NARASARAOPETA ENGINEERING COLLEGE (AUTONOMOUS)

ACADEMIC REGULATIONS   R-19 FOR B.TECH
(Applicable for the students of B.Tech admitted from the academic year 2019-20)

1. PREAMBLE

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

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

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

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

2. PROGRAMS OFFERED BY THE COLLEGE

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

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

3. ELIGIBILITY FOR ADMISSION

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

The admissions for category A and B seats shall be as per the guidelines of Andhra Pradesh State Council for Higher Education (APSCHE) in consonance with government reservation policy.

     a. Under Category A: 70% of the seats are filled through EAMCET counselling.

     b. Under Category B: 30% seats are filled based on 10+2 merits in compliance with guidelines of APSCHE

Admission eligibility - Under Lateral Entry Scheme

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

Academic Calendar

For all the eight semesters a common academic calendar shall be followed in each semester by having sixteen weeks of instruction, one week for the conduct of practical exams and with three weeks for theory examinations and evaluation. Dates for registration, sessional and end semester examinations shall be notified in the academic calendar of every semester. The schedule for the conduct of all the curricular and co-curricular activities shall be notified in the planner.

4. AWARD OF B.TECH. DEGREE

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

     i) Pursue a course of study for not less than four academic years and not more than eight academic years.

     ii) Registers for 160 credits and secures all 160 credits.

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

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

5. ABOUT PROGRAM RELATED TERMS

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

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

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

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

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

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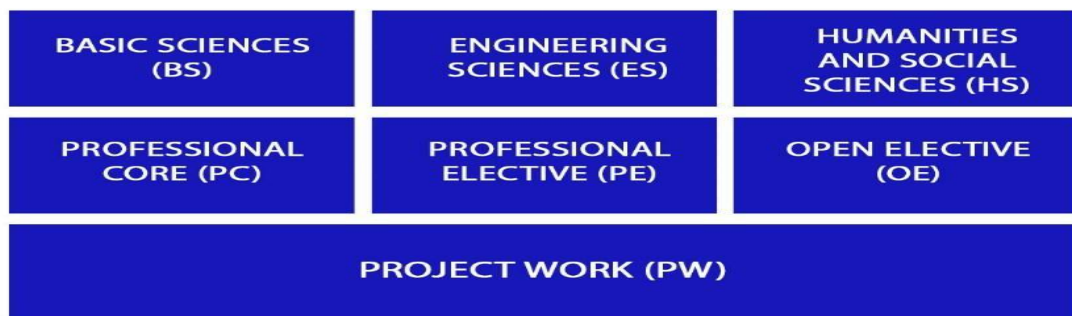
5.1 SUBJECT / COURSE CLASSIFICATION

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

S.No.	Broad Course Classification	Course Group/Category	Course Description	No. of Credits
1	FOUNDATION COURSES	BS – Basic Sciences	Includes Mathematics, Physics and Chemistry Subjects	25
2		ES – Engineering Sciences	Includes fundamental engineering subjects like Engineering Practices, Engineering Graphics, Basics of Electrical / Electronics / Mechanical / Computer Engineering, etc.	24
3		HS – Humanities and Social Sciences	Includes subjects related to Humanities, Social Sciences and Management Courses like English, Professional Ethics and Human Values, Communication skills and Environmental Science and Engineering	12
4	Core Courses	PC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Engineering.	48
5	Electives	PE – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.	18
6		OE – Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering	18
7	Project Work	PR-Project Work	B.Tech. Project or UG Project or UG Major Project	15
8		Industrial training/ Internship	Industrial training/ Summer Internship	
9		Mini- project	Industrial Oriented Mini-project/ Mini-project	
10		Seminar	Seminar/ Colloquium based on core contents related to parent discipline/ department/ branch of Engineering.	
11	Mandatory Courses (MC)	Mandatory Courses (non-credit)		0
			Total	160

5.2. Induction Program

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

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

The objectives of the program are as follows:

1. Assimilation in the ethos and culture of the institution

2. Exposure to a larger vision of life

3. Bonding among students and teachers

4. Learning a creative skill in arts

5. Regular lifestyle and professional discipline

6. Special assistance for needy students for improving proficiency in English and Mathematics

The above objectives will be achieved through the following activities:

1. Physical activity: Yoga, Mild Exercise, Games and sports etc.

2. Creative arts: Painting, Photography, music, dance etc.

3. Literary activity: General reading, writing summaries, debating, enacting a play etc.

4. Human Values: Discussion/Lectures in small groups of students with a faculty member

5. Lectures by eminent people: From industry, entrepreneurs, public life, social activists,

   alumni

6. Exposure to department/branch, Innovation, Exploring Engineering.

6. DISTRIBUTION AND WEIGHTAGE OF MARKS

The performance of a student in each semester shall be evaluated subject – wise with a maximum of 100 marks for Theory, 50 marks for Practical Subject / Mini Project and 50 marks for Practical Training / Internship. The Project Work shall be evaluated for 200 marks.

6.1. THEORY

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

6. 1.a. INTERNAL EVALUATION

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

Descriptive test   - 20 Marks
Objective test   - 10 Marks
Assignment test   - 10 Marks

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

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

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

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

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

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

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

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

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

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

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

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

6.1.b. EXTERNAL EVALUATION

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

6.2. PRACTICALS

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

6.2.a. INTERNAL EVALUATION

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

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

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

6.2.b. EXTERNAL EVALUATION

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

6.3. DRAWING SUBJECTS

For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, etc.,) and estimation, the distribution shall be 40 marks for Internal Evaluation and 60 marks for End Examination.
The 40 internal marks will be evaluated as follows:

Internal Tests : 20 marks. (1½ hour duration)
Day – to – day work: 20 marks (evaluation of charts)

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

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

The syllabus for the subject "**Machine drawing and CAD Lab**" consists of two major portions:
1. Unit 1, 2 –Conventional drawing pattern.
2. Unit 3 and 4 - CAD lab using drafting packages

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

Internal Evaluation: Max Marks: 40

The total internal evaluation marks are distributed in the following two components:
1. Day-to-day work : 20 Marks (Evaluation of Charts)
2. Descriptive Test : 20 Marks

Cycle–I Examination – Conventional drawing pattern

In Cycle-I examination the 40 marks will be awarded as follows:
Day-to-day evaluation - 20 Marks
Internal Test - 20 Marks

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

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

In Cycle-II examination the 40 marks will be awarded as follows:
Day-to-day evaluation - 20 Marks
Internal Test - 20 Marks

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

End Examination (Total Duration: 4 hours, Max, marks: 60) in the presence of external examiner
Conventional drawing pattern (Duration: 2 Hours, Marks: 30)
Computer lab pattern using any drafting packages (Duration: 2 Hours, Max:30)
(Note: Both Conventional drawing pattern and Computer lab pattern using any drafting packages are compulsory and are to be conducted in separate sessions)

6.4. MANDATORY NON-CREDIT COURSES

A student is required to take up Non-Credit / Mandatory courses (zero credit), viz. Environmental Science, Constitution of India, Community service, Advanced Communication Skills (ACS), Quantitative Aptitude and Reasoning (QAR), MOOCs (Massive Open Online Courses) etc., as and when the courses are offered. The B.Tech

degree shall only be awarded only if a student gets satisfactory grade in each of the mandatory non-credit courses besides acquiring 160 credits.

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

MOOCS:

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

Advanced Communication Skills (ACS) & Quantitative Aptitude & Reasoning (QAR) :

There will be two online internal examinations of 40 marks of each and another 20 marks will be awarded based on day to day evaluation. The student has to secure a minimum of 40 marks out of the above mentioned 100 marks to secure satisfactory report.

Community Service:

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

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

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

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

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

6.5 PRACTICAL TRAINING / INTERNSHIP

As a part of curriculum in all branches of Engineering, it is mandatory for all students to undergo summer internship Programme at industries (core or allied) / R & D organization to get practical insight of their subject domain during summer break after

the 6th semester. This internship Programme shall be availed by the students in a duration of minimum 2 weeks or maximum of 4 weeks and the assessment shall be carried out by internal experts.

After the completion of internship, the student shall submit a certificate, a technical report and presentation to the concerned departmental committee constituted by the HOD for evaluation. 50 marks shall be awarded for the submission of certificate, technical report, presentation and Viva-Voce examination.

Students are advised to take up Industrial Internship. In case, the student is unable to obtain the internship, they can opt for Practical Training at College.

Assessment for Practical Training:

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

6.6. MINI PROJECT

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

Mini Project:
Continuous Assessment (Internal Evaluation): 20 Marks
Distribution
Literature Survey   : 04 Marks
Innovativeness of the Project : 04 Marks
Review 1   : 04 Marks
Review 2   : 04 Marks
Marks Final Presentation : 04 Marks

6.7. PROJECT WORK

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

Continuous Assessment (Internal Evaluation): 80 Marks

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

6.8. Technical Seminar:

For the Technical Seminar the student shall collect information on an advanced topic, prepare a technical report and submit it to the department. It shall be evaluated by the departmental committee consisting of HOD, supervisor and senior faculty. The seminar report and his/her presentation shall be evaluated for 50 internal marks.

Student has to secure a minimum of 40% of marks to pass the Technical Seminar.

If he/she fails, he/she has to repeat the Technical Seminar and get the pass grade for the award of the degree.

7.   PASS MARK CRITERIA

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

S.No.	Category of Subject	Max. Marks	Internal Marks	External Marks	External pass %	External pass mark	Overall pass %	Overall pass mark
1	Theory/ Drawing	100	40	60	35	21	40	40
2	Practical	50	20	30	35	11	40	20
3	Mini Project	50	20	30	35	11	40	20
4	Project work	200	80	120	35	42	40	80
5	Practical Training / Internship	50	50	-	-	-	40	20

8. PROMOTION POLICY

8.1. ATTENDANCE REQUIREMENTS

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

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

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

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

8.2. CREDIT REQUIREMENTS

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

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

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

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

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

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

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

8.3. COURSE PATTERN

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

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

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

Re-admission Criteria:

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

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

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

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

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

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

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

For mandatory courses, "**Satisfactory**" or "**Unsatisfactory**" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA

10. CRITERIA FOR AWARD OF GRADES/DIVISION

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

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

The SGPA is calculated as given below:

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

Where CR = Credits of a subject

GP = Grade Points awarded for a subject

*SGPA is calculated for a candidate who passed all the subjects in that semester.

