

**ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS**

MECHANICAL ENGINEERING

B.Tech - Four Year Degree Course

(Applicable for the Batches Admitted from 2020-21)

R-20

(Choice Based Credit System)



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



Course Structure and Syllabus

(R20 Regulations)

Mechanical Engineering

B.Tech – I Year

(Applicable for the Batches admitted from 2020-21)



NARASARAOPETA
ENGINEERING COLLEGE
(AUTONOMOUS)

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

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

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

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

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

The curriculum mandates students to take up five skill courses which are relevant to the industry from second year onwards, two basic level skill courses, one on soft skills and other two on advanced level skill courses. The students are also given the option of choosing between skill courses offered by the college and a certificate course offered by industry, a professional body, APSSDC or any other accredited body.

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

1. PROGRAMS OFFERED BY THE COLLEGE

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

S. No.	Name of the Program	Program Code
1.	Civil Engineering	01
2.	Electrical and Electronics Engineering	02
3.	Mechanical Engineering	03
4.	Electronics and Communication Engineering	04
5.	Computer Science and Engineering	05
6.	Information Technology	12
7.	CSE (Artificial Intelligence)	43

2. ELIGIBILITY FOR ADMISSION

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

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

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

Eligibility for Admission - Under Lateral Entry Scheme (LES)

Students with diploma qualification have an option of direct admission into 2nd year B. Tech. (Lateral Entry Scheme). Under this scheme 10% seats of sanctioned intake will be available in each course as supernumerary seats. Admissions to this three-year B Tech 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.

3. AWARD OF THE DEGREE:

For Regular and LES students

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

- (a) Pursues a course of study in not less than four and not more than eight academic years for regular students. For LES students, pursue a course of study for not less than three academic years and not more than six academic years counted from the academic year of admission.
- (b) He/she shall forfeit their seat in B. Tech course and their admission stands cancelled after eight academic years for regular students and six academic years for LES students starting from the academic year of admission.
- (c) Registers for 160 credits and must secure all the 160 credits for Regular students. Registers for 121 credits and must secure all the 121 credits for LES students
- (d) A student shall be eligible for the award of B.Tech degree with Honors or Minor if he/she earns 20 credits in addition to the 160/121 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

Academic Calendar

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

4. Assigning of Credits:

- 1 Hr. Lecture (L) per week - 1 credit
- 1 Hr. Tutorial (T) per week - 1 credit
- 1 Hr. Practical (P) per week - 0.5 credits
- 2 Hours Practical (Lab)/week - 1 credit

5. There shall be mandatory student induction program for freshers, with a three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., shall be included in the guidelines issued by AICTE

6. All undergraduate students shall register for NCC/NSS activities. A student will be required to participate in an activity for two hours in a week during second and third semesters. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behaviour. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

7. Courses like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. A student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

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

9. All Open Electives are offered to students of all branches in general. However, a student shall choose an open Elective from the list in such a manner that he/she has not studied the same course in any form during the Programme.

10. A student shall be permitted to pursue up to a maximum of two elective courses under MOOCs during the Programme. Attendance will not be monitored for MOOC courses. Student has to pursue and acquire a certificate for a MOOC course only from the organizations/agencies approved by the BoS in order to earn the 3 credits. The Head of the department shall notify the list of such courses at the beginning of the semester.

11. The college shall invite registration forms from the students at the beginning of the semester for offering professional and open elective courses. There shall be a limit on the minimum and maximum number of registrations based on class/section strength.

12. Students shall undergo mandatory summer internships for a minimum of six weeks duration at the end of second and third year of the Programme. There shall also be mandatory full internship in the final semester of the Programme along with the project work.

13. There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain courses and the remaining one shall be a soft skills course.

14. Under graduate Degree with Honors/Minor shall be issued by the Institute to the students who fulfil all the academic eligibility requirements for the B. Tech program and Honors/Minor program. The objective is to provide additional learning opportunities to academically motivated students.

15. Assessment: The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory, 50 marks for practical subject. The distribution shall be 30% marks for Internal Evaluation and 70% marks for the End Semester Examinations. A student has to secure not less than 35% of marks in the end semester examination and minimum 40% of marks in the sum total of internal and end semester examination marks to earn the credits allotted to each course.

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.

