Enabling the student to understand basic hardware and software tools through practical exposure.

COURSE OUTCOMES:

After completion of this course, the student should be able to

CO1: Discuss different passive components and active devices used in laboratory.
CO2: Identify different measuring instruments used in laboratory.
CO3: Demonstrate the need of PC hardware components, applications, World Wide Web, Search engines and software.
CO4: Experiment with the installation and use of different software like Windows XP, Linux
CO5: Make use of various options in Microsoft word, Excel, and Power point

PART A: ELECTRONIC WORKSHOP

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards. Introduction to surface mount devices and Solar panels.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

PART B: IT WORKSHOP

PC Hardware:

Identification of basic peripherals, assembling a PC, installation of system software like MS Windows, device drivers, Trouble shooting Hardware and Software, some tips and tricks.

Internet & World Wide Web:

Different ways of hooking the PC on to the internet from home and workplace and effectively use the internet, web browsers, email, newsgroups and discussion forums. Awareness of cyber hygiene protecting the personal computer from getting infected with the viruses, worms and other cyber-attacks.

Productivity tools: Crafting professional word documents; excel spread sheets, power point presentations and personal websites using the Microsoft suite of office tools.

PC Hardware

Task 1: Identification of the peripherals of a computer. To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions.Description of various I/O Devices.

Task 2: A Practice on disassembling the components of a PC and assembling them to back to working condition.

Task 3: Examples of Operating Systems- DOS, MS Windows, and Installation of MS windows on a PC

Task 4: Introduction to Memory and Storage Devices, I/O Port, Device Drivers, Assemblers, Compilers, Interpreters, Linkers, Loaders.

Task 5: Hardware Troubleshooting Demonstration: Identification of a problem and fixing a defective PC (improper assembly) or defective peripherals.

Software Troubleshooting Demonstration: Identification of problem and fixing the PC for any software issues.

Internet & Networking Infrastructure

Task 6: Demonstrating Importance of Networking, Transmission Media, Networking Devices-Gateway, Routers, Hub, Bridge, NIC, Bluetooth technology, Wireless Technology, Modem, DSL, and Dialup Connection.

Orientation & Connectivity Boot Camp and Web Browsing: Students are trained to configure the network settings to connect to the Internet. They are trained to demonstrate the same through web browsing (including all tool bar options) and email access.

Task 7: Search Engines & Netiquette:

Students are enabled to use search engines for simple search, academic search and any other context based search (Bing, Google etc).Students are acquainted to the principles of micro-blogging, wiki, collaboration using social networks, participating in online technology forums.

Task 8: Cyber Hygiene (Demonstration) : Awareness of various threats on the internet. Importance of Security patch updates and Anti-Virus solution Ethical Hacking, Firewalls, Multi-factors authentication techniques including Smart card Biometrics and also practiced

WORD

Task 9: MS Word Orientation: Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting, Drop Cap, Applying Text effects, Using Character Spacing, OLE in Word, using templates, Borders and Colors, Inserting Header and Footer, Using Date and Time option, security features in word, converting documents while saving.

Task 10 : Creating Project : Abstract Features to be covered:-Formatting Styles, Inserting Table, Bullets and Numbering, Changing Text Direction, Cell alignment, footnote, Hyperlink, Symbols, Spell Check, Track Changes, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

Task 10A: Create a document using Google Docs, Create a Survey Form using Google Forms, Create a document using Google Docs with voice typing, Translate Document from one language to another language.

EXCEL

Task 11: Using spread sheet features of EXCEL including the macros, formulae, pivot tables, graphical representations.

Creating Scheduler - Features to be covered:-Gridlines, Format Cells, Summation, auto fill, Formatting Text.

LOOKUP/VLOOKUP

Task 12: Performance Analysis: Features to be covered:-Split cells, freeze panes, group and outline, Sorting, Boolean and Logical operators, Conditional Formatting.

POWER POINT

Task 13: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes:- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting –Images, Clip Art, Tables and Charts in PowerPoint.

Task 14: Focusing on the power and potential of Microsoft power point Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes:- Master Layouts (slide, template and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background , textures, Design Templates, Hidden slides, OLE in PPT.

Task 14A: Create a Power point Presentation with audio recording and video recording, Create an animation video using Plotogon Tool.

TEXT BOOKS:

Faculty to consolidate the workshop manuals using the following references.

1. Anita Goel , Computer Fundamentals, Pearson
2. Scott. Mueller QUE , Scott Mueller's Upgrading and Repairing PCs, 18/e, Pearson, 2008

REFERENCE BOOKS:

1. Dr.N.B.Venkateswarlu, Essential Computer and IT Fundamentals for Engineering and Science Students.
2. G Praveen Babu, M V Narayana, "Information Technology Workshop", BS Publications, 3e
3. Vikas Gupta, "Comdex Information Technology", Dreamtech.

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	-	-	-	-
Code: 19BCC2MC01	CONSTITUTION OF INDIA						

COURSE OBJECTIVES:

1. To train students in understanding the basic structure of Indian Constitution
2. To aware the students about the role of constitution in a democratic society
3. To prepare students to live better and happily with other fellow beings through the application of Fundamental Rights in their lives.
4. To know about the powers of Union Government and State Government

COURSE OUTCOMES:

After completion of this course, the student should be able to

CO1: Examine salient features of Indian Constitution and live accordingly in society & interpret the meaning of Fundamental Rights of State Policy

CO2: Discover various aspects of Union Government legislation and live up to the expectations of the rules.

CO3: Critically examine State Government legislation and improve your living standards by following the rules strictly

CO4: Examine powers and functions of local bodies such as Municipalities and Panchayats and, take advantage of available resources for better living

CO5: Analyze the powers and functions of Election Commission and The Union Public Service Commission and decide upon it for safe and secured life.

UNIT-I: INTRODUCTION TO INDIAN CONSTITUTION & FUNDAMENTAL RIGHTS

Meaning of the term Indian Constitution –Preamble- Constituent Assembly- Salient Features of Indian Constitution. Fundamental Rights -Fundamental Duties -The Directive Principles of State Policy.

UNIT-II: UNION GOVERNMENT

Union Government -Union Legislature (Parliament) -LokSabha and RajyaSabha (with Powers and Functions) -Union Executive -President of India (with Powers and Functions) -Prime Minister of India (with Powers and Functions) -Union Judiciary (Supreme Court) -Jurisdiction of the Supreme Court

UNIT-III: STATE GOVERNMENT

State Government -State Legislature (Legislative Assembly / VidhanSabha, Legislative Council / VidhanParishad) -Powers and Functions of the State Legislature -State Executive-Governor of the State (with Powers and Functions) -The Chief Minister of the State (with Powers and Functions) -State Judiciary (High Courts)

UNIT-IV: LOCAL SELF GOVERNANCE

Powers and functions of Municipalities, Panchyats, ZP's and Co – Operative Societies

UNIT-V: SOVEREIGN BODIES

Election Commission of India (with Powers and Functions) -The Union Public Service Commission (with Powers and Functions)

TEXT BOOKS:

1. Introduction to constitution of India, Durga Das Basu, Lexis Nexis Publications
2. Constitution of India by Professional Book Publishers
3. The Constitution of India by Arun K Tiruvengadam, Blooms bury publishers.
4. The constitution of India by PM Bakshi, Universal law publishing co
5. The Constitution of India by S.R. Bhansali, Universal law publishing co

II B.TECH. – I SEMESTER

S.No.	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	Numerical Methods & Complex Variables	BS	40	60	100	3	-	-	3
2	Electronic Devices and Circuits	PC	40	60	100	3	-	-	3
3	Signals and Systems	PC	40	60	100	3	-	-	3
4	Internet of Things	ES	40	60	100	3	-	-	3
5	Data Structures	ES	40	60	100	3	-	-	3
6	Electronic Devices and Circuits Lab	PC	20	30	50	-	-	3	1.5
7	Signals and Systems Lab	PC	20	30	50	-	-	3	1.5
8	IOT Lab	ES	20	30	50		-	3	1.5
9	Data Structures Lab	ES	20	30	50	-	-	3	1.5
10	Quantitative Aptitude and Reasoning	MC	-	-	-	3	-	-	-
Total			**280**	**420**	**700**	**18**	**-**	**12**	**21**

II B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC3TH01	NUMERICAL METHODS AND COMPLEX VARIABLES						

COURSE OBJECTIVES:

1. To elucidate the different numerical methods to solve nonlinear algebraic equations.
2. To propagate the use of different numerical techniques for carrying out numerical integration.
3. To analyze the function of complex variable and its analytic property with a review of elementary complex function.
4. To get the knowledge of the Taylor and Laurent expansion with their use in finding out the residue and improper integral.

COURSE OUTCOMES:

After successful completion of the course, the students should be able to

CO1: Evaluate approximating roots of polynomials and transcendental equations by different algorithms.

CO2: Apply Newton's forward backward and Lagrange's interpolation for equal and unequal intervals.

CO3: Apply different algorithms for approximating solutions of ordinary differential equation to its analytical computations.

CO4: Determine harmonic function, velocity potential and stream lines in fluid flow systems.

CO5: Evaluate a contour integral and definite integral involving exponential, sine and cosine functions.

UNIT-I: ITERATION METHODS

Solution of Algebraic and Transcendental Equations: Introduction- Bisection method, Method of False position, Iteration method, Newton-Raphson method (One variable and simultaneous Equations).

UNIT-II: INTERPOLATION

Interpolation: Introduction- Errors in polynomial interpolation – Finite differences- Forward differences- Backward differences –Central differences – Symbolic relations and separation of symbols - Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unequal intervals – Newton's divided difference formula, Lagrange's interpolation formula.

UNIT-III: NUMERICAL SOLUTIONS OF ODE AND INTEGRATION

Numerical Differentiation, Ordinary differential equations-Taylor's series, Euler and modified Euler's methods.Runge-Kutta method of fourth order for solving first and second order equations. Numerical integration- trapezoidal rule and Simpson's 1/3rd and $3/8^{th}$ rules.

UNIT-IV: FUNCTIONS OF COMPLEX VARIABLES

Limit and Continuity of f(z), Derivative of f(z), Cauchy-Riemann equations (without proof), analytic functions, harmonic functions, Orthogonal system. Application: Flow problems.

UNIT-V: COMPLEX INTEGRATION

Integration of Complex functions, Cauchy theorem (without proof), Cauchy integral formula (without proof), Series of complex terms, Taylor's series, Laurent's series, zeros and singularities of analytic functions, residues and residue theorem(without proof), Calculation of residues.
Applications: Evaluation of real definite integrals (Integration around the semi circle and Unit Circle)

TEXT BOOK:

1. B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publisher.

REFERENCE BOOKS:

1. N.P. Bali, BhavanariSatyanarayana, IndraniPromodKelkar, "Engineering Mathematics", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGrawhill.
3. ErwynKreyszig, Advanced Engineering Mathematics, 9thEditiwiley-India.
4. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage Learning, 2011.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC3TH02	ELECTRONIC DEVICES AND CIRCUITS						

COURSE OBJECTIVES:

1. Analyze the operation and principles of P-N diode.
2. Examine various types of Special diodes, rectifiers and filters.
3. Identify the working of BJT.
4. Analyze the need for transistor biasing and stabilization.
5. Identify the working of FET and other Transistors.

COURSE OUTCOMES:

After completion of the course, students will be able to

CO1: Use P-N diodes in electronic circuits.
CO2: Use special diodes and rectifiers in electronic circuits.
CO3: Explore the operation of BJT and its applications.
CO4: Analyse the thermal stability of BJT.
CO5: Explore the operation of FET, other transistors and their applications.

SYLLABUS:

UNIT-I: PN JUNCTION DIODE CHARACTERISTICS

Insulators, Semiconductors and Metals–Classification using Energy gap, Intrinsic and Extrinsic Semiconductors. P-N Junction Diode - Formation of P-N Junction, Open Circuited P-N Junction, Biased P-N Junction - Forward Bias, Reverse Bias, Current Components in PN Junction Diode, Law of Junction, Diode Current Equation - Quantitative Analysis, V-I Characteristics of Diode - Forward Bias, Reverse Bias, Breakdown in P-N Junction Diode, Temperature Dependence on V-I Characteristics, Diode Resistance-Static Resistance, Dynamic Resistance, Reverse Resistance, Diode Capacitance - Transition Capacitance, Diffusion Capacitance, Energy Band Diagram of PN Junction Diode.

UNIT-II: SPECIAL DIODES AND RECTIFIERS

SPECIAL DIODES: Zener Diode - V-I Characteristics, Applications, Breakdown Mechanisms - Zener Breakdown and Avalanche Breakdown, Construction, Operation, Characteristics and applications of LED, LCD, Photodiode, Varactor Diode and Tunnel diode.

RECTIFIERS: Basic Rectifier setup, Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Inductive and Capacitive Filters, L– Section and π- Section, Derive and compare rectifier parameters with and without filter.

UNIT-III: BIPOLAR JUNCTION TRANSISTOR (BJT)

Bipolar Junction Transistor – Types, Symbols and Operation, Transistor Current Components, Transistor Equation - Relation among I_C, I_B, I_{CBO}, Transistor Configurations - CB, CE and CC, Transistor as a switch, Transistor switching times, Transistor as an Amplifier.

Characteristics of Transistor in Common Base Configuration, Common Emitter and Common Collector Configurations - Input and output characteristics, Early effect, Transistor parameters, Current amplification factor, Relation among α, β, and γ, Comparison of CB, CE and CC Configurations, Punch Through/ Reach through, Typical transistor junction voltage values, Photo Transistor.

UNIT-IV: BJT BIASING AND THERMAL STABILITY

Need For Biasing, Operating Point, Load Line Analysis - D.C. Load Line, A.C. Load Line, Biasing - Methods, Basic Stability, Fixed Bias, Collector-to-base Bias and Self Bias, Stabilization against variations in VBE, Ic and β, Stability Factors S, S' and S'', Bias Compensation - Thermistor, Sensistor, Diode Compensation for variation in ICO, Thermal Runaway, Thermal Stability.

UNIT-V: FET & OTHER TRANSISTORS

FET Types and Symbols - JFET and MOSFET/IGFET, JFET: N- Channel and P-Channel Construction, Operation, Characteristics - Drain and Transfer, Parameters - Drain Resistance, Amplification factor, Transconductance, Pinch-off voltage, MOSFET - Types - Depletion MOSFET - N Channel and P Channel, Enhancement MOSFET - N-Channel and P-Channel, Construction, Operation, Characteristics - Transfer and Drain Characteristics for Depletion and Enhancement Modes , Comparison between JFET and MOSFET.

SCR- Symbol, Two-Transistor version, UJT - Negative Resistance Property and Applications.

TEXT BOOKS:

1. J. Millman, C. Halkias, "Electronic Devices and Circuits", Tata McGraw-Hill, Third edition, 2010.
2. Allen Mottershed, "Electronic Devices and Circuits", PHI, 2011.
3. Salivahanan, N. Suresh Kumar, A. Vallavaraj, "Electronic Devices and Circuits" Tata McGraw-Hill, Second Edition, 2008.

REFERENCE BOOKS:

1. Jacob Millman, C. Halkies, C.D. Parikh, SatyabrataJit, "Integrated Electronics", Tata McGraw-Hill, Second Edition, 2011.
2. R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Publications, Eleventh Edition, 2013.
3. A.P. Godse and U.A. Bakshi, "Electronic Devices and Circuits", Technical Publications, First Edition, 2009.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC3TH03	SIGNALS AND SYSTEMS						

COURSE OBJECTIVES:

1. To explain about signals and perform various operations on it.
2. To build Trigonometric and Exponential Fourier series of various signals.
3. To develop Fourier transforms for various signals.
4. To solve Laplace transforms and z-transforms for various signals.
5. To summarize the principle, filter characteristics, band width of a LTI Systems and concepts of sampling.

COURSE OUTCOMES:

After completion of this course, the students will be able to

CO1: Define basic signals and its operations.
CO2: Identify Trigonometric and Exponential Fourier Series of signals.
CO3: Develop Fourier Transforms for various signals.
CO4: Solve Laplace Transform and z-Transform for various signals.
CO5: Compare LTI system responses for different inputs and illustrate sampling concepts.

SYLLABUS:

UNIT- I: SIGNAL ANALYSIS

Classification of Signals: Analog, Discrete, Digital, Deterministic & Random, Periodic & Aperiodic, Even & Odd, Energy & Power signals. Basic Operations on Signals: Time-Shifting, Time-Scaling, Time-Reversal, Amplitude Scaling and Signal Addition. Elementary Signals: Unit Step, Unit Ramp, Unit Parabolic, Impulse, Sinusoidal function, Exponential function, Gate function, Triangular function, Sinc function and Signum function. Signal approximation using orthogonal functions, Mean square error, Orthogonality in complex functions.

UNIT- II: FOURIER SERIES

Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet conditions, Trigonometric Fourier Series and Exponential Fourier Series, Conversion of Exponential Fourier Series from Trigonometric Fourier series.

UNIT- III: FOURIER TRANSFORMS

Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of periodic signals.

Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform.

UNIT- IV: LAPLACE TRANSFORMS AND Z- TRANSFORMS

Laplace Transforms: Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of Region of Convergence (ROC), Constraints on ROC for various classes of signals, Properties of Laplace transforms, Relation between Laplace transform and Fourier transform.

Z-Transforms: 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.

UNIT-V: SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS & SAMPLING

Signal transmission through linear systems: System and its types: Linear & Non-Linear, Time Variant & Time Invariant, Causal & Non Causal, Static & Dynamic, Stable & Unstable. Impulse response of a linear time invariant (LTI) system and linear time variant (LTV) system, Transfer function of a LTI system, Filter characteristics of linear systems, Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF and its characteristics.

Sampling: Sampling theorem, Types of Sampling: Impulse Sampling, Natural and flattop Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing.

TEXT BOOKS:

1. B.P. Lathi, "Signals, Systems and Communications", BS Publications, 2008.
2. Simon Haykin and Van Veen, Wiley, "Signals and Systems", Second Edition, 2003.

REFERENCE BOOKS:

1. A.V. Oppenheim, A.S. Will sky and S.H. Nawab, "Signals and Systems", PHI, Second Edition, 2013.
2. Ramesh Babu, "Signals and Systems", SciTech Publications, Third Edition, 2011.
3. A. Anand Kumar, "Signals and Systems", PHI Publications, Third Edition, 2013.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC3TH04	INTERNET OF THINGS						

COURSE OBJECTIVES:

1. To build interconnection and integration of the physical world and the cyber space.
2. To demonstrate applications of Internet of Things
3. To develop building blocks and characteristics of Internet of Things
4. To define communication protocols used in Internet of Things
5. To examine design & develop IoT devices.

COURSE OUTCOMES:

After completion of this course, the students will be able to

CO1: Examine the application areas of IoT
CO2: Illustrate revolution of Internet in Mobile Devices, Cloud & Sensor Networks
CO3: Examine communication protocols used in IoT
CO4: Make use of python programming to implement Internet of Things
CO5: Design IoT applications using Raspberry Pi

SYLLABUS:

UNIT-I: INTRODUCTION & CONCEPTS

Introduction to Internet of Things, Physical design of IoT, Logical design of IoT, IoT enabling Technologies, IoT levels.

UNIT-II: DOMAIN SPECIFIC IOT'S

Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.

UNIT-III: IOT &M2M

M2M, Difference between IOT and M2M, SDN and NFV for IOT.
Software defined Networking, Network Function Virtualization.

UNIT-IV: M2M & SYSTEM MANAGEMENT WITH NETCONF-YANG

Need for IOT Systems Management, Simple Network Management Protocol, Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systems management with NETCONF-YANG.

UNIT-V: IOT PHYSICAL DEVICES & ENDPOINTS

What is an IOT Device, Exemplary Device, Board, Linux on Raspberry Pi, Interfaces, and Programming with Python, Python web application framework – Django, Designing a Restful web API.

TEXT BOOKS:

1. Vijay Madisetti, ArshdeepBahga, Internet of Things A Hands-On- Approach,2014.

REFERENCE BOOKS:

1. Matt Richardson & Shane Wallace, Getting Started with Rasperry Pi, O'Reilly (SPD), 2014.
2. Adrian McEwen, Designing the Internet of Things, Wiley Publishers, 2013.
3. Daniel Kellmereit, The Silent Intelligence: The Internet of Things, 2013.

II B.TECH- I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC3TH05	DATA STRUCTURES						

COURSE OBJECTIVES:

1. Comprehensive knowledge of data structures and exposure to algorithmic complexities, recursive algorithms, searching and sorting techniques
2. Applying stack and queue techniques for logical operations
3. Understand Linked-list representation models in various types of applications
4. Implementation of tree in various forms, orientation on graphs, representation of graphs, graph traversals, spanning trees Graphs

COURSE OUTCOMES:

After the completion of this course, the student should be able to

CO1 : Analyze algorithms, searching and sorting techniques
CO2 : Explain elementary data structures such as stacks, queues and linked lists
CO3 : Implement trees and advanced concepts of trees in various
CO4 : Design a variety of graph data structures and used in practical Applications

SYLLABUS:

UNIT-I

INTRODUCTION TO DATA STRUCTURES AND ALGORITHMS: Basic Terminology, Elementary Data Structure Organization, Classification of Data structures, Operations on Data structures, Abstract Data Type.

RECURSION: Pseudocode, recursive examples, Factorial, GCD implementation, Fibonacci numbers.

UNIT-II

SEARCHING AND SORTING: Introduction to Searching, Linear Search, Binary Search, Introduction to Sorting, Internal Sorting, External Sorting, Insertion sort, Merge sort.

UNIT–III

STACKS: Introduction to Stacks, Array Representation of stacks, Operations on stack, Push operation, pop operation, peek operation, Linked representation of stacks, operations on a linked stack, Push operation, pop operation, Applications of stacks, Evaluation of a postfix expression, Conversion of infix expression into a prefix expression.

QUEUES: Introduction, Array Representation of Queues, Linked representation of Queues, , Circular Queues, Applications of queues.

UNIT-IV

LINKED LISTS: Introduction, Basic terminologies, Linked lists versus Arrays, Memory allocation and De-allocation for a linked list, single linked list, Operations on single linked list, Circular linked list, Operations on Circular linked list, Doubly linked list, Operations on Doubly linked list.

UNIT–V

TREES: Introduction, Basic Terminology, Types of Trees, Traversing a Binary Tree, Constructing a Binary Tree from Traversals**,** Binary Search Trees and operations on Binary Search Trees.

GRAPHS: Introduction, Graph Terminology, Directed Graphs, Representations of Graphs, Graph Traversal algorithms, Breadth- First Search Algorithm, Depth-First-Search Algorithm,

TEXT BOOKS:

1. Data Structures using C,ReemaThareja, Oxford, Second Edition, 2014 (UNITS: I, II, III, IV, V)
2. Data Structures, 2/e, Richard F, Gilberg , Forouzan, Cengage (UNIT: I)

REFERENCE BOOKS:

1. Data Structures and Algorithms, 2008,G.A.V.Pai, TMH
2. Data Structure with C, Seymour Lipschutz, TMH
3. Data structures and algorithm analysis in C, Second ed, mark allenweiss

ADDITIONAL RESOURCES:

1. nptel.ac.in/courses/106102064/1
2. nptel.ac.in/courses/106103069

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	20	30	50	1.5
Code: 19BEC3LB01	ELECTRONIC DEVICES AND CIRCUITS LAB						

COURSE OBJECTIVES:

1. Analyze the operation of PN diode and Zener diode.
2. Identify and verify the efficiency of Half wave and Full wave Rectifiers.
3. Examine the working of BJT.
4. Identify the characteristics of transistor.
5. Examine the UJT characteristics.

COURSE OUTCOMES:

After the completion of this course the student will able to

CO1: Analyze the behaviour of PN junction diode, Zener diode.
CO2: Apply the operational difference between Half wave and Full wave Rectifiers.
CO3: Identify the switching characteristics of transistor.
CO4: Analyze the characteristics of transistor.
CO5: Identify and analyze the UJTcharacteristics and its applications.

