NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Academic Regulations, Course Structure and Syllabus

(R20 Regulations)

Electronics and Communication Engineering

(4 Year Program)

B.Tech – I & II Year
(Applicable for the Batches admitted from 2020-21)

NARASARAOPETA ENGINEERING COLLEGE
(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

INSTITUTE VISION AND MISSION

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 infra-structure 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

DEPARTMENT VISION AND MISSION

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:

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.

PROGRAMME SPECIFIC OUTCOMES:

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.

CURRICULAR FRAMEWORK FOR REGULAR, MINORS AND HONORS B.TECH PROGRAMMES OF ALL BRANCHES

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 nurturing knowledge, skills, and 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.

The Engineering curriculum is revised with an objective to fill the gaps in the existing curriculum with reference to skill development. The revised curriculum underwent a reorganization making the engineering education enshrined with skill development ecosystem to suit the industry's needs and to ensure the graduates employability.

The curriculum mandates students to take up five skill courses, Out of the five skill courses two shall be skill-oriented courses from the same domain and shall be completed in second year. Of the remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature. The students are also given the option of choosing between skill courses offered by the college and a certificate course offered by industry, a professional body, APSSDC or any other accredited body.

Another major change brought in the curriculum is the introduction of B.Tech with Honors or a B.Tech. with a Minor. This is to give an opportunity for the fast learners to earn additional credits either in the same domain or in a related domain, making them more proficient in their chosen field of discipline or be a graduate with multidisciplinary knowledge and job ready skills.

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	01
2.	Electrical and Electronics Engineering	02
3.	Mechanical Engineering	03
4.	Electronics and Communication Engineering	04
5.	Computer Science and Engineering	05
6.	Information Technology	12
7.	CSE (Artificial Intelligence)	43

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

Eligibility for Admission - Under Lateral Entry Scheme (LES)

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 Lateral entry Programme will be through ECET.

4. AWARD OF THE DEGREE

For Regular and LES (Lateral Entry Scheme) **students**

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

(a) Pursues a course of study in not less than four and not more than eight academic years for regular students. For LES students, 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) He/she shall forfeit their seat in B. Tech course and their admission stands cancelled after eight academic years for regular students and six academic years for LES students starting from the academic year of admission.

(c) Registers for 160 credits and must secure all the 160 credits for Regular students. Registers for 121 credits and must secure all the 121 credits for LES students

(d) A student shall be eligible for the award of B.Tech degree with Honors or Minor if he/she earns 20 credits in addition to the 160/121 credits and meet other specified requirements in the appropriate section of this document.

(e) A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

Academic Calendar

For all the eight/six 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 two weeks for theory examinations. 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. Assigning of Credits:

1 Hr. Lecture (L) per week - 1 credit

1 Hr. Tutorial (T) per week - 1 credit

2 Hr. Practical (P) per week - 0.5 credits

2 Hours Practical (Lab)/week - 1 credit

5. **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 three-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 and 50 marks for Mini Project/Practical Training/Internship/ Research Project/ Community Service Project. The Project Work shall be evaluated for 200 marks.

THEORY

For all theory subjects consisting of 5 units in each subject, the assessment shall be for 30 marks through internal evaluation and 70 marks through external end semester examination of 3 hours duration.

INTERNAL EVALUATION

Internal evaluation is based on two **Cycle** examinations. Each **Cycle** consists of three components.

1) **Assignment Test – 1 (A1)**:

   A1 will be conducted after the completion of 1st unit of syllabus. 5 or 6 questions will be given to students before 1 week of the commencement of the test. On the day of test each student will be given two questions at random. A1 will be evaluated for 05 marks.

2) **Quiz - 1(Q1)**:

   After the first two and half Units of syllabus is over along with the descriptive test, online quiz test will be conducted for 20 marks and scaled down to 10 marks.

3) **Descriptive Test – 1(D1)**:

   Along with the Q1, a descriptive test will be conducted for 25 marks and scaled down to 15 marks. One 10 marks question from unit 1, one 10 marks question from unit 2, and one 5 marks question from first half of 3rd unit will be given.

Cycle–I final marks = A1 (05 marks) + Q1 (10 marks) + D1 (15 marks) = 30 marks

In the similar manner, Cycle–II Examination will be conducted as follows:

A2 test will be conducted after 3.5 units of syllabus (covering syllabus from 2.5 to 3.5 units)
Q2 and D2 will be conducted after 5th unit is over. For D2, one 5 marks question will be given from second half of third unit, two 10 marks questions will be given each from units 4 and 5.

Cycle–II final marks = A2 + Q2 + D2 = 30 Marks.

Final internal marks will be computed as **80 % of best cycle marks + 20% of least cycle marks.**

EXTERNAL EVALUATION

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

PRACTICALS

INTERNAL EVALUATION

For practical subjects there shall be continuous evaluation during the semester for 15 internal marks and 35 end examination marks. The internal 15 marks shall be awarded as follows:

Day to day work - 5 marks,

Record-5 marks and

Internal laboratory test -5 marks.

EXTERNAL EVALUATION

For practical subjects there shall be an external examination at the end of the semester for 35 marks in the presence of external examiner. The examination duration is 3 hours.

DRAWING SUBJECTS

For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing etc.,) and estimation, the distribution shall be 30 marks for Internal Evaluation and 70 marks for End Examination. There shall be two internal tests in a semester.

The 30 internal marks will be evaluated as follows:

Cycle–I:

Internal Test : 15 marks. (1½ hour duration)
Day – to – day work: 15 marks (evaluation of charts)

In the Similar manner, **Cycle–II examination will be conducted for 30 marks**
The sum of 80% of the best and 20% of the least of two internal tests shall be considered.

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

1. Unit I to III –Conventional drawing pattern.
2. Unit IV to VI-Computer lab pattern using any drafting packages

The distribution of internal and external marks is 30 and 70 marks respectively.

Internal Evaluation: Max Marks: 30

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

1. Day-to-day work : 15 Marks (Evaluation of Charts)
2. Descriptive Test : 15 Marks

Cycle–I Examination – Conventional drawing pattern

In Cycle-I examination the 30 marks will be awarded as follows:

Day-to-day evaluation - 15 Marks

Descriptive Test - 15 Marks

In the Descriptive Test of duration 2 hours, 3 questions will be given to the student and he has to answer all the three questions (3x05M = 15M).

Cycle–II Examination – Computer lab pattern using any drafting packages

for duration of 2 hours.

In Cycle-II examination the 30 marks will be awarded as follows:

Record - 10 Marks

Execution - 10 Marks

Paper Work - 10 Marks

Of two cycle examinations conducted during the semester, sum of 80% of the best and 20% of the least of two cycle examinations shall be considered for the award of internal marks.

End semester Examination (Total Duration: 4 hours, Max, marks: 70)

Conventional drawing pattern (Duration: 2 Hours, Marks: 35)

Computer lab pattern using any drafting packages (Duration: 2 Hours, Max:35)

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

Mandatory Course (M.C): Environmental Sciences/NSS/NCC, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc non-credit (zero credits) mandatory courses. Environmental Sciences shall be offered compulsorily as mandatory course for all branches. A minimum of 75% attendance is mandatory in these subjects. There shall be an external examination for 70 marks and it shall be conducted by the college internally. Two internal examinations shall be conducted for 30 marks and a student has to secure at least 40% of the marks for passing the course. There is no online internal exam for mandatory courses. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only SATISFACTORY(S)/NOT-SATISFACTORY (F) will be specified.

- There shall be 05 Professional Elective courses and 04 Open Elective courses. All the Professional & Open Elective courses shall be offered for 03 credits, wherever lab component is involved it shall be (2-0-2) and without lab component it shall be (3-0-0) or (2-1-0) and for all minors /honors, it shall be (4-0-0). If a course comes with a lab component, that component has to be cleared separately. The concerned BOS shall explore the possibility of introducing virtual labs for such courses with lab component.

- All Open Electives are offered to students of all branches in general. However, a student shall choose an open Elective from the list in such a manner that he/she has not studied the same course in any form during the Programme.
- The college shall invite registration forms from the students at the beginning of the semester for offering professional and open elective courses. There shall be a limit on the minimum and maximum number of registrations based on class/section strength.
- Students shall undergo mandatory summer internships for a minimum of six weeks duration at the end of second and third year of the Programme.
- There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain courses and the remaining one shall be a soft skills course.
- Undergraduate Degree with Honors/Minor shall be issued by the Institute to the students who fulfil all the academic eligibility requirements for the B.Tech program and Honors/Minor program. The objective is to provide additional learning opportunities to academically motivated students.
- **Assessment:** 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. The distribution shall be 30% marks for Internal Evaluation and 70% marks for the End Semester Examinations. A student has to secure not less than 35% of marks in the end semester examination and minimum 40% of marks in the sum total of internal and end semester examination marks to earn the credits allotted to each course.

Mini Project/Practical Training/ Internship/ Research Project/ Community Service Project (1.5 Credits):

It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydal and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programme.

Students shall pursue this course during summer vacation just before its offering as per course structure. The minimum duration of this course is at least 6 weeks. The student shall register for the course as per course structure after commencement of academic year. A supervisor/mentor/advisor has to be allotted from the institute to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. After successful completion, students shall submit a summer internship technical report to the concerned department and appear for an oral presentation before the departmental committee consists of an external examiner; Head of the Department; supervisor of the internship and a senior faculty member of the department.

A certificate from industry/skill development center shall be included in the report. The report and the oral presentation shall carry 40% and 60% weightages respectively. It shall be evaluated for 50 external marks at the end of the semester. A student shall secure a minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted.