THEORY

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

INTERNAL EVALUATION

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

- 1) **Assignment Test – 1 (A1):**

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

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

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

3) **Descriptive Test – 1(D1):**

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

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

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

A2 test will be conducted after 3.5 units of syllabus (covering syllabus from 2.5 to 3.5 units)

Q2 and D2 will be conducted after 5th unit is over. For D2, one 5 marks question will be given from second half of third unit, two 10 marks questions will be given each from units 4 and 5.

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

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

EXTERNAL EVALUATION

External theory examination Question Paper will have the following format

PART-A (5 X 4 Marks = 20 Marks)

Answer ALL questions

Five 4-Marks Questions from each 5 Units

PART-B (5 X 10 marks = 50 marks)

Two questions will be given from each unit of syllabus with internal choice of one question.

PRACTICALS

INTERNAL EVALUATION

There shall be continuous evaluation during the semester for 15 internal marks.

The internal marks shall be awarded as follows:

- i) Day to day performance: Record (2M) +Experiment (2M)+ Viva (1M) - 05 Marks
- ii) Internal Lab Test : 10 Marks

Total =i +ii =05+10 = 15 Marks.

EXTERNAL EVALUATION

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

DRAWING SUBJECTS

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

The 30 internal marks will be evaluated as follows:

Internal Tests : 15 marks. (1½ hour duration)

Day – to – day work: 15 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 (3x05 M = 15M)

There shall be two internal tests in a semester. The sum of 80% of the best and 20% of the least of two internal tests shall be considered for the award of internal marks.

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

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

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

Internal Evaluation: Max Marks: 30

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

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

Cycle-I Examination – Conventional drawing pattern

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

Day-to-day evaluation	- 15 Marks
Descriptive Test	- 15 Marks

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

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

for duration of 2 hours.

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

Record	- 10 Marks
Execution	- 10 Marks
Paper Work	- 10 Marks

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

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

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

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

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

PASS MARK CRITERIA

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

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

S.No	Category of Subject	Max. Marks	Internal Marks	External Marks	External pass %	External pass mark	Over all pass %	Over all pass mark
1	Theory/ Drawing	100	30	70	35	25	40	40
2	Practical	50	15	35	35	12	40	20

16. Attendance Requirements:

- i. A student shall be eligible to appear for end semester examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.
- ii. Shortage of Attendance below 65% in aggregate shall in NO case be condoned.
- iii. Condonation for shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
- v. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end semester examination of that class and their registration shall stand cancelled.
- vi. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester, as applicable. They may seek readmission for that semester when offered next.
- vii. A stipulated fee shall be payable towards condonation of shortage of attendance to the college. (a) A student is eligible to write the end semester examinations if he acquires a minimum of 50% in each subject and 75% of attendance in aggregate of all the subjects.

18. Promotion Rules:

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

19. Grading:

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

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

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

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

$$\text{SGPA} = \frac{\sum (C_i \times G_i)}{\sum C_i}$$

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

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

$$\text{CGPA} = \frac{\sum (C_i \times S_i)}{\sum C_i}$$

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

- iii. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- iv. SGPA & CGPA will be calculated for those candidates who have passed all the subjects in that or up to that semester respectively.
- v. *Grade Point*: It is a numerical weight allotted to each letter grade on a 10-point scale.
- vi. *Letter Grade*: It is an index of the performance of students in a said course. Grades are denoted by letters A+, A, B, C, D, E and F.
- vii. As per AICTE regulations, conversion of CGPA into equivalent percentage as follows:

$$\text{Equivalent Percentage} = (\text{CGPA} - 0.75) \times 10$$

Award of Class:

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

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

20. **Gap - Year:**

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

REVALUATION

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

MINIMUM INSTRUCTION DAYS

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

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

WITHHOLDING OF RESULTS

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

TRANSITORY REGULATIONS

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

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

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

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

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

Transfer candidates (from an autonomous college affiliated to JNTUK)

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

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

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

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

Scope

1. The academic regulations should be read as a whole, for the purpose of any interpretation.
2. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.
3. The college may change or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the date notified by the College Authorities.

MALPRACTICES RULES**DISCIPLINARY ACTION FOR / IMPROPER CONDUCT INEXAMINATIONS**

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

	Nature of Malpractices/ Improper conduct	Punishment
	<i>If the candidate:</i>	
1(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination).	Expulsion from the examination hall and cancellation of the performance in that subject only.