LIST OF EXPERIMENTS

1. P- N Junction diode characteristics
   Part A: Germanium Diode (Forward bias & Reverse bias)
   Part B: Silicon Diode (Forward bias & Reverse bias)
2. Zener diode characteristics
   Part A: V-I characteristics.
   Part B: Zener diode as voltage regulator.
3. Half wave Rectifier (with and without c-filter)
4. Full wave Rectifier (with and without c-filter)
5. Switching characteristics of BJT
6. BJT Characteristics (CE configuration)
   Part A: input characteristics
   Part B: output characteristics
7. BJT Characteristics (CB configuration)
   Part A: input characteristics
   Part B: output characteristics
8. BJT Characteristics(CC configuration)
   Part A: input characteristics
   Part B: output characteristics
9. FET characteristics(CS configuration)
   Part A: Drain characteristics
   Part B: Transfer characteristics
10. UJT characteristics

EXPERIMENTS BEYOND SYLLABUS:

1. To obtain Hybrid parameters of BJT.
2. Bridge Rectifier.

VIRTUAL LAB EXPERIMENTS:

1. Zener Diode as Voltage Regulator.
2. BJT Characteristics (Common Base & Common Emitter Configuration).

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	20	30	50	1.5
Code: 19BEC3LB02	SIGNALS AND SYSTEMS LAB						

COURSE OBJECTIVES:

1. To build elementary signals and implement Trigonometric and Exponential Fourier series.
2. To Construct Fourier transform, Hilbert Transform and Laplace transform of continuous time signals and properties of Fourier Transform.
3. To develop various properties of Laplace and z- transforms of continuous time signals.
4. To Identify linear time variant and linear time invariant systems.
5. To construct of various filters and about sampling.

COURSE OUTCOMES:

After completion of this course, the student will able to

CO1: Build elementary signals and implement Trigonometric Fourier series and Exponential Fourier series.

CO2:.Construct Fourier, Hilbert and Laplace Transform of a continuous time signal of various signals.

CO3: Identify different properties of Fourier & Laplace Transforms.

CO4: Develop z-transform of continuous time signal and experiment with different properties of it.

CO5: Construct various filters and develop the sampled signal.

LIST OF EXPERIEMENTS:

1. Generate Elementary Signals: Unit Step, Unit Ramp, Unit Parabolic, Impulse, Sinusoidal function, Exponential function, Gate function, Triangular function, Sinc function and Signum function.
2. Implement Trigonometric Fourier series and convert to exponential Fourier series.
3. Verify the properties of Fourier Transform for continuous Time signals.
   i. Periodicity ii. Linearity. iii. Time scaling iv. Time reversal
4. Find the Fourier transform of a square pulse. Plot its amplitude and phase spectrum.
5. Find the Hilbert transform of a sinusoidal signal. Plot its amplitude and phase spectrum.
6. Find the Laplace transform of a continuous time signal. Plot its amplitude and phase spectrum.
7. Verify the properties of Laplace Transform for continuous Time signals.

i. Periodicity ii. Linearity iii. Time scaling iv. Time reversal

8. Find the Z- transform of a continuous time signal. Plot its amplitude and phase spectrum
9. Verify the properties of Z- Transform for continuous Time signals.

i. Periodicity ii. Linearity iii. Time scaling iv. Time reversal

10. Implement Linear Time Variant (LTV) and Liner Time Invariant (LTI) systems.
11. Find the magnitude and phase response of low pass, high pass and band pass filter.
12. Generate a discrete time sequence by sampling a continuous time signal.

Virtual Lab Experiments:

1. Fourier analysis of signals
2. Sampling and Signal reconstructions.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	20	30	50	1.5
Code: 19BEC3LB03	IOT LAB						

COURSE OBJECTIVES:

1. Classify the latest microcontrollers with application development
2. Plan about the product design and prototyping.
3. Build interconnection and integration of the physical world and the cyber space.
4. Construct the IOT Devices.
5. Apply to develop the IOT Devices.

COURSE OUTCOMES:

After completion of this course, the student will able to

CO1: Explain the application areas of IOT ·
CO2: Influence the revolution of Internet in Mobile Devices,
CO3: Discuss about the importance of Cloud in IOT.
CO4: Justify about the importance of Sensor Networks.
CO5: Explain building blocks of Internet of Things and characteristics.

LIST OF EXPERIEMENTS

1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
6. To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
8. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth.
9. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud.
10. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.

EXPERIMENTS BEYOND SYLLABUS:

1. To install MySQL database on Raspberry Pi and perform basic SQL queries.
2. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.
3. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it.
4. Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.
5. Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.

Virtual Experiments:

1. Auto desk Eagle & Microsoft Raspberay Pi Simulation.
2. Proteus.
3. Virtronics simulation.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
Code: 19BEC3LB04	DATA STRUCTURES LAB						

COURSE OBJECTIVES:

1. To teach efficient storage mechanisms of data for an easy access
2. To design and implementation of various basic and advanced data structures.
3. To introduce various techniques for representation of the data in the real world.
4. To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

COURSE OUTCOMES:

After the completion of this course, the student should be able to

CO1: Analyze algorithms, Searching, Sorting and hashingTechniques.

CO2: Make use of elementary data structures such as stacks, Queues and linked list to develop their applications.

CO3: Examine different tree traversal techniques.

CO4: Experiment with different graph traversal techniques.

LABORATORY EXPERIMENTS

Week – 1

a) Write a recursive C program which computes the n th Fibonacci number, for appropriate values of n.

b) Write recursive C programs for the following

i) Factorial of a given number

ii) GCD Computation

iii) Towers of Hanoi

Week – 2

a) Write a C program that use both recursive and non-recursive functions to perform linear search.

b) Write a C program that use both recursive and non-recursive functions to perform binary search.

Week -- 3

a) Write a C program to implement Bubble sort.

b) Write a C program to implement Insertion sort.

Week -- 4

a) Write a C program to implement Selection sort.

b) Write a C program to implement Merge sort.

Week -- 5

a) Write a C program to implement Stack operations using arrays

b) Write a C program to implement Stack operation using Linked list.

c) Write a C program to convert infix expression into postfix expression using stack.

Week -- 6

a) Write a C program to implement Queue operation using arrays.
b) Write a C program to implement Queue operations using Linked lists.

Week – 7

a) Write a C program to implement the following operations on a singly Linked using functions

i) Insertion ii) Deletion
iii) Displaying iv) Reversing

Week - 8

a) Write a C program to implement following Operations on a Binary Tree

i) Create ii) In-order traversal
iii) Pre-order traversal iv) Post-order traversal

b) Write a C program to implement following Operations a Binary Search Tree

i) Create ii) Insert iii) Delete

Week - 9

Virtual Lab: http://cse01-iiith.vlabs.ac.in/
Any three programs must be submitted with result from the above link.

II B.Tech I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	-	-	-	0
Code: 19BCC3MC01	QUANTITATIVE APTITUDE AND REASONING						

COURSE OBJECTIVES:

1. To train students in analyzing real life scenarios considering all factors
2. To educate the students on principles of mathematical problems and problem solving methods
3. To train students for campus placements
4. To make students adept in applying appropriate logic and shortcuts to solve the problems in the least possible time.

COURSE OUTCOMES:

After the completion of this course, the student should be able to

CO1: Take part in Quantitative Aptitude and Reasoning tests for campus placements.

CO2: Evaluate critically various real life situations by resorting to Analysis of key issues and factors.

CO3: Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.

SYLLABUS FOR QUANTITATIVE APTITUDE

UNIT I: SIMPLE EQUATIONS, RATIO, PROPORTION, VARIATION

1. Simple equations

a. Definition of Linear Equations
b. Formation of simple equations
c. Problems on Ages, Fractions and Digits
d. Indeterminate system of equations
e. Special cases in indeterminate system of equations

2. Ratio and proportion

a) Definition of Ratio
b) Properties of Ratios
c) Comparison of Ratios
d) Problems on Ratios
e) Compound Ratio
f) Problems on Proportion, Mean proportional and Continued Proportion

3. Variation

a) Direct variation
b) Inverse variation
c) Joint variation
d) Problems on Variations

UNIT II: PERCENTAGES, PARTNERSHIP.

1. Percentages

a) Introduction
b) Converting a percentage into decimals
c) Converting a Decimal into a percentage

d) Percentage equivalent of fractions
e) Problems on percentages

2. Partnership
a) Introduction
b) Relation between capitals, Period of investments and Shares

Unit III: Profit And Loss
a) Problems on Profit and Loss percentage
b) Relation between Cost Price and Selling price
c) Discount and Marked Price
d) Two different articles sold at same Cost Price
e) Two different articles sold at same Selling Price
f) Gain% / Loss% on Selling Price

SYLLABUS FOR REASONING

UNIT III: DEDUCTIONS & CONNECTIVES

1. Deductions
a) Finding the conclusions using Venn diagram method
b) Finding the conclusions using syllogism method

2. Connectives
a) Definition of a simple statement
b) Definition of compound statement
c) Finding the Implications for compound statements
d) Finding the Negations for compound statements

UNIT IV: ANALYTICAL REASONING PUZZLES
a) Problems on Linear arrangement
b) Problems on Circular arrangement
c) Problems on Double line-up
d) Problems on Selections
e) Problems on Comparisons

UNIT V: CLOCKS, CALENDARS & BLOOD RELATIONS

1. Clocks
a) Finding the angle when the time is given
b) Finding the time when the angle is known
c) Relation between Angle, Minutes and Hours
d) Exceptional cases in clocks

2. Calendars
a) Definition of a Leap Year
b) Finding the number of Odd days
c) Framing the year code for centuries
d) Finding the day of any random calendar date

3. Blood relations
a) Defining the various relations among the members of a family
b) Solving Blood Relation puzzles
c) Solving the problems on Blood Relations using symbols and notations

TEXT BOOKS:

1. GL Barrons, McGraw Hills, Thorpe's verbal reasoning, LSAT Materials
2. R S Agarwal, S.Chand , 'A modern approach to Logical reasoning'
3. R S Agarwal, S Chand, 'Quantitative Aptitude'
4. Quantitative Aptitude - G. L BARRONS
5. Quantitative Aptitude - AbhijitGuhaMcGraw Hills

REFERENCE BOOKS:

1. www.careerbless.com/aptitude/qa/home.php
2. www.affairscloud.com/quantitative-aptitude-questions
3. www.careerafter.com/rs-aggarwal-quantitative-aptitude-pdf/
4. www.amazon.in/Quantitative-Aptitude-Competitive-Examinations.../8121924987
5. www.indiabix.com
6. www.practiceaptitudetests.com/numerical-reasoning-tests

II B.TECH. – II SEMESTER

S.No.	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	Electronic Circuit Analysis	PC	40	60	100	3	-	-	3
2	Switching Theory and Logic Design	PC	40	60	100	3	-	-	3
3	Random Variables and Stochastic Processes	BS	40	60	100	3	-	-	3
4	Communication Systems	PC	40	60	100	3	-	-	3
5	Electromagnetic Waves and Transmission Lines	PC	40	60	100	3	-	-	3
6	**Open Elective - I:** i. Principles of Signals, Systems& Communications(Other than ECE) ii. Medical Electronics	OE	40	60	100	3	-	-	3
7	English Communication Skills Lab - II	BS	20	30	50	-	-	3	1.5
8	Communication Systems Lab	PC	20	30	50	-	-	3	1.5
9	Community Services	MC	-	-	-	-	-	-	-
Total			**280**	**420**	**700**	**18**	**-**	**6**	**21**

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC4TH01	ELECTRONIC CIRCUIT ANALYSIS						

COURSE OBJECTIVES:

1. Analysis of single stage and multistage amplifiers
2. Frequency response of single stage and multistage amplifiers.
3. Concept of negative feedback in amplifiers.
4. Operation, types and stability of Oscillators.
5. Different types of power amplifiers and their efficiency.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1: Interpret the transistor configuration at different frequencies.
CO2: Develop different single stage and multistage amplifiers.
CO3: Summarize the importance of negative feedback in amplifiers
CO4: Interpret the applications of oscillators.
CO5: Make use of Power Amplifiers in communication systems.

SYLLABUS:

UNIT- I: TRANSISTOR AMPLIFIERS ANALYSIS

Two port devices and the Hybrid Model, Transistor Hybrid Model, Analysis of a transistor amplifier circuit using h-parameters, Conversion of h-parameters, Comparison of Transistor amplifier configurations. Simplified Common Emitter hybrid model, FET small signal model, Low frequency Common Source FET Amplifier, Transistor at high frequencies, Hybrid- π common emitter transistor model, High frequency analysis of CE amplifier (with & without resistive load), Single stage CE transistor amplifier response, Gain bandwidth product.

UNIT- II: MULTISTAGE AMPLIFIERS

Introduction, Classification of Amplifiers, Distortion in amplifiers, frequency response of RC coupled amplifier, High input resistance transistor circuits- Darlington pair, Biasing problem, Bootstrapped Darlington circuit.

UNIT– III: FEEDBACK AMPLIFIERS

Feedback principle and concept, Types of feedback, Feedback topologies, Characteristics of negative feedback amplifiers, General analysis of feedback amplifiers-input resistance and output resistance, Performance comparison of feedback amplifiers.

Method of analysis of feedback amplifiers, Analysis feedback amplifier- Voltage series feedback, Current shunt feedback.

UNIT- IV: OSCILLATORS

Introduction, Oscillator principle and condition for oscillation, Types of oscillators, RC phase shift oscillator using BJT, RC phase shift oscillator using BJT with cascade connection of high pass and low pass filters. Wien bridge oscillator using BJT, Generalized analysis of LC oscillators-load impedance, Voltage gain without feedback, feedback fraction, equation of the oscillator, Hartley oscillator with BJT and their analysis, Colpitts Oscillator with BJT and their analysis and Crystal oscillators-quartz crystal construction.

UNIT- V: POWER AMPLIFIERS

Introduction, Amplifier types - Class A, Class B, Class AB, Class C and Class D amplifiers, Series fed class A amplifier-D.C. bias operation, AC operation, Efficiency, Maximum efficiency, Transformer coupled Class A amplifier-transformer action, Operation of amplifier stage efficiency, Class B amplifier operation- Input power, Output power, Efficiency, Class B amplifier circuits – Transformer coupled push pull circuits, Complementary symmetry circuits, Power transistor heat sinking, introduction to Class C and Class D amplifiers.

TEXT BOOKS:

1. Jacob Millman, Christos C Halkias, "Integrated Electronics Analog and Digital Circuits and Systems", Tata McGraw-Hill, Fifty Edition, 1991.
2. R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Publications, Eleventh Edition, 2013.

REFERENCE BOOKS:

1. Salivahanan, N. Suresh Kumar, A. Vallavaraj, "Electronic Devices and Circuits", Tata McGraw-Hill, Second Edition, 2008.
2. Robert T. Paynter, "Introductory Electronic Devices and Circuits", Pearson Education, Seventh Edition, 2006.
3. Sedra A.S. and K.C. Smith, "Micro Electronic Circuits", Oxford University Press, Fifth Edition, 2004.
2. Donald A. Neaman, "Electronic Circuit Analysis and Design", Tata McGraw-Hill, Second Edition, 2001.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC4TH02	SWITCHING THEORY AND LOGIC DESIGN						

COURSE OBJECTIVES:

1. To illustrate the number representation in digital electronic circuits and to convert into different representations.
2. To demonstrate the concept of Boolean algebra and minimization of Boolean expressions.
3. To design combinational logic circuits and sequential logic circuits.
4. To Construct synchronous and asynchronous state machines using flip-flops.
5. To compare various PLD's and apply the PLD concept to realize switching functions.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1: Classify and work on different types of number systems and codes that are used in the design of digital systems.

CO2: Make use of theorems and postulates of Boolean algebra to minimize various Boolean expressions.

CO3: Construct basic logic circuits and combinational circuits.

CO4: Apply different models of Finite State Machines for design of sequential circuits.

CO5: Utilize the concept of PLDs to realize switching functions and code converters.

SYLLABUS:

UNIT-I: NUMBER SYSTEMS & CODES

Review of number systems – binary arithmetic-binary weighted and non-weighted codes, Error detecting and correcting codes.

UNIT-II: LOGIC OPERATIONS AND MINIMIZATION TECHNIQUES

Logic Operations: Basic logical operations, logic gates and universal gates. Boolean postulates and theorems, representation of switching functions –standard SOP & POS forms,

Minimization Techniques: Minimization of logic functions using Boolean theorems, minimization of switching functions using K-Map representation.

UNIT-III: DESIGN OF COMBINATIONAL CIRCUITS

Introduction, Design procedure, Design of Adders, Subtractors and their applications, Encoders, Decoder, Multiplexers, Demultiplexers, code converters, Comparators.

Realization of Boolean functions using decoders, multiplexers and de-multiplexers.

UNIT-IV: DESIGN OF SEQUENTIAL CIRCUITS

Introduction, sequential circuits versus combinational circuits, classification of sequential circuits, Latches, flip-flops and their excitation requirements. Design of sequential circuits-counters and shift registers. Applications of counters and shift registers.Finite State Machines- Melay and Moore machines, capabilities and limitations of finite state machine.Mealy to Moore conversion and vice-versa.

UNIT-V: INTRODUCTION TO PLDs

Introduction to PLDs, Realization of switching functions using PROM, PLA and PAL, Basics structures, comparison of PROM, PAL and PLA, Implementation of code converters, Introduction to CPLDs and FPGAs.

TEXT BOOKS:

1. M. Morris Mano, "Digital Design", PHI, Fourth Edition, 2008.
2. A. Anand Kumar, "Switching Theory and Logic Design", PHI, Pvt. Ltd, 2nd Ed, 2014.
3. ZviKohavi, "Switching and Finite Automata Theory", Cambridge University Press, 3rd Edition, 2009.

REFERENCE BOOKS:

1. R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill, Fourth Edition, 2010.
2. A. P. Godse, D. A. Godse, "Switching Theory & Logic Design", Technical publications, Second Edition, 2013.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC4TH03	RANDOM VARIABLES & STOCHASTIC PROCESSES						

COURSE OBJECTIVES:

1. Illustrate and formulate fundamental probability distribution and density functions,
2. Explain the concepts of expectation and conditional expectation, and describe their properties.
3. Explain the concepts of joint distribution, marginal distribution and statistical independence and their properties.
4. Analyze continuous and discrete-time random processes
5. Explain the concepts of stationary and wide-sense stationarity,

COURSE OUTCOMES:

After completion of this course, the student should able to

CO1: Analyze the concept of random variable.
CO2: Calculate the expectation of different random variables.
CO3: Apply different operations on multiple random variables.
CO4: Explain types of random processes.
CO5: Explain random processes and its spectral characteristics.

SYLLABUS:

UNIT-I: THE RANDOM VARIABLE

Introduction, 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 RANDOM VARIABLE – EXPECTATIONS

Introduction, 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, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable.

UNIT-III: MULTIPLE RANDOM VARIABLES

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.

Operations on Multiple Random Variables: 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

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

The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

TEXT BOOKS:

1. PeytonZ. Peebles, "Probability, Random Variables & Random Signal Principles", TMH, 4th Edition, 2001.
2. Athanasios Papoulis and S.Unnikrisha, "Probability, Random Variables and Stochastic Processes", PHI, 4th Edition, 2002.

REFERENCE BOOKS:

1. B. PrabhakaraRao, "Probability Theory and Stochastic Processes", Oxford University Press.
2. Henry Stark and John W. Woods, "Probability and Random Processes with Applications to Signal Processing", Pearson Education, 3rd Edition.
3. George R. Cooper, Clave D. McGillem, "Probabilistic Methods of Signal & System Analysis", Oxford, 3rd Edition, 1999.
4. S. P. Eugene Xavier, "Statistical Theory of Communication", New Age Publications, 2003.
5. B.P. Lathi, "Signals, Systems & Communications", B.S. Publications, 2003.
6. Davenport W.B, "Probability and Random Processes, An Introduction for Applied Scientists and Engineers", McGraw-Hill, 1970.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC4TH04	COMMUNICATION SYSTEMS						

COURSE OBJECTIVES:

1. To Discuss the fundamental concepts of the Analog communication system
2. To analyze various analog modulation and demodulation techniques.
3. To construct the concepts of different pulse modulation and digital modulation techniques.
4. To apply different information theorems and capacity to digital data transmission.
5. To familiarize with the error detection and correction techniques.

COURSE OUTCOMES:

After completion of this course, the student should able to

CO1: Elaborate the basic concepts of Analog Communication Systems.
CO2: Analyze the Analog modulated and demodulated systems.
CO3: Construct different digital modulation techniques.
CO4: Analyze the fundamental concepts of information theorems and capacity.
CO5: Assess the right method of error detection and error correction for data transmission

UNIT-I: ANALOG COMMUNICATION

Introduction to Communication Systems – Modulation – Types – Need for Modulation.Theory of Amplitude Modulation – Generation of AM waves-Square law Modulator, Switching modulator, Detection of AM waves-Square law detector and Envelope detector.– Theory of Frequency and Phase Modulation – Comparison of Analog Communication Systems (AM – FM – PM).
Noise: Source of Noise – External Noise- Internal Noise- Noise Calculation.

UNIT-II: RADIO TRANSMITTERS & RECEIVERS

Radio Transmitters-Function of a Transmitter, Basic Components of a Radio Transmitter, Classification of Transmitter- MW, SW, UHF and VHF, Micro Wave Transmitter, AM, FM, PM, TV, Radio broadcasting Transmitters, AM Transmitter-Low-Level Transmitter, High Level Transmitter, Effect of feedback on performance of AM Transmitter.
Radio Receivers - Receiver Types- AM, FM, Communication, Television, Radar Receivers, And Radio Receivers, Tuned radio frequency receiver-Block Diagram of TRF Receiver, Draw backs of TRF Receiver, Super heterodyne receiver-Block Diagram of Super heterodyne Receiver, And Advantages, RF section and Characteristics.

UNIT-III: DATA AND PULSE COMMUNICATION

Data Communication: History of Data Communication – Standards Organizations for Data Communication- Data Communication Circuits – Data Communication Codes – Error Detection and Correction Techniques.
Pulse Communication: Pulse Amplitude Modulation (PAM) – Pulse Time Modulation (PTM) – Pulse code Modulation (PCM) – Comparison of various Pulse Communication System (PAM – PTM – PCM). Delta modulation

UNIT-IV: DIGITAL MODULATION TECHNIQUES

Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK) Minimum Shift Keying (MSK) –Phase Shift Keying (PSK) – BPSK – QPSK – 8 PSK – 16 PSK – Quadrature Amplitude Modulation (QAM) – 8 QAM – 16 QAM – Bandwidth Efficiency– Comparison of various Digital Communication System (ASK – FSK – PSK – QAM).

UNIT-V: SOURCE AND ERROR CONTROL CODING

Entropy, Source encoding theorem, Shannon fano coding, Huffman coding, mutual information, channel capacity, channel coding theorem, Error Control Coding, linear block codes, cyclic codes, convolution codes.

TEXT BOOKS:

1. Principles of Communication Systems - Herbert Taub, Donald L Schiling, GoutamSaha, 3rd Edition, McGraw-Hill, 2008
2. Communication Systems by Simon Haykins John Wiley & Sons, 4th Edition.

REFERENCE BOOKS:

1. Wayne Thomasi "Electronic communication systems fundamentals through advanced",4th edition.
2. Communication Systems, 2E, R. P. Singh, S. D. Sapre, McGraw-Hill Education, 2008.
3. Analog and Digital Communication – K. Sam Shanmugam, Willey, 2005
4. George Kennedy and Bernard Davis, "Electronics & Communication System", TMH, 2004.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC4TH05	ELECTROMAGNETIC WAVES AND TRANSMISSION LINES						

COURSE OBJECTIVES:

1. To introduce the concepts of Electrostatics and Magneto statics.
2. To analyze Maxwell's equations and physical significance for each equation.
3. To discuss Electromagnetic waves and their propagation in different media.
4. To analyze different Boundary conditions and study the changes in the properties of Electromagnetic waves during their travel across the boundary conditions.
5. To familiarize with the transmission line concepts.

COURSE OUTCOMES:

After completion of this course, the student should able to

CO1: Apply the knowledge of the fields to the real time problems involving in the fields and solve them.

CO2: Develop Maxwell's equations in different forms (differential and integral) and apply them to diverse engineering problems.

CO3: Interpret EM Wave Propagation in different media and applying the knowledge in solving the real time problems.

CO4: Interpret EM Waves for different applications during their travel across different media.