Mini Project/Practical Training/ Internship/ Research Project/ Community Service Project will be evaluated at the end of the semester for 50 marks (Record/Report: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external and internal examiner. There are no internal marks for the Mini Project/Practical Training/ Internship/ Research Project/ Community Service Project.

Major Project **(12 credits):**

Evaluation: The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner and is evaluated for 140 marks.

MOOCS (1.5 Credits):

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 of IV year I sem. The student shall register for the course (Minimum of 8 weeks) offered by SWAYAM/NPTEL/ Any other reputed organization, through online with the approval of Head of the Department. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only after submission of the certificate.

Skill Oriented Courses (2 Credits)

1. For skill oriented/skill advanced course, one theory and 2 practical hours or two theory hours may be allotted as per the decision of concerned BOS.
2. Out of the five skill courses two shall be skill-oriented courses from the same domain and shall be completed in second year. Of the remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.

3. A pool of interdisciplinary job-oriented skill courses shall be designed by a common Board of studies by the participating departments/disciplines and the syllabus along with the pre requisites shall be prepared for each of the laboratory infrastructure requirements.

4. The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies/APSSDC or any other accredited bodies as approved by the departmental committee.

5. The Board of Studies of the concerned discipline of Engineering shall review the skill advanced courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest courses based on industrial demand.

6. If a student chooses to take a Certificate Course offered by industries/Professional bodies/APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency/professional bodies as approved by the departmental committee.

Evaluation: The job oriented skill courses may be registered at the college or at any accredited external agency as approved by departmental committee. A student shall submit a record/report on the on the skills learned. If the student completes job oriented skill course at external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of the semester for 50 marks (record: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external and internal examiner. There are no internal marks for the job oriented skill courses.

Curricular Framework for Honors Programme

1. Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.

2. A student shall be permitted to register for Honors program at the beginning of 4^{th} semester provided that the student must have acquired a minimum of 8.0 SGPA up to the end of 2^{nd} semester without any backlogs. In case of the declaration of the 3^{rd} semester results after the commencement of the 4^{th} semester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Honors Programme registration active.

3. Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.

4. In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

5. Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Departmental committee.

6. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.

7. The concerned departmental committee shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with departmental committee. MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the departmental committee. with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as per the guidelines approved by the departmental committee. .

8. The concerned BoS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

9. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will be mentioned in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a “pass (P)” grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

10. In case a student fails to meet the SGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

11. Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor’s degree.

Curricular Framework for Minor Programme:

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

b) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

2. The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE,CE,ME etc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Robotics, VLSI etc.

3. The list of disciplines/branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BoS.

4. There shall be no limit on the number of programs offered under Minor. The Institution can offer minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.

5. The concerned BoS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

6. A student shall be permitted to register for Minors program at the beginning of 4^{th} semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA (Semester Grade point average) upto the end of 2^{nd} semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4^{th} semester. If a student fails to acquire 8 SGPA upto 3^{rd} semester or failed in any of the courses, his registration for Minors program shall stand cancelled. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.

7. A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

8. Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete

prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

9. In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits.

10. Student can opt for the Industry relevant minor specialization as approved by the concerned Departmental committee. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Departmental committee of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

11. A committee should be formed at the level of College/Universities/department to evaluate the grades/marks given by external agencies to a student which are approved by concerned Departmental committee. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

12. If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a “pass (P)” grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

13. In case a student fails to meet the SGPA requirement for B.Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

14. Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he/she has already earned bachelor’s degree.

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	30	70	35	25	40	40
2	Practical	50	15	35	35	12	40	20
3	Miniproject/Internship/Industrial Training /Skill development courses/ Research project/ Community service project	50	-	50	40%	20	40	20
4	Project Work	200	60	140	35	50	40	80
5	MOOCs(Credit Course)	Certificate must be submitted before the end semester examinations of that semester in which MOOCS course is offered.						

11. Attendance Requirements:

a) A student is eligible to write the end semester examinations if he acquires a minimum of 40% in each subject and 75% of attendance in aggregate of all the subjects.

b) Condonation of shortage of attendance in aggregate up to 10% (65% and above, and below 75%) may be granted by the College Academic Committee. However, this condonation concession is applicable only to any two semesters during the entire programme.

c) Shortage of Attendance below 65% in aggregate shall not be condoned.

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

e) Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class.

f) A stipulated fee shall be payable towards condonation of shortage of attendance to the college. Students availing condonation on medical ground shall produce a medical certificate issued by the competitive authority.

g) A student will be promoted to the next semester if he satisfies the (i) attendance requirement of the present semester and (ii) minimum required credits.

h) If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

i) For induction programme attendance shall be maintained as per AICTE norms.

j) For non-credit mandatory courses the students shall maintain the attendance similar to credit courses

18. Promotion Rules:

a) A student shall be promoted from first year to second year if he fulfils the minimum attendance requirements.

b) A student will be promoted from II year to III year if he fulfils the academic requirement of 40% of credits up to II year II-Semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.

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

d) For LES, point C is only applicable

19. Grading:

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.

Marks Range	Level	Letter Grade	Grade Point
≥ 90	Outstanding	A+	10
80-89	Excellent	A	9
70-79	Very Good	B	8
60-69	Good	C	7
50-59	Fair	D	6
40-49	Satisfactory	E	5
< 40	Fail	F	0
-	Absent	AB	-
-	Malpractice	MP	-

Calculation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

i. The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$$SGPA = \Sigma (Ci \times Gi) / \Sigma Ci$$

Where, Ci is the number of credits of the i^{th} subject and Gi is the grade point scored by the student in the i^{th} course.

ii. The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

$$CGPA = \Sigma (Ci \times Si) / \Sigma Ci$$

Where 'Si' is the SGPA of the i^{th} semester and Ci is the total number of credits in that semester

iii. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

iv. SGPA & CGPA will be calculated for those candidates who have passed all the subjects in that or up to that semester respectively.

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

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

vii. As per AICTE regulations, conversion of CGPA into equivalent percentage as follows:

Equivalent Percentage = (CGPA – 0.75) x 10

Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. degree, he/she shall be placed in one of the following:

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.75 (With No subject failures)
First Class	≥ 6.75 (With subject failures)
Second Class	≥ 5.75 & < 6.75
Pass Class	≥ 4.75 & < 5.75
FAIL	< 4.75

20. Gap - Year:

Gap Year – concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I year/II year/III year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee at institute level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the Gap Year.

REVALUATION

1. Student can submit the application for revaluation, along with the prescribed fee for revaluation evaluation 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 evaluator, other than the first evaluator shall revaluate the answer script(s).

MINIMUM INSTRUCTION DAYS

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

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

WITHHOLDING OF RESULTS

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

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.

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.

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

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.

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.

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.

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, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the 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 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	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.

	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 6to 8.	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 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.

ANNEXURE-I

COMMUNITY SERVICE PROJECT

……Experiential learning through community engagement

As per the decision of the decision of the concerned department BoS

Introduction

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

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of the society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in a minimum of **180 hours** for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
- The log book has to be countersigned by the concerned mentor/faculty incharge.
- Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.

- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
    - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers; rather, it could be another primary source of data.
    - Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
        - Agriculture
        - Health
        - Marketing and Cooperation
        - Animal Husbandry
        - Horticulture
        - Fisheries
        - Sericulture
        - Revenue and Survey
        - Natural Disaster Management
        - Irrigation
        - Law & Order
        - Excise and Prohibition
        - Mines and Geology
        - Energy
        - Internet
        - Free Electricity
        - Drinking Water

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
- Improved ability to understand complexity and ambiguity

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

Career Development

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

Relationship with the Institution

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

- Improved institutional commitment
- Improved student retention
- Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals
- New energy, enthusiasm and perspectives applied to community work
- Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following is the recommended list of projects for engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

For Engineering Students

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA-533003, Andhra Pradesh (India)

For Constituent Colleges and Affiliated Colleges of JNTUK

Ragging

Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

- Ragging within or outside any educational institution is prohibited.
- Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student

	Imprisonment upto		Fine Upto
Teasing, Embarrassing & Humiliation	6 Months	+	Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation	1 Year	+	Rs. 2,000/-
Wrongfully restraining or confining or causing hurt	2 Years	+	Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence	5 Years	+	Rs. 10,000/-
Causing death or abetting suicide	10 Months	+	Rs. 50,000/-

In Case of Emergency CALL TOLL FREE No. : 1800 - 425 - 1288

LET US MAKE JNTUK A RAGGING FREE UNIVERSITY

R20 COURSE STRUCTURE
I & II B.TECH

I B.TECH., I SEMESTER

S.No.	Course code	SUBJECT	Cat. Code	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
1	R20CC1102	Linear Algebra and Calculus	BS	2	1	0	30	70	100	3
2	R20CC1103	Engineering Chemistry	BS	3	0	0	30	70	100	3
3	R20CC1101	Technical and Communicative English-I	HS	3	0	0	30	70	100	3
4	R20EC1110	Engineering Graphics	ES	1	0	4	30	70	100	3
5	R20CC1105	Problem solving using C	ES	3	0	0	30	70	100	3
6	R20CC11L1	Soft Skills and Communication Skills Lab	HS	0	0	3	15	35	50	1.5
7	R20CC11L5	Engineering Chemistry Lab	BS	0	0	3	15	35	50	1.5
8	R20CC11L2	Problem solving using C Lab	ES	0	0	3	15	35	50	1.5
Total				12	1	13	195	455	650	19.5