1(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the college.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals 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.	<p>Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent /any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or 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.</p>	<p>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.</p>
7.	<p>Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.</p>	<p>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.</p>
8.	<p>Possess any lethal weapon or firearm in the examination hall.</p>	<p>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.</p>

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

NARASARAOPETA ENGINEERING COLLEGE:: NARASARAOPET

(AUTONOMOUS)

DEPARTMENT OF MECHANICAL ENGINEERING

I B.TECH- I SEMESTER

S. No	Subject	Course Code	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	Engineering Chemistry	R20CC1103	BS	30	70	100	3	0	0	3
2	Matrix Algebra and Calculus	R20CC1102	BS	30	70	100	2	1	0	3
3	Technical and Communicative English-I	R20CC1101	HS	30	70	100	3	0	0	3
4	Engineering Mechanics	R20CC1107	ES	30	70	100	2	1	0	3
5	Problem Solving using Python	R20ME1106	ES	30	70	100	3	0	0	3
6	Soft skills and Communication Skills Lab-1	R20CC11L1	HS	15	35	50	0	0	3	1.5
7	Engineering Chemistry Lab	R20CC11L5	BS	15	35	50	0	0	3	1.5
8	Problem Solving using Python Lab	R20ME11L3	ES	15	35	50	0	0	3	1.5
Total										19.5

I B.TECH – II SEMESTER

S. No	Subject	Course Code	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	Differential Equations and Vector Calculus	R20CC1201	BS	30	70	100	2	1	0	3
2	Engineering Physics	R20CC1203	BS	30	70	100	3	0	0	3
3	Engineering Drawing	R20CC1207	ES	30	70	100	1	0	4	3
4	Elements of Electrical and Electronics Engg.	R20ME1214	ES	30	70	100	3	0	0	3
5	Material Science and Metallurgy	R20ME1218	ES	30	70	100	3	0	0	3
6	Elements of Electrical and Electronics Engg. Lab	R20CC12L7	ES	15	35	50	0	0	3	1.5
7	Engineering Physics Lab	R20CC12L5	BS	15	35	50	0	0	3	1.5
8	Engineering Workshop	R20CC12L4	ES	15	35	50	0	0	3	1.5
9	Constitution of India (MC)	R20CCMC2	MC	-	-	-	2	0	0	0
Total										19.5

I B.TECH- I SEMESTER

S. No	Subject	Course Code	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	Engineering Chemistry	R20CC1103	BS	30	70	100	3	0	0	3
2	Matrix Algebra and Calculus	R20CC1102	BS	30	70	100	2	1	0	3
3	Technical and Communicative English-I	R20CC1101	HS	30	70	100	3	0	0	3
4	Engineering Mechanics	R20CC1107	ES	30	70	100	2	1	0	3
5	Problem Solving using Python	R20ME1106	ES	30	70	100	3	0	0	3
6	Soft skills and Communication Skills Lab-1	R20CC11L1	HS	15	35	50	0	0	3	1.5
7	Engineering Chemistry Lab	R20CC11L5	BS	15	35	50	0	0	3	1.5
8	Problem Solving using Python Lab	R20ME11L3	ES	15	35	50	0	0	3	1.5
Total										19.5

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Code: R20CC1103	ENGINEERING CHEMISTRY (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. Sessa 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
	2	1	0	30	70	100	3
Code: R20CC1102	MATRIX ALGEBRA AND 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:

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

CO1: Solve the system of linear equations.

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

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

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

CO5: Identify 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 Jordan and Gauss Seidal Methods. Solutions of linear simultaneous equations: LU decomposition.

Application: Finding the current in an electrical circuit, Traffic flow

UNIT – II: EIGENVALUES AND EIGENVECTORS

Eigenvalues, Eigenvectors, Properties, Cayley - Hamilton Theorem (without proof), Quadratic forms, Reduction of quadratic form to canonical form, Rank, Positive definite, negative definite, semi definite, index, signature.

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

UNIT – III: MEAN VALUE THEOREMS

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 DIFFERENTIATION:

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

UNIT-V: MULTIPLE INTEGRALS:

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

TEXT BOOKS:

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

REFERENCES:

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

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Code: R20CC1101	TECHNICAL AND COMMUNICATIVE ENGLISH-I (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 inculcate the skills of listening, reading and critical thinking.
- To integrate English Language learning with employability skills and training.
- To enhance the students' proficiency in reading skills enabling them meet the academic demands of their course.

COURSE OUTCOMES:

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

CO1: Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it.

CO2: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams.

CO3: Build grammatically correct sentences using a variety of sentence structures.