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

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

The CGPA is calculated as given below:

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

Where CR= Credits of a subject

GP = Grade Points awarded for a subject

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

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

10.3 Award of Division:

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

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

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

10.4. CONSOLIDATED GRADE MEMO

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

11. REVALUATION/CHALLENGE EVALUATION

1. Student can submit the application for revaluation, along with the prescribed fee for revaluation of his answer script(s) of theory subject(s) as per the notification issued by the Controller of Examinations.

2. The Controller of Examinations shall arrange for revaluation of such answer script(s).

3. An External evaluator, other than the first evaluator shall revaluate the answer script(s).

12. MINIMUM INSTRUCTION DAYS

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

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

14. WITHHOLDING OF RESULTS

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

15. TRANSITORY REGULATIONS

Discontinued or detained candidates are eligible for readmission as and when next offered. A candidate, who is detained or discontinued in a semester, on readmission shall be required to do all the subjects in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those candidates who have already passed such subjects in the earlier semester(s) he was originally admitted into and substitute subjects are offered in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

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

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

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

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

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

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

A student who is transferred from the other autonomous colleges to this college in second year first semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the subjects in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree.

However, exemption will be given in the subjects of the semester(s) of the batch which he had passed earlier and substitute subjects are offered in their place as decided by the Board of studies.

The total number of credits to be secured for the award of the degree will be the sum of the credits up to previous semester as per the regulations of the college from which he has transferred and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

16. Scope

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

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

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

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

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

1. AWARD OF B. TECH. DEGREE

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

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

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

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

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

3. PROMOTION RULE:

(a) Attendance requirement is same as regular course.

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

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

4. TRANSITORY REGULATIONS:

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

4.2 A student who is following JNTUK curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester of second year or at the subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the subjects in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the subjects of the semester(s) of the batch of them as decided by the Board of Studies.

The student has to clear all his backlog subjects up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the award of degree. The total number of credits to be secured for the award of the degree will be sum of the credits up to previous semester under JNTUK regulations and the credits prescribed for the semester in which a candidate seeks readmission and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

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

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT INEXAMINATIONS

➢ The Principal shall refer the cases of Malpractices in Internal Assessment Test and Semester end examinations to a malpractice prevention committee constituted by him for the purpose. Such committee shall follow the approved levels of punishment. The Principal shall take necessary action against the students based on the recommendations of the committee.

➢ Any action by the candidate trying to get undue advantage in the performance or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder:

	Nature of Malpractices/ Improper conduct	Punishment
	If the candidate:	
1(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination).	Expulsion from the examination hall and cancellation of the performance in that subject only.
1(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination	Expulsion from the examination hall and

	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.	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	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.

	hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 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.

R19 1st and 2nd year Course Structure

I B.TECH - I SEMESTER

S.No.	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	Communicative English-I	HS	40	60	100	2	-	-	2
2	Engineering Chemistry	BS	40	60	100	3	-	-	3
3	Linear Algebra & Calculus	BS	40	60	100	3	-	-	3
4	C Programming	ES	40	60	100	3	-	-	3
5	Basics in Mechanical and Civil Engineering	ES	40	60	100	3	-	-	3
6	C Programming Lab	ES	20	30	50	-	-	3	1.5
7	IT workshop	ES	20	30	50	-	-	3	1.5
8	English Communication Skills Lab – I	HS	20	30	50	-	-	3	1.5
9	Engineering Chemistry Lab	HS	20	30	50	-	-	3	1.5
10	Constitution of India(MC)	MC	-	-	-	3	-	-	-
	Total		**280**	**420**	**700**	**17**	**0**	**12**	**20**

I B.TECH. – II SEMESTER

S.No.	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	Engineering Physics	BS	40	60	100	3	-	-	3
2	Differential Equations & Vector Calculus	BS	40	60	100	3	-	-	3
3	Communicative English-II	HS	40	60	100	2	-	-	2
4	Engineering Graphics	ES	40	60	100	3	-	-	3
5	Electrical Circuit Analysis-I	PC	40	60	100	3	-	-	3
6	Power Generation and Economic Aspects	PC	40	60	100	3	-	-	3
7	Engineering workshop Practice	ES	20	30	50	-	-	3	1.5
8	Engineering Physics Lab	BS	20	30	50	-	-	3	1.5
9	Environmental Science	MC	-	-	-	3	-	-	-
	Total		**280**	**420**	**700**	**20**	**0**	**6**	**20**

II B.TECH. – I SEMESTER

S.No.	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	Electronics Devices and Circuits	ES	40	60	100	3	-	-	3
2	Numerical Methods & Transformations	BS	40	60	100	3	-	-	3
3	Electrical Circuit Analysis - II	PC	40	60	100	3	-	-	3
4	Electrical Machines-I	PC	40	60	100	3	-	-	3
5	Electro Magnetic Fields	PC	40	60	100	3	-	-	3
6	Analog Electronics	PC	40	60	100	3	-	-	3
7	Electronics Devices and Circuits Lab	ES	20	30	50	-	-	3	1.5
8	Electrical Circuit Analysis Lab	PC	20	30	50	-	-	3	1.5
9	Community Service	MC	-	-	-	-	-	-	-
	Total		**280**	**420**	**700**	**18**	**-**	**6**	**21**

II B.TECH. – II SEMESTER

S.No.	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	Problem Solving with Python	ES	40	60	100	3	-	-	3
2	Digital logic and circuits	PC	40	60	100	3	-	-	3
3	Open Elective-I	OE	40	60	100	3	-	-	3
4	Complex Variables , Probability & Statistics	BS	40	60	100	3	-	-	3
5	Electrical Machines-II	PC	40	60	100	3	-	-	3
6	Python Lab	ES	20	30	50	-	-	3	1.5
7	English Communication Skills Lab-II	HS	20	30	50	-	-	3	1.5
8	Electrical Machines Lab-I	PC	20	30	50	-	-	3	1.5
9	Analog and Digital Circuits Lab	PC	20	30	50	-	-	3	1.5
10	Quantitative Aptitude and Reasoning	MC	-	-	-	3	-	-	-
	Total		**280**	**420**	**700**	**18**	**-**	**12**	**21**

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	0	0	40	60	100	2

19BCC1TH01	**COMMUNICATIVE ENGLISH - I** **(Common to All Branches)**

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:

CO 1: Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it.
CO 2: Compose paragraphs, essays as creative writing.
CO 3: Build grammatically correct sentences using a variety of sentence structures.
CO 4: Enhance word power and usage of lexicons.
CO 5: Compile emails, letters, reports, resume and information transfer.

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

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

UNIT–III : Louis Braille
a) **Speaking**: Discussions on specific topic
b) **Reading**: Sequencing of ideas and recognizing verbal techniques to link the ideas in a paragraph.
c) **Writing**: Paragraph writing, using key words/phrases and organizing points in a coherent manner.
d) **Grammar and Vocabulary**: Cohesive devices, articles and prepositions

UNIT-IV : Mallika Srinivasan
a) **Speaking:** Role plays, asking for and giving information/directions/instructions

b) **Reading**: Understand and interpret graphic elements used in texts.
c) **Writing**:   Information transfer.
d) **Grammar and Vocabulary**: Adjectives, adverbs and antonyms.

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

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

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

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

I B.TECH I & II SEMESTERS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3

19BCC1TH07	**ENGINEERING CHEMISTRY** **(COMMON TO ALL BRANCHES)**

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.
CO 2: Compare different types of polymers, fuels and their importance.
CO 3: Utilize the advanced materials as engineering materials and apply them in domestic and industrial life.
CO 4: Distinguish electrical energy sources and importance of corrosion science.
CO 5: Identify different types of engineering materials and applications in engineering.

UNIT-I: WATER CHEMISTRY
Characteristics of water: Sources, Impurities–Hardness & its units–Industrial water characteristics– Softening of water by external treatment methods (Lime soda process, Zeolite and Ion exchange process)–Numerical problems on lime soda process–Desalination of brackish water (Reverse osmosis and Electrodialysis).
Water analysis techniques: Alkalinity–hardness (Complexo-metric)–Break point chlorination–Free chlorine–DO–BOD and COD.

UNIT-II: POLYMERS AND FUEL CHEMISTRY
Polymers: Introduction to polymers–Chain growth (free radical, ionic)–Step growth polymerization–Coordination polymerization–Copolymerization with specific examples–Thermoplastics and thermosets–Plastic moulding methods (Compression & Injection moulding)–Rubbers–Natural rubber–Processing–Vulcanization.
Fuels-Types of fuels–Calorific value–Numerical problems based on calorific value–Analysis of coal–Liquid fuels–Refining of petroleum–Cracking of heavy oil–Knocking and anti knocking agents–Octane and cetane values.

UNIT-III: CHEMISTRY OF ADVANCED MATERIALS
Nano materials: Introduction–Sol-gel method & Chemical reduction method of preparation – Characterization by BET method and TEM methods–Carbon nano tubes and fullerenes: Types–Preparation–Properties and Applications.
Liquid crystals: Introduction–Types–Applications.
Composite materials: Introduction–Definition–Types–Applications–Cermets.

UNIT-IV: ELECTROCHEMISTRY AND CORROSION

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

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

UNIT-V: CHEMISTRY OF ENGINEERING MATERIALS

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

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

TEXT BOOKS:

1. 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	40	60	100	3
19BCC1TH03				**LINEAR ALGEBRA & CALCULUS** (Common to All Branches)			

COURSE OBJECTIVES:

- Understanding basic concepts of linear algebra (systems of linear equations, matrix calculus).
- To become proficiency in solving computational problems of linear algebra.
- To acquire knowledge on mean value theorems in calculus.
- Familiarization about the techniques in calculus and multivariate analysis.

COURSE OUTCOMES:

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

CO 1: Solve the system of linear equations.