I B.TECH., II SEMESTER

S.No.	Course Code	SUBJECT	Cat. Code	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
1	R20CC1201	Differential Equations and Vector Calculus	BS	2	1	0	30	70	100	3
2	R20EC1205	Applied Physics	BS	3	0	0	30	70	100	3
3	R20CC1206	Problem Solving using Python	ES	3	0	0	30	70	100	3
4	R20EC1215	Network Analysis	ES	3	0	0	30	70	100	3
5	R20EC1219	Data Structures	ES	3	0	0	30	70	100	3
6	R20CC12L8	Data Structures Lab	ES	0	0	3	15	35	50	1.5
7	R20CC12L10	Applied Physics Lab	BS	0	0	3	15	35	50	1.5
8	R20CC12L1	Problem Solving using Python Lab	ES	0	0	3	15	35	50	1.5
9	R20CCMC2	Constitution of India/NSS/NCC	MC	2	0	0				0
Total				16	1	9	195	455	650	19.5

II B.TECH. – I SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
1	R20CC2101	Numerical Methods and Transformations	BS	2	1	0	30	70	100	3
2	R20EC2102	Electronic Devices and Circuits	PC	3	0	0	30	70	100	3
3	R20EC2103	Signals and Systems	PC	2	1	0	30	70	100	3
4	R20EC2104	Switching Theory and Logic Design	PC	3	0	0	30	70	100	3
5	R20EC2105	Linear Control Systems	PC	3	0	0	30	70	100	3
6	R20EC21L1	Electronic Devices and Circuits Lab	PC	0	0	3	15	35	50	1.5
7	R20EC21L2	Signals and Systems Lab	PC	0	0	3	15	35	50	1.5
8	R20EC21L3	Digital Logic Design Lab	PC	0	0	3	15	35	50	1.5
9	R20EC21SC1	Design of Systems using Arduino and Raspberry Pi	SC	0	0	4		50	50	2
10	R20CC21MC1	Environmental Studies	MC	2	0	0				0
		Total		15	02	13	195	505	700	21.5

II B.TECH. – II SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
1	R20EC2202	Internet of Things	ES	3	0	0	30	70	100	3
2	R20EC2203	Analog and Digital Communications	PC	3	0	0	30	70	100	3
3	R20EC2204	Electronic Circuits and Pulse Circuits	PC	3	0	0	30	70	100	3
4	R20EC2205	Electromagnetic Waves and Transmission Lines	PC	3	0	0	30	70	100	3
5	R20CC2201	Technical and Communicative English-II	HS	3	0	0	30	70	100	3
6	R20EC22L1	Internet of Things Lab	ES	0	0	3	15	35	50	1.5
7	R20EC22L2	Analog and Digital Communications Lab	PC	0	0	3	15	35	50	1.5
8	R20EC22L3	Electronic Circuits and Pulse Circuits Lab	PC	0	0	3	15	35	50	1.5
9	R20EC22SC1	Design and Simulation of Electronic Circuits	SC	0	0	4		50	50	2
10		Internship two months (Mandatory) during summer vacation								
	Total			15	0	13	195	505	700	21.5
	Honors/minor course		>4	4	0	0				**4**

I B.TECH., I SEMESTER
COURSE STRUCTURE
&
SYLLABUS

I B.TECH., I SEMESTER

S.No.	Course code	SUBJECT	Cat. Code	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
1	R20CC1102	Linear Algebra and Calculus	BS	2	1	0	30	70	100	3
2	R20CC1103	Engineering Chemistry	BS	3	0	0	30	70	100	3
3	R20CC1101	Technical and Communicative English-I	HS	3	0	0	30	70	100	3
4	R20EC1110	Engineering Graphics	ES	1	0	4	30	70	100	3
5	R20CC1105	Problem solving using C	ES	3	0	0	30	70	100	3
6	R20CC11L1	Soft Skills and Communication Skills Lab	HS	0	0	3	15	35	50	1.5
7	R20CC11L5	Engineering Chemistry Lab	BS	0	0	3	15	35	50	1.5
8	R20CC11L2	Problem solving using C Lab	ES	0	0	3	15	35	50	1.5
Total				12	1	13	195	455	650	19.5

I B. TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	0	30	70	100	3
Code: R20CC1102	LINEAR ALGEBRA AND CALCULUS						

COURSE OBJECTIVES:

1. Understanding basic concepts of linear algebra (systems of linear equations, matrix calculus).
2. To become proficiency 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

1. Solve the system of linear equations.
2. Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors.
3. Relate the results of mean value theorems in calculus to Engineering problems.
4. Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering.
5. Compute the area and volume by interlinking them to appropriate double and triple integrals.

SYLLABUS:

UNIT-I: LINEAR SYSTEMS OF EQUATIONS (10 hours)

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, Traffic flow

UNIT – II: EIGENVALUES AND EIGENVECTORS (12 hours)

Eigenvalues, Eigenvectors, Properties, Cayley - Hamilton Theorem(without proof), 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 (8 hours)

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 (8 hours)

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: MULTIPLE INTEGRALS (10 hours)

Double and triple integrals, Change of Variables, Change of order of Integration, volume.
Application: Momenta of Inertia.

TEXT BOOK :

1. Dr. B.S. Grewal, "*Higher Engineering Mathematics*", 43rd Edition, Khanna Publishers, 2012.
2. B.V. Ramana, "Higher Engineering Mathematics", 32nd Edition, McGraw Hill Education, 2018.

REFERENCES:

1. N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, "*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. Bhavanari Satyanarayana, 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
	3	0	0	30	70	100	3
Code: R20CC1103	ENGINEERING CHEMISTRY						

COURSE OBJECTIVES:

- To analyze water for its various parameters and its significance in industrial and domestic allocations.
- To acquire the knowledge on types of polymers, fuels and their applications.
- To provide information on exciting advanced materials available in engineering.
- To apply the electrochemical principles, understand the fundamentals of corrosion and development of different techniques in corrosion control.
- 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**

SYLLABUS:

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 Electro dialysis).

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. Shikha Agarwal, "**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. Venkata Ramana 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, Dhanpat Rai & Sons, Delhi, (2015).
2. B.S Murthy and P. Shankar, "**A Text Book of NanoScience and NanoTechnology"**, University Press (2013).
3. K. Sesha Maheshwaramma and Mridula Chugh, "**Engineering Chemistry"**, Pearson India Edn services, (2016).
4. S.S. Dara, "**A Textbook 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- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Code: R20CC1101	TECHNICAL AND COMMUNICATIVE ENGLISH - I						

COURSE OBJECTIVES:

- To enable the engineering students develop their basic communication skills in English for academic and social purposes.
- To equip the students with appropriate oral and written communication skills.
- To inculcate the skills of listening, reading and critical thinking.
- To integrate English Language learning with employability skills and training.
- To enhance the students' proficiency in reading skills enabling them meet the academic demands of their course.

COURSE OUTCOMES:

Learners are able to

- **CO1**: Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it **(Apply-3).**
- **CO2**: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. **(Creating-5).**
- **CO3**: Build grammatically correct sentences using a variety of sentence structures **(Apply3).**
- **CO4**: Enhance word power and usage of lexicons **(Apply3).**

Teaching Methodology:

The methodology of teaching will be chalk and talk, PPT, audio-visual, flipped class and activity based teaching.

SYLLABUS:

UNIT-I

Hours of Instruction per unit: 8

1. **A Drawer full of Happiness**

a. **Listening** : Dialogues, Task based listening activities.

b**. Speaking** : Asking and answering general questions.

c. **Reading** : Skimming, Scanning.

d. **Writing** : Punctuations, Paragraphs.

e. **Grammar & Vocabulary** : Nouns, Adjuncts,
GRE Vocabulary,
Technical Vocabulary.

UNIT-II

Hours of Instruction per unit: 8

2. Nehru's Letter to daughter Indira on her Birthday

a. **Listening** : Individual and pair based listening to the audio track.

b**. Speaking** : Discussion in pairs / small groups on specific topics.

c. **Reading** : Identifying sequence of ideas; recognising verbal techniques.

d. **Writing** : Summarising, Paraphrasing.

e. **Grammar & Vocabulary** : Articles, Adjectives, Prepositions
Verbal Competence,
Synonyms & Antonyms,
Analogy,
GRE Vocabulary,
Technical Vocabulary.

UNIT-III

Hours of Instruction per unit: 8

3. Stephen Hawking- Positivity 'Benchmark'

a. **Listening** : Listening for global comprehension and summarising.

b**. Speaking** : Discussing specific topics in pairs (or) small groups and reporting the discussion, Complaining, Apologising.

c. **Reading** : Reading between the lines, Critical reading for evaluation.

d. **Writing** : Official Letter writing, E-Mail etiquette, General Netiquette, Covering Letter & Resume writing.

e. **Grammar & Vocabulary** : Phrasal verbs, Verbs, Tenses (Present, Past & Future), Concord: Subject-Verb Agreement,
Verbal reason,
Using equivalents,
Word associations,
GRE Vocabulary,
Technical Vocabulary.

UNIT-IV

Hours of Instruction per unit: 8

4. Like a Tree, Unbowed: Wangari Maathai- Biography

a. **Listening** : Making predictions while listening to conversations (or) transactional dialogues.

b**. Speaking** : Role plays for practice of conversational English in academic contexts (formal and informal) .

c. **Reading** : Information transfer (Tables, Bar Diagrams, Line Graphs, Pie Diagrams)

d. **Writing** : Interpreting visual information, Statement of Purpose (SOP)

e. **Grammar & Vocabulary** : Gender inclusive language (Gendered Noun, Gender-neutral Noun), Quantifying expressions, Adjectives, Adverbs, Degrees of comparison,
GRE Vocabulary,
Technical Vocabulary.