CO5: Solve problems related to transmission lines for different applications.

SYLLABUS:

UNIT-I: STATIC FIELDS

ELECTROSTATICS: Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Field Intensity due to point charge, Infinite line charge, Infinite sheet of charge, Uniformly charged sphere, Electric Potential - Electric Potential due to point charge and infinite line charge, Energy Density, Poisson's and Laplace's Equations.

MAGNETOSTATICS: Biot-Savart Law, Ampere's Law and Applications, Magnetic Flux Density, Magnetic Vector Potential.

UNIT-II: MAXWELL'S EQUATIONS

Faraday's Law and Transformer emf, Inconsistency of Ampere's Law and Displacement Current Density, Continuity Equation, Maxwell's Equations in Differential and Integral Forms and Word Statements for static fields and time varying fields of electric and magnetic.

UNIT-III: EM WAVES

Types of Media, Wave Propagation in Perfect Dielectrics, Lossy (General Case - conducting) media. Uniform Plane Waves – Definition, Uniform Plane Wave Propagation in Free Space and Conducting media,

Conductors & Dielectrics – Characterization. Poynting Vector and Poynting Theorem – Applications.

UNIT-IV: EM WAVE CHARACTERISTICS

Electric and Magnetic Boundary Conditions, Polarization, Reflection and Refraction of Plane Waves – Normal and Oblique Incidence on Perfect Dielectric and conductor, Brewster Angle, Critical Angle and Total Internal Reflection Surface Impedance.

UNIT-V: TRANSMISSION LINES

Types, Parameters, Transmission Line Equations, Primary and Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless/Low Loss Characterization, Distortion – Condition for Distortionless and Minimum Attenuation, Loading - Types of Loading, Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR,. UHF Lines as Circuit Elements; λ/4, λ/2 and λ/8 Lines.

TEXT BOOKS:

1. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", PHI, Second Edition, 2000.
2. Matthew N.O. Sadiku, "Elements of Electromagnetics", Oxford Univiversity Press, Third Edition, 2001.
3. G. S. N. Raju, "Electromagnetic Waves and Transmission Lines", Pearson Education India, 2006.

REFERENCE BOOKS:

1. G. SasiBhushanaRao, "Electromagnetic Field Theory and Transmission Lines", Wiley India Pvt Ltd, 2012.
2. J. D. Kraus, Keith R. Carver, "Electromagnetics", TMH, Third Edition, 1984.
3. J.A. Edminister, MahmoodNahvi, "Schaum's Outline of Electromagnetics", Tata McGraw Hill, Fourth Edition, 2014.
4. UmeshSinha, SatyaPrakashan, "Transmission Lines and Networks", Tech. India Publications, New Delhi, 2010.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
Code: 19BCC4LB11	ENGLISH COMMUNICATION SKILLS LAB-II (Common to All Branches)						

COURSE OBJECTIVES:

1. To train the students to use language effectively in various professional interactions like Group Discussions, Public Speaking, Presentations and Interviews.
2. To make the students understand the importance of body language.
3. To provide exposure to students to soft skills like Goal Setting, Assertiveness, Time Management, Positive Attitude and Stress Management
4. To expose the students to variety of a self-instructional, learner friendly, electronic media and stimulate intellectual faculties/resources

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Utilize Non-verbal cues and interpret nonverbal symbols. **(Apply -3)**

CO 2: Develop presentation Skills and make formal presentations using strategies. **(Apply 3)**

CO 3: Analyse problem solving skills effectively to participate in Group Discussions (**Analyze-4)**

CO 4: Build interview skills for employability. **(Apply -3)**

UNIT– I

Body Language

UNIT–II

Presentation Skills

UNIT–III

Group Discussions

UNIT-IV

Interviews and Telephonic Interviews

UNIT-V

Debates

TEXT BOOKS:

"Strengthen Your Communication Skills", Maruthi Publications, 2013.

REFERENCE BOOKS:

1. "Personality Development and Soft Skills", Oxford University Press, New Delhi.
2. M Ashraf Rizvi, "Effective Technical Communication skills", McGraw-Hill, 2005.
3. Barun K Mitra, "Personality Development and Soft Skills", Oxford University Press, 2011.
4. Konar N, "Communication Skills for Professionals", PHI Learning Private Limited, 2011.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	20	30	50	1.5
Code: 19BEC4LB02	COMMUNICATION SYSTEMS LAB						

COURSE OBJECTIVES:

1. To Analyze Analog Communication system modulation and demodulation techniques.
2. To design the Pulse Modulation techniques.
3. Illustrate the concept of pre-emphases and de-emphasis.
4. To categorize different digital modulation techniques
5. To Assess various channel encoding schemes

COURSE OUTCOMES:

After completion of this course, the student should able to

CO1: Design and measure performance of AM and FM communication systems.
CO2: Choose the different pulse modulation techniques
CO3: Compare pre-emphasis and de-emphasis.
CO4: Experiment with different digital modulation techniques and observe their results.
CO5: Classify various channel encoding schemes for a given data stream.

LIST OF EXPERIMENTS: (any 10 experiments can proceed)

1. Amplitude modulation and Demodulation
2. Frequency modulation and Demodulation
3. Pre-Emphasis and De-Emphasis
4. Sampling theorem
5. Pulse amplitude modulation and Demodulation
6. Pulse width modulation and Demodulation
7. Pulse code modulation
8. Delta modulation
9. Frequency shift keying
10. Phase shift keying
11. Convolution code- encoder & decoder
12. Source encoder and decoder
13. Linear block encoder and decoder
14. Binary cyclic code- encoder & decoder

EXPERIMENTS BEYOND SYLLABUS:

1. Time division Multiplexing
2. Companding

Virtual Labs:

1. To explore the relationship of signals in the time and frequency domain.
2. To analyze the bit error rate of M-QAM over an AWGN channel.

III B.TECH. – I SEMESTER

S.No.	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	Linear & Digital IC Applications	PC	40	60	100	3	-	-	3
2	Entrepreneurship and Innovation	HS	40	60	100	2	-	-	2
3	Pulse and Digital Circuits	PC	40	60	100	3	-	-	3
4	Control Systems	PC	40	60	100	3	-	-	3
5	Computer Organization and Microprocessors	PC	40	60	100	3	-	-	3
6	**Open Elective – II** i. Fundamentals of Image Processing (Other than ECE) ii. Consumer Electronics	OE	40	60	100	3	-	-	3
7	LDICA Lab	PC	20	30	50	-	-	3	1.5
8	EC & PDC Lab	PC	20	30	50	-	-	3	1.5
9	Skills Lab	OE	20	30	50	-	-	3	1.5
Total			**300**	**450**	**750**	**17**	**-**	**9**	**21.5**

III B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC5TH02	LINEAR AND DIGITAL IC APPLICATIONS						

COURSE OBJECTIVES:

1. To familiarize with the functioning of various Linear ICs such as OP AMP, Timer, Voltage Controlled Oscillator and Phase Locked Loop.
2. To introduce different digital MSI ICs and memories.
3. To familiarize in digital logic families and interfacing
4. To extend logic gate concepts to realize combinational and sequential circuits.
5. To familiarize with CAD tools and writing VHDL programs

COURSE OUTCOMES: At the end of the course, Students will be able to

CO1: Recall the basics of FET, MOSFET, amplifiers, standard memories and their characteristics.

CO2: Extend the logic gate concept to realize basic combinational and sequential circuits for various Boolean expressions.

CO3: Illustrate the operation of IC 555 timer, utilization of filters, VCO, data converters and PLL in the development of various circuits.

CO4: Demonstrate the applications of Operational amplifier and IC 555 timer such as Adder, Subtractor, V-I, I-V converter, Differentiator, Integrator, and Triangular, Square wave generators, PWM, PPM generation respectively.

CO5: Make use of the computer-aided design tools for development of complex digital logic circuits.

SYLLABUS:

UNIT–I: OPERATIONAL AMPLIFIER AND ITSAPPLICATIONS

The Operational Amplifier, Ideal Operational Amplifier, Operational Amplifier internal circuit, DC and AC characteristics, compensation techniques, Analysis of data sheets of IC 741, Op-amp applications: Adder, Subtractor, V to I and I to V converters, Sample and Hold circuit, Log and Anti log Amplifiers, Integrator and Differentiator, Triangular and Square wave generators.

UNIT–II: D-A AND A-D CONVERTERS & 555 IC TIMER

Need for D-A and A-D conversion, Basic DAC techniques, A-D converters, DAC/ADC Specifications. 555 IC Timer- Pin diagram, functional description, Monostable and Astable operation.

UNIT–III: ACTIVE FILTERS, VCO & PHASE LOCKED LOOP

Active filters, Voltage Controlled Oscillator (VCO) - IC 566- Pin diagram, Block diagram Description, 565 IC PLL- Pin diagram, block schematic, basic principle of operation

UNIT–IV: DIGITAL LOGIC FAMILIES AND INTERFACING

Introduction to logic families, CMOS logic, CMOS steady state and dynamic electrical behavior, CMOS logic families. Bipolar logic, TTL families, Emitter coupled logic, Comparison of CMOS, TTL and ECL.

UNIT–V: DESIGN OF COMBINATIONAL & SEQUENTIAL LOGIC CIRCUITS

Ripple adders and subtractors-74x999,283, Design of decoders, Encoders, Priority encoder, Multiplexers, Demultiplexers, Parity circuits, Comparators, Simple Floating-Point Encoder and basic flip-flops with relevant Digital ICs, design of Counters, MSI Registers, Shift registers, bi-directional shift register, universal shift register with relevant Digital ICs.

History of VHDL, Design flow, program structure, Modeling Styles of VHDL, Example programs.

TEXT BOOKS:

1. D.Roy Choudhury,ShailB.Jain,–LinearIntegratedCircuits,4th MultiColourEdition, New Age International (p) Ltd, 2010.
2. JohnF.Wakerly, – Digital Design Principles & Practices‖, 3rdEdition, PHI/Pearson Education Asia, 2005.

REFERENCE BOOKS:

1. Ramakanth, A. Gayakwad, ―OP-Amps & Linear ICs, PHI, 1987.
2. J. Bhasker, ―VHDL Primer, 3rdEdition, Pearson Education/ PHI.
3. AtulP.Godseand Deepali A.Godse, ―Digital IC Applications, Technical Publ., Pune, 2005.
4. K. LalKishore, V.S.V.Prabhakar, –VLSI Design, I.K International publishing house, PvtLtd.

III B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	2
Code: 19BCC5TH01	ENTREPRENEURSHIP & INNOVATION						

COURSE OBJECTIVES:

1. Creating awareness among the students about the significance of entrepreneurship and its social relevance.
2. Imparting knowledge to the students on institutional support available to start a business venture.
3. To understand the significance of entrepreneurial training in the development of new and existing entrepreneurs.
4. Understanding the role and importance of entrepreneurship for economic development.
5. Adopting of the key steps in the elaboration of business idea.

COURSE OUTCOMES: At the end of the course, Students will be able to

CO1: Outline the concepts of Entrepreneurship.[K2]
CO2: Create the awareness on creativity and innovation.[K6]
CO3: Adopt the Entrepreneurship Development programs[K6]
CO4: Evaluate the project planning and feasibility studies.[K5]
CO5: Analyze the concept of small and micro enterprises.[K4]

SYLLABUS:

UNIT–I: ENTREPRENEUR AND ENTREPRENEURSHIP

Entrepreneur – Definitions, concept of entrepreneur, characteristics of entrepreneur, types of entrepreneurs, concept of entrepreneurship, characteristics of entrepreneurship, role of entrepreneurship in economic development, ethics and social responsibilities of an entrepreneur, Financial institutional support to entrepreneurs(IDBI,SISI,DIC,NIESBUD, Commercial banks etc.,

UNIT-II: CREATIVITY AND INNOVATION IN ENTREPRENEURSHIP

Meaning and concept of creativity - Nature and characteristics of creativity -Creativity Process- Factors affecting creativity - Meaning and Importance Innovation - Process -Distinguish the Creativity and Innovation.

UNIT–III: ENTREPRENEURSHIP DEVELOPMENT PROGRAMMES

Designing Appropriate Training Programme to inculcate Entrepreneurial Spirit -Training for Entrepreneurs, Entrepreneurship Development Programme (EDP) – Need and objectives of EDP's -Phases and evolution on EDP's existing and new Entrepreneurs.

UNIT–IV: PROJECT PLANNING AND FEASIBILITY STUDIES

Meaning of a project, Project identification – Sources of new Ideas, Methods of generating ideas, Project selection, - Project Feasibility Study -Project evaluation and Techniques (PBP, ARR, NPV, IRR & PI).

UNIT–V: SMALL AND MICRO ENTERPRISES

Importance, definitions, MSME's Development Act 2006 – policies and their support to MSMEs - Growth of Firm and growth strategies, Factors inducing growth – sickness in small business and remedies.

TEXT BOOKS:

1. "Entrepreneurship", Arya Kumar: Pearson, Publishing House, New Delhi,2012.
2. "Entrepreneurship', VSP Rao, Kuratko: Cengage Learning, NewDelhi,2012
3. ShoimoMaital, DVR Seshadri, "Innovation Management", Response Books 2007

REFERENCE BOOKS:

1. "Entrepreneurship Development" B.Janakiram, M Rizwana: Excel Books, ND,2011
2. "Entrepreneurship Development", P.C.Shejwalkar Everest Publishing House, ND,2011
3. Vinnie Jauhari & SudhanshuBhushan, "Innovation Management". Oxford University Press, 2014.

III B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC5TH03	PULSE AND DIGITAL CIRCUITS						

COURSE OBJECTIVES:

1. Study the concepts of linear and non-linear wave shaping circuits.
2. Study the concept of switching characteristics of diode and transistor and design various logic families.
3. Explain different types of Multi vibrators and their design procedures.
4. Study the concepts of Time-base Generators.
5. Study the concepts of Sampling Gates.

COURSE OUTCOMES: After completion of this course, the students would be able to

CO 1: Apply different linear wave shaping circuits.
CO 2: Analyze different non-linear wave shaping circuits.
CO 3: Make use of different diode and transistor switching times to design various Logic families.
CO 4: Construct different multi-vibrators.
CO 5: Explain time base generators and sampling gates.

SYLLABUS:

UNIT- I: LINEAR WAVE SHAPING

The high pass and low pass RC circuits: Sinusoidal input, Step input, Pulse input, Square and Ramp input, RC network as a differentiator and an integrator, RL and RLC circuits and their response for step input.

UNIT- II: NON-LINEAR WAVE SHAPING

Diode and its characteristics, Diode series clippers, Diode parallel clippers, Transistor clippers, two level clipping circuits and Emitter coupled clipper, Clamping operation, Clamping circuits using diode with different inputs, Clamping circuit theorem, Practical clamping circuits.

UNIT- III: SWITCHING CHARACTERISTICS OF DEVICES

Diode as a switch, Diode switching times, Piecewise linear diode characteristics, Transistor as a switch, Transistor switching times (delay time, rise time, storage time and fall time), Break down voltage consideration of transistor, Design of transistor switch, Characteristics of logic family, Realization of Logic Gates using DTL, TTL, ECL and CMOS logic circuits, Comparison of logic families.

UNIT- IV: MULTIVIBRATORS

Introduction to multivibrator, Types of multivibrator, Analysis and design of fixed bias, self-bias bistable multivibrator, Methods of Triggering using RC network & Diode, Analysis and design of collector coupled monostable multivibrator, Application of monostable multivibrator as a voltage to time converter, Analysis and design of collector coupled astable multivibrator, Expression for time period T, Astable Multivibrator as a voltage to frequency converter, Schmitt trigger: operation of the circuit, Hysteresis.

UNIT- V: TIME BASE GENERATORS AND SAMPLING GATES

Time Base Generators: General features of a time-base signal, Errors and expressions for sweep speed error, displacement error and transmission error, Relation between e_s, e_d and e_t, Methods of generating time base waveform, Miller and Bootstrap time base generators and basic principles, Transistor Miller time base generator, Transistor Bootstrap time base generator

Sampling Gates: Basic operating principles of sampling gates, Unidirectional sampling gates, Bidirectional sampling gates, Two diode sampling gates, four diode sampling gate, Sampling oscilloscope, Reduction of pedestal in gate circuits, Applications of sampling gates.

TEXT BOOKS:

1. Pulse, Digital and Switching Waveforms – J. Millman, H. Taub and Mothiki S. Prakash Rao, Tata McGraw-Hill, Second Edition, 2008.
2. Solid State Pulse circuits – David A. Bell, PHI, Fourth Edition, 2002.

REFERENCE BOOKS:

1. Pulse and Digital Circuits – A. Anand Kumar, PHI, Second Edition, 2005.
2. Wave Generation and Shaping – L. Strauss, Tata McGraw-Hill, Second Edition, 1970.
3. Pulse and Digital Circuits – Mothiki S. Prakash Rao, Tata McGraw-Hill, 2006.
4. Pulse and Digital Circuits – Venkata Rao K, Rama Sudha K, Manmadha Rao G, Pearson Education India, 2010.

III B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC5TH04	CONTROL SYSTEMS						

COURSE OBJECTIVES:

1. Learn the fundamental concepts of Control systems, mathematical models and transfer function.
2. Learn the time response analysis for various inputs and frequency response analysis.
3. Understand the basics of stability analysis of the system in time domain
4. Understand the basics of stability analysis of the system in frequency domain
5. Study the classical control design techniques.

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1: Develop the mathematical model of a system and find its transfer function

CO2: Apply the time response analysis and the frequency response analysis

CO3: Determine the stability of a system in time domain

CO4: Determine the stability of a system in frequency domain

CO5: Analyze the classical control design techniques

SYLLABUS:

UNIT-I: INTRODUCTION AND TRANSFER FUNCTION REPRESENTATION

Introduction to Control Systems: Types of Control Systems- Open loop and Closed loop control systems and their differences, Effects of feedback on systems. Mathematical models: Differential equations of Physical Systems – Mechanical Systems- translational and rotational systems, Electrical Systems.

Transfer Function Representation: Block diagrams and signal flow graphs: Transfer functions, Block diagram Reduction and Signal Flow graphs- Reduction using mason's gain formula.

UNIT-II: TIME RESPONSE ANALYSIS

Time Response of feedback control systems: Standard test signals - Step, Ramp, Parabolic and Impulse signals, Time response of first and second order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications, Steady state response - Steady state errors and error constants.

UNIT-III: STABILITY ANALYSIS IN S-DOMAIN AND ROOT LOCUS TECHNIQUE

Stability Analysis: The concept of stability, Condition for stability, Routh's stability criterion, Routh table, Qualitative stability and Conditional stability.

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

UNIT-IV: FREQUENCY RESPONSE ANALYSIS AND STABILITY ANALYSIS IN FREQUENCY DOMAIN

Frequency domain Analysis: Introduction to Frequency domain specifications- Resonant peak, resonant frequency, Bandwidth, Phase margin and Gain margin.

Stability Analysis in frequency domain: Bode plots – construction, determination of frequency domain specifications and transfer function and stability analysis from Bode plots, Polar plots – construction and stability analysis, Nyquist plots – construction and stability analysis.

UNIT-V: CLASSICAL CONTROL DESIGN TECHNIQUES AND STATE VARIABLE ANALYSIS

Compensation techniques: Lag, Lead and Lead-Lag Controllers design in frequency domain, Introduction to State Variable Analysis: Introduction, Concept of state, State variables & State model, State model from differential equations and Transfer functions, State transition matrix and its properties, Concepts of Controllability and Observability.

TEXT BOOKS:

1. Control Systems Engineering – I. J. Nagrath and M. Gopal, New Age International Pvt. Ltd, Sixth Edition, 2017.
2. Automatic Control Systems – B.C. Kuo, John Wiley & Sons, Eighth Edition, 2003.

REFERENCE BOOKS:

1. Modern Control Engineering – Katsuhiko Ogata, Pearson, Fifth Edition, 2009.
2. Control Systems – N. K. Sinha, New Age International, Fourth Edition, 2013.
3. Control Systems – A. Anand Kumar, PHI Learning Pvt. Ltd, Second Edition, 2014.

III B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC5TH05	COMPUTER ORGANISATION & MICROPROCESSORS						

COURSE OBJECTIVES:

1. To familiarize with the computer system concepts.
2. To learn the concepts of memory organization I/O organization
3. To understand the 8086 architecture and its programming.
4. To understand the hardware features of 8086 and Pentium processor.
5. Explore how to interface the memory and I/O devices to 8086 microprocessor.

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

CO1: Apply the concepts of computer system and CPU design.
CO2: Demonstrate memory organization and I/O processing.
CO3: Make use of Instruction set in developing the assembly language programming
CO4: Demonstrate the hardware features of 8086 and Pentium processors.
CO5: Model an 8086 based microcomputer system by interfacing memory and I/O devices.

SYLLABUS:

UNIT–I: COMPUTER SYSTEM

Basic Structure of Computers : Computer Types, Functional units, Basic Operational Concepts, Bus Structures, Software, Performance, Multiprocessors and Multi computers, CPU Organization: Processor Organization, Control Unit Design, Instruction pipelining, The RISC versus CISC.

UNIT–II: MEMORY & I/O SUB SYSTEMS

Memory Organization: Basic Concepts, Semi conductor memories, Cache memory organization, Virtual memory organization.

Input/Output Organization: Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt, Direct memory Access, Input –Output Processor (IOP).

UNIT–III: 8086 MICROPROCESSOR ARCHITECTURE & PROGRAMMING

Introduction to 8085, Architecture of 8086, Register organization of 8086, physical memory organization, I/O addressing capability, addressing modes of 8086, instruction set off 8086, assembler directives and operators. Assembly language programming of 8086, introduction to stack, stack structure of 8086/8088,

UNIT-IV: 8086 INTERRUPTS

Signal description of 8086, interrupts and interrupt service routines, interrupt cycle of 8086, non-mask able interrupt and mask able interrupts, interrupt programming, minimum mode, maximum mode of 8086 system and timings diagrams for different bus operations. Introduction to Pentium processor architecture.

UNIT–V: 8086 INTERFACING

Semiconductor memory interfacing, Interfacing I/O ports, PIO 8255, modes of operation of 8255, interfacing of D/A and A/D converters and stepper motor. Programmable interrupt controller 8259A, programmable communication interface 8251 USART, 8257 DMA.

TEXT BOOKS:

1. Morris Mano, "Computer system architecture", 3rd Edition.
2. A.K.Ray, K.M.Bhurchandi, "Advanced Microprocessors and Peripherals", Tata McGraw Hill Publications, 2000.

REFERENCE BOOKS:

1. William Stallings, "Computer Organization and Architecture", 8th Edition, Pearson, 2010.
2. Douglas V Hall, "Microprocessors and interfacing, Programming and Hardware", 2nd Edition, TMH, 2006

III B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	1.5
Code: 19BEC5LB01	LINEAR & DIGITAL IC APPLICATIONS LAB						

COURSE OBJECTIVES:

1. Demonstrate applications of OP-Amp and IC 555timer
2. Classify the operation of analog filters
3. Illustrate and compare the operation of multivibrator
4. Illustrate and compare the operation of different voltage regulators
5. Develop the internal circuits for different digital operations

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

CO1: Demonstrate the applications of Op-amp such as Adder, Subtractor, Comparator, Integrator and Differentiator Circuits.

CO2: Classify the active filters such as LPF, HPF, BPF and Band Reject Filters.

CO3: Interpret the operation of Oscillator circuits.

CO4: Illustrate the operation of Multivibrator circuits and compare various types of voltage regulators.

CO5: Develop the complex digital logic circuits including both combinational and Sequential logics by using computer-aided design tools.

SECTION-I:

1. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
2. Integrator and Differentiator Circuits using IC741.
3. Active Filter Applications – LPF, HPF, BPF, Band Reject Filters.
4. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
5. IC 555 Timer – Monostable & Astable Operation Circuit.
6. Schmitt Trigger Circuits – using IC 741 and IC555.
7. Voltage Regulator
   A) Using IC723.
   B) Three Terminal Voltage Regulators – 7805, 7809, 7912.
8. 4 bit DAC using OPAMP.