CO 2: Analyze the applications of matrices in various fields and obtain Eigen values and Eigen vectors.

CO 3: Relate the results of mean value theorems in calculus to Engineering problems.

CO 4: Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering.

CO 5: Compute the area and volume by interlinking them to appropriate double and triple integrals.

UNIT-I: Linear Systems of Equations

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

Application: Finding the current in a electrical circuit

UNIT – II: Eigenvalues and Eigenvectors

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

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

UNIT – III: Mean Value Theorems

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

UNIT- IV: Partial Differention

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

UNIT-V: Application of Integration and Multiple Integrals:

Applications of Integration to Lengths, Volumes and Surface areas of revolution in Cartesian and Polar Coordinates. Multiple Integrals- double and triple integrals, Change of Variables, Change of order of Integration.

TEXT BOOK:

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

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
	2	1	-	40	60	100	3
19BCC1TH10	C PROGRAMMING

19BCC1TH10	C PROGRAMMING

COURSE OBJECTIVE:
* 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.
CO2: Utilize suitable control structures for developing code in C.
CO3: Make use of functions and arrays in developing modular programs.
CO4: Make use of structures and pointers to write well-structured programs.
CO5: Make use of file Operations in C programming for a given application.

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

UNIT II
Decision Control and Looping Statements: Introduction to Decision Control Statements – Conditional Branching Statements – Iterative Statements – Nested Loops – Break and Continue Statement – Goto Statement.
Functions: Introduction – using functions – Function declaration/ prototype – Function Definition – function call – return statement – Passing parameters – Scope of variables – Storage Classes – Recursive functions – Recursion vs Iteration.

UNIT III
Arrays: Introduction – Declaration of Arrays – Accessing elements of the Array - Storing Values in Array – Calculating the length of the Array - Operations on Array - Two Dimensional Arrays –Operations on Two Dimensional Arrays.
Strings: Introduction – Reading Strings – Writing Strings – String Manipulation functions - Array of Strings.

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

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

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

TEXT BOOKS:
1. 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
	4	0	0	40	60	100	3
19BEE1TH08			**BASICS IN MECHANICAL AND CIVIL ENGINEERING**				

COURSE OBJECTIVES:
- To impart the overview of Civil Engineering and its measuring techniques.
- To familiarize the materials used in Civil Engineering.
- To provide required knowledge on joining, forming, welding & power transmissions.
- To provide an available energy sources.

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO 1: Illustrate the basics and elements of civil engineering.
CO 2: Explain the role of traditional and modern infrastructure engineering its planning and execution, its impact on the socio-economic development of the nation.
CO 3: Examine the joining, welding, forming techniques for different applications.
CO 4: Classify available energy sources.

UNIT-I: Introduction to Civil Engineering
Civil Engineering contributions to the welfare of Society-Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering- Classification of structures, buildings, towers, chimneys, bridges, water tanks, roads, railways.
Surveying: Objects-classification-principles-measurements of distances-angles-leveling-determination of areas-contours-examples.

UNIT-II: Building Materials
Stones – Classification of stones, Bricks – Composition & Classification and Cement - Basic ingredients, manufacturing process, grades of cement; Aggregates – fine aggregates, coarse aggregates, Timber, steel – structural steel, steel as a reinforcement

UNIT-III: Joining and Forming Processes: Types of joining:
Arc welding, Resistance welding, Gas welding, Brazing and Soldering, Metal forming**:** Forging, Rolling, Extrusion operations, working principle.

UNIT-IV: Power Transmission:
Different types of power transmission, power transmission by belts, ropes, Power Transmission by chain. Gear: Classification of gears, applications.

UNIT-V: Energy Sources:
Renewable and non-renewable energy resources, renewable energy forms and conversions, internal combustion engines**:** classification – working principle - engine components. Four stroke and two stroke petrol and diesel engines, comparison Performance parameters: IP, BP, FP, ME

TEXT BOOKS:
1. Elements of Civil Engineering and Engineering Mechanics, R. V. Ravikar, PHI Learning Pvt. Ltd
2. Basic Civil Engineering, M S Palanichamy, Tata McGraw-Hill

3. Civil Engineering: Through Objective Type Questions, Gupta S.S., CBS Publishers and Distributors

4. Mechanical Engineering Science K R Gopala Krishna, Subhas publications

5. Elements of Mechanical Engineering, M.L. Mathur, F.S.Metha & R.P.Tiwari; Jain Brothers Publications, 2009

REFERENCES:

1. Fundamentals of Civil Engineering: An Introduction to the ASCE Body of Knowledge By Richard H. McCuen, Edna Z. Ezzell, Melanie K. Wong, CRC Press

2. Civil Engineer's Handbook of Professional Practice, Karen Hansen, Kent Zenobia

3. John Wiley and Sons (ASCE Press)

4. Production Technology by P.N.Rao by I & II McGraw-Hill publications

NARASARAOPETA ENGINEERING COLLEGE (AUTONOMOUS)

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
19BCC1LB07	**C PROGRAMMING LAB**						

COURSE OBJECTIVE:

• 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 should be able to:

CO 1: Study, analyze and understand logical structure of computer programming and different constructs to develop programs in C Language.

CO 2: Compare and contrast various data types and operator precedence.

CO 3: Analyse the use of conditional and looping statements to solve problems associated with conditions and repetitions.

CO 4: Analyse simple data structures, use of pointers & dynamic memory allocation techniques.

CO 5: Make use of functions and file I/O operations in developing C Programs.

Exercise l

Construct Flowcharts for the following through Raptor:

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

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

iii) Calculate the average of n numbers.

Exercise 2

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

b) Write a C Program to find the largest of three numbers using 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) Draw a flow chart using Raptor and write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Exercise 5

a) Draw a flow chart using Raptor and write a C Program to print the multiplication table of a given number n up to a given value, where n is entered by 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) Draw a flow chart using Raptor and write a C Program to find both the largest and smallest number of an array of integers
b) Write a C Program to find transpose of a matrix.

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) Draw a flow chart using Raptor and write a C Program for the following 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

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) Draw a flow chart using Raptor and write a C program to implement a linear search.
b) Draw a flow chart using Raptor and write a C program to implement binary search
c) Write a C program to implement sorting of an array of elements.

Exercise 15

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 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 I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
19BEE1LB06	IT WORKSHOP						

COURSE OBJECTIVES:

- Enabling the student to understand basic hardware and software tools through practical exposure.

COURSE OUTCOME:

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

CO 1: Demonstrate the need of PC hardware components, applications and softwares.

CO 2: Explain the knowledge of networks, internet and World Wide Web, Search engines, Netiquette.

CO 3: Experiment with the installation and use of different software like Windows XP, Linux.

CO 4: Identify and fix the defective PC and software related issues.

CO 5: Make use of various options in Microsoft word, Excel and Power point.

PC Hardware:

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

PC Hardware

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

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

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

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

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

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

Internet & World Wide Web:

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

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

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

Task 7: Search Engines & Netiquette:
Students are enabled to use search engines for simple search, academic search and any other context based search (Bing, Google etc).Students are acquainted to the principles of micro-blogging, wiki, collaboration using social networks, participating in online technology forums.

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

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

WORD

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

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

EXCEL

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

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

LOOKUP/VLOOKUP

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

POWER POINT

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

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

TEXT BOOKS:

Faculty to consolidate the workshop manuals using the following references.

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

REFERENCE BOOKS:

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

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

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 through emphasis on word accent, intonation and rhythm

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO 1: Develop various conversations skills /discourses using formal and informal expressions.
CO 2: Apply phonological knowledge to speak English with good pronunciation, overcoming mother tongue influence.
CO 3: Identify and comprehend several accents of English Language by listening to audio clips.
CO 4: Utilize basic communication skills in JAMS and Role plays.

UNIT– I
a. Greeting, Introducing and Taking leave
b. Pure Vowels
c. Listening - TEDx Talks (https://www.ted.com/talks/ashweetha_shetty_how-education-helped-me-rewrite-my-life?language-en#t-623369)
d. Self-Introduction
UNIT–II
a. Giving information and Asking for information
b. Diphthongs
c. Listening -TEDx Talks(https://www.youtube.com/watch?v=Dk20-E0yx_s)
d. Role Play
UNIT–III
a. Inviting, Accepting and Declining Invitations
b. Consonants
c. Listening - TEDx Talks (https://www.youtube.com/watch?v=IgAnj6r1O48)
d. JAM
UNIT-IV
a. Commands, Instructions and Requests
b. Accent and Rhythm
c. Listening -TEDx Talks(https://youtu.be/SKvMxZ284AA)
d. Tables Turned
UNIT-V
a. Suggestions and Opinions
b. Intonation
c. Listening -TEDx Talks(https://youtu.be/ov6pEGXRYZo)
d. Impromptu

TEXT BOOKS:

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

REFERENCE BOOKS:

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

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
19BCC1LB05			**ENGINEERING CHEMISTRY LAB** **(COMMON TO ALL BRANCHES)**				

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).
CO 2: Explain the functioning of different analytical instruments.
CO 3: Compare viscosity and surface tension of different oils.
CO 4: Measure molecular/system properties such as strength of solutions, conductance of solutions and acid number of lubricating oils, etc

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

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	-	-	-	-
19BCC1MC02				CONSTITUTION OF INDIA			

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

COURSE OUTCOMES:
CO 1: Examine salient features of Indian Constitution and live accordingly in society & interpret the meaning of Fundamental Rights of State Policy

CO 2: Discover various aspects of Union Government legislation and live up to the expectations of the rules.

CO 3: Critically examine State Government legislation and improve your living standards by following the rules strictly

CO 4: Examine powers and functions of local bodies such as Municipalities and Panchayats and, take advantage of available resources for better living

CO 5: Analyze the powers and functions of Election Commission and The Union Public Service Commission and decide upon it for safe and secured life.

UNIT-I: INTRODUCTION TO INDIAN CONSTITUTION & FUNDAMENTAL RIGHTS
Meaning of the term Indian Constitution –Preamble- Constituent Assembly- Salient Features of Indian Constitution. Fundamental Rights - Fundamental Duties -The Directive Principles of State Policy.