UNIT-V

Hours of Instruction per unit: 8

5. "Stay Hungry, Stay Foolish"- Rushmi Bansal

a. **Listening** : Identifying key terms, understanding concepts, interpreting the concepts.

b**. Speaking** : Formal oral presentations on topics from academic contexts.

c. **Reading** : Reading comprehension, The RAP strategy for in-depth reading, Intensive reading and extensive reading.

d. **Writing** : Academic proposals, Poster presentation.

e. **Grammar & Vocabulary** : Reported Speech, Reporting verbs for academic purposes,
Corrections of sentences,
GRE Vocabulary,
Technical Vocabulary.

TEXTBOOKS:

1. INFOTECH ENGLISH , Maruthi Publications, Guntur- 522001.

REFERENCES:

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

Online Sources:

1. www.enchantedlearning.com
2. https://www.englisch-hilfen.de/en/
3. https://www.bbc.co.uk/learningenglish/
4. https://in.usembassy.gov/education-culture/american-spaces/american-space-new-delhi/collection/
5. https://www.talkenglish.com/speaking/basics/speaking_basics_ii.aspx
6. https://www.englishclub.com/speaking/
7. https://agendaweb.org/listening-exercises.html
8. https://www.esolcourses.com/content/topicsmenu/listening.html
9. https://www.esl-lab.com/
10. https://www.eagetutor.com/eage-fluent-english-speaking-search-p.htm?gclid=EAIaIQobChMIpr-F5OzH7QIVChsrCh1kBAkzEAMYASAAEgINpfD_BwE
11. https://www.myenglishpages.com/site_php_files/reading.php

https://www.cambridgeenglish.org/learning-english/free-resources/write-and-improve/

I B. TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	1	0	4	30	70	100	3
Code: R20EC1110	ENGINEERING GRAPHICS						

COURCE OBJECTIVES:

- The students to use drawing instruments and to draw polygons, engineering Curves & engineering scales.
- The students use to make orthographic projections, projections of points, simple lines & projections of the lines inclined to both the lines.
- The students use to draw the projections of the plane inclined to both the plane.
- The students use to draw the projections of solids & development of surfaces.
- 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, and scales.
CO 2: **illustrate** the orthographic projections, projections of points, and lines.
CO 3: **construct** the projection of planes inclined to both the planes.
CO 4: **construct** the projection of solids for engineering applications.
CO 5: **analyse** the conversion of isometric views to orthographic views vice versa.

SYLLABUS:

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 lines parallel 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 planes.

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.Venu gopal, New age international Publishers.

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

Web References:
https://nptel.ac.in/courses/112103019/17

E-Books:
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	0	0	30	70	100	3
CODE: R20CC1105	PROBLEM SOLVING USING C						

COURSE OBJECTIVES:

- To know the basic problem solving process using Flow Charts and algorithms.
- To understand the basic concepts of control structures in C.
- To learn concepts of arrays, functions, pointers and Dynamic memory allocation in C.
- 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: 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. Reema Thareja**, "**Programming in C**"**, First **edition,** OXFORD University Press 2018.

REFERENCE BOOKS:

1. REEMA THAREJA, "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- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
Code: R20CC11L1	SOFT SKILLS AND COMMUNICATION SKILLS LAB						

COURSE OBJECTIVES:

- To build confidence in the students to communicate effectively in English.
- To strengthen the oral communication skills to enable them to interact with the people in various social situations.
- To enable the learners improve pronunciation with the knowledge of phonetics.
- To provide exposure to students to soft skills like Goal Setting, Time Management, Interpersonal Skills, and Intra Personal Skills.

COURSE OUTCOMES:

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

CO1: Communicate effectively with good pronunciation, overcoming mother tongue influence in academic and professional environment.

CO 2: Listen and comprehend several accents of English Language

CO 3: Take part in various conversations/discourses using formal and informal expressions.

CO 4: Adapt soft skills successfully in personal and professional life.

SYLLABUS:

UNIT– I

a. Introduction to Phonetics.
b. Listening - TEDx Talks (https://www.ted.com/talks/ashweetha_shetty_how-education-helped-me-rewrite-my-life?language-en#t-623369)
c. Self-Introduction

UNIT–II

a. Pronunciation Rules & Common Errors in Pronunciation.
b. Listening -TEDx Talks(https://www.youtube.com/watch?v=Dk20-E0yx_s)
c. Role Play

UNIT–III

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

UNIT-IV

a. Situational Dialogues (Commands, Instructions and Requests)
b. Listening -TEDx Talks(https://youtu.be/SKvMxZ284AA)
c. Telephonic Etiquette.

UNIT-V

a. Time Management.
b. Goal Setting.
c. Interpersonal Skills & Intra personal skills.

TEXT BOOKS:

"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 ur *Grammar Practice Activities,* Cambridge University Press, 2010.
5. Mark Hancock, *Pronunciation in Use,* Oxford University Press 2007.
6. K. R Lakshmi Narayanan, T. Murugavan, *Managing Soft Skills,*Scitech Publications, 2010.
7. K V S G Murali Krishna, K V K K Prasad, *Placement and Personality Development,* Second Edition, Reem Publications Pvt. Limited, 2012
8. Shiv Khera, *You can Win,* Bloomsbury Publication, 2014
9. Stephen R. Covey, *The 7 Havits of Highly Effective People,* Free Press, 1989

I B.TECH.- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
Code: R20CC11L5	ENGINEERING CHEMISTRY LAB						

COURSE OBJECTIVES:

- To provide the students with a solid foundation in chemistry laboratory required to solve the engineering problems.
- To expose the students in practical aspects of the theoretical concepts.
- 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, Dhanpat Rai 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**" Dhanpat Rai Publications, Co., New Delhi. (2009).

WEB REFERENCES:

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

I B. TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
CODE: R20CC11L2	PROBLEM SOLVING USING C LAB						

COURSE OBJECTIVES:

- 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 this C Programming Lab, students would be able to:

CO1: Study, analyze and understand 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]

SYLLABUS:

EXERCISE 1

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 = $\sqrt{(s*(s-a)*(s-b)*(s-c)}$ where s= (a+b+c)/2.

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

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

EXERCISE 3

a) Write a C program to find the roots of a quadratic equation.

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 given number.

b) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

EXERCISE 5

a) Write a C Program to print the multiplication table of a given number n up to a given value, where n is entered by the user.

b) Write a C Program to enter a decimal number, and calculate and display the binary equivalent of that number.

c) Write a C Program to check whether the given number is Armstrong number or not.

EXERCISE 6

a) Write a C program to interchange the largest and smallest numbers in the array.

b) Write a C program to input two m x n matrices, check the compatibility and perform addition and multiplication of them.

EXERCISE 7

a) Write a C Program to find sum of following series for a given n value.

i. 1+(1+2)+(1+2+3)+(1+2+3+4)+(1+2+3+4+5)+...+(1+2+...+n).

ii. 1+(2+2)+(3+3+3)+(4+4+4+4)+…+(n+n+n+n..+n).

b) Write a C Program to display following patterns for a given n value

i.
```
    1
  2   2
3   3   3        if n =3
```

i.
```
    1
  2   2
3   3   3
  2   2
    1            if n=3.
```

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 given integer.

ii) To find the GCD greatest common divisor of two given integers.

EXERCISE 9

a) Write a C Program to find Fibonacci sequence.

b) Write C programs illustrating call by value and call by reference concepts.

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 another string

b) To compare two strings

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 or not

b) Write a C Program to count number of occurrences of each character in a given string. Example: if input 'APPLE' then output is 'A count 1, P count 2, L count 1, E count 1'

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 given position.
ii. To delete n Characters from a given position in a given string.
iii. To replace a character of string either from beginning or ending or at a specified location

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 Runge Kutta method

EXERCISE 14

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

EXERCISE 15

a) Write the following C Programs using Dynamic memory management functions.
   i. Accept size of array from user then read n elements into two arrays and store sum of those two arrays in third array, display three arrays using pointers.
   ii. User will specify data type and data to store, use generic pointer to store that data and display given input. 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 to another.
b) Write a C program to count the number of characters and number of lines in a file.
c) Write a C Program to merge two files into a third file. The names of the files must be entered using command line arguments.

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. Reema Thareja, " Programming in C", OXFORD.
2. The C programming Language by Dennis Richie and Brian Kernighan 2nd ed.

REFERENCE BOOKS:

1. Dr.E.Balaguruswamy, "Programming in ANSI C", Tata McGraw-Hill Education.
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
COURSE STRUCTURE
&
SYLLABUS

I B.TECH., II SEMESTER

S.No.	Course Code	SUBJECT	Cat. Code	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
1	R20CC1201	Differential Equations and Vector Calculus	BS	2	1	0	30	70	100	3
2	R20EC1205	Applied Physics	BS	3	0	0	30	70	100	3
3	R20CC1206	Problem Solving using Python	ES	3	0	0	30	70	100	3
4	R20EC1215	Network Analysis	ES	3	0	0	30	70	100	3
5	R20EC1219	Data Structures	ES	3	0	0	30	70	100	3
6	R20CC12L8	Data Structures Lab	ES	0	0	3	15	35	50	1.5
7	R20CC12L10	Applied Physics Lab	BS	0	0	3	15	35	50	1.5
8	R20CC12L1	Problem Solving using Python Lab	ES	0	0	3	15	35	50	1.5
9	R20CCMC2	Constitution of India/NSS/NCC	MC	2	0	0				0
Total				16	1	9	195	455	650	19.5

I B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	0	30	70	100	3
CODE: R20CC1201	DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS						

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:

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

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

SYLLABUS:

UNIT I: DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE (10 hours)

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 (10 hours)

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 (10 hours)

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 (8 hours)

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 (10 hours)

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. B.V.Ramana, "Higher Engineering Mathematics", 32nd Edition, McGraw Hill Education, 2018.
3. Bhavanari Satyanarayana, Pradeep Kumar T.V. & Srinivasulu D, "Linear Algebra and Vector Calculus", Studera Press, New Delhi, 2017.