EQUIPMENT REQUIRED FOR LABORATORIES:

1. RPS
2. CRO
3. Function Generator
4. MultiMeters
5. IC Trainer Kits(Optional)
6. Bread Boards
7. Components:- IC741, IC555, IC565, IC723, 7805, 7809, 7912 and other essential components.
8. Analog IC Tester

SECTION-II:

1. Realization of Logic Gates.

2. 3 to 8 Decoder-74138
3. 8*1 Multiplexer-74151 andDe-multiplexer-74155
4. -BitComparator-7485.
5. D Flip-Flop-7474
6. Counters
    A) 4 BitCounter-7493
    B) Decade Counter-7490
7. Universal shiftregister-74194/195
8. RAM (16×4)-74189 (read and write operations)

Equipment Required:

1. Xilinx ISE software-latest version
2. Personal computer with necessary peripherals
3. Hardware kits- Various FPGA families.

Note: Six Experiments from each section.

III B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	40	60	100	1.5
Code: 19BEC5LB02	ELECTRONIC CIRCUITS & PULSE AND DIGITAL CIRCUITS LAB						

COURSE OBJECTIVES:

1. Study the frequency response of single stage and multistage amplifiers.
2. How frequency response varies by applying negative & positive feedback on amplifiers.
3. Study the working of Power amplifier
4. Generation of different frequency sinusoidal & non sinusoidal signals.
5. Different logic gates are implemented using diodes and transistors.

COURSE OUTCOMES: After Completion of this course, student must be able to

CO1: Apply the effect of capacitors on frequency response of amplifier.
CO2: Compare the efficiency of power amplifiers.
CO3: Construct high input impedance circuits.
CO4: Experiment with different Sinusoidal and Non sinusoidal circuits.
CO5: Construct different digital circuits using Active & Passive Electronic Components.

LIST OF EXPERIMENTS:

I) DESIGN AND SIMULATION IN SIMULATION LABORATORY USING MULTISIM OR PSPICE OR EQUIVALENT SIMULATION SOFTWARE & VERYFING THE RESULT BY HARDWARE (Any Six):

1. Single Stage CE Amplifier.
2. Voltage series feedback amplifier - Frequency response.
3. Current series feedback amplifier - Frequency response.
4. Wien Bridge oscillator using Transistors –Design for different frequencies.
5. RC Phase Shift Oscillator using Transistors- Design for different frequencies.
6. Class A Power Amplifier.
7. Class B Power Amplifier.
8. Boot strapped emitter follower.

II) PULSE AND DIGITAL CIRCUITS (Any six)-By Designing the circuit

1. Linear wave shaping (Diff. Time Constants, Differentiator, Integrator)
2. Non –linear wave shaping-clippers., Clampers
3. Bistable Multivibrator
4. Astable Multivibrator (voltage-frequency convertor)
5. Monostable Multivibrator
6. Schmitt Trigger
7. Study and implementation of logic gates
8. Study and implement applications of Flip flops- Counters and Registers.

EQUIPMENT REQUIRED FOR LABORATORY

SOFTWARE:

1. Analog and Digital design/ Simulation software.
2. Computer Systems with required specifications.

HARDWARE:

1. Regulated Power supply.

2. Analog/Digital Storage Oscilloscopes.
3. Analog/Digital Function Generators.
4. Digital Multimeters.
5. Decade Résistance Boxes/Rheostats.
6. Decade Capacitance Boxes.
7. Ammeters (Analog or Digital).
8. Voltmeters (Analog or Digital).
9. Active & Passive Electronic Components.

III B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	1.5
Code: 19BEC5LB03	SKILL LAB						

COURSE OBJECTIVES:

1. To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
2. To apply the concept of Internet of Things in the real world scenario.
3. Construct the IOT Devices.
4. Develop the IOT for various applications like home automation etc.
5. IOT cloud and internet

COURSE OUTCOMES: After successful completion of this course, students will be able to
CO1: Analyze the requirements, specifications to design home automation applications.
CO2: Build smart city applications using Arduino.
CO3: Develop agricultural applications using Raspberry pi.
CO4: Construct the IOT Devices.
CO5: Influence the revolution of Internet in Mobile Devices.

LIST OF EXPERIEMENTS

1. a. How to install Arduino IDE.

   b. Blink the LED on and off with 500 ms time delay using Arduino UNO board.

2. Detecting obstacle with IR sensor and Arduino.

3. Find the moisture using Moisture sensor and Arduino.

4. Find the distance using ultrasonic sensor HC-SR04 and Arduino.

5. Smoke detection using MQ-2 gas sensor.

6. a. How to install Raspbian OS on SD card.

   b. Controlling LED with Raspberry Pi.

7. Blink the LED using LDR sensor and raspberry pi.

8. Motion detection using PIR and raspberry pi.

9. Controlling AC light using raspberry pi with Relay module.

10. Display the text using 16 X 2 LCD display module and raspberry pi.

III B.TECH. – II SEMESTER

S. No.	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	Antennas and Wave Propagation	PC	40	60	100	3	-	-	3
2	Digital Signal Processing	PC	40	60	100	3	-	-	3
3	Microcontrollers and Embedded Systems	PC	40	60	100	3	-	-	3
4	Object Oriented Programming through Java	ES	40	60	100	3	-	-	3
5	**Open Elective – III** i. Introduction to Embedded Systems (Other than ECE) ii. Global Positioning System(GPS)	OE	40	60	100	3	-	-	3
6	**Professional Elective–I:** i. Electronic Measurements and Instrumentation ii. Data Communication and Computer Networks iii. Embedded System Design with Advanced Processors iv. Statistical Methods in AI	PE	40	60	100	3	-	-	3
7	MP & MC Lab	PC	20	30	50	-	-	3	1.5
8	Object Oriented Programming through Java Lab	ES	20	30	50	-	-	3	1.5
9	Mini Project	PR	20	30	50	-	-	2	1
10	Advanced Communication Skills	MC	-	-	-	-	-	3	-
Total			**300**	**450**	**750**	**18**	**-**	**11**	**22**

III B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC6TH01	ANTENNAS AND WAVE PROPAGATION						

COURSE OBJECTIVES:

1. To understand the applications of the electromagnetic waves in free space.
2. To introduce radiation mechanism for understanding various forms of narrow band antennas.
3. To introduce radiation mechanism for understanding various forms of broad band antennas.
4. To familiarize with Measure various parameters of antenna,
5. To understand the concepts of wave propagation and its characteristics in atmospheric conditions.

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

CO1: Explain radiation mechanism and basic antenna parameters.
CO2: Interpret different types of antennas and antenna arrays.
CO3: Demonstrate antenna measurements to know antenna's performance.
CO4: Identify the characteristics of radio wave propagation.
CO5: Illustrate the concepts of wave propagation and its characteristics in atmospheric conditions.

SYLLABUS:

UNIT–I: ANTENNA FUNDAMENTALS

Introduction to Antennas, Radiation Mechanism – single wire, 2-wire, dipoles, Current Distribution on a thin wire antenna. Characteristics of Antenna- Radiation Pattern, Radiation intensity, Beam solid angle, Directivity, Gain, Polarization, efficiency, Equivalent areas, Radiation Resistance, Effective length, antenna temperature; Relation between Maximum Directivity and effective area, illustrated Problems.

UNIT–II: LINEAR WIRE ANTENNA

Retarded potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance, Directivity. Introduction to Antenna Theorems and Loop antennas.

UNIT–III: ANTENNA ARRAYS

Introduction, Two element arrays – different cases; N element uniform arrays- Broadside, End-fire Arrays, EFA with Increased Directivity. Principle of pattern multiplication, Binomial and Phased array.

UNIT–IV: HF, VHF, UHF ANTENNAS

Introduction, Traveling wave radiators – basic concepts, Long wire antennas, V-Antenna, Rhombic Antenna, Folded Dipole, Yagi-Uda Antenna, Helical Antenna, Micro strip antenna.

Microwave antennas- Reflector antennas, Parabolic antennas, Horn Antenna, Lens Antenna. **Antenna Measurements**: Radiation pattern, Gain transfer method, Absolute measurement, Directivity.

UNIT–V: WAVE PROPAGATION

Friss Free space Equation for wave Propagation, Ground wave Propagation, Space wave Propagation- Field strength calculation, Line of Sight, Duct Propagation, Tropospheric Scattering. Sky wave Propagation-Formation of Ionospheric Layers, Mechanism of Reflection and Refraction and their Characteristics, Ionospheric Abnormalities and Absorption.

TEXT BOOKS:

1. Constantine A.Balanis, "Antenna Theory: Analysis and Design", 4th Edition, John Wiley & Sons, 2016.
2. K.D. Prasad, Satya Prakashan, "Antennas and Wave Propagation" –Tech India Publications, New Delhi, 2001.

REFERENCE BOOKS:

1. J. D. Kraus, R. J. Marhefka, "Antennas and Wave Propagations", 4th Edition, McGraw-Hill, 2010.
2. E.C.Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd Edition, PHI, 2007.

III B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC6TH02	DIGITAL SIGNAL PROCESSING						

COURSE OBJECTIVES:

1. Make Enhance the analytical ability of the students in the area of signal processing.
2. Develop ability among students to observe the response of the discrete time systems for different types of discrete time sequences.
3. Demonstrate basic knowledge of Digital Signal Processing by understanding various transformations.
4. Understand different types of filters (analog/digital) and their designs.
5. Design DSP systems which are used in the area of communications and networking.

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

CO1: Analyze the signals and system in Time and Frequency domain through transformations

CO2: Find DFT and IDFT coefficients of a given discrete time sequence using Fast Fourier Transform algorithm.

CO3: Illustrate the significance of various filter structures and responses.

CO4: Construct the digital filter circuits for generating desired signal wave shapes (non-sinusoidal)

CO5: verify the performance of a variety of

SYLLABUS:

UNIT-I: INTRODUCTION

Review of Discrete Time Signals: Some Elementary Discrete-Time Signals, Classification of Discrete–Time Signals, Simple Manipulations of Discrete–Time Signals, Discrete Time Systems: Input-Output Description of Systems, Block Diagram Representation of Discrete-Time Systems and Classification of Discrete-Time Systems, Frequency domain representation of Discrete Time Signals and Systems, Discrete-Time Fourier Transform (DTFT): Existence of DTFT, properties of DTFT.

UNIT-II: DISCRETE FOURIER SERIES & DISCRETE FOURIER TRANSFORMS

Discrete Fourier series: Properties of Discrete Fourier Series, DFS representation of periodic sequences. DFT: Properties of DFT, Computation of DFT, Circular & Linear Convolution of Sequences using DFT. FAST FOURIER TRANSFORMS: Radix-2 Fast Fourier Transforms (FFT), Decimation in Time and Decimation in Frequency FFT Algorithms and Inverse FFT. Review of Z-Transforms

UNIT-III: REALIZATION OF IIR & FIR FILTERS

Block Diagram Representation of Linear Constant Coefficient Difference Equations.

Basic structures of IIR systems: Direct form-I realization, Direct form-II realization, transposed, cascade form, parallel form. Lattice structures of IIR systems, Conversion from Lattice structure to direct form and vice-versa. Basic structures of FIR systems: Transversal structure, Linear phase, Lattice structure, Polyphase Lattice structures of FIR systems, Conversion from Lattice structure to direct form and vice-versa.

UNIT-IV: IIR DIGITAL FILTERS

Analog filters approximations: Butterworth and Chebyshev, Design of IIR digital filters from analog filters, Design examples, Frequency Transformations in Analog Domain: Low pass to Low

pass filter, Low pass to High pass filter, Low pass to Band pass filter, and Low pass to Band stop filter. Frequency Transformations in digital domain: Low pass to Low pass filter, Low pass to High pass filter, Low pass to Band pass filter, and Low pass to Band stop filter.

UNIT-V: FIR DIGITAL FILTERS

Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Digital Filters Using Window Techniques: Rectangular Window, Triangular or Bartlett Window, Raised Cosine Window Hanning Window, Blackman Window, Kaiser Window, Frequency Sampling Technique: Frequency Sampling Realization, Frequency Response, Design, Comparison of IIR and FIR filter.

TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, ―Digital signal processing, principles, Algorithms and applications, 4th Edition, Pearson Education/PHI, 2007.
2. A.V. Oppenheim and R.W. Schaffer, ―Discrete Time Signal Processing‖, 2nd Edition, PHI, 2008.

REFERENCE BOOKS:

1. Ramesh Babu, ―Digital Signal Processing‖, SciTech Publications, 2011.
2. Andreas Antoniou, ―Digital signal processing‖, TATA McGraw Hill, 2006.
3. R S Kaler, M Kulkarni,, Umesh Gupta, ―A Text book on Digital Signal processing‖, I K International Publishing House Pvt. Ltd, 2010.
4. M H Hayes, Schaum‘s outlines, ―Digital signal processing‖, TATA Mc-Graw Hill, 2007.

III B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC6TH03	MICROCONTROLLERS AND EMBEDDED SYSTEMS						

COURSE OBJECTIVES:

1. Learn the features of basic Microcontroller, its instruction set and also other advanced controllers.
2. Know the building blocks of typical embedded system, memory devices and supporting devices.
3. Understand the characteristics and quality attributes of embedded systems
4. Study the application specific and domain specific embedded system
5. Understand the concepts of C versus embedded C and compiler versus cross-compiler.

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

CO1: Explain 8051 architecture and the function of on-chip hardware units in 8051.
CO2: Develop 8051 embedded C programs for interfacing Matrix Keyboard, LCD, DAC, ADC and 7segment LED Display.
CO3: Demonstrate the architecture and function of on-chip peripherals in ARM
CO4: Summarize embedded system architecture and its building blocks.
CO5: Outline embedded system components, and Embedded Firmware designs

SYLLABUS:

UNIT–I: INTRODUCTION TO 8051 MICROCONTROLLER

Overview of 8051 microcontroller, Architecture, I/O Ports, Memory organization, addressing modes and instruction set of 8051, Interrupts, timer/ Counter and serial communication

UNIT–II: INTERFACING AND APPLICATIONS OF 8051

Keyboard, LED, 7- segment display, LCD, stepper motor, ADC, DAC, Relays, Opt isolators and sensor interfacing with 8051 microcontroller.

UNIT–III: ARM 32-BIT MICROCONTROLLER

Introduction to 16/32 Bit processors, ARM Processor families, ARM architecture and organization, ARM / Thumb programming model, ARM / Thumb instruction set. Interfacing & Programming concepts of ARM.

UNIT–IV: INTRODUCTION TO EMBEDDED SYSTEMS

Definition of Embedded System, Embedded Systems Vs. General Computing, Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, characteristics and Quality Attributes of Embedded Systems.

UNIT–V: EMBEDDED SYSTEM COMPONENTS AND FIRMWARE

Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Serial/Parallel Communication devices, Embedded Firmware design approaches and Development languages. Operating system basics, Types of operatingsystems.

TEXT BOOKS:

1. Ayala, K.J., "The 8051 Microcontroller Architecture, Programming and Applications", 3rd Edition, Penram International, 2007.
2. Ajay V Deshmukh, "Microcontrollers", McGraw-Hill Education, 2017.
3. Shibu K.V, "Introduction to Embedded Systems ", Tata McGraw-Hill Education Pvt. Ltd., 2009.

REFERENCE BOOKS:

1. Raj Kamal, "Embedded Systems", Tata McGraw-Hill Education, 2011.
2. N.Sentil Kumar,M.Saravanan, S.Jeevananthan, "Microprocessors and Microcontrollers", Oxford University Press, 2010.

III B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC6TH04	OBJECT ORIENTED PROGRAMMING THROUGH JAVA						

COURSE OBJECTIVES:

1. The course provides fundamentals of object-oriented programming in Java and development of user interface.

COURSE OUTCOMES: After successful completion of this course, the students will be able to

CO1: Utilize the basic Object Oriented concepts in writing JAVA programs.
CO2: Experiment with programming constructs of Object Oriented Programing.
CO3: Make use of inheritance, interfaces, packages and Exception handling concepts.
CO4: Apply multi-threading concepts.
CO5: Apply applets, AWT and Event Handling concepts in various UI Applications.

SYLLABUS:

UNIT-I: Introduction to OOP: Introduction, Need of Object Oriented Programming, Principles of Object-Oriented Languages(Classes, Objects, Abstraction, Encapsulation, Inheritance, Polymorphism), Procedural languages Vs. OOP, Applications of OOP, History of JAVA, Java Virtual Machine, Java Features(Platform Independence, Object-Oriented, Both Java compiled and interpreted, Robust, Security, Multithreaded, other features), and Program structures, Installation of JDK1.8(Getting started with JDK, JDK Installation notes, Exploring the JDK).

UNIT-II: Programming Constructs: Variables, Primitive Data types, Identifiers (Naming Conventions, Keywords), Literals, Operators (Binary, Unary and ternary), Expressions, Precedence rules and Associativity, Primitive Type Conversion and Casting, Flow of control (Branching, Conditional, loops).
Classes and Objects: classes, Objects, Creating Objects, Methods (method types, method overloading), constructors (Parameterized Constructors, Constructor overloading), Cleaning up unused objects (Garbage collector, Finalization), Static keyword (static variables, methods, blocks), this keyword, Arrays, Recursion, Command line arguments and String handling

UNIT-III: Inheritance: Types of Inheritance, Deriving classes using extends keyword, Method overriding, super keyword, final keyword, Abstract class.
Interfaces, Packages and Enumeration: Interface (Variables in interface, Extending interface), Interface vs. Abstract classes, Packages (Creating packages, using Packages, Access protection), Understanding CLASSPATH, java.langpackage(Object class, String class), enumeration.
Exceptions: Introduction, Exception handling techniques (try...catch, throw, throws, finally block), user defined exception.

UNIT-IV: Multi-Threading: java.lang.Thread, Thread life cycle, The main Thread, Creation of new threads (by inheriting Thread class, Implementing the Runnable interface), Thread priority, Multithreading using isAlive() and join(), Synchronization(Synchronizing Methods, Statements), Suspending and Resuming threads, Communication between Threads.

UNIT-V: Applets: Applet class, Applet structure, An Example Applet Program, Applet Life Cycle (init()**,** start(), stop(), destroy()), paint(),update() and repaint(), passing parameters to the Applet.
Event Handling: Introduction, Event Delegation Model, java.awt.event Description, Sources of Events, Event Listeners, Adapter classes, Inner classes.
Abstract Window Toolkit: Why AWT?, java.awt package, Components and Containers, Button, Label, Checkbox, Radio buttons, List boxes, Choice boxes, Text field and Text area, container classes, Layouts, Menu, Scroll bar.

TEXT BOOK:
1. The Complete Reference Java, 8ed, Herbert Schildt, TMH.

REFERENCE BOOKS:
1. JAVA Programming, K. Rajkumar, Pearson.
2. Core JAVA, Black Book, Nageswara Rao, Wiley, Dream Tech.

Online References:

1. https://www.coursera.org/learn/object-oriented-java
2. https://www.youtube.com/watch?v=3u1fu6f8Hto
3. https://www.edx.org/course/object-oriented-programming-in-java

III B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC6PE05	ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (PROFESSIONAL ELECTIVE-1)						

COURSE OBJECTIVES:

1. List out Performance Characteristics of Different Electronic Measuring Instruments, Analysis and Calibration Techniques.
2. Describe Concepts of Passive and Active Transducers.
3. Review the concepts of electrical and electronics measurements with different techniques. and Explain about all AC bridges and Q-meters, Design Methods and its Applications.
4. Memorize Signal Generator and Wave Analyzers for Analysis of EM Spectrum.
5. Illustrate concepts of computer controlled test systems, storage elements and display instruments.

COURSE OUTCOMES: After going through this course, the student will be able to

CO1: List out Electronic Instruments, their Characteristics and use, Peculiar Errors Associated with the Instruments and how to minimize such Errors.
CO2: Experiment with transducers, electrical and electronic instruments.
CO3: Review the Principle of Operation of Electronic Measuring Instruments.
CO4: Illustrate various concepts of electronic instruments. Computer controlled test systems.
CO5: Storage and display instruments for experimenting.

SYLLABUS:

UNIT-I: **BASIC MEASUREMENTS:** Functional Elements of measurement system- Examples - Characteristics of instruments: Static characteristics, Dynamic characteristics, Types of errors, sources of errors, methods of eliminating Errors, Histogram, Mean, Measure of dispersion from the mean, Range Deviation Average deviation, Standard Deviation, Variance, Bourdon Tubes.

UNIT-II: TRANSDUCERS: Classification of Transducers, Characteristics, Basic Requirements of a Transducer, Resistive Transducer, Strain Gauge, Inductive Transducer, Capacitive displacement transducer, LVDT, Load cell Transducers, Thermocouple, Thermistor, Radiation Pyrometers.

UNIT-III: ELECTRICAL MEASUREMENTS: Measurement of Voltage and Current: D'Arsonval Galvanometer, permanent magnet moving coil, permanent magnet moving iron, Dynamometer, Measurement of Resistance, Inductance and Capacitance: Wheat stone bridge, Kelvin double bridge, Wien Bridge, Hay's bridge, Maxwell bridge, Anderson bridge, Q- Meter, Schering bridge, Ohmmeter.

UNIT-IV: ELECTRONIC MEASUREMENTS: Signal generators: Function Generator, RF Signal Generator, Random Noise Generator, Sweep generators, Wave Analyzer- Harmonic, Distortion Analyzer - Spectrum Analyzer - DC & AC Voltmeters, Digital Voltmeters, Electronic Multimeters, VOM meters. Measurement of physical parameters force, pressure, velocity, humidity and Data acquisition systems.

UNIT-V: STORAGE AND DISPLAY INSTRUMENTS: Cathode Ray Oscilloscopes– CRT Circuit, Vertical Deflection System, Delay Line, Horizontal Deflection System, Oscilloscope Techniques, Special Oscilloscopes, Recorders -XY & Magnetic Tape Dot Matrix Display.

TEXT BOOKS:

1. A.K.Sawhney ‖ Electrical, Electronic measurement & Instrumentation‖, 18th Edition, Dhanpat Rai & Sons, Reprint 2010
2. Albert.D.Helfrick & William.D.Cooper, ―Modern Electronic Instrumentation & Measurement Techniques‖, PHI , 2003.

REFERENCE BOOKS:

1. E.W.Golding and F.C.Widdis ―Electrical Measurements and measuring Instruments‖, 5th Edition, AH Wheeler & Company, 1993.
2. Electronic instrumentation: H.S.Kalsi - TMH, 2nd Edition 2004.
3. Alan Morris, "Principles of Measurements & Instrumentation", 2nd Edition, PHI, 2003.
4. R. K. Rajput, ―Electronic Measurements & Implementation‖, S. Chand Pu

III B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC6PE06	DATA COMMUNICATIONS AND COMPUTER NETWORKS (PROFESSIONAL ELECTIVE–I)						

COURSE OBJECTIVES:

1. To gain knowledge in network topology, reference models various transmission media and ISDN techniques.
2. To illustrate data link layer design issues, medium access sub layer protocols, routing in computer networking
3. To summarize transport layer and application layer functions.
4. To classify protocols used in different layers of the computer network
5. To understand concepts of network security, domain name service, network management protocol

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

CO1: Describe different types of services, layers and switching techniques in computer networks.
CO2: Identify design issues of various layers in the reference model of computer networks.
CO3: Explain various network topology, transmission media and ISDN techniques.
CO4: Classify protocols used in different layers of the computer network.
CO5: Explain concepts of network security, domain name service, network management protocol.

SYLLABUS:

UNIT–I: PHYSICAL LAYER

Network topologies, ISO-OSI Reference model - TCP/IP Reference model, Problems in OSI Reference model - Problems in TCP/IP Reference model. Transmission media: copper wire, twisted pair, coaxial cable and fibre optic cable - Switching techniques: circuit, message and packet switching – comparison of switching techniques - ISDN.

UNIT–II: DATA LINK LAYER

Design issues: services provided to network layer, framing techniques, flow control, error control Error detection and correction: Cyclic Redundancy Code, Elementary protocols: Unrestricted simplex protocol - simple stop-and-wait protocol - Sliding window protocols: 1-bit sliding window protocol, Go back n and Selective Repeat protocols.

UNIT–III: NETWORK LAYER

Services provided to transport layer - Communication subnet: Virtual Circuit (VC) and datagram subnets, Routing algorithms: optimality principle - Shortest path routing – Flooding - Distance vector routing - Count-to-infinity problem - Hierarchical routing - Link state routing, Broadcast routing - Multicast routing.