UNIT-II: UNION GOVERNMENT
Union Government -Union Legislature (Parliament) -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

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
19BCC2TH07				**ENGINEERING PHYSICS** **(Common to All branches)**			

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: Find the experimental evidence of wave nature of light and interference in thin films, Diffraction grating and Polarisation in various fields.

CO 2: Analyse various types of lasers & optical fibers.

CO 3: Explain the crystal structures and XRD techniques.

CO 4: Develop the strategies to apply the concepts of magnetism in engineering field.

CO 5: Examine the various applications of semiconductors in engineering field.

UNIT-I

Interference & Diffraction: Introduction -Interference in thin films by reflection – Newton's rings, introduction to diffraction – difference between Fresnel's and Fraunhofer diffraction - Fraunhofer diffraction at single slit (qualitative) - Diffraction grating.

Polarization: Introduction – Types of Polarization – Double refraction – Nicol's prism- Quarter wave plate and Half Wave plate

UNIT–II

Lasers: Introduction – Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Population inversion – Ruby laser – Helium Neon laser-Applications.

Fiber Optics: Introduction- Principle of optical fiber - Acceptance angle – cone - Numerical Aperture-Applications.

UNIT–III

Crystallography : Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC,BCC and FCC.

X-Ray Diffraction: Directions and planes in crystals – Miller indices – Separation between successive (h k l) planes – Bragg's law.

UNIT-IV

Electromagnetic Fields: Gauss and stokes theorems (qualitative) – Fundamental laws of electromagnetism – Maxwell's Electromagnetic Equations.

Magnetic materials: Magnetic Susceptibility- Magnetic permeability –Classification of Magnetic materials – Dia, Para, Ferro – Soft and Hard magnetic materials - Applications

UNIT-V

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

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

TEXT BOOKS:

1. A.J. Dekker, "Solid state Physics", ISBN 10: 0333918339 / ISBN 13: 9780333918333, 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	40	60	100	3
19BCC2TH02	**DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS** (Common to Civil, EEE, ME and ECE)						

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

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

UNIT-III: First Order Partial Differential Equations:
Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange's) equations.

UNIT- IV: Vector Differentiation:
Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

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

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

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
	2	0	0	40	60	100	2
19BCC2TH01	**COMMUNICATIVE ENGLISH - II** (Common to All Branches)						

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 enhance the skills of listening, reading and critical thinking.

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO 1: Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it.
CO 2: Compose paragraphs, essays as creative writing.
CO 3: Build grammatically correct sentences using a variety of sentence structures.
CO 4: Enhance word power and usage of lexicons.
CO 5: Compile emails, letters, reports, resume and information transfer.

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

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

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

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

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

TEXT BOOKS:
1. "Modern Trail Blazers" , Orient Black Swan Pvt.Ltd.Publisher, 1ST edition. 2013
2. E Suresh Kumar," Engineering English", Orient Black Swan Pvt. Ltd. Publishers.

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

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	1	0	4	40	60	100	3
19BCC2TH09	**ENGINEERING GRAPHICS** (COMMON TO CSE & ECE & EEE & IT)						

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.

CO 2: Develop the orthographic projections, projections of points, and lines inclined to both the planes.

CO 3: Construct the projection of planes inclined to both the planes.

CO 4: Develop the projection of regular solids and surfaces.

CO 5: Interpret the conversion of isometric views to orthographic views vice versa.

UNIT-I

THE BASIC CONCEPTS IN ENGINEERING DRAWING: Introduction to engineering drawing instruments, lettering and dimensioning practice. Geometrical constructions-Constructing regular polygons by general methods.

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

UNIT–II

ORTHOGRAPHIC PROJECTIONS- Introduction to type of projections, first angle and third angle projections.

PROJECTION OF POINTS: Principles of orthographic projection – Convention – First angle projections, projections of points.

PROJECTIONS OF STRAIGHT LINES:
Projections of straight 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 plane.

UNIT-V
ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS: 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:
1. https://nptel.ac.in/courses/112103019/17

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

I B. TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
19BEE2TH13				**ELECTRICAL CIRCUIT ANALYSIS - I**			

COURSE OBJECTIVES:

- To introduce fundamental laws, basic electrical elements, sources and their characteristics.
- To learn the concept of phase and phase relationship of basic electrical elements.
- To impart the basic knowledge about the Resonance and coupled circuits
- To compute electrical parameters like current, voltage and power using network theorems for AC and DC circuits.

COURSE OUTCOMES:

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

CO 1: Acquire knowledge about basic electrical circuits.

CO 2: Gain knowledge about phase and phase relationship of basic electrical elements and circuits.

CO 3: Apply the network topology to electrical circuits.

CO 4: Design of tank circuit for given frequency and analyse the coupled circuits in series and parallel.

CO 5: Apply the network theorems to compute various parameters of electric network.

UNIT-I: Introduction to Electrical Circuits

Passive components and their V-I relations. Sources (dependent and independent), Ohm's Law- Kirchhoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation). Source transformation technique, nodal analysis, mesh analysis, super node and super mesh analysis for D.C. excitations.

UNIT-II: Single Phase A.C. Circuits

Periodic waveforms (determination of rms, average value and form factor). Concept of phase and phase difference. Complex and polar forms of representations, steady state analysis of R, L and C circuits with sinusoidal excitation, Power Factor and its significance, Real, Reactive power and apparent Power.

UNIT-III: Network Topology

Definitions of Graph and Tree. Basic cut set and tie set matrices for planar networks. Loop and nodal methods of analysis of networks with dependent and independent voltage and current sources. Duality and Dual networks.

UNIT-IV Resonance and Coupled Circuits

Series and parallel resonance - Q factor and bandwidth - Resonant frequency of a tank circuit - Coupled circuits - Self and mutual inductances - Coefficient of Coupling - Analysis of coupled circuits - Dot rule for coupled circuits - Equivalent circuit of coupled circuits - Coupled circuits in Series and Parallel.

UNIT-V: Network Theorems (DC & AC Excitations)

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem, Tellegen's theorem and compensation theorem.

TEXT BOOKS:

1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", TMH, 8th Edition, 2012
2. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.

REFERENCE BOOKS:

1. M.E. Vanvalkenburg, "Network Analysis", PHI, 3rd Edition, 2006.
2. A Sudhakar and Shyam Mohan SP, "Circuits and Networks: Analysis and Synthesis", TMH, 5th Edition, 2015.

Web References:

1. http://www.egate.ws/
2. http://cosmolearning.org/courses/circuit-theory/
3. http://www.nptelvideos.in/2012/11/circuit-theory.html
4. http://pbtstudies.blogspot.in/

E-Books:

1. http://elearning.vtu.ac.in/P9/notes/06ES34/Unit1-KCV.pdf

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
19BEE2TH15	POWER GENERATION & ECONOMIC ASPECTS						

COURSE OBJECTIVES

- To introduce the operation of Hydel, Thermal and Nuclear power plants
- To make the students to understand the significance and power generation using non-conventional energy.
- To impart the knowledge of economic aspects and study different types of load curves.

COURSE OUTCOMES:-

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

CO 1: Explain the working of different kinds of Turbines & concept of Hydro Power Generation

CO 2: Identify the different components of thermal power plants

CO 3: Explain the layout, construction and working of the components inside nuclear power plants

CO 4: Classify the significance of non-conventional energy resources, power generation using solar, wind, tidal, geo thermal and fuel cells.

CO 5: Analyse the significance of various factors for economic analysis of power generation

UNIT-I: Hydel Power Station

Classification of Hydro turbines: Working principle-Efficiency calculation and Design principles for Pelton Wheel-Francis and Kaplan turbines-Selection of site-block diagram approach of hydroelectric power plant and Classification of pumped storage power plants.

UNIT-II: Thermal Power Station

Selection of site-general layout of a thermal power plant showing paths of coal-steam-water-air-ash and flue gasses-ash handling system-Brief description of components: boilers-super heaters-economizers-electrostatic precipitators-steam turbines: impulse and reaction turbines-condensers-feed water circuit-cooling towers and chimney.

UNIT-III: Nuclear Power Station

Basics of Nuclear Engineering-Layout and subsystems of Nuclear Power Plants-Working of Nuclear Reactors: Boiling Water Reactor (BWR),-Pressurized Water Reactor (PWR)-Canada Deuterium- Uranium reactor (CANDU)-Breeder-Gas Cooled and Liquid Metal Cooled Reactors-Safety measures for Nuclear Power plants.

UNIT-IV: Power from Renewable Energy

Solar Energy: Basics of solar energy - solar constant - extra-terrestrial radiation - types of conversion systems - solar thermal power plants -solar pond - solar cell.
Wind Energy: Principles of wind power - types - wind turbine operation, types of wind generators, Tidal energy-Geo thermal Energy - Fuel cells

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UNIT-V: Economic Aspects of Power Generation

Load curve-load duration and integrated load duration curves-connected load-maximum demand-demand factor-load factor-diversity factor-plant capacity factor-utilization factor-plant use factors- Numerical Problems.

TEXT BOOKS:

1. R.K.Bansal -Fluid Mechanics & Hydraulic Machinery, Lakshmi Publications.
2. M.L.Soni,P.V.Gupta, U.S.Bhatnagarand A. Chakrabarti -A Text Book on Power System Engineering, DhanpatRai& Co. Pvt. Ltd.
3. V.K.Mehta & Rohith Mehta Principles of power systems , S.Chand Publications.

REFERENCE BOOKS:

1. V. Kamaraju- Electrical Power Distribution Systems, Tata Mc Graw Hill, New Delhi.
2. M V Deshpande -Elements of Electrical Power Station Design , PHI, New Delhi.
3. M. N. Bandyopadhyay,-Electrical power systems theory and practice -PHI.