REFERENCES:

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, Bhavanari Satyanarayana, Indrani Promod Kelkar, "*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	30	70	100	3
Code: R20EC1205	APPLIED PHYSICS						

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

CO 1: Interpret the experimental evidence of wave nature of light and interference in thin films, Diffraction grating and Polaraisation in various fields. (**K2)**
CO 2: Analyse and understand various types of lasers & optical fibers. **(K4)**
CO 3: Identify the crystal structures and XRD techniques. **(K3)**
CO 4: Apply the magnetic materials in engineering field. **(K3)**
CO 5: Identify the various applications of semiconductors in engineering field. **(K3)**

SYLLABUS:

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 divergence theorem - Stokes theorem (Quantitative) – Fundamental laws of electromagnetism – Maxwell's Electromagnetic Equations.

Magnetic materials: Magnetic Susceptibility- Magnetic permeability –Classification of Magnetic materials – Dia, Para, and Ferro – Hysteresis Loop- Soft and Hard magnetic materials – Applications-Superconductivity- Properties, Meissner effect - Type-I and Type-II super conductors.

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, Mc Millan 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 India Pvt.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- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
CODE: R20CC1206	PROBLEM SOLVING USING PYTHON						

COURSE OBJECTIVES:

- To teach problem solving through flow charting tool-Raptor.
- To elucidate problem solving through python programming language.
- To introduce function oriented programming paradigm through python.
- 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: Outline the computer system concepts and the flowcharts using raptor to solve the given problems.

CO 2:. **S**ummarize the fundamental concepts of python programming.

CO 3: Interpret object oriented and event driven programming in python.

CO 4: Apply the suitable data structures to solve the real time situational problems.

SYLLABUS:

UNIT-I

Introduction to computers: algorithms; modern computer systems: hardware architecture, data representation in computers, software and operating system.

Flowchart design though raptor: Flowchart symbols, input/output, assignment, operators, conditional if, repetition, function and sub charts.

UNIT-II

Introduction to python: Numbers, strings, variables, operators, expressions, statements, string Operations& Methods, math function calls, Input/output statements, conditional if, while and for loops

UNIT-III

Functions: user defined functions, parameters to functions, recursive functions, and lambda function.

Event driven programming: Turtle graphics, Turtle bar chart, Widgets, key press events, mouse events, timer events.

UNIT-IV

Data structures: List- list methods & functions, Tuple-tuple methods & functions, Dictionaries-dictionary methods & functions, traversing dictionaries. Sets-methods & functions, Files

UNIT-V

OOP: class, object, methods, constructors, inheritance, inheritance types polymorphism, operator overloading , abstract classes, exception handling.

TEXT BOOKS:

1. Fundamentals of Python: First Programs ,Kenneth Lambert
2. Allen B. Downey, "think python: how to think like a computer scientist",2nd edition, O'reilly,2016

REFERENCE BOOKS:

1. Python programming : A modern approach, vamsi kurama,pearson.
2. Learning python, Mark Lutz , Orielly.
3. Core python programming, W.Chun, pearson.
4. Introduction to python, Kenneth A. Lambert, Cengage.

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- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
CODE: R20EC1215	NETWORK ANALYSIS						

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:
CO 1: Analyze the basics of electrical circuits with nodal, mesh analysis and network theorems.
CO 2: Apply Laplace Transform for steady state and transient analysis
CO 3: Analyze the phasor representation for ac circuits and magnetic coupled circuits.
CO 4: Describe resonance circuits, two port network parameters and their interconnections.

SYLLABUS:

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.

REFERENCES:

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	30	70	100	3
SUBCODE: R20EC1219	DATA STRUCTURES						

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

After completion of this course the student should be able to

CO1: Analyze sorting and searching algorithms. [K4]
CO2: Analyze elementary data structures such as stacks, queues and linked lists. [K4]
CO3: Compare and contrast various forms of trees. [K4]
CO4: Build graph data structures and various graph traversal techniques. [K3]

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, Tower of Hanoi.

UNIT - II

Searching and Sorting: Introduction to Searching, Linear Search, Binary Search, Introduction to Sorting, Bubble sort, Insertion sort, Selection sort, Merge sort, Quick sort and Heap Sort.

UNIT - III

Stacks: Introduction to stacks, Array Representation of stacks, Operations on stack, Linked representation of stacks, Applications of stacks, evaluation of a postfix expression, conversion of infix expression into a postfix 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, Circular linked, Doubly linked list. (Searching, inserting, Deleting and displaying operations for all Linked Lists)

UNIT – V

Trees: Introduction, Basic Terminology, Types of Trees, Expression Trees, Traversing a Binary Tree, Pre-order Traversal, In-order Traversal, Post-order traversal, Level order traversal**,** constructing a Binary Tree from Traversals**,** Binary Search Trees, operations on Binary Search Trees, AVL 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,Reema Thareja, Oxford, Second Edition, 2014 (UNITS: I, II, III, IV, V & VI).
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, 2/e, Mark Allen Weiss.

WEB RESOURCES:

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

nptel.ac.in/courses/106103069

I B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
SUBCODE: R20CC12L8	DATA STRUCTURES LAB						

COURSE OBJECTIVES:

1. The purpose of this course is to develop skills to design simple linear and nonlinear data structures.
2. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem.
3. It enables them to gain knowledge in practical applications of data structures.

COURSE OUTCOMES:

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

CO1: Develop various algorithms using recursive and non-recursive functions. [K3]

CO2: Experiment with linear data structures. [K3]

CO3: Apply Tree traversal techniques in various applications. [K3]

SYLLABUS:

EXERCISE 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

EXERCISE 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.

EXERCISE 3

a) Write a C program to implement Bubble sort.
b) Write a C program to implement Insertion sort.
c) Write a C program to implement Selection sort.

EXERCISE 4

a) Write a C program to implement Quick sort.
b) Write a C program to implement Merge sort.
c) Write a C program to implement heap sort.

EXERCISE 5

a) Write a C program to implement Stack operations using arrays
b) Write a C program to implement Queue operation using arrays.
c) Write a C program to convert infix expression into postfix expression using stack.

EXERCISE 6

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

EXERCISE 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

EXERCISE 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

I B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
Code:R20CC12L10	APPLIED PHYSICS LAB						

COURSE OBJECTIVES:

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 principles of physics in engineering field. (K3)
CO2: Utilize the modern engineering physics techniques and tools in real time applications. (K3)
CO3: Analyze the characteristics, usage and the behaviour of materials. (K4)

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.

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 II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
SUBCODE: R20CC12L1	PROBLEM SOLVING USING PYTHON LAB						

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

Student should be able to

CO 1: Create interactive visual programs using Scratch. [K6]
CO 2: Develop flowcharts using raptor to solve the given problems. [K6]
CO 3: Develop Python programs for numerical and text based problems. [K6]
CO 4: Develop graphics and event based programming using Python. [K6]

LABORATORY EXPERIMENTS:

WEEK-1:

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.

WEEK-2:

3. 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.
4. 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

WEEK-3:

5. Construct flowcharts with procedures to
   . a)generate first N numbers in the Fibonacci series
   b) Generate N Prime numbers
6. Design a flowchart to perform Linear search on list of N unsorted numbers(Iterative and recursive)

WEEK-4:

7. Design a flowchart to perform Binary search on list of N sorted numbers(Iterative and recursive)
8. Design a flowchart to determine the number of characters and lines in a text file specified by the user

WEEK-5:

9. Design a Python script to convert a Binary number to Decimal number and verify if it is a Perfect number.
10. Design a Python script to determine if a given string is a Palindrome using recursion

WEEK-6:

11. Design a Python script to sort numbers specified in a text file using lists.
12. 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.
13. Design a Python Script to determine the Square Root of a given number without using inbuilt functions in Python.

WEEK-7:

14. 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)
15. Design a Python Script to convert a given number to words

WEEK-8:

16. Design a Python Script to convert a given number to roman number.
17. Design a Python Script to generate the frequency count of words in a text file.

WEEK-9:

18. Design a Python Script to print a spiral pattern for a 2 dimensional matrix.
19. Design a Python script to generate statistical reports(Minimum, Maximum, Count, Average, Sum etc) on public datasets.

WEEK-10:

20. 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.
21. Write a Python program to convert a given tuple of positive integers into an integer.

WEEK-11:

22. Write a Python program to remove the intersection of a 2nd set from the 1st set.
23. Design a Python script on oop's concepts: Class variables and instance variable
    i) Robot ii) ATM Machine

WEEK-12:

24. Write a Python program to create a dictionary grouping a sequence of key-value pairs into a dictionary of lists.
25. Write a Python program to count the number of strings where the string length is 2 or more and the first and last character are same from a given list of strings.