UNIT–IV: TRANSPORT LAYER

Transport services – Transport service primitives - Connection management: Connection
Establishment protocols – Connection release protocol: two-army problem, Transport protocols - TCP protocol: TCP header format – UDP protocol: UDP header format.

UNIT–V: APPLICATION LAYER

Network security: Authentication – Cryptography – Encryption types - Substitution ciphers and transposition ciphers – DES (Data Encryption Standard) – DNS (Domain Name Service) - SNMP (Simple Network Management Protocol) model

TEXT BOOKS:

1. Andrew S Tanenbaum ―Computer Networks‖, 5th Edition, PHI, 2013.
2. Behrouz A. Forouzan ―Data Communications and Networking‖, 3rd Edition, TMH, 2002.

REFERENCE BOOK:

1. W. Stallings, ―Data and Computer Communication‖ , 10th Edition, Pearson Education, 2013.

III B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC6PE07	EMBEDDED SYSTEM DESIGN WITH ADVANCED PROCESSORS (PROFESSIONAL ELECTIVE–I)						

COURSE OBJECTIVES:

1. To understand 3 and 5 stage pipelines of ARM core
2. Apply instructions set of ARM 7 processor using assembly language
3. To understand the AMBA bus architecture & Debugging architectures
4. Analyze different advanced ARM cores.
5. Visualize the use of ARM core for different SOC applications.

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

CO1: Illustrate 3 and 5 stage pipelines of ARM core.
CO2: Able to apply instructions for programming of ARM 7 processor.
CO3: Build the AMBA bus architecture & Debugging
CO4: Analyze different advanced ARM cores.
CO5: Demonstrate the use of ARM core for different SOC applications.

SYLLABUS:

UNIT-I: ARM PROCESSOR AS SYSTEM-ON-CHIP

Acorn RISC Machine – Architecture inheritance – ARM programming model – ARM development tools – 3 and 5 stage pipeline ARM organization – ARM instruction execution and implementation – ARM Co-processor interface.

UNIT-II: ARM ASSEMBLY LANGUAGE PROGRAMMING

ARM instruction types – data transfer, data processing and control flow instructions – ARM instruction set – Co-processor instructions, Thumb Instruction set. Sample assembly language programs of ARM processor.

UNIT-III: ARCHITECTURAL SUPPORT FOR SYSTEM DEVELOPMENT

Advanced Microcontroller bus architecture – ARM memory interface – ARM reference peripheral specification – Hardware system prototyping tools – ARMulator – Debug architecture.

UNIT-IV: ARM PROCESSOR CORES

ARM7TDMI, ARM8, ARM9TDMI, ARM10TDMI, Architectural features of LPC 2148. Architecture of ARM Cortex M0 & operation modes, Technical overview and Comparison of features of Cortex M0, M3 & M4.

UNIT-V: EMBEDDED ARM APPLICATIONS

The VLSI Ruby II Advanced Communication Processor, The VLSI ISDN Subscriber Processor, The OneCTM VWS22100 GSM chip, The Ericssion-VLSI Bluetooth Baseband Controller.

TEXT BOOKS:

1. ARM System-on-Chip Architecture, Second Edition, by Steve Furber, PEARSON, 2013.
2 Joseph Yiu "The Definitive Guide to the ARM Cortex-M0", Newnes, (Elsevier), 2011

REFERENCE BOOKS:

1. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM
2. System on Chip Verification – Methodologies and Techniques –Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001,Kluwer Academic Publishers.

III B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC6PE08	STATISTICAL METHODS IN AI (PROFESSIONAL ELECTIVE-I)						

COURSE OBJECTIVES:

1. Present an overview of artificial intelligence (AI) principles and approaches.
2. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, and learning.
3. Understand what is reasoning and Knowledge Representation
4. Students will implement a small AI system in a team environment.
5. The knowledge of artificial intelligence plays a considerable role in some applications.

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

CO1: Apply the basics of Artificial Intelligence, Intelligent Agents and its structure for problem solving by various searching techniques

CO2: Apply the concept of informed search and Exploration of constraint satisfaction problems and Adversarial Search

CO3: Analyze what is reasoning and Knowledge Representation

CO4: Analyze the concept of Reasoning with Uncertainty & Probabilistic Reasoning

CO5: Apply the basic forms of Machine Learning, decision trees and statistical Learning setting.

SYLLABUS:

UNIT–I:

AI History and applications. Overview of AI application areas: game playing, automated reasoning and theorem proving, expert systems, natural language understanding, planning and robotics, machine learning and Alan Turing Test.

UNIT–II:

Symbol and sentences, the semantics of the Propositional Calculus & Predicate Calculus. Inference Rules and Theorem Proving. Axioms, Literals, Horn clause & Clausal forms.

UNIT–III:

Inductive, Deductive, Abductive and Default reasoning. More examples on Resolution proof. Structures and strategies for state space search. Algorithms for Heuristic search, Heuristic evaluation functions.

UNIT-IV:

Knowledge representation Techniques; conceptual graphs; structured representations; frames, scripts; issues in knowledge representation: hierarchies, inheritance, exceptions. An overview of the induction methods, types and tools. Stages in Knowledge acquisition with examples. Analyzing, coding, documenting and diagramming. Scope of knowledge.

UNIT–V:

Overview of expert system technology; rule-based expert systems; Construction of ES. Components of an ES, The explanation facility, Rule-based formation and forward and backward chaining techniques for problem solving.

TEXT BOOK:

1. Artificial Intelligence - A New Synthesis by Nils J. Nilsson, Morgan Kaufmann Publishers.

REFERENCE BOOKS:

1. Artificial Intelligence: Strategies and techniques for complex problems solving by George Luger, Addison-Wesley, 2003.
2. Artificial Intelligence - A Modern Approach by Stuart Russell & Peter Norvig, Prentice Hall.

III B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	1.5
Code: 19BEC6LB01	MICROPROCESSORS & MICROCONTROLLERS LAB						

COURSE OBJECTIVES:

1. To study the basics architecture model of 8086 microprocessor and 8051 microcontroller.
2. To learn 8086 microprocessor based ALP using arithmetic, logical and shift operations.
3. To understand modular and DOS/BIOS programming using 8086 microprocessor.
4. Familiarize to interface 8086 with I/O and other devices.
5. To develop 8051 system by interfacing different peripherals.

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

CO1: Build Up the assembly language programs on arithmetic, logical and string operations.
CO2: Construct an 8086 system by interfacing I/O and other devices.
CO3: Make Use of Instruction set of 8086 for modular programming and Dos/Bios programming.
CO4: Distinguish processor based systems and controller system
CO5: Model the 8051 based embedded systems for various applications

I. Microprocessor 8086:

1. Introduction to MASM/TASM.
2. Arithmetic operation – Multi byte addition and subtraction, multiplication and division – Signed and unsigned arithmetic operation, ASCII – Arithmetic operation.
3. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
4. String Operations**:** Move block, Reverse string, Sorting, Inserting, Deleting, Length of the string, String comparison.
5. Modular Program: Procedure, Near and Far implementation, Recursion.
6. Dos/BIOS programming: Reading keyboard (Buffered with and without echo) – Display characters, Strings.
7. Interfacing 8255–PPI.
8. Interfacing 8259 – Interrupt Controller.
9. Interfacing 8279 – Keyboard Display Controller.
10. Stepper motor control using 8253/8255.

II.Microcontroller 8051

11. Reading and Writing on a parallel port.
12. Timer in different modes.
13. Serial communication implementation.
14. Understanding three memory areas of 00 – FF (Programs using above areas) using external interrupts
15. Interfacing LED's & LCD

EQUIPMENT REQUIRED FOR LABORATORY

1. MASM/TASM software.
2. 8086 Microprocessor.

Kits

1. 8051 Micro Controller kits.
2. Interfaces/peripheral subsystems.
   i) 8259 PIC
   ii) 8279-KB/Display
   iii) 8255 PPI
   iv) 8251 USART
3. A/D and D/AC Interface.

III B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	1.5
Code: 19BEC6LB02	OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB						

COURSE OBJECTIVE:

1. The course provides user interface and application development program implementation using core java principles.

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

CO1: Develop java programs by using OOP concepts [K3].
CO2: Make use of interfaces, packages, threads in developing JAVA programmes [K3].
CO3: Make use of exception handling in java programming [K3].
CO4: Develop Graphical User Interfaces and applets with event handling [K3].

List of PROGRAMS

1. Write a Java Program to display default value of all primitive data types of Java.
2. Write a Java Program that displays the roots of a quadratic equation $ax2 + bx + c = 0$.Calculate the discriminant D and basing on the value of D, Describe the nature of roots.
3. Write a Java Program to display the Fibonacci sequence.
4. Write a Java Program give examples for Command line arguments.
5. Write a Java Program to sort given list of Numbers.
6. Write a Java Program to search for an element in a given list of elements (linear search).
7. Write a Java Program to search for an element in a given list of elements using Binary Search.
8. Write a Java Program to determine the Addition of two matrices.
9. Write a Java Program to determine the Multiplication of two matrices.
10. Write a Java Program to sort an array of Strings.
11. Write a Java Program to check whether the given string is palindrome or not.
12. Write a Java Program for call by value and call by reference.
13. Write a Java Program for "this" keyword
14. Write a Java Program to demonstrate static variables, methods and blocks.
15. Write a Java Program to give the example for "super" keyword.
16. Write a Java Program that illustrates simple inheritance.
17. Write a Java Program that illustrates multi-level inheritance.
18. Write a Java Program demonstrating the difference between method overloading and method overriding.
19. Write a Java Program demonstrating the difference between method overloading and constructor overloading
20. Write a Java Program that describes the Exception Handling.
21. Write a Java Program for example of try and catch block.in this check whether the given array size is negative or not.
22. Write a Java Program to illustrate sub class exception precedence over base class.
23. Write a Java Program for creation of user defined exception.
24. Write a Java Program to illustrate creation of threads using runnable interface.
25. Write a Java Program to create class MyThread in this class a constructor, call the base class constructor, using super and starts the thread. The run method of the class starts after this. It can be observed that both main thread and created child thread are executed concurrently.

26. Write a Java Program illustrating multiple inheritance using interfaces.
27. Write a Java Program to create a package p1, and implement this package in ex1 class.
28. Write a Java Program to create a package named mypack and import it in circle class.
29. Write a Java Program to give a simple example for abstract class.
30. Write a Java Program that describes the life cycle of an applet.
31. Write a Java Program to create a border layout control.
32. Write a Java Program to create a padding layout control.
33. Write a Java Program to create a simple Calculator.
34. Write a Java Program that displays the x and y positions of the cursor movement using mouse.
35. Write a Java Program that displays number of characters, lines and words in a text file.

III B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC5MC01	ADVANCED COMMUNICATION SKILLS LAB						

COURSE OBJECTIVES:

1. To train the students to use language effectively in professional situations like group discussions, public speaking, presentations and interviews.
2. To make the students understand the importance of body language.
3. To provide exposure to students to soft skills like Goal Setting, Assertiveness, Time Management, Positive Attitude and Stress Management
4. To expose the students to SWOT Analysis, Interpersonal Skills, Intra Personal Skills, Leadership Qualities and Emotional Intelligence.

COURSE OUTCOMES: After successful completion of this course, the students will be able to

CO 1: Apply the nuances of the written language and write letters, emails and Resume effectively.
CO 2: Know how body language is used in communication and interpret non-verbal symbols
CO 3: Participate in Group Discussions using analytical and problem solving skills.
CO 4: Face job interviews confidently and enhance employability.

UNIT– I: Resume Writing, Email & Letter Writing

UNIT–II: Non Verbal Communication skills

UNIT–III: Personal Introduction & JAM

UNIT-IV: Group Discussion

UNIT-V: Interview skills

REFERENCE BOOKS:

1. Rajendra Pal, J S KorlahaHi, Essentials of Business Communication, Sultan Chand & Sons
2. Andrea J. Rutherford, Basic Communication Skills for Technology, Pearson Education Asia
3. V. Prasad, Advanced Communication Skills, Atma Ram Publications
4. Sanjay Kumar, Pushp Lata, Communication Skills, Oxford University Press
5. Meenakshi Raman, Sangeeta Sharma, Fundamentals of Technical Communication, Oxford University Press

IV B.TECH. – I SEMESTER

S.No.	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	Microwave Engineering	PC	40	60	100	3	-	-	3
2	VLSI Design	PC	40	60	100	3	-	-	3
3	**Professional Elective - II:** i. Data Acquisition and Transmission ii. Satellite Communications iii. Embedded and Real time Operating System iv. Soft Computing Techniques	PE	40	60	100	3	-	-	3
4	**Professional Elective - III:** i. Bio Medical Instrumentation ii. Optical Communications iii. Introduction to Deep Learning iv. Image Processing	PE	40	60	100	3	-	-	3
5	**Open Elective – IV** i. Introduction to Micro Processors & Micro Controllers(Other than ECE) ii. Automotive Electronics	OE	40	60	100	3	-	-	3
6	Digital Signal Processing Lab	PC	20	30	50	-	-	3	1.5
7	MW & OC Lab	PC	20	30	50	-	-	3	1.5
8	VLSI & Embedded Systems Lab	PC	20	30	50	-	-	3	1.5
9	MOOCS	PE	-	-	-	-	-	-	1
10	Internship/Practical Training	PR	50	-	50	-	-	-	1
Total			**360**	**390**	**750**	**15**	**-**	**11**	**20.5**

IV B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC7TH01	MICROWAVE ENGINEERING						

COURSE OBJECTIVES:

1. Gain knowledge in fundamental electrical characteristics of waveguides
2. Understand transmission lines through electromagnetic field analysis.
3. Gain knowledge in properties of Polarization and Ferrite materials composition in the case of waveguide components.
4. Gain knowledge in multiport junction concept for splitting the microwave energy in a desired direction.
5. Gain knowledge in function, design, and integration of the major microwave components like oscillator, modulator, power amplifier, filter and mixer in building a Microwave test bench setup for measurements.

CORSE OUTCOMES: After going through this course the student will able to

CO1: Explain about transmission lines and waveguide structures and

CO2: Illustrate how waveguides are used as elements in impedance matching and filter circuits.

CO3: Apply analysis methods to determine circuit properties of passive or active microwave devices.

CO4: Distinguish between M-type and O-type tubes

CO5: Analyze and measure various microwave parameters using a Microwave test bench

UNIT-I: MICROWAVE TRANSMISSION LINES: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Mode Characteristics – Phase and Group Velocities, Impossibility of TEM mode Related Problems. **CIRCULAR WAVEGUIDES**: Introduction, Nature of Fields, Characteristic Equation, Dominant and Degenerate Modes.

UNIT-II: WAVEGUIDE COMPONENTS AND APPLICATIONS - I: Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Electronics & Communication Engineering Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Phase Shifters – Dielectric, Rotary Vane types. Scattering Matrix– Significance, Formulation and Properties. S-Matrix Calculations for – 2 port Junction, Eplane and H-plane Tees, Magic Tee, Hybrid Ring; Directional Couplers – 2 Hole, Bethe Hole types, Ferrite Components– Faraday Rotation, S-Matrix Calculations for Gyrator, Isolator, Circulator, Related Problems.

UNIT-III: MICROWAVE TUBES: Limitations and Losses of conventional tubes at microwave frequencies. Microwave tubes – O type and M type classifications. O-type tubes: 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for o/p Power and Efficiency. Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Electronic Admittance; Related Problems.

UNIT-IV: HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Suppression of Oscillations, Nature of the four Propagation Constants. **M-type Tubes:** Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave. Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics.

UNIT-V: MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory
MICROWAVE MEASUREMENTS: Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, VSWR, Cavity Q. Impedance Measurements.

TEXT BOOKS:

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition, 1994.
2. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004.

REFERENCE BOOKS:

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Circuits and Passive Devices – M.L. Sisodia and G. S. Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd., 1995.
3. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
4. Microwave Engineering – G S N Raju , I K International
5. Microwave and Radar Engineering – G Sasibhushana Rao Pearson
6. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th ed., 1955.

IV B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC7TH02	VLSI DESIGN						

COURSE OBJECTIVES:

1. To learn the MOS Process Technology
2. To understand the operation of MOS devices
3. Understand and learn the characteristics of CMOS circuit construction.
4. Describe the general steps required for processing of CMOS integrated circuits.
5. To impart in-depth knowledge about analog and digital CMOS circuits.

COURSE OUTCOMES: On successful completion of this course, student will be able to

CO1: Demonstrate various fabrication steps of IC and come across basic electrical properties of MOSFET.

CO2: Illustrate concepts and techniques of modern integrated circuit design and testing (CMOS VLSI).

CO3: Interpret the pass transistor, inverters and scaling rules of MOS technology.

CO4: Build the sub systems like adders, 4 -bit processors and ALU.

CO5: Compute inverter delays, fan-in and fan- out, power calculation and clock mechanism in VLSI design.

UNIT-I: INTRODUCTION AND BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS: VLSI Design Flow, Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. Regions of operation of MOSFET. I_{ds} versus V_{ds} 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: BASIC CIRCUIT CONCEPTS:

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, Propagation Delays, Wiring Capacitances, Choice of layers. Switch logic, Gate logic.

UNIT-III: VLSI CIRCUIT DESIGN PROCESS:

MOS Layers, Stick Diagrams, Design Rules and Layout, Layout Diagrams for MOS circuits.

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.

BASIC BUILDING BLOCKS OF ANALOG IC DESIGN: Modelling of transistor, body bias effect, biasing styles, single stage amplifier with resistive load, single stage amplifier with diode connected load

UNIT-IV: CMOS COMBINATIONAL AND SEQUENTIALLOGIC CIRCUIT DESIGN: STATIC CMOS DESIGN: Introduction to Complementary CMOS, Rationed Logic, Pass Transistor Logic.

DYNAMIC CMOS DESIGN: Dynamic Logic-Basic Principles, Speed and Power Dissipation of Dynamic Logic, Issues in Dynamic Design, Cascading Dynamic Gates. Latch versus Register, Latch based design, timing decimation, positive feedback, instability, Metastability, multiplexer based latches.

UNIT-V: FPGA DESIGN:

FPGA design flow, Basic FPGA architecture, FPGA Technologies.

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
3. Digital Integrated Circuits, Jan M. Rabaey, AnanthaChandrakasan and Borivoje Nikolic,2nd edition,2016.

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.

IV B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC7PE03	DATA ACQUISITION AND TRANSMISSION (PROFESSIONAL ELECTIVE – II)						

COURSE OBJECTIVES:

1. To understand different types of data acquisition systems.
2. To understand different types of data transmission systems.
3. To understand different types of digital instruments
4. To understand the different types of display systems
5. To understand the types of recorders

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

CO1: Compare analog and digital data acquisition system.
CO2: Infer different data transmission systems.
CO3: Explain different display systems
CO4: Infer different types of digital instruments
CO5: Explain the working principle of recorders**.**

UNIT-I: DATA ACQUISITION SYSTEM

Definition and generalized block diagram of data acquisition system (DAS), Classification of Data Acquisition System. Analog data acquisition system using time division multiplexing, Analog data acquisition system using frequency division multiplexing, Digital data acquisition system with different configurations and Data logger.

UNIT-II: DATA TRANSMISSION SYSTEMS

Definition, Generalized block diagram of Telemetry system, Classification of Telemetry system and working principle, Block diagram, Construction, Landline Telemetry system, Radio frequency amplitude modulated and frequency modulated telemetry system, Pulse telemetry system, Modem based telemetry system, Satellite Telemetry system and Fiber optic Telemetry system.

UNIT-III: DISPLAY SYSTEMS

Construction, principle of operation and salient features of LED, Nixie tube, LCD, segmental gas discharge type, single and multi-digit LED 7-segmental display system , Nixie tube based display system for numeric display (study of BCD to decimal decoder), to design LED Dot Matrix (3 x 5) numeric display system and LCD 7- segmental numeric display system.

UNIT-IV: DIGITAL INSTRUMENTS

Digital Frequency Meter: working principle, construction, range selection and operation of time period meter, frequency ratio meter, Digital Clock: block diagram construction and working, Analog Storage Oscilloscope and Digital storage oscilloscope: working principle, construction, operation and salient features.

UNIT-V: RECORDERS

The working principle, construction, operation and salient features of X-t strip chart recorder, X-Y strip chart recorder and Magnetic tape recorder.

TEXT BOOKS:

1. Sawhney A K, ―Electric and Electronic Measurement and Instrumentation‖, Dhanpat Rai and Sons, New Delhi, 2007.
2. Electronic Instrumentation and Measurements‖, 3rd Edition, Oxford University Press David A. Bell, ―India, 2013.

REFERENCE BOOKS:

1. Doebelin E O, ―Measurement systems – Applications and Deign‖, McGraw Hill, New Delhi, 2003.
2. Mani and Rangan, ―Instrumentation Devices and Systems‖, Tata McGraw Hill, New Delhi, 1997.

IV B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC7PE04	SATELLITE COMMUNICATIONS (PROFESSIONAL ELECTIVE – II)						

COURSE OBJECTIVES:

1. To learn the concepts of communication satellites, earth stations
2. To understand communication link for satellite communications.
3. To compare various multiple access techniques.
4. To familiarize with various multiple access techniques and Satellite Navigation.
5. To understand Non-Geostationary orbit satellite systems

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

CO1: Apply the concepts of communication satellites and earth stations.
CO2: Analyze communication link for satellite communications.
CO3: Compare various multiple access techniques.
CO4: Illustrate various multiple access techniques and Satellite Navigation
CO5: Apply Non-Geostationary orbit satellite systems and Satellite navigation.

UNIT–I: FUNDAMENTALS AND ORBITAL MECHANICS

Origin of Satellite Communications, Historical Background, Basic concepts and Frequency allocations, Applications and Future Trends, Orbital Mechanics, Look Angle Determination, Orbital Perturbations, Orbit Determination, Orbital Effects.

UNIT–II: LAUNCHERS AND SATELLITE SUB-SYSTEMS

Launchers and Launch Vehicles, Attitude and Orbit Control System, TTCM, Power System, Communication Sub System, Satellite Antennas, Equipment Reliability and Space Qualification.

UNIT–III: LEO, GEO SATELLITE SYSTEMS AND LINK DESIGN

Considerations-Orbit, Power and Frequency, Delay and Throughput, System, Operational NGSO Constellation Design; Basic transmission Theory, System Noise Temperature and G/T Ratio, Design of Uplink and Downlinks, Design of satellite Links for specified C/N, System Design Examples.

UNIT–IV: MULTIPLE ACCESS

FDMA, Inter modulation, Calculation of C/N, TDMA, Frame Structure, Satellite Switched TDMA On-Board Processing, DAMA, CDMA, Spread Spectrum Transmission and Reception.

UNIT–V: EARTH STATION TECHNOLOGY

Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Primary Power, Test Methods.

SATELLITE NAVIGATION AND GPS: Radio and Satellite navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, GPS Receiver Operation, GPS C/A code Accuracy, Differential GPS

TEXT BOOKS:

1. Timothy Pratt, Charles Bostian and Jeremy Allnutt, "Satellite Communications", WSE, Wiley Publications,2nd Edition, 2003.(Units-I,II,III,IV,V).
2. Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, "Satellite Communications Engineering", 2nd Edition, Pearson Publications, 2003.(Unit-V)

REFERENCE BOOKS:

1. M. Richharia, "Satellite Communications: Design Principles", BS Publications, 2 nd Edition,2003.
2. D.C Agarwal, "Satellite Communication"- Khanna Publications, 5th Ed.
3. K. N. Raja Rao, "Fundamentals of Satellite Communications" – PHI, 2004 4.Dennis.Roddy, "Satellite Communications", McGraw Hill, 2nd Edition, 1996.

IV B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC7PE05	EMBEDDED AND REAL TIME OPERATING SYSTEMS (PROFESSIONAL ELECTIVE – II)						

COURSE OBJECTIVES:

1. Develop an understanding of the technologies behind the embedded computing systems
2. Communication required for the real-time embedded systems.
3. Technology capabilities and limitations of the hardware and software components
4. Methods to evaluate and design trade-offs between different technologies choices.
5. Understand and design real time operating systems which are backbone of embedded industry

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

CO1: Outline the basics of an embedded system
CO2: Develop, implement and test an embedded system.
CO3: Identify the unique characteristics of real-time systems
CO4: Explain the general structure of a real-time system
CO5: Define the unique design problems and challenges of real-time systems.