WEB REFERENCES:

1. URL:https://www.youtube.com/watch?v=uy9lZCdkQIM&list=PLD4ED2FAF3C155625 & index=1

E-BOOKS:

1. https://easyengineering.net/principles-of-power-system-by-mehta/
2. https://www.engineeringbookspdf.com/principles-of-power-systems-v-k-mehta/

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
19BCC2LB08	**ENGINEERING WORKSHOP PRACTICE** (COMMON TO CIVIL,MECH & EEE)						

COURSE OBJECTIVES:
- To impart knowledge to students to develop their technical skill sets for creating entities from raw material.
- To give hands on training and practice to students for use of various tools, devices, machines.
- To develop ability of students to understand, plan and implement various processes and operations to be performed on the raw material to create object of desired shape and size.

COURSE OUTCOMES:
CO 1: Make Use of the various carpentry tools, machines, devices used in engineering practice for preparing different carpentry joints.

CO 2: Make Use of the various fitting tools, machines, devices used in engineering practice for preparing different Fits.

CO 3: Develop funnel and square box thorough knowledge of various Tin Smithy tools.

CO 4: Demonstrate the various house wiring connections for different house wiring connections

- **CARPENTARY:**
1. Preparation of T-Joint
2. Preparation of dovetail Joint

- **FITTING:**
1. Preparation of v-fit
2. Preparation of square-fit

- **TIN SMITHY:**
1. Preparation of funnel
2. Preparation of square box

- **HOUSE WIRING:**
1. Series bulbs connection
2. Parallel bulbs connection
3. Stair case connection
4. Florescent lamp connection

I B.TECH I/II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	20	30	50	1.5
19BCC2LB06	ENGINEERING PHYSICS LAB (Common to All branches)						

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:

CO 1: Explain the principle of physics and interpret them in engineering field and compares the results with theoretical calculations.

CO 2: Utilise modern engineering physics techniques and tools in real time applications in engineering studies.

CO 3: Identify the characteristics and the behaviour of materials in a practical manner and gain knowledge and its usage.

CO 4: Apply the analytical techniques and graphical analysis to the experimental data.

LIST OF EXPERIMENTS:

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

VIRTUAL LABS:

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

TEXT BOOKS:

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

Web References:

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

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	0	0	40+40+20	-	100	MC(0)
19BCC2MC02				**ENVIRONMENTAL STUDIES** (Common to all Branches)			

COURSE OBJECTIVES:

• 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.

• Overall understanding of the natural resources.

• To bring the awareness among students about the importance of biodiversity and the need for its conservation.

• To make the students understand the adverse effects of environmental pollution, its causes and measures to control it.

• 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.

UNIT – I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness. Institutions and people in Environment.
Ecosystems:
Definitions and concepts – Characteristics of ecosystem – Structural and functional features – Producers, consumers and decomposers and food webs – Types of ecosystems – Forests, grassland, desert, crop land, pond, lake, river and marine ecosystems – Energy flow in the ecosystem – Ecological pyramids – Ecological successions.

UNIT – II

Natural Resources: Water resources–Use and over utilization of surface and natural resourced ground water–Floods, drought, conflicts over water, dams–benefits and problems on tribal population & Environment.
Forest resources: Use and over–exploitation, deforestation.
Mineral resources: Use and exploitation, tribal & environmental effects of extracting and using mineral resources.

Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer–pesticide problems, water logging, salinity–concept of sustainable agricultural methods.

Energy Resources: Renewable (wind energy, tidal energy) and non renewable energy resources (Fossil fuels, coal).

UNIT – III

Biodiversity: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity

Conservation of biodiversity: Threats to biodiversity: habitat loss, man wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity: In-Situ conservation and Ex- situ conservation.

UNIT – IV

Environmental Pollution and Control Technologies: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, and nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Good Agricultural Practices – Drip irrigation, soil erosion and desertification

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V

Environmental Policy, Legislation and Environmental Management: Environmental ethics: Issues and possible solutions. Environmental Protection Act, Legal aspects -Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation.

Impact Assessment and its significance - various stages of EIA, preparation of EMP and EIS, Environmental audit, Ecotourism.

Visit to some local Polluted Site: Study of an industrially Polluted area.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Deekshita Dave & P. Udaya Bhaskar, Text Book of Environmental Studies Cengage Learning.
2. Shaashi Chawla, a Textbook of Environmental Studies, TMH, New Delhi.
3. Benny Joseph Environmental Studies, Tata McGraw Hill Co, New Delhi.
4. Dr.K.V.S.G. Murali Krishna, Environmental Studies VGS Publishers, Vijayawada, First Edition 2016.
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 Studies 5JM1G2
5. URL:http://www.teacherspayteachers.com/Product/Food-Chains-Trophic-Levels-and-Ecological- Pyramids-PowerPoint Click the above
6. URL:http://iadc-dredging.com/en/371/environment/ecosystem-services/ this webinar will focus on the concept of ecosystem services
7. URL: http://mocomi.com/ presents: What is Air Pollution? Air pollution is the introduction of foreign products into the atmosphere.
8. URL: https://en.wikipedia.org/wiki/green_impact_assessment

E-BOOKS:

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

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
19BEE3TH02				**ELECTRONIC DEVICES AND CIRCUITS**			

COURSE OBJECTIVES:

- Analyze the operation and principles of P-N diode.
- Classify various types of Special diodes, rectifiers and filters.
- Discuss the working of BJT.
- Explain the need for transistor biasing techniques.
- Discuss the working of FET and other Transistors.

COURSE OUTCOMES:

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

CO 1: Use P-N diodes in electronic circuits.
CO 2: Use special diodes and rectifiers in electronic circuits.
CO 3: Explore the operation of BJT and its applications.
CO 4: Analyse the thermal stability of BJT.
CO 5: Explore the operation of FET, other transistors and their applications.

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, Typical transistor junction voltage values.

UNIT- IV: BJT Biasing

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.

UNIT- V: FET & Other Transistors

FET Types and Symbols - JFET and MOSFET/IGFET, JFET: N- Channel and P-Channel Construction, Operation, Characteristics - Drain and Transfer, Parameters - Drain Resistance, Amplification factor, Transconductance, Pinch-off voltage, MOSFET - Types - Depletion MOSFET - N Channel and P Channel, Enhancement MOSFET - N-Channel and P-Channel, Construction, Operation, Characteristics - Transfer and Drain Characteristics for Depletion and Enhancement Modes , Comparison between JFET and MOSFET.SCR- Symbol, Two-Transistor version, DIAC, TRIAC, UJT - Negative Resistance Property and Applications.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

II B. TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
19BCC3TH01	**NUMERICAL METHODS AND TRANSFORMATIONS** (Common to CIVIL, EEE, ME)						

COURSE OBJECTIVES:
- To elucidate the different numerical methods to solve nonlinear algebraic equations.
- To propagate the use of different numerical techniques for carrying out numerical integration.
- Explore the use of Laplace transform method to solve with initial value problems of ODE.
- 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.

UNIT –I: SOLUTIONS TO ALGEBRAIC EQUATIONS AND INTERPOLATION:
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: Newton's divided difference and Lagrange's formulae.

UNIT –II: NUMERICAL SOLUTIONS OF ODE AND INTEGRATION:
Numerical Differentiation, Ordinary differential equations-Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first and second order equations. Numerical integration- trapezoidal rule and Simpson's 1/3rd and 3/8th rules.

UNIT-III: LAPLACE TRANSFORMATIONS:
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:
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:

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.

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. B.V. Ramana, Higher Engineering Mathematics, Tata McGrawhill.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9thEditiwiley-India.
Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage Learning, 2011.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
19BEE3TH03	**ELECTRICAL CIRCUIT ANALYSIS - II**						

COURSE OBJECTIVES:
- To apply circuit analysis to AC Poly phase circuits
- To analyse R, L, C components for transient response.
- To study the basic concepts of different types of filters

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO 1: Analyse the balanced three phase supply connected to balanced systems.
CO 2: Analyse the balanced three phase supply connected to unbalanced systems.
CO 3: Ability to analyse steady state and transient response of various electrical networks.
CO 4: Estimate the different types of two port network parameters.
CO 5: Acquire knowledge on Filters.

UNIT–I Balanced three phase circuits

Advantages of a three phase system - Generation of three phase voltages- Phase sequence - star and delta connection - Relation between line and phase voltages and currents in balanced systems - Analysis of balanced three phase circuits - Three phase four wire supply connected to balanced star connected load - Three phase three wire supply connected to balanced star connected load - Three phase three wire supply connected to balanced delta connected load - Measurement of active and reactive power in balanced three phase systems.

UNIT-II Unbalanced three phase circuits

Analysis of Unbalanced three phase circuits - Three phase four wire supply connected to unbalanced star connected load - Three phase three wire supply connected to unbalanced star connected load -Three phase three wire supply connected to unbalanced delta connected load. Loop method - Star-Delta transformation technique. Three phase three wire supply connected to unbalanced delta connected load - Three wattmeter method and Two wattmeter methods for measurement of three phase power - Power factor by Two wattmeter method.

UNIT–III Transient Response Analysis

Steady state and Transient response of RL, RC & RLC Circuits for DC input and A.C. sinusoidal input. Solutions using differential equations and Laplace transforms.

UNIT-IV Two – Port Network

Two Port network - Z parameters - Y parameters - Transmission line parameters - h-parameters - Inverse h parameters - Inverse Transmission line parameters - Relationship between parameter sets - T and π representation. series connection of two port networks - Parallel connection of two port networks - Cascading of two port networks - Lattice Network.

UNIT-V: Filters

Classification of Filters - Low pass filter - High pass filter - Band pass filter - Band elimination filter - Filter networks - Equations of Filter networks - T Network-Propagation constant of T network - π network - Propagation constant of π network - Classification of Pass band and stop band - characteristic Impedance in the Pass and Stop bands.

TEXT BOOKS:

1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", TMH, 8th Edition, 2012
2. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.

REFERENCE BOOKS:

1. M.E. Vanvalkenburg, "Network Analysis", PHI, 3rd Edition, 2006.
2. A Sudhakar and Shyam Mohan SP, "Circuits and Networks: Analysis and Synthesis", TMH, 5th Edition, 2015.