TEXT BOOKS:

1. Kenneth Lambert, "Fundamentals of Python: First Programs".
2. Allen B. Downey, "think python: how to think like a computer scientist",2nd edition, O'reilly,2016

REFERENCE BOOKS:

1. Python programming : A modern approach, vamsi kurama,pearson.
2. Learning python, Mark Lutz , Orielly.
3. Core python programming, W.Chun, pearson.
4. Introduction to python, Kenneth A. Lambert, Cengage.

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 II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	0	0	-	-	-	0
SUBCODE: R20CCMC2	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:

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.

SYLLABUS:

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) -Lok Sabha and Rajya Sabha (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 / Vidhan Sabha, Legislative Council / Vidhan Parishad) -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 PRFESSIONAL BOOK PUBLISHERS
3. The Constitution of India by Arun K Tiru vengadam, 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 &II SEMESTER,
COURSE STRUCTURE
&
SYLLABUS

II B.TECH. – I SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
1	R20CC2101	Numerical Methods and Transformations	BS	2	1	0	30	70	100	3
2	R20EC2102	Electronic Devices and Circuits	PC	3	0	0	30	70	100	3
3	R20EC2103	Signals and Systems	PC	2	1	0	30	70	100	3
4	R20EC2104	Switching Theory and Logic Design	PC	3	0	0	30	70	100	3
5	R20EC2105	Linear Control Systems	PC	3	0	0	30	70	100	3
6	R20EC21L1	Electronic Devices and Circuits Lab	PC	0	0	3	15	35	50	1.5
7	R20EC21L2	Signals and Systems Lab	PC	0	0	3	15	35	50	1.5
8	R20EC21L3	Digital Logic Design Lab	PC	0	0	3	15	35	50	1.5
9	R20EC21SC1	Design of Systems using Arduino and Raspberry Pi	SC	0	0	4		50	50	2
10	R20CC21MC1	Environmental Studies	MC	2	0	0				0
		Total		15	02	13	195	505	700	21.5

II B.TECH. – II SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
1	R20EC2202	Internet of Things	ES	3	0	0	30	70	100	3
2	R20EC2203	Analog and Digital Communications	PC	3	0	0	30	70	100	3
3	R20EC2204	Electronic Circuits and Pulse Circuits	PC	3	0	0	30	70	100	3
4	R20EC2205	Electromagnetic Waves and Transmission Lines	PC	3	0	0	30	70	100	3
5	R20CC2201	Technical and Communicative English-II	HS	3	0	0	30	70	100	3
6	R20EC22L1	Internet of Things Lab	ES	0	0	3	15	35	50	1.5
7	R20EC22L2	Analog and Digital Communications Lab	PC	0	0	3	15	35	50	1.5
8	R20EC22L3	Electronic Circuits and Pulse Circuits Lab	PC	0	0	3	15	35	50	1.5
9	R20EC22SC1	Design and Simulation of Electronic Circuits	SC	0	0	4		50	50	2
10		Internship two months (Mandatory) during summer vacation								
	Total			15	0	13	195	505	700	21.5
	Honors/minor course		>4	4	0	0				**4**

II B.TECH., I SEMESTER, ECE
COURSE STRUCTURE
&
SYLLABUS

II B.TECH. – I SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
1	R20CC2101	Numerical Methods and Transformations	BS	2	1	0	30	70	100	3
2	R20EC2102	Electronic Devices and Circuits	PC	3	0	0	30	70	100	3
3	R20EC2103	Signals and Systems	PC	2	1	0	30	70	100	3
4	R20EC2104	Switching Theory and Logic Design	PC	3	0	0	30	70	100	3
5	R20EC2105	Linear Control Systems	PC	3	0	0	30	70	100	3
6	R20EC21L1	Electronic Devices and Circuits Lab	PC	0	0	3	15	35	50	1.5
7	R20EC21L2	Signals and Systems Lab	PC	0	0	3	15	35	50	1.5
8	R20EC21L3	Digital Logic Design Lab	PC	0	0	3	15	35	50	1.5
9	R20EC21SC1	Design of Systems using Arduino and Raspberry Pi	SC	0	0	4		50	50	2
10	R20CC21MC1	Environmental Studies	MC	2	0	0				0
		Total		15	02	13	195	505	700	21.5

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	0	30	70	100	3
Code: R20CC2101	NUMERICAL METHODS AND TRANSFORMATIONS						

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. Explore the use of Laplace transform method to solve with initial value problems of ODE.
4. To acquire fundamental Knowledge of Fourier series and Fourier Transform and able to give Fourier expansions of a given function.

COURSE OUTCOMES:

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

1. Evaluate approximating roots of polynomials and transcendental equations by different algorithms.
2. Apply Newton's forward backward and Lagrange's interpolation for equal and unequal intervals.
3. Apply different algorithms for approximating solutions of ordinary differential equation to its analytical computations.
4. Select appropriate technique of Laplace transforms in solving differential equations.
5. Relate Fourier series, integral, transforms techniques in their core.

SYLLABUS:

UNIT –I: SOLUTIONS TO ALGEBRAIC EQUATIONS AND INTERPOLATION: (10 hours)

Solution of polynomial and transcendental equations: bisection method, Regula-Falsi method and Newton-Raphson method. Finite differences, relation between operators, interpolation using Newton's, Gauss's forward and backward difference formulae. Interpolation with unequal intervals: Lagrange's formulae.

UNIT –II: NUMERICAL SOLUTIONS OF ODE AND INTEGRATION: (8 hours)

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-III: LAPLACE TRANSFORMATIONS: (12 hours)

Laplace transform and its properties, Transform of derivatives and integrals, Multiplication by t^n, division by t, Unit step function and unit impulse function. Transform of periodic functions, Evolutions of integrals by Laplace Transforms. Finding inverse transforms by the method of partial fractions, other methods of finding inverse Laplace Transforms, Convolution theorem(without proof), Solutions of Initial and Boundary Value Problems.

UNIT – IV: FOURIER SERIES: (10 hours)

Introduction, Euler's formulae, Periodic functions, Dirichlet's conditions, conditions for a Fourier expansion, functions of any period, functions having points of discontinuity, odd and even functions - half range series.

UNIT – V: FOURIER TRANSFORMS: (8 hours)

Fourier integral theorem (without proof), Fourier cosine and sine integrals, Fourier transform, Fourier sine and cosine transforms, properties of Fourier Transforms, convolution theorem (without proof).

TEXT BOOK:

1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publisher.
2. B.V.Ramana, "Higher Engineering Mathematics", 32nd Edition, McGraw Hill Education, 2018.

REFERENCES:

1. N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, "Engineering Mathematics", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9thEditiwiley-India.
3. 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	30	70	100	3
Code: R20EC2102	ELECTRONIC DEVICES AND CIRCUITS						

COURSE OBJECTIVES:

1. Understand the operation and principles of P-N diode.
2. Understand various types of Special diodes, rectifiers and filters.
3. Know the working of BJT.
4. Know the need for transistor biasing and stabilization.
5. Know 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 , Analysis of MOSFETs, 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, Satyabrata Jit, "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.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	0	30	70	100	3
Code: R20EC2103	SIGNALS AND SYSTEMS						

COURSE OBJECTIVES:

1. To explain about signals and perform various operations on it and to summarize the sampling
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

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 & SAMPLING:

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. Correlation, Auto correlation, Relation between Cross & Auto correlation.

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

UNIT- II: ORTHOGONAL FUNCTIONS & FOURIER SERIES:

Orthogonal Functions: Signal approximation using orthogonal functions, Mean square error, Orthogonality in complex functions.

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:

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.

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.
3. A.V. Oppenheim, A.S. Will sky and S.H. Nawab, “Signals and Systems”, PHI, Second Edition, 2013.

REFERENCE BOOKS:

1. Ramesh Babu, “Signals and Systems”, SciTech Publications, Third Edition, 2011.
2. A. Anand Kumar, “Signals and Systems”, PHI Publications, Third Edition, 2013.
3. Tarun Kumar and Rawat - SIGNALS AND SYSTEMS, Oxford Publications, 2010.

WEB RESOURCES:

http://nptel.iitm.ac.in/courses/

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Code: R20EC2104	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 the 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, octal, Hexa decimal numbers, binary arithmetic-binary weighted and non-weighted codes, Gray codes, Ex-3 Codes, Code Conversions, Error detecting and correcting codes-Hamming codes.

UNIT- II: LOGIC OPERATIONS AND MINIMIZATION TECHNIQUES:

Logic Operations: Basic logical operations, logic gates and universal gates, Pin configurations of 74XX-IC series. 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 up to 6 variables, Tabular (Quine-McCluskey) method with only 4 variables and with single function.

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, Design of clocked sequential circuit to detect the given sequence with and without overlapping, Realization of sequential generator. 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. Zvi Kohavi, "Switching and Finite Automata Theory", Cambridge University Press, 3rd Edition, 2009.

REFERENCE BOOKS:

1. R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill, 4th Edition, 2010.
2. Charles H. Roth Jr, "Fundamentals of Logic Design", CENGAGE Learning, 7th Edition.
3. A. P. Godse, D. A. Godse, "Switching Theory & Logic Design", Technical publications, 2nd Edition, 2013.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Code: R20EC2105	LINEAR CONTROL SYSTEMS						

COURSE OBJECTIVES:

This course will enable students to:

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
4. Study the classical control design techniques.