UNIT-I: INTRODUCTION TO EMBEDDED SYSTEMS:

Embedded system Vs. General computing system, history, classification, major application areas, and purpose of embedded systems, core of embedded system, memory, sensors and actuators, communication interface, embedded firmware, other system components, PCB and passive components.

UNIT-II: RTOS AND SCHEDULING

Operating basics, types, RTOS, tasks, process and threads, multiprocessing and multitasking, types of multitasking, non preemptive, preemptive scheduling, simulators, emulators, Debuggers, Embedded Product Development life cycle (EDLC)

UNIT-III: TASK COMMUNICATION OF RTOS

Architecture of the Kernel, Interrupt service routines, shared memory, pipes, memory mapped objects, message passing, message queue, mailbox, signaling, RPC and sockets, task communication/synchronization issues, racing, deadlock, live lock, the dining philosopher's problem.

UNIT-IV: THE PRODUCER-CONSUMER PROBLEM

Reader writers problem, Priority Inversion, Priority ceiling, Task Synchronization techniques, busy waiting, sleep and wakery, semaphore, mutex, critical section objects, events, device, device drivers, how to clause an RTOS, Integration and testing of embedded hardware and fire ware.

UNIT-V: DESIGN TECHNOLOGY

Introduction, Automation, Synthesis, Parallel evolution of compilation and synthesis, Logic Synthesis, RT synthesis, Behavioral Synthesis, Systems Synthesis and Hardware/ Software Co-Design, Verification, Hardware/Software co-simulation.

TEXT BOOKS:

1. Introduction to embedded systems by Shibu. K.V, TMH, 2009.
2. Embedded / Real Time Systems – KVKK Prasad, Dreamtech Press, 2005.
3. Embedded System Design – A Unified Hardware/Software Introduction - Frank Vahid, Tony D. Givargis, John Wiley, 2002.

REFERENCE BOOKS:

1. Ayala & Gadre: The 8051 Microcontroller & Embedded Systems using Assembly and C, CENGAGE
2. Embedded Systems, Rajkamal, TMH, 2009.
3. Embedded Software Primer, David Simon, Pearson.
4. The 8051 Microcontroller and Embedded Systems, Mazidi, Mazidi, Pearson.

IV B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC7PE06	SOFT COMPUTING TECHNIQUES (PROFESSIONAL ELECTIVE –II)						

COURSE OBJECTIVES:

1. To introduce principles, techniques, and applications of soft computing.
2. To teach about the concept of fuzziness involved in various systems.
3. To expose the ideas about genetic algorithm
4. To learn the basic concepts & techniques of Soft Computing for problem solving.
5. To know different applications of these models to solve engineering and other problems.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1: Demonstrate knowledge in Artificial Neural Networks Supervised and Unsupervised LearningNetworks

CO2: Analyze neural network architectures, Fuzzy systems and Geneticalgorithms.

CO3: Relate with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems

CO4: Apply contextual knowledge to solve problems related to societal issues like Business Intelligence, Forecasting.

CO5: Reveal different applications of these models to solve engineering and other problems.

UNIT-I: INTRODUCTION TO SOFT COMPUTING & ARTIFICIAL NEURAL NETWORKS

Soft Computing: Neural networks, Application scope of neural networks, Hybrid systems, Soft computing, Applications of soft computing.

Artificial Neural Networks: Fundamentals, Evolution, Basic Models, Terminologies, Hebb network.

UNIT-II: SUPERVISED LEARNING NETWORKS

Perceptron Networks: Theory, Perceptron learning rule, Architecture, Flowchart for training process, Perceptron training algorithm for single and multiple output classes, Perceptron network testing algorithm. **Back-Propagation Networks:** Theory, Architecture, Flow chart for training process, Training algorithm, learning factors of back- propagation networks, Testing algorithm for back-propagation networks.

UNIT-III: UNSUPERVISED LEARNING NETWORKS

Unsupervised Learning Networks: Fixed weight competitive nets, Kohonen self-organizing feature maps, Learning vector quantization, Counter-propagation networks, Adaptive response theory network.

UNIT-IV: FUZZY LOGIC

Classical Sets and Fuzzy Sets: Classical sets- Operations, Properties, Function mapping; Fuzzy sets- Operations, Properties.

Classical Relations and Fuzzy Relations: Cartesian product of relation, Classical relations, Fuzzy relations, Tolerance and equivalence relations, Non-interactive fuzzysets.

UNIT-V: FUZZY SYSTEMS AND GENETIC ALGORITHMS

Fuzzy Arithmetic and Fuzzy Measures: Fuzzy arithmetic, Extension principle, Fuzzy measures, Measures of fuzziness.

Genetic Algorithms: Biological Background, Operations in Genetic Algorithm

TEXT BOOK:

1. S. N. Sivanandan and S. N. Deepa, Principles of Soft Computing, Wiley India, Second Edition, 2011.

REFERENCE BOOKS:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun and Eiji Mizutani,Neuro-Fuzzy and Soft Computing,Prentice-Hall India,2003.
2. S. Rajasekaran and G. A. Vijayalakshmi Pai, NeuralNetworks, Fuzzy Logic and Genetic Algorithms:Synthesis and Applications, PHI Learning Private Ltd,2011.

IV B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC7PE07	BIOMEDICAL INSTRUMENTATION (PROFESSIONAL ELECTIVE – III)						

COURSE OBJECTIVES:

1. Identify and describe operation of biomedical instrumentation.
2. Analyze and evaluate the effect of different diagnostic and therapeutic methods, their risk potential, physical principles, opportunities and possibilities for different medical procedures.
3. Explain and contrast measurement principles for blood flow, pressure and volume as well as respiratory variables.
4. Find the best suitable method for different pathological diagnoses
5. Outline the design of cardiac pacemakers and defibrillators

.

COURSE OUTCOMES: After going through this course the student will be able to

CO1: Compare the different bio potential characteristics and recording methods so as to enable to record various bio signals.

CO2: Apply nonelectrical parameters measurements so as to enable to record various non-electrical parameters

CO3: Identify the patient safety issues related to biomedical instrumentation.

CO4: Build and operate bio potential amplifiers

CO5: Illustrate the role of bio potential electrodes and the different medical imaging systems.

UNIT-I: FUNDAMENTALS OF BIOMEDICAL INSTRUMENTATION

Age - Development of Biomedical Instrumentation - Man Instrumentation System - Components of the Man - Instrument System - Physiological System of the Body – Sources of biomedical signals - Problems Encountered in Measuring a Living System.

UNIT-II: ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS

Electrodes – Types of electrodes – silver-silver Chloride Electrodes – Electrodes for ECG - Amplifiers: Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier. ECG – EEG – EMG – Lead systems and recording methods – Typical waveforms. Biopotential Amplifiers -Shock Hazards and Prevention – Physiological Effects and Electrical Current - leakage current - Shock Hazards from Electrical Equipment - Instruments for checking safety parameters of biomedical equipment‘s - Methods of Accident Prevention - Isolated Power Distribution System.

UNIT-III: NON-ELECTRICAL PARAMETER MEASUREMENTS

The Heart and Cardiovascular System - Electro Cardiography - Measurement of blood pressure – Cardiac output – Heart rate – Heart sound – Pulmonary function measurements – spirometer – Plethysmography - Photo Plethysmography - Body Plethysmography – Blood Gas analyzers : pH of blood –measurement of blood pCO2, pO2.

UNIT-IV: PATIENT CARE MONITORING AND THERAPEUTIC EQUIPMENTS

Elements of Intensive - Care Monitoring - Cardiac Monitor - Patient Monitoring Displays – Diagnosis - Calibration and Repair ability of Patient - Monitoring Equipment - Other Instrumentation for Monitoring Patients - Organization of the Hospital for Patient – Care

Monitoring - Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy- Heart – Lung machine – Audio meters – Dializers.

UNIT-V: BIOTELEMETRY SYSTEM:

Different types of biotelemetry systems and patient monitoring – Introduction to Biometric systems - Introduction to Biotelemetry - Physiological Parameters Adaptable to Biotelemetry - The Components of Biotelemetry System - Implantable Units - Telemetry for ECG Measurements during Exercise - Telemetry for Emergency Patient Monitoring.

MEDICAL IMAGING: Principles of Ultrasonic Measurement - Ultrasonography - Ultrasonic Applications of Therapeutic Uses - Ultrasonic Diagnosis - X-Ray and Radio-Isotope Instrumentations - Computer tomography - CAT Scan - Emission Computerized Tomography – MRI - Endoscopy .

TEXT BOOKS:

1. Cromwell, Wiebell, Pfeiffer, ―Bio-Medical Instrumentation & Measurements‖ 2nd Edition, Prentice Hall of India, 2001.
2. Onkar N. Pandey, Rakesh Kumar, ―Bio-Medical Electronics and Instrumentation‖, Katson Books, 2011.

REFERENCE BOOKS:

1. Joseph J. Carr, John Brown, ―Introduction to Bio-Medical Equipment Technology‖, 4th Edition, Pearson Publications, 2018.
2. Khandapur, ―Hand Book of Bio-Medical Instrumentation‖, McGraw Hill, 2014.
3. M. Arumugam, ―Bio-Medical Instrumentation‖, Anuradha Agencies, 2003.
4. L.A. Geddes and L.E. Baker, ―Principles of Applied Bio-Medical Instrumentation‖, 1969.

IV B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC7PE08	OPTICAL COMMUNICATIONS (PROFESSIONAL ELECTIVE – III)						

COURSE OBJECTIVES:

1. The functionality of each of the components that comprise a fiber- optic communication system and types of fiber materials with their properties and the losses occur in fibers.
2. The principles of single and multi-mode optical fibers and their characteristics
3. Analyze the operation of LEDs, laser diodes, and PIN photo detectors (spectral properties, bandwidth, and circuits) and apply in optical systems.
4. Analyze and design optical communication and Fiber optic sensor systems.
5. The models of analog and digital receivers.

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

CO1: Choose necessary components required in modern optical communications systems.

CO2: Design and build optical fiber experiments in the laboratory, and learn how to calculate electromagnetic modes in waveguides, the amount of light lost going through an optical system, dispersion of optical fibers.

CO3: Use different types of photo detectors and optical test equipment to analyze optical fiber and light wave systems. Choose the optical cables for better communication with minimum losses.

CO4: Compare different optical detectors as well as optical sources.

CO5: Design, build, and demonstrate optical fiber experiments in the laboratory.

UNIT-I: OVERVIEW OF OPTICAL FIBER COMMUNICATION

Historical development, The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers- Modes, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index, Related problems.

UNIT-II: FIBER MATERIALS:

Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in optical fibers-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Information capacity determination, Group delay, TypesofDispersion:-Materialdispersion,Wave-guidedispersion,Polarization-Modedispersion, Inter modal dispersion , Pulse broadening in Graded index fiber, Related problems.

UNIT-III: OPTICAL FIBER CONNECTORS

Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing- Splicing techniques, Splicing single mode fibers, Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints.

UNIT-IV: OPTICAL SOURCES

LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies, Reliability of LED & ILD, Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors, Related problems.

UNIT-V: SOURCE TO FIBER POWER LAUNCHING AND OPTICAL SYSTEM DESIGN

Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling, Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of Error, Quantum limit, Analog receivers. Point-to- point links- Component choice and considerations, Link power budget, Rise time budget with examples, Line coding in Optical links, WDM, Necessity, Principles, Measurement of Attenuation and Dispersion, Eye pattern.

TEXT BOOKS:

1. Optical Fiber Communications – Gerd Keiser, McGraw-Hill International edition, 3rd Edition, 2000.
2. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

REFERENCE BOOKS:

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education,2005.
2. Text Book on Optical Fiber Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Edition, 2004.
4. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.

IV B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC7PE09	INTRODUCTION TO DEEP LEARNING (PROFESSIONAL ELECTIVE – III)						

COURSE OBJECTIVES:

1. To familiarize with the concepts of Perception, Back Propagation, PCA, Singular Value Decomposition
2. To learn the concepts of auto encoders- Regularization, Denoising, Sparse, Contractive, Vectoral Representations of words Convolutional Neural Networks
3. To understand the vanishing gradient problem with LSTMs Encoder Decoder Models
4. To understand the Markov Chains Sampling for training RBMs, Contrastive Divergence for training RBMS
5. Explore basic Neural Networks, optimization algorithms, engine vector decomposition, various types of auto encoders.

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

CO1: Apply the concepts of Perception, Back Propagation, PCA, Singular Value Decomposition

CO2: Analyse auto encoders- Regularization, Denoising, Sparse, Contractive, Vectoral Representations of words Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogleNet, ResNet Object Detection RCNN, Fast RCNN, Faster RCNN, YOLO

CO3: Solve the vanishing gradient problem with LSTMs Encoder Decoder Models, Attention Mechanism, Attention over images, Hierarchical Attention Directed Graphical Models, Markov Networks

CO4: Use Markov Chains Sampling for training RBMs, Contrastive Divergence for training RBMS

CO5: Implement basic Neural Networks, optimization algorithms, engine vector decomposition, various types of auto encoders, batch normalization, convolutional neural networks

UNIT–I: History of Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Perceptron's, Perceptron Learning Algorithm and Convergence, Multilayer Perceptron's (MLPs), Representation Power of MLPs, Sigmoid Neurons, Feedforward Neural Networks, Backpropagation

UNIT–II: Gradient Descent (GD), Momentum Based GD, NetServ Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Eigenvalues and eigenvectors, Eigenvalue Decomposition, Basis, Principal Component Analysis and its interpretations, Singular Value Decomposition , Basis, Principal Component Analysis and its interpretations, Singular Value Decomposition. Auto encoders and relation to PCA, Regularization in autoencoders, Denoising autoencoders, Sparse autoencoders, Contractive autoencoders, Bias Variance Tradeoff, L2 regularization, Early stopping

UNIT–III: Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout, Greedy Layerwise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization, Learning Vectorial Representations Of Words Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet Object Detection, RCNN, Fast RCNN, Faster RCNN, YOLO. Visualizing

UNIT-IV: Convolutional Neural Networks, Guided Backpropagation, Deep Dream, Deep Art, Fooling Convolutional Neural Networks, Recurrent Neural Networks, Backpropagation Through Time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, Gated Recurrent Units (GRUs), Long Short Term Memory (LSTM) Cells, Solving the vanishing gradient problem with LSTMs Encoder Decoder Models, Attention Mechanism, Attention over images

UNIT–V: Hierarchical Attention Directed Graphical Models, Markov Networks. Using joint distributions for classification and sampling, Latent Variables, Restricted Boltzmann Machines, Unsupervised Learning, Motivation for Sampling, Markov Chains, Gibbs Sampling for training RBMs, Contrastive Divergence for training RBMs, Variational autoencoders, Autoregressive Models: NADE, MADE, PixelRNN, Generative Adversarial Networks (GANs)

TEXT BOOK:

1. Ian Goodfellow and Yoshua Bengio and Aaron Courville (2016) Deep Learning Book. Reference

REFERENCE BOOKS:

1. Deep Learning with PyTorch: A practical approach to building neural network models using PyTorch by Vishnu bramanian.
2. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996 Pattern Recognition and Machine Learning, Christopher Bishop, 2007.

IV B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC7PE10	IMAGE PROCESSING (PROFESSIONAL ELECTIVE – III)						

COURSE OBJECTIVES:

1. To study the image fundamentals and mathematical transforms necessary for image processing.
2. To study the image enhancement techniques
3. To study image restoration procedures.
4. To study the image compression procedures.
5. To study morphological processing techniques.

COURSE OUTCOMES:

CO1: Develop any image processing application and List different techniques employed for the enhancement of images.

CO2: Match different causes for image degradation and overview of image restoration techniques.

CO3: Relate the need for image compression and to learn the spatial and frequency domain techniques of image compression.

CO4: Interpret Image compression standards and representation techniques.

CO5: Contrast different feature extraction techniques for image analysis and recognition

UNIT-I: INTRODUCTION AND IMAGE TRANSFORMS

Elements of Visual perception. Image sensing and Acquisition . Imaging in different bands. Digital Image Representation. Relationship between pixels. Image transformations: 2D-DFT, DCT, DST, Hadamard, Walsh, Hotelling transformation, 2D-Wavelet transformation, Wavelet packets.

UNIT-II: TRANSFORMATIONS AND FILTERING

Some basic intensity transformation functions, histogram processing, Image Enhancements in spatial domain and Frequency domain, Image Restoration techniques, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions

UNIT-III: COLOR IMAGE PROCESSING

Color fundamentals, color models, pseudo color image processing, basic of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

UNIT-IV: WAVELETS AND MULTI-RESOLUTION PROCESSING:

Image pyramids, sub band coding & Haar transforms multi resolution expressions, wavelet transforms in one dimensions. The fast wavelets transform, wavelet transforms in two dimensions, wavelet packets. Image compression: Fundamentals, various compression methods-coding techniques, digital image water marking.

UNIT-V: MORPHOLOGICAL IMAGE PROCESSING

preliminaries Erosion and dilation, opening and closing, the Hit-or-miss transformation, some Basic Morphological algorithms, grey –scale morphology Image segmentation: Fundamentals,

point, line, edge detection thresholding, region –based segmentation, segmentation using Morphological watersheds, the use of motion in segmentation.

TEXT BOOKS:

1. R. C.Gonzalez, R.E.Woods," Digital Image processing", Pearson edition, Inc3/e,2008.
2. A.K.Jain," Fundamentals of Digital Image Processing", PHI,1995
3. Jayaraman, S. Esakkirajan, and T. Veerakumar, Digital Image Processing, Tata McGraw-Hill Education, 2011.

REFERENCE BOOKS:

1. J.C. Russ," The Image Processing Handbook", (5/e), CRC, 2006
2. R.C.Gonzalez & R.E. Woods; "Digital Image Processing with MATLAB", Prentice Hall, 2003

IV B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	1.5
Code: 19BEC7LB01	DIGITAL SIGNAL PROCESSING LAB						

COURSE OBJECTIVES:

1. Illustrate time and frequency domain response of discrete time signals and systems.
2. Develop IIR filters and FIR filters.
3. Learn to develop the programs for the designing of filters.
4. Understand the response of an LTI system.
5. Develop the power spectrum of the sequences

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

CO1: Demonstrate the architecture of DSP chips – TMS 320C 5X/6X.

CO2: Illustrate time and Frequency domain response of signals and systems through simulation.

CO3: Develop IIR filters and extend it to convert into FIR filters using windowing techniques and also to obtain the frequency response.

CO4: Interpret the LTI system response for different types of inputs

CO5: Develop the power density spectrum of different sequence to analyze the power of the sequences

LIST OF EXPERIMENTS:

1. To Study the architecture of DSP chips – TMS 320C 5X/6X.
2. Time domain and Frequency domain Analysis of signals and systems.
3. To obtain spectrum of the discrete time sequence (without using default functions)
4. To obtain output of an LTI system (without using default functions).
5. To verify linear and circular convolution.
6. To design FIR filter (LP/HP) using windowing technique
   a) Using rectangular window
   b) Using triangular window
   c) Using Kaiser Window
7. To Implement IIR filter (LP/HP) on DSP Processors
8. To obtain frequency samples of a time sequence using FFT algorithm.
9. To obtain frequency response of analog LP/HP filters.
10. To compute power density spectrum of a sequence.

IV B.TECH- I- SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	1.5
Code: 19BEC7LB02	MICROWAVE ENGINEERING AND OPTICAL COMMUNICATIONS LAB						

COURSE OBJECTIVES:

1. Know about practical application of microwave components
2. Obtain knowledge in microwave parameters
3. To measure attenuation and distortions in optical fiber link.
4. To analyze radiation pattern of horn antenna Lab
5. To verify the characteristics of optical sources.

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

CO1: Illustrate the different microwave sources

CO2: Obtain the characteristics of microwave components.

CO3: Measure signal parameters at microwave frequencies.

CO4: analyze Microwave Active Devices by conducting experiments and measuring various parameters

CO5: analyze the characteristics of optical fiber by conducting experiments and measuring various parameters

Part – A (Any seven experiments):

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics
3. Attenuation Measurement
4. Directional Coupler Characteristics
5. VSWR Measurement
6. Impedance and Frequency Measurement
7. Waveguide parameters measurement
8. Scattering parameters of Circulator
9. Scattering parameters of Magic Tee.

Part – B (Any Five 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.

IV B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	1.5
Code: 19BEC7LB03	VLSI AND EMBEDDED SYSTEMS LAB						

COURSE OBJECTIVES:

1. Students will be able to draw the schematic diagram & layout for the gates, Flip Flops, Counters, Static RAM cell & Differential Amplifier circuits using EDA Tool.
2. Students will be able to programs simulate & test 8051 & ARM processor based circuits & their interfaces.

COURSE OUTCOMES: On the successful completion of the course, students will be able to

CO1: Construct and test Logic gates and flip flops using CMOS EDA Tool.
CO2: Construct and test static RAM cell and Differential Amplifier using CMOS EDA Tool.
CO3: Develop basic programs using LEDs, Serial communication and timers using 8051.
CO4: Develop an interfacing and programming of Interrupt handler, LED, BUZZER, and LCD using ARM.
CO5: Examine the delay generation using timers in 8051 Microcontroller.

PART – A: USING SIMULATION TOOLS (Implement all six experiments from Part-A).

1. Design and Implementation of CMOS Inverter, CMOS NOR/NAND gates.
2. Design and Implementation of CMOS XOR and XNOR gates.
3. Design and Implementation of D-Flip flop.
4. Design and Implementation of Decade Counter.
5. Design and Implementation of static RAM cell.
6. Design and Implementation of Differential Amplifier.

PART: B: USING MICROCONTROLLERS (Implement any six experiments from Part-B)

1. Serial and Parallel Blinking of LEDs using 8051.
2. Serial communication implementation using 8051.
3. Delay generation using timers of 8051.
4. Simple Assembly Program for Loops, Branches, System Calls and Interrupts using ARM.
5. Program to generate Time delay using built in Timer / Counter on IDE environment using ARM.
6. Program to demonstrate a simple interrupt handler and setting up a timer using ARM.
7. Program to Interface 8 Bit LED and Switch Interface using ARM.
8. Program to implement Buzzer Interface on IDE environment using ARM.
9. Program to Display a message in a 2X16 LCD and verify in debug terminal using ARM.
10. Generation of PWM Signal using ARM.

IV B.TECH. – II SEMESTER

S.No.	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	**Professional Elective - IV:** i. Analytical Instrumentation ii. Cellular and Mobile Communication iii. System-On-Chip iv. DSP Architectures	PE	40	60	100	3	-	-	3
2	**Professional Elective - V:** i. PC based Instrumentation ii. Radar Systems iii. Low Power VLSI design iv. Speech Processing	PE	40	60	100	3	-	-	3
3	Project Work	PR	80	120	200	-	-	14	7
Total			**160**	**240**	**400**	**6**	**-**	**-**	**13**

IV B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC8PE01	ANALYTICAL INSTRUMENTATION (PROFESSIONAL ELECTIVE – IV)						

COURSE OBJECTIVES:

1. Identify the whole array of modern analytical instrumentation with tools, which are useful in further applied Research.
2. List out different meters and analyzers.
3. Indicates the purpose of chromatography in various matters.
4. Select spectrophotometers in source and detection levels.
5. Predict Detectors Used in Analytical Instrumentation.

COURSE OUTCOMES: After going through this course, the student will be able to

CO1: Distinguish different analyzers in analytical instrumentation.
CO2: Select the basic principles of Spectroscopy and Chromatography Techniques.
CO3: Relate different analytical techniques to solve analytical and Bio-analytical Problems.
CO4: Extend the use of spectrophotometers in various aspects.
CO5: Write principles of NMR and their use.

UNIT-I: PH AND CONDUCTIVITY METERS & DISSOLVED COMPONENT ANALYZER

Conductivity meters, pH meters, Dissolved oxygen Analyzer, hydrogen analyzers, Sodium analyzer, Silica analyzer and sampling systems.

UNIT-II: GAS ANALYZERS

Thermal conductivity types, CO monitor, NOX analyzer, Industrial analyzer circuits, Theory and problems on Beer – Lamberts Law.