WEB REFERENCES:

1. http://www.egate.ws/
2. http://cosmolearning.org/courses/circuit-theory/
3. http://www.nptelvideos.in/2012/11/circuit-theory.html
4. http://pbtstudies.blogspot.in/

E-BOOKS:

1. http://elearning.vtu.ac.in/P9/notes/06ES34/Unit1-KCV.pdf

NARASARAOPETA ENGINEERING COLLEGE (AUTONOMOUS)

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
19BEE3TH04				**ELECTRICAL MACHINES-I**			

COURSE OBJECTIVES:

- To familiarize with basic Electromechanical energy conversion principle & the constructional details and working principles of D.C. machines
- To introduce the methods of starting, speed control and testing of D.C. Machines.
- To impart knowledge on constructional details, working principles, and performance characteristics of transformers.

COURSE OUTCOMES:

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

CO 1: Gain the knowledge of electromechanical energy conversion principles for rotating machines.

CO 2: Determine the performance of D.C generator for various operating conditions.

CO 3: Select suitable speed control and testing methods of D.C motor for various applications

CO 4: Acquire knowledge about the constructional details, principle of operation, testing and applications of single phase transformers.

CO 5: Implement parallel operation and three phase transformer Connections.

UNIT-I: Electromechanical Energy Conversion and introduction to DC machines

Principles of electromechanical energy conversion – singly excited and multi excited system– Calculation of force and torque using the concept of co-energy.

Construction and principle of operation of DC machine – EMF equation for generator – Classification of DC machines based on excitation – OCC of DC shunt generator.

UNIT-II: Performance of D.C. Machines

Torque and back-emf equations of dc motors– Armature reaction and commutation – characteristics of separately-excited, shunt, series and compound motors - losses and efficiency- applications of dc motors.

UNIT-III: Starting, Speed Control and Testing of D.C. Machines

Necessity of starter – Starting by 3 point and 4 point starters – Speed control by armature voltage and field control – testing of DC machines - brake test, Swinburne's method – principle of regenerative or Hopkinson's method - retardation test -- separation of losses.

UNIT-IV: Single-phase Transformers

Types and constructional details - principle of operation - emf equation - operation on no load and on load – lagging, leading and unity power factors loads - phasor diagrams of transformers – Tests on single phase transformers – open circuit and short circuit tests – Sumpner's test -equivalent circuit – regulation – losses and efficiency — All day efficiency – parallel operation with equal voltage ratios – auto transformer

UNIT-V: 3-Phase Transformers

Polyphone connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ -- Third harmonics in phase voltages- three winding transformers: determination of Zp, Zs and Zt -- transients in switching – off load and on load tap changers -- Scott connection.

TEXT BOOKS:

1. P.S. Bimbhra, Electrical Machinery, Khanna Publishers.
2. Nagrath I J and D P Kothari - Electric Machines – Tata McGraw Hill, 4th edition, 2010.
3. J.B. Gupta, "Theory & Performance of Electrical Machines", S. K. Kataria& Sons, 2013.

REFERENCE BOOKS:

1. R.K. Rajput, Electrical Machines in S.I. Units, Laxmi Publica   tions (P) Ltd, 6th edition, New Delhi, 2017.
2. B.L. Theraja and A.K. Theraja, A Text Book of Electrical   Technology in S. I. Units, Vol.2, S. Chand & Company Ltd, Multicolour illustrative edition, New Delhi, 2014.
3. Asfaq Hussain 'Electrical Machines second edition by Dhanpatrai publications.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
19BEE3TH05				ELECTRO MAGNETIC FIELDS			

COURSE OBJECTIVES:

- To acquire the knowledge in electrostatic fields, electrical potential, energy density and their applications.
- To gain the knowledge in magnetic fields produced by currents in various configurations, application of Ampere's and Biot-Savart's Law.
- To study the magnetic force and torque through Lorentz's force equation in magnetic field environment.
- To develop a solid grasp about Maxwell's equations and their usage in solving time varying field problems.

COURSE OUTCOMES:

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

CO 1: Acquire knowledge in the laws of Electrostatics and apply them in electrostatic field.

CO 2: Gain the knowledge in laws of Magneto statics and apply them in static magnetic field.

CO 3: Compute the force experienced by charged bodies in magnetic field and identifies magnetic potential and its properties.

CO 4: Identify the time varying field and understand Faraday's Laws of Electromagnetic Induction.

UNIT-1: Electrostatics – I

Coordinate systems: Cartesian - cylindrical-spherical co-ordinates- coulombs law-Electric field intensity-Field due to a point charge - line charge - sheet of charge.

Definition of potential and potential difference - the potential field of a point charge - a line charge - sheet of charge - potential gradient - the dipole - dipole moment - Energy stored and Energy density in electrostatic field.

UNIT-2: Electrostatics – II

Electric flux density - Gauss's law - Applications of Gauss law - Maxwell's First equation (Electrostatics) $div(D) = \rho v$ - Current and current density - continuity of current - conductor properties and boundary conditions - Boundary conditions for perfect dielectric materials- Derivations of Poisson's and Laplace's equations.

UNIT-3: Magnetostatics

Capacitance - Capacitance of parallel plates - Spherical and Coaxial Cables with composite dielectrics - Biot-Savart's Law - Ampere's Circuital Law - Magnetic Flux and Magnetic Flux Density (B) - scalar and vector magnetic potentials - Magnetic Field Intensity (MFI) due to straight current carrying filament - Infinite sheet of current - circular loop - rectangular and square loop - Maxwell's Second equation $div(B)=0$ and Third Equation Curl H = J.

UNIT-4: Magnetic Forces

Force on a moving charge- Lorentz force equation - Force on a differential current element - Force between differential current elements - Force and torque on current loop placed in magnetic fields - Inductors and inductances: Inductor - Self Inductance - mutual inductance - energy stored and energy density in a magnetic field.

UNIT-5: Time Varying Fields

Magnetic Circuits - Faraday's law of electromagnetic fields– static and motional EMF – Displacement current – Point form of Maxwell's equations and Integral form of Maxwell's equations. The Uniform Plane Wave: Wave propagation in free space, dielectrics and good conductors: skin effect, Poynting theorem and wave power.

TEXT BOOKS:

1. W H Hayt, J A Buck 'Engineering Electromagnetics', 8th Edition TMH, 2012.
2. Mathew NO Sadiku, 'Elements of Electromagnetics', 6th Edition Oxford University Press, 2014.

REFERENCE BOOKS:

1. Joseph A Edminister, 'Theory and Problems of Electromagnetics', 4th Edition, Schaum's Outline Series, Mc-Graw Hill International, 2014
2. EC Jordan and KG Balmain, 'Electromagnetic Waves and Radiating Systems', 2nd Edition PHI 2003.

WEB REFERENCES:

1. http://nptel.ac.in/courses/108106073/
2. http://ocw.mit.edu/resources/res-6-001-electromagnetic-fields-and-energy-spring-2008/
3. http://freevideolectures.com/Course/2340/Electromagnetic-Fields#
4. https://www.brainkart.com/article/Electrostatics_12824/
5. https://www.brainkart.com/article/Magnetostatics_12825/

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II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
19BEE3TH06	**ANALOG ELECTRONICS**						

COURSE OBJECTIVES:

- Design and understand the operation of analog electronics circuits such as feedback amplifiers,
- Operational Amplifiers and its applications.
- Discuss the operation of Linear, Non-Linear wave shaping circuits and its applications
- Analyze the different basic op-amp circuits.
- Compare the working of multivibrators using op-amp, IC 555and the operation of different oscillators.
- Discuss the operation of the most commonly used D/A and A/D converters.

COURSE OUTCOMES:

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

CO 1: Design the operation of feedback amplifiers.
CO 2: Explain different wave shaping circuits
CO 3: Design different basic op-amp circuits.
CO 4: Design different multivibrators using op-amp and 555 timers, different oscillators.
CO 5: Analyze about different D/A and A/D converters.

UNIT -I: Feedback Amplifiers

Feedback principle and concept, Types of feedback, Classification of amplifiers-Voltage amplifier, Current amplifier, Trans conductance amplifier, Trans resistance amplifier, Feedback topologies, Characteristics of negative feedback amplifiers, General analysis of feedback amplifiers-input resistance and output resistance, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers, Analysis feedback amplifier-Voltage series feedback, Current shunt feedback.

UNIT -II: Linear and Non-Linear Wave Shaping

Linear Wave Shaping: The high pass and low pass RC circuits: Sinusoidal input, Step input, Pulse input, Square and Ramp input, RC network as a differentiator and an integrator.
Non-Linear Wave Shaping: Diode and its characteristics, Diode series clippers, Diode parallel clippers, Two level clipping circuits and Emitter coupled clipper, Clamping operation, Clamping circuits using diode with different inputs.

UNIT -III: Operational Amplifier and its Applications

Different stages of Operational Amplifier: Differential Amplifier, Ideal and practical Op-Amp. Characteristics of OP-Amps, DC and AC characteristics, Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, V to I and I to V converters, Comparators, Log and Anti log amplifiers.

UNIT -IV: Multivibrators and Timers

Multivibrators: Monostable, Bistable and Astable multivibrators using Op-amp. Timers: Introduction to 555 timer, Functional diagram, Monostable and Astable operation using 555 timer

UNIT -V: Active Filters, D/A and A/D Converters

Active Filters Introduction–Merits and demerits of active filters over passive filters–1st order, 2nd order LPF, HPF filters, Band pass, Band reject and All pass filters. D/A and A/D Converters: Introduction, Basic DAC techniques, Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different types of ADCs -Parallel comparator type ADC, Counter type ADC, Successive approximation ADC and Dual slope ADC.

TEXT BOOKS:

1. Integrated Electronics-Jacob Millman, C. Halkies, C.D. Parikh, Satyabrata Jit, Tata McGraw-Hill,Second Edition, 2011.
2. Linear Integrated Circuits -D. Roy Chowdhury, New Age International Pvt Ltd, Second Edition, 2003.
3. Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, Tata
4. McGraw-Hill, Second Edition, 2008.

REFERENCE BOOKS:

1. Op-Amps & Linear ICs -Ramakanth A. Gayakwad, Pearson Education, Fourth Edition, 2015.
2. Electronic Devices and Circuit Theory–R.L. Boylestad and Louis Nashelsky, Pearson Publications, Eleventh Edition, 2013.
3. Operational Amplifiers with Linear Integrated Circuits–William D. Stanley, Pearson Education India, Fourth Edition, 2002.