CO4: Enhance word power and usage of lexicons.

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

UNIT-I**Hours of Instruction per unit: 8****1. A Drawer full of Happiness**

- Listening** : Dialogues, Task based listening activities.
- Speaking** : Asking and answering general questions.
- Reading** : Skimming, Scanning.
- Writing** : Punctuations, Paragraphs.
- Grammar & Vocabulary** : Nouns, Adjuncts, GRE Vocabulary, Technical Vocabulary.

UNIT-II**Hours of Instruction per unit: 8****2. Nehru's Letter to daughter Indira on her Birthday**

- Listening** : Individual and pair based listening to the audio track.
- Speaking** : Discussion in pairs / small groups on specific topics.
- Reading** : Identifying sequence of ideas; recognising verbal techniques.
- Writing** : Summarising, Paraphrasing.
- Grammar & Vocabulary** : Articles, Adjectives, Prepositions Verbal Competence, Synonyms & Antonyms, Analogy, GRE Vocabulary, Technical Vocabulary.

UNIT-III**Hours of Instruction per unit: 8****3. Stephen Hawking- Positivity ‘Benchmark’**

- a. **Listening** : Listening for global comprehension and summarising.
- b. **Speaking** : Discussing specific topics in pairs (or) small groups and reporting the discussion, Complaining, Apologising.
- c. **Reading** : Reading between the lines, Critical reading for evaluation.
- d. **Writing** : Official Letter writing, E-Mail etiquette, General Netiquette, Covering Letter & Resume writing.
- e. **Grammar & Vocabulary** : Phrasal verbs, Verbs, Tenses (Present, Past & Future), Concord: Subject-Verb Agreement, Verbal reason, Using equivalents, Word associations, GRE Vocabulary, Technical Vocabulary.

UNIT-IV**Hours of Instruction per unit: 8****4. Like a Tree, Unbowed: Wangari Maathai- Biography**

- a. **Listening** : Making predictions while listening to conversations (or) transactional dialogues.
- b. **Speaking** : Role plays for practice of conversational English in academic contexts (formal and informal) .
- c. **Reading** : Information transfer (Tables, Bar Diagrams, Line Graphs, Pie Diagrams)
- d. **Writing** : Interpreting visual information, Statement of Purpose (SOP)
- e. **Grammar & Vocabulary** : Gender inclusive language (Gendered Noun, Gender-neutral Noun), Quantifying expressions, Adjectives, Adverbs, Degrees of comparison, GRE Vocabulary, Technical Vocabulary.

UNIT-V**Hours of Instruction per unit: 8****5. “Stay Hungry, Stay Foolish”- Rushmi Bansal**

- a. **Listening** : Identifying key terms, understanding concepts, interpreting the concepts.
- b. **Speaking** : Formal oral presentations on topics from academic contexts.
- c. **Reading** : Reading comprehension, The RAP strategy for in-depth reading, Intensive reading and extensive reading.
- d. **Writing** : Academic proposals, Poster presentation.
- e. **Grammar & Vocabulary** : Reported Speech, Reporting verbs for academic purposes, Corrections of sentences, GRE Vocabulary, Technical Vocabulary.

TEXTBOOKS:

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

REFERENCES:

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

Web References:

1. www.enchantedlearning.com
2. <https://www.englisch-hilfen.de/en/>
3. <https://www.bbc.co.uk/learningenglish/>
4. <https://in.usembassy.gov/education-culture/american-spaces/american-space-new-delhi/collection/>
5. https://www.talkenglish.com/speaking/basics/speaking_basics_ii.aspx
6. <https://www.englishclub.com/speaking/>
7. <https://agendaweb.org/listening-exercises.html>
8. <https://www.esolcourses.com/content/topicsmenu/listening.html>
9. <https://www.esl-lab.com/>
10. https://www.eagetutor.com/eage-fluent-english-speaking-search-p.htm?gclid=EAIaIQobChMIpr-F5OzH7QIVChsrCh1kBAkzEAMYASAAEgINpFD_BwE
11. https://www.myenglishpages.com/site_php_files/reading.php
12. <https://www.cambridgeenglish.org/learning-english/free-resources/write-and-improve/>

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	0	30	70	100	3
Code: R20CC1107	ENGINEERING MECHANICS (COMMON TO ME, CE BRANCHES)						

COURSE OBJECTIVES:

- Learn and understanding the basic principles of mechanics of rigid bodies, various types of force systems and to analyze problems in a simple and logical manner.
- Study and calculate the concepts of wedge friction, and to analyze simple trusses using method of joints and method of sections.
- Study and determine centroids and center of gravity of various standard geometrical shapes as well as composite areas and bodies.
- Learn the concept of moment of inertia and the mathematical calculations involved in finding moments of inertia of two dimensional areas.
- The students are to be exposed to concepts of work, energy and particle motion.