COURSE OUTCOMES:

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

CO 1: Develop the mathematical model of a system and find its transfer function

CO 2: Understand the time response analysis and the frequency response analysis

CO 3: Determine the stability of a system in time domain and frequency domain

CO 4: Understand the classical control design techniques

SYLLABUS:

UNIT I: INTRODUCTION AND TRANSFER FUNCTION REPRENTATION:

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, State Variable Analysis: 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.
3. Modern Control Engineering – Katsuhiko Ogata, Pearson, Fifth Edition, 2009.

REFERENCE BOOKS:

1. Control Systems – N. K. Sinha, New Age International, Fourth Edition, 2013.
2. Control Systems – A. Anand Kumar, PHI Learning Pvt. Ltd, Second Edition, 2014.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
Code: R20EC21L1	ELECTRONIC DEVICES AND CIRCUITS LAB						

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

After the completion of this course the student will able to

CO1: Understand and analyze the behavior of PN junction diode, Zener diode.
CO2: Understand 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 UJT characteristics and its applications.

LIST OF EXPERIMENTS:

PART A: ELECTRONIC WORKSHOP:

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
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: ELECTRONIC DEVICES AND CIRCUITS:

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	15	35	50	1.5
Code: R20EC21L2	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 to draw their magnitude and phase responses.

LIST OF EXPERIEMENTS:

1. Generate Elementary Signals: Unit Step, Unit Ramp, Unit Parabolic, Impulse, Sinusoidal function, Exponential function, Gate function, Triangular function,
2. Operations of the signals(Shifting, Scaling, Addition & Multiplication)
3. Implement Trigonometric Fourier series and convert to exponential Fourier series.
4. Verify the properties of Fourier Transform for continuous Time signals.
   i. Periodicity ii. Linearity. iii. Time scaling iv. Time reversal
5. Find the Fourier transform of a square pulse. Plot its amplitude and phase spectrum.
6. Find the Hilbert transform of a sinusoidal signal. Plot its amplitude and phase spectrum.
7. Find the Laplace transform of a continuous time signal. Plot its amplitude and phase spectrum.
8. Verify the properties of Laplace Transform for continuous Time signals.
   i. Periodicity ii. Linearity iii. Time scaling iv. Time reversal
9. Find the Z- transform of a continuous time signal. Plot its amplitude and phase spectrum
10. Verify the properties of Z- Transform for continuous Time signals.
    i. Periodicity ii. Linearity iii. Time scaling iv. Time reversal
11. Implement Linear Time Variant (LTV) and Liner Time Invariant (LTI) systems.
12. Find the magnitude and phase response of low pass, high pass and band pass filter.

Experiments beyond syllabus:

1. Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S. Value and its Skew,
Kurtosis, and PSD, Probability Distribution Function
2. Extraction of Periodic Signal masked by noise using Correlation.

Virtual Lab link*:

https://play.google.com/store/apps/details?id=com.mathworks.matlabmobile

* Every experiment can be simulated virtually by using the MAT Lab mobile app or using trail version of MAT lab software.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
Code: R20EC21L3	DIGITAL LOGIC DESIGN LAB						

COURSE OBJECTIVES:

1. Verify the operations and use of logic gates.
2. Design various combinational and sequential circuits.
3. Illustrate and compare the operation of different flipflops.
4. Develop the internal circuits for different digital operations

COURSE OUTCOMES:

After successful completion of this course the student will be able to

CO1: Identify the operation of various logic gates.
CO2: Examine basic logical and arithmetic circuit operations.
CO3: Illustrate and compare the operation of different flipflops.
CO4: Develop the complex digital logic circuits including both combinational and sequential logics by using computer-aided design tools.

LIST OF EXPERIMENTS:

1. Design the Logic gates and verify its operation.
2. Design Majority gates using NAND and NOR gates.
3. Implementation of a two variable Boolean function both in SOP and POS forms.
4. Implementation and verification of Decoder circuit using logic gates.
5. Implementation and verification of 4X1 Multiplexer circuit using logic gates.
6. Implementation and verification of Full Adder circuit using logic gates.
7. Verification of the state table of SR and D Flipflop.
8. Verification of the state table of JK Flipflop.
9. Implementation of Parallel adder circuit using IC 7483
10. Verify the operation of 4 bit comparator using IC7485
11. Verify the operation of 4 bit counter using IC7493
12. Verify the read and write operations of RAM(16 X 4) using IC74189

EXPERIMENTS BEYOND THE SYLLABUS:

1. Construct 4-Bit ring counter with T- Flip- Flop and verify the truth table.
2. Design a 8–Bit right Shift Register using D- Flip- Flop and verify the truth table.
3. Design a Gray code De-coder and interface it to SRAM IC 74189 for Read operation display on 7- segment.

VIRTUAL LAB EXPERIMENTS:

1. Multiplexer using Universal Gates.
2. Demultiplexer using universal logic gate

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	4		50	50	2
Code: R20EC21SC1	DESIGN OF SYSTEMS USING ARDUINO AND RASPBERRY PI						

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. Apply to develop the IOT Devices

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: 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 of Raspbian OS on Memory 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.

II B.TECH –I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	0	0				MC(0)
Code : R20CC21MC1	ENVIRONMENTAL STUDIES						

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:

CO-1 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.

CO-2 Analyze the natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources.

CO-3 Explain the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity.

CO-4 Distinguish various attributes of the pollution, their impacts and measures to reduce or control the pollution along with waste management practices.

CO-5 Define Environmental policy, legislation, environmental assessment and the stages involved in EIA Environmental audit.

SYLLABUS:

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.Covid-19- and environmental Health –Impact of the Coronavirus-Precautions and infection control

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. ManjulaRani,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. Shaashi Chawla, 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 ecosystemservices

7. URL: http://mocomi.com/ presents: What is Air Pollution? Air pollution is the introduction of foreign products into theatmosphere.

8. URL: https://en.wikipedia.org/wiki/green_impact_assessment

E-BOOKS:

1. .https://faculty.psau.edu.sa/.../doc-5-pdf-d78456fce3bebc84d9320fa2f9cf9e2a-original

2. https://www.researchgate.net/.../273775623_Introduction_to_Environmental_Sciences

II B.TECH., II SEMESTER, ECE
COURSE STRUCTURE
&
SYLLABUS

II B.TECH. – II SEMESTER

S.No.	Subject Code	SUBJECT	Cat. Code	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
1	R20EC2202	Internet of Things	ES	3	0	0	30	70	100	3
2	R20EC2203	Analog and Digital Communications	PC	3	0	0	30	70	100	3
3	R20EC2204	Electronic Circuits and Pulse Circuits	PC	3	0	0	30	70	100	3
4	R20EC2205	Electromagnetic Waves and Transmission Lines	PC	3	0	0	30	70	100	3
5	R20CC2201	Technical and Communicative English-II	HS	3	0	0	30	70	100	3
6	R20EC22L1	Internet of Things Lab	ES	0	0	3	15	35	50	1.5
7	R20EC22L2	Analog and Digital Communications Lab	PC	0	0	3	15	35	50	1.5
8	R20EC22L3	Electronic Circuits and Pulse Circuits Lab	PC	0	0	3	15	35	50	1.5
9	R20EC22SC1	Design and Simulation of Electronic Circuits	SC	0	0	4		50	50	2
10		Internship two months (Mandatory) during summer vacation								
	Total			15	0	13	195	505	700	21.5
	Honors/minor course		>4	4	0	0				**4**

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Code: R20EC2202	INTERNET OF THINGS						

COURSE OBJECTIVES:

1. To present interconnection and integration of the physical world and the cyber space.
2. To demonstrate applications of Internet of Things
3. To educate building blocks and characteristics of Internet of Things
4. To build a small low cost embedded system using Arduino/Raspberry Pi or equivalent boards.
5. To apply the concept of internet of things in the real world scenario.

COURSE OUTCOMES:

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

CO1: Outline the concept of internet of things.

CO2: Analyze the requirements, specifications to design IoT applications.

CO3: Analyze domain specific applications using Arduino and Raspberry pi.

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: IoT DESIGN METHODOLOGY:

Purpose & Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specification, IoT Level Specification, Functional View Specification, Operational View specification, Device & Component Integration and Application Development.

UNIT- III: IOT &M2M :

M2M, Difference between IOT and M2M, SDN and NFV for IOT, Software defined Networking, Network FunctionVirtualization

UNIT-IV: PROTOTYPING EMBEDDED DEVICE WITH ARDUINO & RASPBERRY PI:

Sensors, Actuators, Embedded Computing Basics- Micro Controllers, System on Chips, Choosing your Platform, Arduino – Developing (IDE, pushing code, language and debugging) on the Arduino.

Raspberry PI – Introduction, cases and Extension Board (difference between raspberry pi and beagle bone black board), Developing (operating system, programming language and debugging) on the Raspberry PI.

UNIT- V: DOMAIN SPECIFIC APPLICATIONS OF IOT:

Home Automation, Agriculture Applications, Smart City applications.

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 II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Code: R20EC2203	ANALOG AND DIGITAL COMMUNICATIONS						

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

SYLLABUS:

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.

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.

Radio Receivers - Receiver Types- AM, FM, Communication, Television, Radar Receivers, and Radio Receivers, Tuned radio frequency receiver-Block Diagram of TRF Receiver, Super heterodyne receiver-Block Diagram of Super heterodyne Receiver and Advantages.

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 – Quadrature Amplitude Modulation (QAM) – 8 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.

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.