NARASARAOPETA ENGINEERING COLLEGE (AUTONOMOUS)

II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	1.5
19BEE3LB01	**ELECTRONIC DEVICES AND CIRCUITS LAB**

COURSE OBJECTIVES:
- Analyze the operation of PN diode and Zener diode.
- Identify and verify the efficiency of Half wave and Full wave Rectifiers.
- Explain the characteristics of transistor.
- Discuss the UJT characteristics.
- Discuss the working of FET.

COURSE OUTCOMES:
After the completion of this course, the students will able to
CO 1: Analyze the behavior of PN junction diode, Zener diode.
CO 2: Discuss the operational difference between Half wave and Full wave Rectifiers.
CO 3: Analyze the characteristics of transistor.
CO 4: Identify and analyze the UJT characteristics and its applications.
CO 5: Design transistor and FET amplifier circuits.

LIST OF EXPERIMENTS
1. P- N Junction diode characteristics
    Part A: Germanium Diode (Forward bias & Reverse bias)
    Part B: Silicon Diode (Forward bias & Reverse bias)
2. Zener diode characteristics
    Part A: V-I characteristics.
    Part B: zener diode as voltage regulator.
3. Rectifiers (with and without c-filter)
    Part A: Half-wave Rectifier
    Part B: Full-wave Rectifier
4. BJT Characteristics (CE configuration)
    Part A: input characteristics
    Part B: output characteristics
5. FET characteristics(CS configuration)
    Part A: Drain characteristics
    Part B: Transfer characteristics
6. SCR Characteristics.
7. UJT characteristics
8. CRO Operation and its Measurements
9. BJT-CE Amplifier
10. FET-CS Amplifier

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

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	20	30	50	1.5
19BEE3LB02	**ELECTRICAL CIRCUIT ANALYSIS LAB**						

COURSE OBJECTIVES:

- To learn the methods used for verification of circuit theorems.
- To study the concepts of resonance in series and parallel circuits.
- To understand the measurement of active and reactive power in a three-phase system
- To conduct experiment to calculate network parameters
- To learn the measurement of inductance of a mutually coupled coil.

COURSE OUTCOMES:

Upon successful completion of the course, the students able to

CO 1: Become familiar with the basic circuit components and know how to connect them to make a real electrical circuit.

CO 2: Verify the basic network theorems and understand the relationships and differences between theory and practice.

CO 3: Estimate the different types of two port network parameters

CO 4: Analyse the balanced three phase supply connected to balanced and unbalanced systems

LIST OF EXPERIMENTS

Any 10 of the following experiments to be conducted:

1. Verification of Thevenin's and Norton's Theorems.
2. Verification of Superposition theorem.
3. Verification of Maximum Power Transfer Theorem.
4. Verification of Reciprocity Theorem.
5. Verification of Millman's Theorem.
6. Series and Parallel Resonance of a RLC circuit.
7. Determination of Self, Mutual Inductances and Coefficient of coupling.
8. Z and Y Parameters of a Two-Port Network.
9. Transmission and hybrid parameters of a Two-Port Network.
10. Measurement of Active Power for Star and Delta connected balanced loads.
11. Measurement of Reactive Power for Star and Delta connected balanced loads.
12. Measurement of 3-phase Power by two wattmeter method for unbalanced loads.
13. Verification of Thevenin's and Norton's Theorems.(**virtual experiment**)
14. Series and Parallel Resonance of a RLC circuit(**virtual experiment**)

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
19BEE4TH02	**PROBLEM SOLVING USING PYTHON**						

COURSE OBJECTIVE:

- 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: Summarize the fundamental concepts of computer and python programming.
CO 2: Solve the given problems using raptor.
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.

UNIT-I

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

UNIT-II

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

UNIT-III

Introduction to python: Python-numbers, strings, variables, operators, expressions, statements, string operations, math function calls, Input/output statements, conditional if, while and for loops
Functions: user defined functions, parameters to functions, recursive functions, and turtle graphics.

UNIT-IV

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

UNIT-V

Event driven programming: Turtle bar chart, event driven programming, key press events, mouse events, timer events.
OOP: Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects ,inheritance, polymorphism, operator overloading (_eq_, _str_, etc); abstract classes; exception handling, try block.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

WEB RESOURCES:

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

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II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
19BEE4TH03	DIGITAL LOGIC CIRCUITS						

COURSE OBJECTIVES:

- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To discuss common forms of number representation in digital electronic circuits and to be able to convert between different representations.
- To implement simple logical operations & to familiarize with the concepts of Boolean algebra.
- To design combinational & sequential logic circuits for Various Applications.
- To implement the logic circuits on Programmable Logic Devices such as PROM, PLA, PAL.

COURSE OUTCOMES:

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

CO 1: Manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD.

CO 2: Deploy simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.

CO 3: Design and analyze combinational circuits for various Applications.

CO 4: Design and analyze sequential circuits for various Applications.

CO 5: Implement the logic circuits on PLD's such as PROM, PAL, PLA, CPLD and FPGAs.

UNIT- I: NUMBER SYSTEMS & CODES

Number systems: Representation of numbers of different radix, Conversation from one radix to another radix, r-1's compliments and r's compliments of signed numbers, Problem solving. Arithmetic operations (addition & subtraction): Binary, Octal, Decimal & Hexadecimal. Binary Codes: Classifications, BCD, Execess-3, Gray and their Properties.

UNIT- II: LOGIC OPERATIONS AND MINIMIZATION TECHNIQUES

Logic Operations: Basic logic operations- AND, OR, NOT, Universal building blocks, EX-OR, EX- NOR gates, Boolean theorems, Principle of complementation & Duality, De-Morgan theorems, Standard SOP & POS forms and their conversions, Two level NAND – NAND and NOR- NOR realizations.

Minimization Techniques: Minimization of logic functions using Boolean theorems, minimization of switching functions using K-Map up to 4 variables, Tabular (Quine-McCluskey) minimization, Problem solving.

UNIT- III: COMBINATIONAL LOGIC CIRCUIT DESIGN

Introduction, Design of Half adder, Full adder, half subtractor, Full subtractor. Applications: 4-bit binary parallel adder, Binary parallel subtractor, Adder-Subtractor circuits & Look ahead carry adder. BCD adder circuit, Excess 3 adder circuit. Encoders & Decoder: Design of decoder, Encoder, priority encoder, Realization of Boolean functions using decoders. Multiplexers & Demultiplexer: Design, Higher order, Realization of Boolean functions using multiplexers & demultiplexer. Comparators: Design of 2, 3 & 4-bit digital comparator.

UNIT- IV: SEQUENTIAL LOGIC CIRCUIT DESIGN

Introduction, Distinctions between Combinational and Sequential circuits.
Latches and Flip Flops: SR, JK, D and T type Flip Flops, Race around Condition in JK, JK Master Slave flip flop, Excitation table of all Flip Flops. Conversion from one flip-flop to another flip-flop. **Registers and Counters:** Shift Registers, Data Transmission in Shift Registers, Operation of Shift Registers, Bidirectional Shift Registers, and Universal Shift register. Design of synchronous and Asynchronous Counters, Design and Operation of Ring and Twisted Ring Counter.

UNIT- V: INTRODUCTION TO PLDs

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

TEXT BOOKS:

1. Digital Design – M. Morris Mano, PHI, Fourth Edition, 2008.
2. Switching and Finite Automata Theory – Zvi Kohavi, Cambridge University Press, Third Edition, 2009.
3. Switching Theory and Logic Design – A. Anand Kumar, Prentice-Hall of India Pvt. Ltd, Second Edition, 2014.

REFERENCE BOOKS:

1. Modern Digital Electronics – R. P. Jain, TMH, Fourth Edition, 2010.
2. Fundamentals of Logic Design – Charles H. Roth, Jr, Jaico Publishing House, Fourth Edition, 2006.
3. Microelectronics – Jacob Millman, Arvin Grabel, TMH, Second Edition, 2009.
4. Introduction to Switching Theory & Logical Design – Frederick J. Hill & Gerald R. Peterson, John Wiley & Sons Inc, Second Edition, 2012.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
19BCC4TH01	COMPLEX VARIABLES, PROBABILITY AND STATISTICS (CIVIL, EEE & ME(VI-semester))						

COURSE OBJECTIVES:

• To analyze the function of complex variable and its analytic property with a review of elementary complex function.

• To understand the Taylor and Laurent expansion with their use in finding out the residue and improper integral.

• To revise the elementary concepts of probability

• To introduce techniques for carrying out probability calculations and identifying probability distributions.

COURSE OUTCOMES:

On successful completion of this course, student will be able to:

CO 1: Apply the probability concepts in their respective engineering data.

CO 2: Apply discrete and continuous probability distributions to solve various engineering problems.

CO 3: Analyze the multivariate problems in engineering.

CO 4: Apply the method of least squares to estimate the parameters of a regression model.

CO 5: Determine the confidence interval for a population parameter for single sample and two sample cases.

UNIT I: FUNCTIONS OF COMPLEX VARIABLES:

Limit and Continuity of f(z), Derivative of f(z), Cauchy-Riemann equations, analytic functions, harmonic functions, Orthogonal system. Application: Flow problems.

UNIT II: COMPLEX INTEGRATION:

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

UNIT III: PROBABILITY AND RANDOM VARIABLES:

Probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), Binomial - Poisson approximation to the binomial distribution and normal distribution-their properties.

UNIT IV: SAMPLING DISTRIBUTION:

Estimation: Point Estimation, Interval Estimation, Bayesian Estimation.

UNIT V: TESTING OF HYPOTHESIS:

Formulation of null hypothesis, critical regions, level of significance.

Large sample tests: test for single proportion, difference of proportions, test for single mean and difference of means. Student t-distribution (single mean, two means and paired t-test),

Testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, 11/e (Reprint) 2019, Sultan Chand & Sons Publications.