COURSE OUTCOMES:

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

- CO 1:** Apply the principles of mechanics to determine the resultant of several concurrent forces acting on a particle.
- CO 2:** Analyze the trusses using method of joints and method of sections; apply the basic concepts of dry friction and wedges.
- CO 3:** Illustrate the centroid and center of gravity bodies and composite sections.
- CO 4:** Determine the Area Moment of Inertia and Mass Moment of Inertia of areas bodies and Composite sections.
- CO 5:** Apply the work-energy principle to particles and connected systems for engineering Applications.

Prerequisites: Vectors, Differential equations and integrations.

UNIT-I

INTRODUCTION TO ENGINEERING MECHANICS: Basic Concepts, Characteristics of a Force, Force system, classification, Resultant of Force Systems, parallelogram law of forces, Triangle law of forces.

SYSTEMS OF FORCES: Resolution of forces, Coplanar Concurrent forces, Moment of Force and its Application–Couples, Varignon's theorem.

EQUILIBRIUM OF SYSTEMS OF FORCES: Equations of Equilibrium of Coplanar concurrent forces, Lami's Theorem, support reactions, free body diagrams.

UNIT-II

ANALYSIS OF PLANE TRUSSES: Definition, Assumptions made in the analysis of plane trusses-methods of joints and method of sections.

FRICTION: Introduction, Classification of friction, Laws of Friction, Coefficient of Friction, Angle of Friction, Angle of Repose, Motion of a body on an Inclined Plane, Ladder friction, Wedge friction.

UNIT-III

CENTROID: Centroids of simple figures (from basic principles)-Centroids of composite figures.

CENTRE OF GRAVITY: Centre of Gravity of simple body (from basic principles), Centre of gravity of composite bodies, pappu's theorem.

UNIT-IV

AREA MOMENTS OF INERTIA: Definition, Radius of gyration, Parallel axis theorem, perpendicular axis theorem, Moments of Inertia of composite figures, polar moment of Inertia.

MASS MOMENT OF INERTIA: Moment of Inertia of Rigid body-Moment of Inertia from basic principles-Slender bar, Rectangular Plate, Circular Plate, Moment of Inertia of 3D Bodies-Cone, Solid Cylinder.

UNIT-V

KINETICS: Analysis as a particle, Newton's laws of motion, D'Alembert's principle –simple applications-analysis as a rigid body in translation-fixed axis rotation-Simple applications.

WORK-ENERGY METHOD: Equations for Translation, work-Energy applications to particle motion, connected system-Impulse momentum method-simple applications

TEXT BOOKS:

1. Engineering Mechanics by S.Timoshenko & D.H.Young., 4th Edn - ,Mc Graw Hill publications.
2. Engineering Mechanics by S.S. Bhavikatti-New age publications
3. Engineering Mechanics Statics and Dynamics A.K.TAYAL Umesh publications.

REFERENCE BOOKS:

1. Engineering Mechanics by Fedinand . L. Singer , Harper –Collins.
2. Mechanicsof Materials (In SI Units) by Beer and Johnson, Tata McGraw-Hil.
3. Strengthof Materials (Mechanics of Materials) by James M.Gere and Barry J.Goodno, PWS-KENT Publishing Company, 1990
4. Strengthof Materials (Mechanics of Solids) by R.K. Rajput , S.Chand Publications.

Web References:

1. <https://nptel.ac.in/courses/112103109/142>.
2. <https://nptel.ac.in/courses/112103109/113>.
3. <https://nptel.ac.in/courses/122104014/4>

E-Books:

1. <https://easyengineering.net/engineeringmechanicsbooks/>

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Code: R20ME1106	PROBLEM SOLVING USING PYTHON (OTHER THAN CSE)						

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

CO 1: Outline the computer system concepts and the flowcharts using raptor to solve the given problems.

CO 2: Summarize the fundamental concepts of python programming.