REFERENCES:

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	30	70	100	3
Code: R20EC2204	ELECTRONIC CIRCUITS AND PULSE CIRCUITS						

COURSE OBJECTIVES:

1. Analysis of single stage and multistage amplifiers
2. Concept of feedback in amplifiers and oscillators.
3. Concept of power amplifiers.
4. Concepts of linear and non-linear wave shaping.
5. Operation and design of multivibrators.

COURSE OUTCOMES:

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

CO1: Develop single stage and multistage amplifiers.

CO2: Summarize the importance of feedback in amplifiers and oscillators.

CO3: Make use of Power Amplifiers in communication systems.

CO4: Understand different linear and non-linear wave shaping circuits.

CO5: Construct different multivibrators.

SYLLABUS:

UNIT- I: TRANSISTOR AMPLIFIERS ANALYSIS:

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, Single stage CE transistor amplifier response, Gain bandwidth product.

MULTISTAGE AMPLIFIERS:

RC coupled amplifier, High input resistance transistor circuits- Darlington pair, Bootstrapped Darlington circuit.

UNIT– II: FEEDBACK AMPLIFIERS:

Feedback principle and concept, Types of feedback Characteristics of negative feedback amplifiers, General analysis of feedback amplifiers-input resistance and output resistance, Analysis feedback amplifier- Voltage series feedback, Current shunt feedback.

OSCILLATORS:

Introduction, Oscillator principle and condition for oscillation, Types of oscillators: RC phase shift oscillator, Hartley oscillator , Crystal oscillator.

UNIT- III: POWER AMPLIFIERS:

Introduction, Class A, Class B, Class AB, Class C and Class D amplifiers, Transformer coupled push pull circuits, Complementary symmetry circuits, heat sinking.

UNIT- IV: LINEAR WAVE SHAPING:

The high pass and low pass RC circuits: Sinusoidal input, Step input, Pulse input, Square and Ramp input resonses, RC network as a differentiator and an integrator.

NON-LINEAR WAVE SHAPING:

Diode clippers, Transistor clippers, Two level clipping circuits and Emitter coupled clipper, Clamping circuits, Clamping circuit theorem.

UNIT- V: MULTIVIBRATORS:

Introduction to multivibrator, Types of multivibrator, Analysis and design of bistable multivibrator, 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.

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.
3. Pulse, Digital and Switching Waveforms – J. Millman, H. Taub and Mothiki

   S. Prakash Rao, Tata McGraw-Hill, Second Edition, 2008.

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. Pulse and Digital Circuits – A. Anand Kumar, PHI, Second Edition, 2005

II B. TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Code: R20EC2205	ELECTROMAGNETIC WAVES AND TRANSMISSION LINES						

COURSE OBJECTIVES:

1. To introduce the concepts of Electrostatics and Magneto statics.
2. To understand Electromagnetic Waves and their Propagation.
3. To understand the Maxwell‘s Equations and boundary conditions.
4. To familiarize with the transmission line concepts.

COURSE OUTCOMES:

After completion of this course, the students will be able to
CO1: Apply the concepts of Electric and Magnetic Fields in different applications.
CO2: Apply Maxwell‘s equations in electromagnetics.
CO3: Understand wave propagation and derive the Wave Equations in Perfect Dielectric and Conducting Media.
CO4: Understand wave characteristics - reflection and refraction of Electromagnetic Waves in different media and analyze different transmission lines and applications.

SYLLABUS:

UNIT- I: REVIEW OF COORDINATE SYSTEMS & 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, Poynting Vector and Poynting Theorem, Electric and Magnetic Boundary Conditions, Polarization, EM Wave Normal Incidence on Perfect Conductor and Dielectric, EM Wave Oblique incidence on Dielectric with Parallel and Perpendicular Polarizations, Brewster Angle, Critical Angle and Total Internal Reflection

UNIT- IV: TRANSMISSION LINES -I:
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 Distortion less and Minimum Attenuation, Loading - Types of Loading,

UNIT- V: TRANSMISSION LINES-II:

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

REFERENCE BOOKS:

1. Electromagnetic Field Theory and Transmission Lines – G. Sasi Bhushana Rao, Wiley India Pvt Ltd, 2012.
2. Electromagnetics – J. D. Kraus, Keith R. Carver, TMH, Third Edition, 1984.
3. Schaum‘s Outline of Electromagnetics – J.A. Edminister, Mahmood Nahvi, TMH, Fourth Edition, 2014.
4. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan (Tech. India Publications), New Delhi, 2010.

II B. TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Code: R20CC2201	TECHNICAL AND COMMUNICATIVE ENGLISH - II						

COURSE OBJECTIVES:

- To equip the students with appropriate oral and written communication skills.
- To inculcate the skills of listening, reading and critical thinking.
- To enhance the students' proficiency in reading skills enabling them meet the academic needs of their course.
- 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:

CO1: Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it **(Apply-3).**

CO2: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. **(Creating-5).**

CO3: Build grammatically correct sentences using a variety of sentence structures **(Apply3).**

CO4: Enhance word power and usage of lexicons **(Apply3).**

SYLLABUS:

UNIT– I

1. **A Proposal to Gridle the Earth, Nellie Bly**
   a) **Placement Papers**.
   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

2. **The District School As It Was by One who Went to It, Warren Burton**
   a) **Placement Papers.**
   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

3. **The future of Work- Jacob Morgan**
   a) **Placement Papers**.
   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

4. **H.G.Wells and the Uncertainties of Progress, Peter J. Bowler**
   a) **Placement Papers**.
   b) **Reading**: Understand and interpret graphic elements used in texts.
   c) **Writing**: Information transfer.
   d) **Grammar and Vocabulary**: Adjectives, adverbs and antonyms.

UNIT-V

5. **Leaves from the Mental Portfolio of a Eurasian, Sui Sin Far**
   a) **Placement Papers**.
   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. 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

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II B. TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS	
	0	0	3	15	35	50	1.5	
Code: R20EC22L1	INTERNET OF THINGS LAB							

COURSE OBJECTIVES:

Students will be explored to

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 Thing speak cloud.

10. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from Thing speak 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 II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
Code: R20EC22L2	ANALOG AND DIGITAL COMMUNICATIONS 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)

Part-A:

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

Part-B:

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. Multiple channel DSSS – spreading, dispreading, decoding etc

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.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
Code: R20EC22L3	ELECTRONIC CIRCUITS AND PULSE CIRCUITS LAB						

COURSE OBJECTIVES:

1. Study the Frequency response of single stage amplifier.
2. How frequency response varies by applying negative feedback on amplifiers.
3. Working of oscillators and Power amplifier.
4. Different responses for linear and nonlinear wave shaping circuits.
5. Working of different multivibrators.

COURSE OUTCOMES:

After Completion of this course, student must be able to

CO1: Understand the effect of Frequency response of single stage amplifier.

CO2: Understand how frequency response varies by applying negative feedback on amplifiers.

CO3: Determine the efficiency of power amplifiers.

CO4: Construct high input impedance circuits.

CO5: Understand different responses for linear and nonlinear wave shaping circuits.

CO6: Design and working of different multivibrators.

LIST OF EXPERIMENTS:

I) DESIGN AND SIMULATION IN SIMULATION LABORATORY USING MULTISIM OR PSPICE OR EQUIVALENT SIMULATION SOFTWARE & VERYFING THE RESULT BY HARDWARE:

1. Single Stage CE Amplifier.
2. Voltage series feedback amplifier - Frequency response.
3. Current series feedback amplifier - Frequency response.
4. RC Phase Shift Oscillator using Transistors- Design for different frequencies.
5. Class A Power Amplifier.
6. Boot strapped emitter follower.

II) PULSE AND DIGITAL CIRCUITS -BY DESIGNING THE CIRCUIT:

1. Linear wave shaping (Diff. Time Constants, Differentiator, Integrator)
2. Non –linear wave shaping-clippers., Clampers
3. Bistable Multivibrators
4. Astable Multivibrators
5. Monostable Multivibrators
6. Schmitt Trigger

EXPERIMENTS BEYOND SYLLABUS:

1. Single tuned Amplifier
2. Boot strap sweep Circuits.

VIRTUAL EXPERIMENTS:

1. Two stage RC coupled Amplifier
2. Linear wave shaping and Nonlinear wave shaping circuits.

II B. TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	4		50	50	2
Code: R20EC22SC1	DESIGN AND SIMULATION OF ELECTRONIC CIRCUITS						

COURSE OBJECTIVES:

The main objective of this lab is to introduce the Laboratory Virtual Instrument Engineering Workbench to

1. Construct a simple virtual instrument (VI).
2. Navigate and use pre-made Simulation Software.
3. To apply the Simulation Software for development of various applications

COURSE OUTCOMES: Upon completion of this course, students will be able to

CO1: To solve problems using Simulation Software
CO2: To develop, debug and test various electronic circuits
CO3: To use File I/O techniques.
CO4: To transfer data among parallel processes.
CO5: To use Simulation Software to create various applications

LIST OF EXPERIEMENTS:

1. Introduction to the Graphical programming environment
2. Introduction to Data Acquisition – G Approach to Hardware Integration
3. Data Acquisition – API Programming
4. Signal Processing – Acquire, Analyze & Generation
5. Signal Processing – Fourier Transform
6. Communication- Modulation and correlation
7. Digital Image Processing -Image acquisition and processing
8. Digital Image Processing - Morphology and Edge Detection
9. Machine Learning -Algorithms and Applications
10. Introduction to the Deep Learning System using Graphical Approach
11. Hand written character recognition and examples
12. Introduction to Industrial IoT Systems – Edge node
13. Industrial IoT Systems – Dashboard and cloud connectivity