Reference Books:

1. Miller and Freund's, Probability and Statistics for Engineers, 7/e, Pearson, 2008.
2. T. K. V. Iyenger, Probability and Statistics, S. Chand & Company Ltd, 2015.
3. Jay I. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
19BEE4TH04				**ELECTRICAL MACHINES – II**			

COURSE OBJECTIVES:

- To familiarize with Construction, principle of operation and performance of induction machines.
- To introduce the methods Starting and speed control of three-phase induction motors.
- To impart basic knowledge on construction, principle of operation and performance of single phase induction motors
- To understand common performance of salient and non – salient type synchronous generators.
- To learn the basic principle of operation and performance of synchronous motor.

COURSE OUTCOMES:

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

CO 1: Explain the working of poly phase induction motor and its testing and to draw Equivalent circuit.

CO 2: Use suitable starting and speed control methods to enhance the performance of three phase induction motors.

CO 3: Acquire the knowledge of 1-ph induction motors and their characteristics and their applications.

CO 4: Gain the knowledge on the construction and performance of Sailent and Non-Sailent Synchronous Generator

CO 5: Recall the knowledge on the construction and performance of Sailent and Non-Salient type Synchronous Motor.

UNIT-I: Three Phase Induction Motor

Constructional details - Types of rotors- Principle of operation - Slip –cogging and crawling-Equivalent circuit – Torque-Slip characteristics - Condition for maximum torque –Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram –Separation of losses – Double cage induction motors –Induction generators

UNIT-II: Starting and Speed Control of Three Phase Induction Motor

Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer and Star delta starters – Speed control – Voltage control, Frequency control and pole changing –Cascaded connection-V/f control – Slip power recovery scheme-Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking.

UNIT-III: Single Phase Induction Motors

Constructional details of single phase induction motor – Double field revolving theory and operation – Equivalent circuit -No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor- Shaded pole induction motor - Linear induction motor – Repulsion motor -Hysteresis motor .

UNIT-IV: Synchronous Generator

Constructional details – Types of rotors –winding factors- emf equation – Synchronous reactance – Armature reaction – Phasor diagrams - synchronous generator connected to infinite bus-Synchronizing and parallel operation-Voltage regulation-EMF-MMF-ZPF and ASA methods–slip test

UNIT-V: Synchronous Motor

Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted V curves – Power input and power developed equations – Starting methods – constant power input-constant excitation and constant power developed-Hunting — damper windings-synchronous condenser.

TEXT BOOKS:

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', McGraw Hill Publishing Company Ltd, 2002.
2. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003.

REFERENCE BOOKS:

1. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016
2. M.N. Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD., New Delhi, 2009.
3. B.R.Gupta,'Fundamental of Electric Machines' New age International Publishers, 3rd Edition , Reprint 2015.
4. Murugesh Kumar, 'Electric Machines', Vikas Publishing House Pvt. Ltd, 2002.

WEB RESOURCES:

1. www.allaboutcircuits.com/vol_2/chpt_13/7.html % poly phase induction

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
19BEE4LB02				**PROBLEM SOLVING USING PYTHON LAB**			

COURSE OBJECTIVE:

- 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:

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

CO 1: Develop interactive visual programs using Scratch.

CO 2: Develop flowcharts using raptor to solve the given problems.

CO 3: Develop Python programs for numerical and text based problems.

CO 4: Develop graphics and event based programming using Python.

LABORATORY EXPERIMENTS

1. Design a script in Scratch to make a sprite to draw geometrical shapes such as Circle, Triangle, Square, and Pentagon.

2. Design a script in Scratch to make a sprite to ask the user to enter two different numbers and an arithmetic operator and then calculate and display the result.

3. Design a Memory Game in Scratch which allows the user to identify positions of similar objects in a 3 x 3 matrix.

4. Construct flowcharts to
   a. calculate the maximum, minimum and average of N numbers
   b. Develop a calculator to convert time, distance, area, volume and temperature from one unit to another.

5. 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

6. Construct flowcharts with procedures to
   a)generate first N numbers in the Fibonacci series
   b) Generate N Prime numbers

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

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

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

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

11. Design a Python script to determine if a given string is a Palindrome using recursion

12. Design a Python script to sort numbers specified in a text file using lists.

13. 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.

14. Design a Python Script to determine the Square Root of a given number without using inbuilt functions in Python.

15. 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)

16. Design a Python Script to find the value of (Sine, Cosine, Log, PI, e) of a given number using infinite series of the function.

17. Design a Python Script to convert a given number to words

18. Design a Python Script to convert a given number to roman number.

19. Design a Python Script to generate the frequency count of words in a text file.

20. Design a Python Script to print a spiral pattern for a 2 dimensional matrix.

21. Design a Python Script to implement Gaussian Elimination method.

22. Design a Python script to generate statistical reports(Minimum, Maximum, Count, Average, Sum etc) on public datasets.

23. 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.

24. Design a Python script on oop's concepts: Class variables and instance variable
i) Robot ii) ATM Machine

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

TEXT BOOKS:

1. Kenneth Lambert, "Fundamentals of Python: First Programs" , ISBN-13: 978-1337560092,cengage learning publishers, first edition,2012.

2. Allen B. Downey, "think python: how to think like a computer scientist", ISBN-13: 978-1491939369, O'reilly, 2nd edition, 2016.

3. Reema Thareja, "Python Programming using Problem Solving Approach", ISBN-13:978-0-19-948017-3, Oxford University Press, 2017.

REFERENCE BOOKS:

1. Vamsi kurama, "Python programming : A modern approach", ISBN-978-93-325-8752-6, pearson,2018.

2. Mark Lutz , "Learning python", ISBN: 1-56592-464-9,Orielly, 4th edition, 1999 .

3. W.Chun, "Core python programming", ISBN-13: 978-0132269933, pearson, 2nd edition, 2016.

WEB RESOURCES:

1. https://raptor.martincarlisle.com/

2. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf

3. https://zhanxw.com/blog/wp-content/uploads/2013/03/BeautifulCode_2.pdf

4. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf

5. https://www.cse.msu.edu/~stockman/ITEC/Scratch/BGC2011Scratch-Rev1.pdf

6. https://nostarch.com/scratchplayground

7. http://fusecontent.education.vic.gov.au/9f79537a-66fc-4070-a5ce e3aa315888a1/scratchreferenceguide14.pdf

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
19BCC4LB01				**ENGLISH COMMUNICATION SKILLS LAB-II** (Common to All Branches)			

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

CO 1: Utilize Non-verbal cues and interpret nonverbal symbols.
CO 2: Develop presentation Skills and make formal presentations using strategies.
CO 3: Analyse problem solving skills effectively to participate in Group Discussions.
CO 4: Build interview skills for employability.

UNIT– I

Body Language

UNIT–II

Presentation Skills

UNIT–III

Group Discussions

UNIT-IV

Interviews and Telephonic Interviews

UNIT-V

Debates

TEXT BOOKS:

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

REFERENCE BOOKS:

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

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	20	30	50	1.5
19BEE4LB03	**ELECTRICAL MACHINES LAB-I**						

COURSE OBJECTIVES:
- To expose the students to the operation of D.C. machines and transformers and give them experimental skill.
- To familiarize various testing methods and speed control of DC Machines.
- To disseminate knowledge on various tests and parallel operation of single-phase transformers.

COURSE OUTCOMES:
Upon successful completion of the course, the students will be able to
CO 1: Select the appropriate apparatus for determining the performance of DC machines and transformers based on the capacity experimentally.
CO 2: Determine the equivalent circuit parameters of transformers experimentally.
CO 3: Compute the performance characteristics of transformers and DC machines through suitable tests

LIST OF EXPERIMENTS
Any 10 of the following experiments are to be conducted
1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Load test on D.C Shunt Generator.
3. Load test on D.C series generator.
4. Brake test on DC shunt motor. Determination of performance curves.
5. Fields test on DC series machines. Determination of efficiency.
6. Hopkinson's test on DC shunts machines. Predetermination of efficiency.
7. Swinburne's test and Predetermination of efficiencies as Generator and Motor.
8. Speed control of DC shunt motor by Field and armature Control.
9. Sumpner's test on a pair of single-phase transformers.
10. Parallel operation of two single phase transformers.
11. Load test on single-phase transformer
12. Scott connection of transformers.
13. Speed control of DC shunt motor by Field and armature Control(**Virtual experiment**)
14. Determination of Transformer equivalent circuit from Open Circuit and Short Circuit Test (**Virtual experiment**).

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	1.5
19BEE4LB04	**ANALOG AND DIGITAL CIRCUITS LAB**						

COURSE OBJECTIVES:

• Discuss the realization of logic gates, realize the logic gates with universal gates and realize the Flip-Flops.
• Realization of Adder, Subtractor, Comparator, Differentiator, Integrator and Schmitt trigger circuit using op-amp.
• Realization of LPF, HPF, and RC Phase shift oscillator (first order) using Op-amp.
• Analyzing linear wave shaping and nonlinear wave shaping
• Explain multivibrators using 555 IC timers

COURSE OUTCOMES:

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

CO 1: Realization of logic gates using universal gates and realization of Flip-Flops.

CO 2: Designing Adder, Subtractor, Comparator, Differentiator and Integrator using Op-amp.

CO 3: Designing LPF, HPF, and RC Phase shift oscillator (first order) using Op-amp.

CO 4: Design and analyze clippers, Clampers and also implement the applications using op-amps.

CO 5: Design of multivibrators using 555 IC timers and Schmitt trigger circuit using op-amp.

LIST OF EXPERIMENTS:

1. Realization of logicgates.
2. Representation of logic gates with universal gates.
3. Verification of SR and JK Flip-Flops operation.
4. Design of half adder, full adder and half subtractor.
5. Linear wave shaping-low pass and high pass circuits.
6. Nonlinear wave shaping-clippers and clampers circuits.
7. Realization of adder, subtractor, and comparator circuits using Op-amp.
8. Designing LPF, HPF (first order) using Op-amp.
9. Designing Differentiator and Integrator using Op-amp.
10. Designing Monostable and Astable operation circuits using IC 555timer.
11. Designing RC Phase shift oscillator using Op-amp
12. Design of Schmitt trigger using Op-amp