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

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

UNIT-I

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

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

UNIT-II

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

UNIT-III

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

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

UNIT-IV

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

UNIT-V

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

WEB RESOURCES:

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

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
Code: R20CC11L1	SOFT SKILLS AND COMMUNICATION SKILLS LAB -1 (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 with the knowledge of phonetics.
- To provide exposure to students to soft skills like Goal Setting, Time Management, Interpersonal Skills, and Intra Personal Skills.

COURSE OUTCOMES:

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

- CO1:** Communicate effectively with good pronunciation, overcoming mother tongue influence in academic and professional environment.
- CO 2:** Listen and comprehend several accents of English Language
- CO 3:** Take part in various conversations/discourses using formal and informal expressions.
- CO 4:** Adapt soft skills successfully in personal and professional life.

UNIT- I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

- Time Management.
- Goal Setting.
- Interpersonal Skills & Intra personal skills.

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.
6. K. R Lakshmi Narayanan, T. Murugavan, *Managing Soft Skills*, Scitech Publications, 2010.
7. K V S G Murali Krishna, K V K K Prasad, *Placement and Personality Development*, Second Edition, Reem Publications Pvt. Limited, 2012
8. Shiv Khera, *You can Win*, Bloomsbury Publication, 2014
9. Stephen R. Covey, *The 7 Havits of Highly Effective People*, Free Press, 1989

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

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

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
Code: R20ME11L3	PROBLEM SOLVING USING PYTHON PROGRAMMING LAB (OTHER THAN CSE)						

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

CO 1: Create 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:**WEEK-1:**

1. Design a script in Scratch to make a sprite to draw geometrical shapes such as Circle, Triangle, Square, and Pentagon.
2. Design a script in Scratch to make a sprite to ask the user to enter two different numbers and an arithmetic operator and then calculate and display the result.

WEEK-2:

3. Construct flowcharts to
 - a. calculate the maximum, minimum and average of N numbers
 - b. Develop a calculator to convert time, distance, area, volume and temperature from one unit to another.
4. Construct flowcharts with separate procedures to
 - a) calculate simple and compound interest for various parameters specified by the user
 - b) Calculate the greatest common divisor using iteration and recursion for two numbers as specified by the user

WEEK-3:

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

WEEK-4:

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

WEEK-5:

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

WEEK-6:

11. Design a Python script to sort numbers specified in a text file using lists.
12. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format($0 \leq YYYY \leq 9999$, $1 \leq MM \leq 12$, $1 \leq DD \leq 31$) following the leap year rules.
13. Design a Python Script to determine the Square Root of a given number without using inbuilt functions in Python.

WEEK-7:

14. Design a Python Script to determine the time difference between two given times in HH:MM:SS format. ($0 \leq HH \leq 23$, $0 \leq MM \leq 59$, $0 \leq SS \leq 59$)
15. Design a Python Script to convert a given number to words

WEEK-8:

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

WEEK-9:

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

WEEK-10:

20. Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorizing them into distinction, first class, second class, third class and failed.
21. Write a Python program to convert a given tuple of positive integers into an integer.

WEEK-11:

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

WEEK-12:

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

WEB RESOURCES:

1. <https://raptor.martincarlisle.com/>
2. <http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf>
3. https://zhanxw.com/blog/wp-content/uploads/2013/03/BeautifulCode_2.pdf
4. <http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf>
5. <https://www.cse.msu.edu/~stockman/ITEC/Scratch/BGC2011Scratch-Rev1.pdf>
6. <https://nostarch.com/scratchplayground>

I B.TECH – II SEMESTER

S. No	Subject	Course Code	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	Differential Equations and Vector Calculus	R20CC1201	BS	30	70	100	2	1	0	3
2	Engineering Physics	R20CC1203	BS	30	70	100	3	0	0	3
3	Engineering Drawing	R20CC1207	ES	30	70	100	1	0	4	3
4	Elements of Electrical and Electronics Engg.	R20ME1214	ES	30	70	100	3	0	0	3
5	Material Science and Metallurgy	R20ME1218	ES	30	70	100	3	0	0	3
6	Elements of Electrical and Electronics Engg. Lab	R20CC12L7	ES	15	35	50	0	0	3	1.5
7	Engineering Physics Lab	R20CC12L5	BS	15	35	50	0	0	3	1.5
8	Engineering Workshop	R20CC12L4	ES	15	35	50	0	0	3	1.5
9	Constitution of India (MC)	R20CCMC2	MC	-	-	-	2	0	0	0
Total										19.5

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

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

CO1: Apply first order ordinary differential equations to real life situations.