UNIT-III: CHROMATOGRAPHY

Gas Chromatography, Liquid chromatography, their principles and applications, Oxygen analyzer, paramagnetic type detectors and sampling systems.

UNIT-IV: SPECTROPHOTOMETERS

UV, VIS Spectrophotometers – Single beam and double beam instruments, Instrumentation associated with the above Spectrophotometers Sources, and detectors , Sources and detectors for IR Spectrophotometers. FT IR Spectrometer, Flame Emission and Atomic Absorption Spectrophotometer, Atomic Emission Spectrophotometer, Sources for Flame Photometer.

UNIT-V: PRINCIPLE OF NUCLEAR MAGNETIC RESONANCE

Instrumentation Associated with (NMR) Spectrophotometer, Introduction to mass spectrophotometers, Principle and brief discussion on ELECTRON SPIN RESONANCE (ESR), Nuclear Radiation Detectors - Ionization chamber, GM Counter, Proportional Counter, Solid state detectors.

TEXT BOOK:

1. R. S.Khandpur, ―Handbook of Analytical Instruments‖, 2nd Edition, TMH, 2006.

REFERENCE BOOKS:

1. Skoog D. A, ―Principles of Instrumental Analysis‖, Weste D.M., Holt Sounder Publication, Philadelphia, 1985.
2. R.K. Jain, ―Mechanical & Industrial Measurements‖, 2nd Edition, Khanna Publishers, New Delhi, 1992.
3. D. Sirisha, D. Srinivas, ―Analytical Instrumentation‖, Sure Publications, 2004.

IV B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC8PE02	CELLULAR AND MOBILE COMMUNICATIONS (PROFESSIONAL ELECTIVE – IV)						

COURSE OBJECTIVES:

1. To know the evolution of Mobile communication and cell concept to improve capacity of the system.
2. To know the fading mechanism and types of fading and effect of fading on Mobile communication.
3. To know the role of equalization in Mobile communication and to study different types of Equalizers and Diversity techniques.
4. To know the types of channel coding techniques, data transmission modes and services of GSM.
5. To know the types of channel coding techniques, data transmission modes and services of CDMA.

COURSE OUTCOMES: After successful completion of the course, the students are are able to

CO1: Illustrate fundamental concept of Cellular Radio System Operation and Design

CO2: Compare Measurement of C/I value in Omni directional & Directional Antenna System, Co-channel, Non Co-channel interference, and Adjacent Channel Interference.

CO3: Interpret cell coverage for signal and traffic, diversity techniques and mobile antennas and demonstrate Frequency management and Channel assignment.

CO4: Classify different types of handoffs.

CO5: Summarize GSM architecture-channels, TDMA architecture-channels and CDMA architecture-channels.

SYLLABUS:

UNIT I: INTRODUCTION TO CELLULAR MOBILE RADIO SYSTEMS

Limitations of Conventional Mobile Telephone Systems, Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems, Uniqueness of Mobile Radio Environment- Fading -Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time. Fundamentals of Cellular Radio System Design: Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I From a Normal Case in a Omni Directional Antenna System, System Capacity, Trunking and Grade of Service, Improving Coverage and Capacity in Cellular Systems- Cell Splitting, Sectoring.

UNIT-II: CO-CHANNEL INTERFERENCE

Measurement Of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and Their Effects, Diversity Techniques-Space Diversity, Polarization Diversity, Time Diversity. Non-Co-Channel Interference: Adjacent Channel Interference, Near End Far End Interference, Cross Talk, Effects on Coverage and Interference by Power Decrease, Antenna Height Decrease.

Cell Coverage for Signal and Traffic: Signal Reflections in Flat And Hilly Terrain, Effect of Human Made Structures, Phase Difference Between Direct and Reflected Paths, Constant Standard Deviation, Straight Line Path Loss Slope.

UNIT- III: CELL SITE AND MOBILE ANTENNAS

Space Diversity Antennas, Umbrella Pattern Antennas, Minimum Separation of Cell Site Antennas, Mobile Antennas.

FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT

Numbering And Grouping, Setup Access And Paging Channels, Channel Assignments to Cell Sites and Mobile Units, Channel Sharing and Borrowing, Sectorization, Overlaid Cells, Non Fixed Channel Assignment.

UNIT- IV: HANDOFFS AND DROPPED CALLS

Handoff Initiation, Types of Handoff, Delaying Handoff, Advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, inter system Handoff, Introduction to Dropped Call Rates and their Evaluation.

UNIT- V: DIGITAL CELLULAR MOBILE SYSTEM

GSM architecture, GSM-channels, TDMA-architecture, TDMA channels, CDMA architecture, CDMA-channels.

TEXT BOOKS:

1. William C.Y. Lee, ―Mobile Cellular Telecommunications: Analog and Digital Systems‖, Mc Graw Hill, 2nd Edition, 2006..
2. Theodore. S. Rapport, ―Wireless Communications‖, Pearson Education, 2010.
3. GottapuSashibhushana Rao, ―Mobile Cellular Communication‖ Pearson, 2012..

REFERENCE BOOKS:

1. Gordon L. Stuber,‖Principles of Mobile Communications‖, Springer International, 2nd Edn., 2001.
2. Simon Haykin, Michael Moher,‖Modern Wireless Communications‖, Pearson Education, 2005.

IV B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC8PE03	SYSTEM ON CHIP (PROFESSIONAL ELECTIVE – IV)						

COURSE OBJECTIVES:

1. Understand the System Architecture and Processor Architecture, approach for a SOC Design.
2. Learn the, Basic concepts in Processor Micro Architecture, and Learn Different Types of Processors like VLIW Processors, Superscalar Processors etc.
3. Learn about SOC external memory, Scratchpads and Cache memory and Multilevel Caches.
4. Learn the SOC Design approach, Design and evaluation, Applications like Image compression etc.
5. Understand the Reconfiguration Technologies and devices.

COURSE OUTCOMES: After going through this course the student will be able to

CO1: Know basics of System Architecture and Processor Architecture.

CO2: Know different Types of Processors like VLIW Processors, Superscalar Processors etc. and basic concepts in Processor Micro Architecture.

CO3: Distinguish Cache memory and Multilevel Caches, SOC external memory.

CO4: Explain the Concept of Inter Connect Architectures, SOC Standard Buses and Reconfiguration Technologies.

CO5: Know about Reconfigurable Technologies and devices, soc design and AES algorithms.

UNIT-I: INTRODUCTION TO THE SYSTEM APPROACH

System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, an approach for SOC Design, System Architecture and Complexity.

UNIT-II: PROCESSORS

Introduction , Processor Selection for SOC, Basic concepts in Processor Architecture, Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT-III: MEMORY DESIGN FOR SOC

Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation , SOC Memory System, Models of Simple Processor – memory interaction.

UNIT-IV: INTERCONNECT CUSTOMIZATION AND CONFIGURATION

Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses, Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization: An overview, Customizing Instruction Processor.

UNIT-V: INTERCONNECT CONFIGURATION AND APPLICATION STUDIES / CASE STUDIES

Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration – overhead analysis and trade-off analysis on reconfigurable Parallelism, SOC Design approach, AES algorithms, Design and evaluation, Image compression – JPEG compression.

TEXT BOOKS:

1. Computer System Design System-on-Chip – Michael J. Flynn and Wayne Luk, Wiely India Pvt. Ltd.
2. Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer

REFERENCE BOOKS:

1. ARM System on Chip Architecture – Steve Furber –2nd Ed., 2000, Addison Wesley Professional.
2. System on Chip Verification – Methodologies and Techniques – Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers.

IV B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC8PE04	DSP PROCESSORS & ARCHITECTURES (PROFESSIONAL ELECTIVE – IV)						

COURSE OBJECTIVES:

1. Recall Digital Signal Processing and classify various computational errors in DSP.
2. Interpret basic Architecture for programmable DSP devices.
3. Learn the Architecture and programming of TMS320C6x Processors.
4. Implement DSP algorithm for digital filters.
5. Analyze various DSP interfacing techniques.

COURSE OUTCOMES: After undergoing the course, students will be able to

CO1: Determine the functions of building blocks in Digital Signal Processor Architecture.

CO2: Perceive the knowledge on Instructions and Interrupts of TMS320C6x Processors.

CO3: Develop programming of TMS320C6x Processors

CO4: Recommend suitable FFT algorithms for computation on TMS320C54XX DSP device.

CO5: Select the DSP programmable devices that will interface with memories and I/O peripherals.

SYLLABUS

UNIT–I: ARCHITECTURES FOR PROGRAMMABLE DIGITAL SIGNAL-PROCESSORS

Introduction, Basic Architectural Features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Features for External Interfacing.

UNIT–II: PROGRAMMABLE DIGITAL SIGNAL PROCESSORS

Introduction, Commercial digital Signal-processing Devices, Data Addressing Modes of TMS32OC54xx., Memory Space of TMS32OC54xx Processors, Program Control. Detail Study of TMS320C54X & 54xx Instructions and Programming, On-Chip peripherals, Interrupts of TMS32OC54XX Processors, Pipeline Operation of TMS32OC54xx Processor.

UNIT–III: IMPLEMENTATION OF BASIC DSP ALGORITHMS

Introduction, The Q-notation, FIR Filters, IIR Filters, Interpolation and Decimation Filters (one example in each case). PID Controller, Adaptive Filters, An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

UNIT–IV: IMPLEMENTATION OF FFT ALGORITHMS

Introduction, An FFT Algorithm for DFT Computation, Overflow and Scaling, Bit-Reversed Index Generation & Implementation on the TMS32OC54xx.

UNIT – V: INTERFACING MEMORY AND PARALLEL I/O PERIPHERALS TO DSP DEVICES

Introduction, Memory Space Organization, External Bus Interfacing Signals. Memory Interface, Parallel I/O Interface, Programmed I/O, Interrupts and I / O Direct Memory Access (DMA).

TEXT BOOKS:

1. Avatar Singh and S. Srinivasan, Digital Signal Processing, Thomson Learning, 2004.
2. B Venkataramani and M Bhaskar, Digital Signal Processors, TMH, 2002.

REFERENCE BOOKS:

1. Ifeachor E. C., Jervis B. W, Digital Signal Processing: A practical approach, Pearson-Education, PHI, 2002.
2. Sen M. Kuo & Woon-Seng S. Gan, Digital Signal Processors, Architectures, Implementations, and Applications, Prentice Hall, 2004

IV B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC8PE05	PC BASED INSTRUMENTATION (PROFESSIONAL ELECTIVE – V)						

COURSE OBJECTIVES:

1. To Provide and ensure a comprehensive understanding of using personal computers in measurement and control instrumentation.
2. To analyze and learn the process of collecting information/ data through PC from real world sources.
3. To analyze remote and networked data acquisition and operating system.
4. To understand programmable logic controllers, and its application.
5. To understand the basics of SCADA Hardware and software and implement real time systems on the PC.

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

CO1: Recall the main functional units in a PC and be able to explain how they interact.
CO2: Interpret the standard serial and parallel interfacing buses and able to distinguish account for different generations of PCs.
CO3: Infer the basics of PLC and its programming.
CO4: Demonstrate different PLC functions to applications.
CO5: Illustrate the basics of SCADA and develop DAQ using I/O systems.

SYLLABUS:

UNIT-I: REVIEW OF COMPUTER INSTRUMENT COMMUNICATION

Personal Computer, Overview of operating System, I/O Ports, Plug-in-slots, PCI bus, Operators Interface. Computer Interfacing for Data Acquisition and Control – Interfacing Input Signals, Output system with continuous actuators. Data Acquisition and Control using Standard Cards: PC expansion systems, Plug-in Data Acquisition Boards; Transducer to Control room, Backplane bus – VXI.

UNIT-II: PROGRAMMABLE LOGIC CONTROLLER (PLC) BASICS

Definition, Overview of PLC systems, input/output modules, Power supplies and Isolators.
BASIC PLC PROGRAMMING**:** Programming On-Off inputs/ outputs. Creating Ladder diagrams, Basic PLC functions, register basics, timer functions, counter functions.

UNIT-III: PLC INTERMEDIATE AND ADVANCED FUNCTIONS

Arithmetic functions, Number comparison functions, Skip and MCR functions, data move systems. Utilizing digital bits, sequencer functions, Matrix functions. PLC Advanced functions: Analog PLC operation, Networking of PLC.

UNIT-IV: APPLICATION OF PLC

Controlling of Robot using PLC, PID control of continuous processes, Continuous Bottle-filling system, Batch mixing system, 3-stage air conditioning system, Automatic frequency control of Induction heating.
RELATED TOPICS: Alternate programming languages. Auxiliary commands and functions. PLC installation, troubleshooting and maintenance. Field bus: Introduction, concept. HART

protocol: Method of operation, structure, and applications. Smart transmitters, smart valves and smart actuators.

UNIT-V: SCADA BASICS

Computer Process interface for Data Acquisition and control – Computer control loops.– Supervisory Digital Control (SCADA) - introduction and brief history of SCADA – SCADA Hardware and software – Landlines for SCADA – use of modems in SCADA – SCADA with

DATA ACQUISITION ON THE PC

The PC as a platform for data acquisition: types of pc, the processor, memory, input and outputs ports, buses and adapter card slots. Software considerations: an overview of DA&C software, DA and control in real time, implementing real time systems on the PC and robustness reliability and safety .

TEXT BOOKS:

1. John. W .Webb Ronald A Reis , ―Programmable Logic Controllers – Principles and Applications, Fourth edition, Prentice Hall Inc., New Jersey, 2003.
2. M.Chidambaram, Computer Control of Processes‖, Narosa 2003.

REFERENCE BOOKS:

1. Gary Dunning, Introduction to Programmable Logic Controllers, Thomson Delmar Learning 2nd Edition Second reprint 2003.
2. S.A.Boyer ,Supervisory control and data acquisition, 4th edition,2010
3. Mike Tooley, ― PC Based Instrumentation and Control‖, 3rd Edition, Elsevier.
4. Kevin James, ― PC Interfacing and Data Acquisition Techniques for Measurement, Instrumentation and Control, Elsevier.
5. John Park and Steve Mackay, ―Practical Data Acquisition for Instrumentation and Control Systems, Elsevier, 2003.
6. Frank D. Petruzella, ―Programmable Logic Controllers‖, 2nd Edition, Mc Graw Hill, Newyork, 1997.

IV B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC8PE06	RADAR SYSTEMS (PROFESSIONAL ELECTIVE-V)						

COURSE OBJECTIVES:

1. To derive the basic radar equation and its dependence on various parameters.
2. To study CW radar system and its application along with FMCW radar system for altimeter applications.
3. To study Doppler Effect and its applications with respect to pulsed Doppler radar.
4. To understand moving target indicator and to study its application.
5. To study and understand the Radar receiver and effect of noise on radar signal detection.

COURSE OUTCOMES: After completion of this course, the students are able to

CO1: Demonstrate the factors affecting the radar performance using Radar Range Equation.
CO2: Analyze the principle of CW &FM-CW radar and apply it in FM- CW Altimeter.
CO3: Differentiate between a MTI Radar and a Pulse Doppler Radar based on their working principle.
CO4: Analyze various practices of RADAR tracking and compare them.
CO5: Calculate Noise Figure and Noise Temperature in Radar Receivers and can describe antennas used for Radars.

SYLLABUS:

UNIT–I: INTRODUCTION

Nature of Radar: Basic Radar, Maximum Unambiguous Range, Radar Waveforms, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications, Related Problems.

Radar Equation: Prediction of Range Performance, Minimum Detectable Signal, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets-sphere, cone-sphere), Transmitter power, PRF and Range Ambiguities, System Losses (Qualitative treatment), Related Problems.

UNIT–II: CW AND FM-CW RADAR

CW Radar: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Bandwidth Requirement, Sign of the radial velocity, Doppler frequency shift, Applications of CW radar.

Frequency Modulated CW Radar: Range and Doppler Measurement, Block Diagram FMCW Radar, FMCW altimeter, Measurement errors, Multiple Frequency CW Radar.

UNIT–III: MTI AND PULSE DOPPLER RADAR

Introduction, Description of operation , MTI Radar with-Power Amplifier Transmitter, Power Oscillator Transmitter, Delay Line Cancellers, Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs, Range Gated Doppler Filters, MTI Radar Parameters, Limitations to MTI Performance, Equipment instability, Internal fluctuation, Limiting in MTI Radar, Noncoherent MTI, MTI versus Pulse Doppler radar.

UNIT–IV: TRACKING RADAR

Tracking with Radar, Types of Tracking Radar , Angle Tracking, Sequential Lobing, Conical Scan, Boxcar generator, Automatic gain control, Squint angle, Other considerations, Mono-pulse Tracking, Amplitude comparison mono pulse, Hybrid tracking system, Phase comparison mono

pulse, Target Reflection Characteristics and Angular Accuracy, Amplitude fluctuations, Angle fluctuations, Receiver and servo noise, Summary of errors, Frequency agility and glint reduction, Low angle tracking, Tracking in Range, Acquisition, Comparison of Trackers.

UNIT–V: RADAR RECEIVERS

Antenna Parameters: Directive gain, power gain, effective aperture, polarization, side lobe radiation, aperture efficiency, Parabolic Reflector Antennas, Lens Antennas, Cosecant- Squared Antenna Pattern, Radomes.

Introduction to Phased Array Antennas: Basic Concepts, Radiation Pattern, Beam Steering, Beam Width changes, Series versus Parallel Feeds, Frequency scan arrays, Radiation for Phased Array, Architecture for Phased Arrays, Applications of the array in radar, Advantages and Limitations.

Detection of Radar Signals in Noise: Introduction, Matched Filter Receiver, Response Characteristics of Matched Filter Receiver, Derivation of Matched Filter Receiver, Correlation detection, Detection criteria, Detector Characteristics, Automatic Detection, Constant False Alarm Rate Receiver.

Receivers: Introduction, Noise Figure, Noise Temperature, Displays – types, Duplexer – Branch type Duplexer, Balanced type Duplexer, Circulators as Duplexers.

TEXT BOOK:

1. Merrill I. Skolnik, ―Introduction to Radar Systems‖, 3 rd Edition, Tata McGraw –Hill, 2001.

REFERENCE BOOKS:

1. G.S.N. Raju, ―Radar Engineering and fundamentals of Navigational Aids‖, I.K International, 2008.
2. Byron Edde,‖Radar: Principles, Technologies, Applications‖, Pearson Education, 2008.

IV B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC8PE07	LOW POWER VLSI DESIGN (PROFESSIONAL ELECTIVE – V)						

COURSE OBJECTIVES:

1. The student will be able to understand the Fundamentals of Low Power VLSI Design.
2. In this course, students can study low-Power Design Approaches, Power estimation and analysis.
3. The graduate students are motivated to study and analyze the Low-Voltage Low-Power Adders, Multipliers.
4. To understand the encoding Pre computation logic.
5. The concepts of Low-Voltage Low-Power Memories and Future Trend and Development of DRAM.

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

CO1: Illustrate the concepts of Low-Power Design Approaches.
CO2: Determine Power reduction techniques possible at circuit level and logic level.
CO3: Interpret the low voltage technologies and gate level logic circuits in PSPICE tool.
CO4: Analyze the Low Power Design to Different Applications
CO5: Categorize Low-Voltage Low-Power Memories and Basics of DRAM.

SYLLABUS:

UNIT–I: FUNDAMENTALS OF LOW POWER VLSI DESIGN

Need for low power VLSI chips, Sources of power dissipation on Digital Integrated circuits. Basic principles of Low Power Design, Emerging Low power approaches. Power dissipation in CMOS device, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

UNIT–II: LOW POWER DESIGN

Circuit level: Power consumption in circuits. Flip Flops & Latches design, high capacitance nodes, low power digital cells library.
Logic level: Gate reorganization, signal gating, logic encoding, state machine encoding, pre-computation logic.

UNIT–III: LOW-POWER DESIGN APPROACHES AND ANALYSIS

Low-Power Design through Voltage Scaling: VTCMOS circuits, MTCMOS circuits, Architectural Level Approach –Pipelining and Parallel Processing Approaches. **Power Estimation and Analysis**: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, static state power and gate level capacitance estimation.

UNIT–IV: LOW VOLTAGE LOW POWER ADDERS, MULTIPLIERS

Introduction, Standard Adder Cells, CMOS Adder‘s Architectures, Low Voltage Low Power Design Techniques, Current Mode Adders. Overview of Multiplication, Types of Multiplier Architectures- Braun, Baugh-Wooley, Booth, and Wallace Tree Multipliers.

UNIT–V: LOW-VOLTAGE LOW-POWER MEMORIES

Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

TEXT BOOKS:

1. Gary K. Yeap,‖Practical Low Power Digital VLSI Design‖, Kluwer Academic Press, 2002.
2. Kiat-Seng Yeo, Kaushik Roy, –Low-Voltage, Low-Power VLSI Subsystems, TMH Professional Engineering, 2004.

REFERENCE BOOK:

1. Kaushik Roy, Sharat C. Prasad, –Low Power CMOS VLSI Circuit Design, John Wiley & Sons, 2000.

IV B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC8PE08	SPEECH PROCESSING (PROFESSIONAL ELECTIVE – V)						

COURSE OBJECTIVES:

1. To introduce the models for speech production and develop time and frequency domain techniques for estimating speech parameters.
2. To introduce a predictive technique for speech compression
3. To understand speech recognition, synthesis and speaker identification.
4. To discuss research, both orally and in writing, to other students and scientists.
5. To locate, interpret, and synthesize scientific literature.

COURSE OUTCOMES: After going through this course the student will be able to

CO1: Record, analyze, characterize, modify, and synthesize speech (and other vocal) signals.

CO2: Use speech analysis and synthesis technologies, explain how they work, and discuss their strengths and limitations.

CO3: Design, execute, interpret, and evaluate simple studies that utilize speech processing methods.

CO4: Present and discuss research, both orally and in writing, to other students and scientists.

CO5: Locate, interpret, and synthesize scientific literature.

SYLLABUS:

UNIT-I: SPEECH PRODUCTION AND ACOUSTIC PHONETICS

Articulatory Phonetics, **Acoustic Phonetics**, Acoustic theory of speech production, Digital models of speech signals, Uniform lossless tube model, Articulator phonetics, Co- articulation, Prosody.

UNIT-II: SPEECH ANALYSIS

Time and frequency domain analysis of speech, linear predictive coding (LPC) analysis, Cepstral analysis, Speech parameter (pitch) estimation.

UNIT-III: CODING OF SPEECH SIGNALS

Introduction, Quantization, Speech redundancies, Time domain waveform coding, and linear predictive coding: linear delta modulation, Adaptive delta modulation, and Adaptive differential pulse code modulation, Filter bank analysis: Phase vocoders and Channel vocoders, Adoptive Multirate Coders.

UNIT-IV: SPEECH ENHANCEMENT & RECOGNITION

Introduction, Nature of interfering sounds, speech enhancement techniques: spectral subtraction and filtering, harmonic filtering, Adaptive noise cancellation.

Introduction, Bayes ‘rule, Segmental feature extraction, MFCC, DTW, HMM and DNN approaches for speech recognition

UNIT-V: SPEECH SYNTHESIS

Principles of speech synthesis, Methods: Articulatory synthesis, Formant synthesis and LPC synthesis, Applications of speech synthesis.

TEXT BOOKS:

1. **Speech Communications**: Human & Machine – Douglas O'Shaughnessy, 2nd Ed., Wiley India, 2000.
2. L R Rabiner, B-H Juang and B Yegnanarayana, "Fundamentals of Speech Recognition," Pearson, 2009 (Indian subcontinent adaptation).
3. Lawrence R. Rabiner and Ronald W. Schafer, "Digital Processing of Speech Signals", Pearson Education, Fourth Impression 2009.

REFERENCE BOOKS:

1. JR Deller, Jr, JG Proakis & JHL Hansen, "Discrete-Time Processing of Speech Signals", Macmillan 1993.
2. Ben Gold &Nelson Morgan, "Speech and Audio Signal Processing", John Wiley and Sons, 2006.
3. Thomas F. Quatieri, "Discrete Time Speech Signal Processing: Principles and Practice", Prentice Hall, 2002.
4. J. L. Flanagan, "Speech Analysis Synthesis and Perception", 2nd Edition, Springer-Verlag, 1983.