CO2: Identify and apply suitable methods in solving the higher order differential equations.

CO3: Solve the partial differentiation equations.

CO4: Interpret the physical meaning of different operators as gradient, curl and divergence.

CO5: Estimate the work done against a field, circulation and flux using vector calculus.

UNIT –I

DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE: Linear-Bernoulli's-Exact equations and equations reducible to exact form.

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

UNIT-II

LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER: Finding the complementary functions, Inverse operator, Rules for finding the particular integrals, Method of variation of parameters. Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients.

Application: L-C-R Circuit problems.

UNIT –III

FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS: Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange's) equations.

UNIT –IV

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

UNIT –V

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

TEXT BOOK :

1. Dr. B.S. Grewal, “*Higher Engineering Mathematics*”, 43rd Edition, Khanna Publishers, 2012.
2. B.V.Ramana, “*Higher Engineering Mathematics*”, 32nd Edition, McGraw Hill Education, 2018.
3. Bhavanari Satyanarayana, Pradeep Kumar T.V. & Srinivasulu D, “*Linear Algebra and Vector Calculus*”, Studera Press, New Delhi, 2017.

REFERENCES:

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

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Code: R20CC1203	ENGINEERING PHYSICS (Common to CE and ME)						

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

CO 2: Analyze and understand various types of lasers & optical fibers.

CO 3: Identifies the crystal structures and XRD techniques.

CO 4: Knowing the applications of magnetic and superconducting materials in engineering field.

CO 5: Identifies the use of Acoustics and Ultrasonics 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 - Applications

UNIT-II

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

Fiber Optics: Introduction- Basic Structure and Principle of optical fiber - Acceptance angle – Acceptance 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

Magnetic materials: Magnetic dipole moment- Magnetization- Magnetic Susceptibility- Magnetic permeability –Classification of Magnetic materials – Dia, Para, and Ferro – Hysteresis Loop- Soft and Hard magnetic materials – Applications of Magnetic materials

Superconductivity: Introduction- Properties, Meissner effect - Type-I and Type-II super conductors-BCS theory (Qualitative) – AC and DC Josephson effects - Applications of Superconductors

UNIT-V

Acoustics: Introduction – requirements of acoustically good hall– Reverberation – Reverberation time – Sabine’s formula - Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedial measures.

Ultrasonics: Introduction - Properties - Production by Magnetostriction and Piezoelectric methods – Non Destructive Testing (Qualitative) – Applications.

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 Kittel, “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
	1	0	4	30	70	100	3
Code: R20CC1207	ENGINEERING DRAWING						

COURSE 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 planes 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:

CO1: Construct the geometrical shapes of regular polygons, Engineering Curves, and scales.

CO2: Illustrate the orthographic projections, projections of points, and lines inclined to both the planes.

CO3: Construct the projection of planes inclined to both the planes.

CO4: Analyze the projection of solids and the development of surfaces for regular solids.

CO5: Analyze 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.

ENGINEERING SCALES: Introduction scales on drawings Representation fraction: Construction of plain, diagonal and vernier scale.

UNIT–II

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

PROJECTION OF POINTS: Principles of orthographic projection – Convention.

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, determination of true lengths, angle of inclination and traces.

UNIT–III

PROJECTIONS OF PLANES: regular planes perpendicular / parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT-IV

PROJECTIONS OF SOLIDS: introduction to projections of solids, types of solids: prisms, pyramids, cones and cylinders –simple positions and the axis inclined to one of the planes.

DEVELOPMENT OF SURFACES: Development of surfaces of right regular solids- Prisms, Cylinder, Pyramids, Cone and their sectional parts

UNIT-V

INTRODUCTION OF ISOMETRIC VIEWS: Isometric projections & orthographic projections. Conversion of isometric views to orthographic views and orthographic views to isometric views.

INTRODUCTION TO AUTO CAD: Practice on Draw, Edit & Modify commands using auto CAD.

TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications.
2. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers.

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://www.youtube.com/watch?v=ohhdNRtDpCY>,

E-Books:

1. <https://www3.nd.edu/~cpoellab/teaching/cse40814/Lecture1-Handouts.pdf>

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Code: R20ME1214	ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGG.						