List of open Electives offered by Department

OPEN ELECTIVE-I

S.No.	Open Elective-I Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Principles of Signals, Systems & Communications (Other than ECE)	ECE	19BCC4OE07	3	0	0	3
2	Medical Electronics	ECE	19BCC4OE08	3	0	0	3

OPEN ELECTIVE-II

S.No.	Open Elective-I Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Fundamentals of Image Processing (Other than ECE)	ECE	19BCC5OE07	3	0	0	3
2	Consumer Electronics	ECE	19BCC5OE08	3	0	0	3

OPEN ELECTIVE-III

S.No.	Open Elective-I Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Introduction to Embedded Systems (Other than ECE)	ECE	19BCC6OE07	3	0	0	3
2	Global Positioning System(GPS)	ECE	19BCC6OE08	3	0	0	3

OPEN ELECTIVE-IV

S.No.	Open Elective-I Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Introduction to Micro Processors & Micro Controllers(Other than ECE)	ECE	19BCC7OE07	3	0	0	3
2	Automotive Electronics	ECE	19BCC7OE08	3	0	0	3

Open Elective Course: At any semester, student can choose an open elective course offered by any department provided that he/she has not studied it.

OPEN ELECTIVE-I

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC4OE11	PRINCIPLES OF SIGNALS, SYSTEMS AND COMMUNICATIONS (Other than ECE)						

COURSE OBJECTIVES:

1. To analyze different types of signals, systems.
2. To analyze basic signals in frequency domain by using Fourier Series and Fourier Transform.
3. To Explain the principles of linear system.
4. To classify various analog modulation techniques.
5. To develop the concepts of pulse modulation and digital modulation techniques.

COURSE OUTCOMES:

After completion of this course, the student should able to

CO1: Explain basic concepts of signals.
CO2: Analyze time-domain signals in frequency-domain using Fourier transforms.
CO3: Demonstrate the concepts of linear systems.
CO4: Illustrate various analog modulation techniques.
CO5: Compare various digital modulation techniques.

SYLLABUS:

UNIT–I: INTRODUCTION TO SIGNALS

Introduction of Standard Signals, Signal Operations- Time Shifting, Scaling and Reversal Classification of Signals- Analog, Digital, Discrete, Periodic and Aperiodic, Even and Odd, Energy and Power.

UNIT–II: SIGNAL ANALYSIS

Introduction to Fourier Series - Trigonometric and Exponential Fourier Series, Fourier Transform - Analysis of non-periodic functions, Fourier Transform of standard signals, Properties of Fourier Transform.

UNIT–III: LINEAR SYSTEMS

Introduction, Definition of system function, Classification of systems.
Distortion less transmission, Signal bandwidth and System band width; Energy signals and Power signals.

UNIT–IV: INTRODUCTION TO COMMUNICATION SYSTEM

Need for Modulation, Types of Modulation, Amplitude modulation- Generation of AM, Demodulation of AM, Frequency modulation, Phase modulation, Types of FM.

UNIT–V: PULSE MODULATION

Pulse Analog Modulation: PAM Modulation and Demodulation, PWM and PPM- modulation and demodulation, Time Division Multiplexing, Frequency Division Multiplexing.

Pulse Digital Modulation: PCM System, Differential pulse code modulation, Delta Modulation, Adaptive delta modulation and comparisons. ASK, FSK, PSK and comparison.

TEXT BOOKS:

1. R. P. Singh, S. D. Sapre, "Communication systems - Analog and Digital, Tata McGraw Hill, Reprint 2003.
2. H. Taub and D. Schilling, "Principles of Communication Systems", TMH, 2003.
3. B.P.Lathi, "Signals systems and communication", BS Publications, 2008.

REFERENCE BOOKS:

1. Simon Haykin, John Wiley, "Communication Systems", 3rd Edition, 2008.
2. P. Ramesh Babu, R. Anandanatarajan, "Signals and Systems", Scitech Publications, 4th Edition, 2006.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BEC4OE12	MEDICAL ELECTRONICS						

COURSE OBJECTIVES:

1. Discuss basic medical terms and physical values that can be handled by medical instrumentation.
2. Explain electro-physiology and bio-potential recording.
3. Demonstrate measuring of basic medical parameters.
4. Utilize basic parameters of the equipment for using in electro diagnostic and electro therapy.
5. Discuss Biotelemetry & Computer Applications in Biomedical field.

COURSE OUTCOMES:

After completion of this course, the student should able to

CO1: Identify basic medical terminology and relevant for biomedical instrumentation.
CO2: Explain methods and implementation of electrical and nonelectrical medical parameters.
CO3: Illustrate the effect of different diagnostic and therapeutic methods for different medical procedures.
CO4: Examine the concept of Biotelemetry &Telemedicine
CO5: List out Computer Applications in Biomedical field.

SYLLABUS:

UNIT-I: ANATOMY AND PHYSIOLOGY

Physiological Systems of the Body, Basic Medical Instrumentation System, Elementary ideas of cell structure, Cell and its structure, Characteristics of Living Organisms, Nervous system, Nerve cell, Heart and circulatory system, Muscle action, Respiratory system.

UNIT-II: OVERVIEW OF MEDICAL ELECTRONICS EQUIPMENT

Fundamentals, Performance Requirements of Medical Instrumentation System, Intelligent Medical Instrumentation System, General Constraints in design, Regulation of Medical Devices.

UNIT-III: ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING

The origin of Bioelectric Signals, Electrolyte Interface, Electrode Types – Surface Metal Plate Electrodes, Bio potential electrodes, Needle and Wire Electrodes, Micro Electrodes, Recording Electrodes.

Electrodes for ECG, Electrodes for EEG Electrodes, for EMG, Electrical Conductivity of Electrode Jellies and Creams.

UNIT-IV: BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT

Blood pH Measurement, Blood PO_2 Measurement, Measurement of Blood PCO_2, Internal-arterial Blood Gas Monitoring, A Complete Blood Gas Analyzer, Blood Cell Counters, Types of Blood Cells, Methods of Cell Counting, Automatic Recognition and Differential Counting of cells.

UNIT-V: BIOTELEMETRY & BIOMEDICAL COMPUTER APPLICATIONS
Introduction, Wireless Telemetry, Single-Channel Telemetry Systems, Multi-Channel wireless Telemetry Systems, Multi-Patient Telemetry, Implantable Telemetry Systems, Transmission of Analog Physiological Signals over Telephone, Telemedicine. Computer Analysis of the ECG, CAT Scanner, Computerized Aid to Patient Monitoring.

TEXT BOOKS:

1. Khandpur, R.S., "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003.
2. C. Raja Rao, Sujoy K. Guha, "Principles of Medical Electronics and Biomedical Instrumentation", Universities Press (India) Ltd, 2001.

REFERENCES BOOKS:

1. John G.Webster, "Medical Instrumentation Application and Design", 3rd Edition, Wiley India Edition, 2007
2. Joseph J.Carr and John M.Brown, "Introduction to Biomedical Equipment Technology", John Wiley and Sons, New York, 2004.
3. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2007.
4. Edward J. Bukstein, "Introduction to BioMedical Electronics", Howard W Sams, USA, 1973.

OPEN ELECTIVE-II

III B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC5OE07	FUNDAMENTALS OF IMAGE PROCESSING						

COURSE OBJECTIVES:

1. To introduce the fundamental techniques and algorithms used for acquiring, processing and extracting useful information from digital images.
2. To comprehend the relation between human visual system and machine perception and processing of digital images.
3. To introduce the concepts of image processing and basic analytical methods to be used in image processing.
4. To familiarize students with image enhancement and restoration techniques
5. To provide a detailed approach towards image processing applications like enhancement, segmentation, and compression.

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

CO1: Interpret the limitations of the computational methods on digital images.
CO2: Develop Fourier transform for image processing in frequency domain.
CO3: Illustrate the spatial and frequency domain image transforms on enhancement and restoration of images.
CO4: Utilize the image enhancement techniques.
CO5: Define the need for compression and evaluate the basic compression algorithms.

SYLLABUS:

UNIT–I: DIGITAL IMAGE FUNDAMENTALS & IMAGE TRANSFORMS

Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels. Image Transforms: 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

UNIT–II: IMAGE ENHANCEMENT (SPATIAL DOMAIN)

Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or Neighborhood criterion, Median Filter, Spatial Domain High-Pass Filtering. Image Enhancement (Frequency Domain): Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

UNIT–III: IMAGE RESTORATION

Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT–IV: IMAGE SEGMENTATION

Detection of Discontinuities, Edge Linking and Boundary Detection, thresholding, Region Oriented Segmentation. Morphological Image Processing: Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation.

UNIT–V: IMAGE COMPRESSION

Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

TEXT BOOKS:

1. Digital Image Processing – Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson, 2008
2. Digital Image Processing- S Jayaraman, S Esakkirajan, T Veerakumar- MC GRAW HILL EDUCATION, 2010.
3. A.K.Jain, Fundamentals of Digital Image Processing, Prentice Hall.

REFERENCE BOOKS:

1. Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools – Scotte Umbaugh, 2nd Ed, CRC Press, 2011
2. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, 2nd Edition, MC GRAW HILL EDUCATION, 2010.
3. Digital Image Processing and Computer Vision – Somka, Hlavac, Boyle- Cengage Learning (Indian edition) 2008.
4. Introductory Computer Vision Imaging Techniques and Solutions- Adrian low, 2008, 2nd Edition.

III B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC5OE08	CONSUMER ELECTRONICS						

COURSE OBJECTIVES:

1. To uunderstand the principle and operation of microphones and loud speakers, study the recording and reproduction of sound without significant noise.
2. To uunderstand the elements of television, scanning process and transmission of composite video signal.
3. To uunderstand the essentials of colour television, signal transmission and colour television standards.
4. To uunderstand the TV controls, digital TV, direct to home (DTH) system and Cable television (CATV).
5. To uunderstand the operation of office equipment and domestic appliances such as microwave ovens, air conditioners, fax machine etc.

COURSE OUTCOMES: After undergoing the course, students will be able to:

CO1: List technical specification of electronics Audio system (microphone and Loud speaker).
CO2: Demonstrate audio and video recording systems.
CO3: Contrast working principles of Monochrome TV and Colour TV.
CO4: Outline Broadcasting techniques of CATV and DTH TV.
CO5: Illustrate the basic functions of various consumer electronic domestic Appliances.

SYLLABUS:

UNIT-I: MICROPHONES AND LOUDSPEAKERS

Principle of Microphones, Characteristics of Microphones, Types of Microphones, Principle of Loudspeakers and Headphones, Types of loudspeakers, Types of Headphones, Speaker Baffles and Enclosures.

UNIT–II: AUDIO SYSTEMS

Acoustics, Audio recording and reproduction: Gramophone disc recording, Magnetic tape recording, Optical disc recording, Hi-Fi(High-Fidelity) system, Stereophony, PA(Public Addressing) system, Equalizers and Mixers, Noise reduction in audio systems.

Video Recording: Video recording and reproduction using magnetic tape, Video recording and reproduction using optical disc.

UNIT-III: MONOCHROME and COLOUR TV

Monochrome TV: Elements of a Television System, Analysis and Synthesis of monochrome Television Pictures, Scanning process, Composite Video Signal, Synchronization, TV Standards, Monochrome TV Camera, Camera Tube characteristics, Monochrome picture tube.

Colour TV: Essentials of colour television, three colour theories, the luminance signal, and Colour television display tubes, Colour signal transmission and reception, Colour TV standards, Merits and demerits of different colour TV standards.

UNIT–IV: TV CONTROLS, CABLE TV AND DIGITAL TV

Operating and servicing controls of Monochrome and Colour TV receivers, Remote controls, TV applications, and TV Broadcasting system, DTH TV, Cable television (CATV), MAC Encoder and Decoder, Digital TV System.

UNIT–V: OFFICE EQUIPMENT AND DOMESTIC APPLIANCES

Fax (Facsimile) machine, Xerography, Calculators, Digital clocks, Microwave Ovens, Washing machines, Air conditioners, Refrigerators.

TEXT BOOKS:

1. S P Bali, "Consumer Electronics", Pearson First Impression, 2008.
2. R R Gulati, "Monochrome and Colour Television", 2nd Edition, New Age International Publishers, 2009.

REFERENCE BOOKS:

1. R G Gupta, "Audio and Video Systems: Principles, Maintenance and Troubleshooting" , Tata McGraw Hill, 2010.
2. Roy Blake, "Electronic communication systems", Thomson Delmar, 2002.
3. R R Gulati, "Colour Television", 2nd Edition, New Age International Publishers, 2007.
4. Robert L. Goodman, "How electronic Things Work and What to Do when they don't", Tata McGraw Hill, 2002.

OPEN ELECTIVE-III

III B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC6OE07	INTRODUCTION TO EMBEDDED SYSTEMS						

COURSE OBJECTIVES:

1. To gain knowledge and fundamental concepts and basic building blocks of an embedded system
2. To learn characteristics, quality attributes and applications of embedded systems
3. To understand the concept of real time operating systems
4. To learn the RTOS basics and various Communication & Synchronization techniques
5. To understand the classification and applications of embedded systems

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

CO1: Illustrate the classification and applications of embedded systems.
CO2: Recall the basic memory devices, passive components and core of embedded systems.
CO3: Summarize various Communication interface in Embedded Systems.
CO4: Demonstrate characteristics of embedded systems.
CO5: Explain the RTOS basics and various Communication & Synchronization techniques.

SYLLABUS:

UNIT–I: INTRODUCTION

Embedded Systems vs. general computing systems, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems.

UNIT–II: CORE AND MEMORY

Core of the embedded system: general purpose and domain specific processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS).

Memory: ROM, RAM, memory according to the type of interface, memory shading, memory selection for embedded system.

UNIT–III: COMMUNICATION INTERFACE AND EMBEDDED SYSTEM COMPONENTS

Communication Interface: Onboard and external Communication Interfaces embedded firmware.

Embedded system Components: reset circuit, brown-out protection circuit, oscillator unit, Real Time Clock (RTC), watchdog timer, PCB and passive components.

UNIT–IV: CHARACTERISTICS, QUALITY ATTRIBUTES AND EXAMPLES OF EMBEDDED SYSTEMS.

Characteristics of embedded systems and quality attributes of embedded systems. Embedded systems application and domain-specific: washing machine-application-specific embedded system, automotive- domain-specific embedded system

UNIT–V: RTOS BASED EMBEDDED SYSTEM DESIGN

Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, task scheduling. Task communication, task synchronization, task communication/synchronization issues, task synchronization techniques, device drivers, how to choose an RTOS?

TEXT BOOKS:

1. Shibu K.V, "Introduction to Embedded Systems", Mc Graw Hill Education, 2013.
2. Raj Kamal, "Embedded Systems", TMH,2007.
3. Tammy Noergaard, "Embedded systems Architecture", Elsevier publications, 2005.

REFERENCE BOOKS:

1. Frank Vahid, Tony Givargis, "Embedded System Design", John Wiley, 1999.
2. David E. Simon, "An Embedded Software Primer", Pearson Education, 1999.

III B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC6OE08	GLOBAL POSITIONING SYSTEM						

COURSE OBJECTIVES:

1. To understand the fundamental concepts of GPS.
2. To analyze the GPS observables.
3. To Demonstrate the Surveying Procedure.
4. To list the different methods of processing GPS data.
5. To conclude various application areas of GPS.

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

CO1: Identify the importance of Space segment, Control segment and User segment in GPS.
CO2: Analyze the GPS observables like code, phase pseudo ranges, Doppler data and Biases.
CO3: Estimate surveying with GPS.
CO4: Categorize the different application areas of GPS.
CO5: Recommend the Hardware and Software improvements for future GPS.

SYLLABUS:

UNIT–I: OVERVIEW OF GPS

Basic concepts- History of GPS, Basic definitions, GPS system operation, Trilateration method. Space segment- constellation, satellites, operational capabilities, denial of accuracy and access. Control segment- master control station, monitor stations, ground control stations. User segment- user categories, receiver types, information services.

UNIT–II: GPS OBSERVABLES

Data acquisition- code pseudo ranges, phase psecudo ranges, Doppler data, biases and noise.Data combinations- linear phase combinations, code, psecud orange smoothing. Atmospheric effects- phase and group velocity, ionospheric refraction, toposoheric refraction, atmospheric monitoring. Reletivitistic effects- special relativity, general relativity, relevant relativistic effects of GPS. Antenna Phase center offset and variation Multipath- general remarks, mathematical model,multipath reduction.

UNIT–III: SURVEYING WITH GPS

Introduction-terminology definitions-code range Vs carrier phase,real time processing Vspostprocessing, point positioning Vs relative positioning, static Vs kinematic, static point processing Vs kinematic point processing, static relative positioning Vs kinematic relative positioning. Observation techniques- point positioning, differential GPS, relative positioning. Field equipment Planning a GPS survey- General remarks, Pre survey planning, field reconnaisence, monumentation, organizational design. Surveying Procedure-preobservation, observation, postobservation, ties to control monuments.In Situ data Processing- data transfer, data processing, trouble shooting and quality control, datum transformations, computation of plane coordinates,Survey report.

UNIT–IV: APPLICATIONS OF GPS

General Uses of GPS- global uses, regional uses, local uses. Attitude determination- theoretical and practical considerations.Air borne GPS for photo control. Interoperability of GPS- GPS and inertial navigation systems, GPS and GLONASS, GPS and other sensors.

UNIT–V: FUTURE OF GPS

New application aspects. GPS modernization- future GPS satellites, augmented signal structure. GPS augmentation- ground based and satellite based augmentation. GNSS - GNSS development, GNSS/Loran-C integration. Hardware and software improvements- Hardware, Software.

TEXT BOOKS:

1. B. Hofmann- Wellnhoff , H. Lichtenegger and J. Collins, "GPS theory and practice" , Fifth edition, Springer-Verlag Wien, Newyork, 2001.
2. Bradford W. Parkinson, James Spilker, "Global Positioning System: Theory and Applications", Vol. I, 1996.

REFERENCE BOOK:

1. Gunter Seeber, "Satellite Geodesy Foundations, Methods and Applications", Walter de Gruyter publications, 2003.

OPEN ELECTIVE-IV

IV B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC7OE07	INTRODUCTION TO MICROPROCESSORS AND MICROCONTROLLERS						

COURSE OBJECTIVES:

1. To familiarize the students with architecture of 8086 microprocessor and 8051 microcontroller.
2. To introduce the assembly language programming concepts of 8086 processor.
3. To expose the students to various interfacing devices with 8086.
4. To introduce the concepts of interrupt mechanism.
5. To understand various interfacing and applications of 8051

COURSE OUTCOMES: After completion of the course, the students should be able to

CO1: Explain the architecture of 8086 microprocessor.
CO2: Demonstrate programming proficiency using Instruction set.
CO3: Analyse concept of interfacing different peripheral devices with 8086.
CO4: Interpret the memory organization and I/O management of 8051.
CO5: Summarize various interfacing and applications of 8051.

UNIT–I: **8086 MICROPROCESSOR**

Evolution of Microprocessors, Introduction to 8086 Processor, Architecture-Functional diagram, Register Organization, Physical memory organization, signal descriptions of 8086- common function signals, Minimum and Maximum mode signals, Timing diagrams.

UNIT–II: **INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING OF 8086**

Instruction formats, addressing modes, instruction set, assembler directives, macros, simple programs involving logical, branch and call instructions, sorting, evaluating arithmetic expressions, string manipulations. Interrupt structure of 8086, Vector interrupt table, Interrupt service routine.

UNIT–III: **BASIC PERIPHERALS AND THEIR INTERFACING**

8255 PPI various modes of operation and interfacing to 8086. Interfacing keyboard, display, stepper motor interfacing, D/A and A/D converter, Keyboard/Display Controller-8279, Memory interfacing to 8086, Interfacing DMA controller 8257 to 8086.

UNIT–IV: 8051 MICROCONTROLLER

Microprocessors vs Microcontrollers. Overview of 8051 microcontroller, Architecture, I/O Ports, Memory organization, addressing modes and instruction set of 8051, Interrupts, timer/ Counter and serial communication.

UNIT–V: **INTERFACING AND APPLICATIONS OF 8051**

Interfacing 8051 to LED's, Push button, Relays and latch Connections, Keyboard Interfacing, Interfacing Seven segment display, ADC and DAC Interfacing.

TEXT BOOKS:

1. A. K. Ray, K.M. Bhurchandi, "Advanced Microprocessors and Peripherals", TMH, 2000.
2. D. V. Hall' "Microprocessors and Interfacing", 3rd Edition,Mcgraw Higher Ed, 2012.
3. Muhammad Ali Mazidi, Janice GillispieMazidi and RolinD.McKinlay, "The 8051 Microcontrollers and Embedded Systems", 2nd Edition,Pearson, 2007.

REFERENCE BOOKS:

1. Barry B. Brey, "The Intel Microprocessors", 7th Edition,PHI, 2006.
2. Liu and GA Gibson, "Micro Computer System 8086/8088 Family Architecture. Programming and Design", 2nd Edition, PHI, 1985.
3. Kenneth. J. Ayala, "The 8051 Microcontroller", 3rd Edition, Cengage Learning, 2010.

IV B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC7OE08	AUTOMOTIVE ELECTRONICS						

COURSE OBJECTIVES:

1. To understand the concepts of Automotive Electronics and its evolution and trends
2. To understand the basic electronic components used in automotive systems.
3. To understand all the sensors, actuators and electronics engine control in automotive systems.
4. To understand the basics of microcomputer system and its applications.
5. To understand various communication systems used in vehicle.

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

CO1: Define basics of automotive and electronics fundamentals.
CO2: List out the different types of electronic components.
CO3: Explain the concepts involved in micro computer system.
CO4: Classify and demonstrate various types of Sensors and Actuators.
CO5: Make use of Future Automotive Electronic Systems for building prototypes and to be able to demonstrate practical competence in these areas.

UNIT–I: AUTOMOTIVE FUNDAMENTALS

Use of electronics in the automobile, evolution of automotive electronics, the automobile physical configuration, Motivation for electronic engine control, exhaust emissions, fuel economy, concept of an electronic engine control system, engine functions and control, electronic fuel control configuration, electronic ignition with sensors.

UNIT–II: ELECTRONICS FUNDAMENTALS

Semiconductor devices- diodes, rectifier circuit, transistors, field effect transistors; transistor amplifiers, use of feedback in op amps, summing mode amplifier, analog computers, digital circuits- binary number system, combinational- Basic logic gates, multiplexer (IC 74151), 3 to 8 decoder (IC74138) , sequential- flip flops, decade counters(IC 7490).

UNIT–III: AUTOMOTIVE MICRO-COMPUTER SYSTEM

Microcomputer fundamentals-digital versus analog computers, basic computer block diagram, microcomputer operations, CPU registers, accumulator registers, condition code register-branching; microprocessor architecture, memory-ROM,RAM; I/O parallel interface, digital to analog converter and analog to digital converters with block diagram, microcomputer application in automotive systems.

UNIT–IV: SENSORS AND ACTUATORS

Introduction; Basic sensor arrangement; Types of Sensors such as oxygen sensors, Crank angle position sensors, fuel Metering/vehicle speed sensors and detonation sensors, altitude sensors, flow Sensors, throttle position sensors, solenoids, stepper motors, relays. Actuators – Fuel Metering Actuator, Fuel Injector, Ignition Actuator

UNIT–V: FUTURE AUTOMOTIVE ELECTRONIC SYSTEMS

Telematics, Safety: Collision Avoidance Radar warning System with block diagram, speech synthesis, sensor multiplexing, control signal multiplexing with block diagram, fiber optics inside

the car, automotive internal navigation system, GPS navigation system, voice recognition cell phone dialling, advanced cruise control system.

TEXT BOOKS:

1. William B. Ribbens, "Understanding Automotive Electronics", 6th Edition, SAMS/Elsevier Publishing.
2. Robert Bosch Gmbh, "Bosch Automotive Electrics and Automotive Electronics", 5th Edition, Springer, 2007.

REFERENCE BOOKS:

1. Ronald K Jurgen, "Automotive Electronics Handbook", 2nd Edition, McGrawHill, 1999.
2. G. Meyer, J. Valldorf and W. Gessner,"Advanced Microsystems for Automotive Applications", Springer, 2009.
3. Robert Bosch, "Automotive Hand Book" SAE, 5th Edition, 2000.

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