COURSE OBJECTIVES:

- To familiarize with the basic DC network.
- To explain the concepts of electrical machines and their characteristics.
- To identify the importance of transformers and induction motor.
- To impart knowledge about the characteristics of semiconductor devices.
- To expose basic concepts and applications of Transistor

COURSE OUTCOMES:

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

CO 1: Analyze the behaviour of an electrical circuit.

CO 2: Measure the performance quantities such as losses, efficiency of DC machines

CO 3: Create the construct of transformer and Induction motor

CO 4: Classify the importance and applications of p-n junction diode.

CO 5: Evaluate the configurations and applications of Transistor.

UNIT-I

Basic laws and Circuits: Active and passive elements-voltage-current-power-power factor-energy-Ohms law-Kirchhoff's Laws-series and parallel circuits-source transformations-delta-wye conversion.

UNIT-II

DC Machines: Principle Operation-Constructional features-induced EMF-Types of DC generators-Working of DC motor-Torque expression-3point starter-Speed controls-Losses and Efficiency by direct loading.

UNIT-III

Transformers: Constructional details-working principle-EMF equation-voltage regulation-losses and efficiency-open/short circuit tests.

Induction Motors: 3-Phase Induction motor Construction-working principle-Types-slip-Performance characteristics-1-phase Induction motor working principle-applications

UNIT –IV

Semiconductor Devices: Introduction-Bonds-extrinsic-intrinsic-p-n Junction diode-current and voltage characteristics-rectifier circuits-half wave-full wave-bridge rectifier-Zener diode as Voltage Regulator- Characteristics of operation amplifiers (OP-AMP) – application of OP-AMPs (inverting, non-inverting, integrator and differentiator)

UNIT –V

Transistor Configurations: Construction-working-Transistor as amplifier-Transistor as switch - Analysis of CE, CB and CC Characteristic's-Comparison of CE, CB and CC configurations.

TEXT BOOKS:

1. D.P.Kothari, I.J.Nagrath, Basic Electrical and Electronics Engineering, 1st edition, McGraw Hill Education (India) Private Limited, 2017.
2. B.L. Theraja, Fundamentals of Electrical Engineering and Electronics, 1st edition, S. Chand Publishing, New Delhi, 2006.
3. Adel S. Sedra and Kenneth C. Smith, Microelectronic Circuits 6th edition, Oxford University Press, 2014.
4. V.K. Mehta, "Principle of Electrical and Electronics Engg." S.Chand publishing, New Delhi, 2006.

REFERENCES:

1. S.K.Bhattacharya, Basic Electrical and Electronics Engineering, Pearson Education, 2011.
2. Dharma Raj Cheruku, B T Krishna, Electronic Devices and Circuits, 2/e, Pearson Education, 2008.
3. R.K.Rajput, Basic Electrical and Electronics Engineering, University Science Press, New Delhi, 2012.

Web References:

1. <https://www.youtube.com/watch?v=ohhdNRtDpCY>

E-Books:

1. <https://www3.nd.edu/~cpoellab/teaching/eee40814/Lecture1-Handouts.pdf>

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Code: R20ME1218	MATERIAL SCIENCE AND METALLURGY						

COURSE OBJECTIVES:

- To learn the principles of materials science and engineering through lab investigation
- To learn to organize the lab results into a logic, concise and accurate report
- To review physics and chemistry in the context of materials science and engineering
- To give an introduction to metals, ceramics, composites powder metallurgy

COURSE OUTCOMES:

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

- CO 1:** Illustrate the knowledge related to the structure and properties of materials, crystal systems and phase diagrams of alloys.
- CO 2:** Examine properties of ferrous materials and their engineering applications
- CO 3:** Explain the basic concepts of Heat treatment processes and their applications
- CO 4:** Examine nonferrous materials properties and their engineering applications.
- CO 5:** Choose the various types of ceramics, composite materials and basic steps involved in the Powder Metallurgy process.

UNIT- I

STRUCTURE OF METALS AND CONSTITUTION OF ALLOYS: Ionic, Covalent and Metallic bonds; Amorphous and Crystalline solids. Crystal structure - BCC, FCC, HCP. Crystallization of metals, Necessity of alloying, substitutional and interstitial solid solutions.

EQUILIBRIUM DIAGRAMS: Introduction, Importance and types - Unary, Binary and Ternary phase diagrams; Binary phase diagrams of Fe-Fe₃C and Cu-Ni. Micro constituents in steels- Austenite, Ferrite, Cementite, Pearlite, Bainite, Martenite; eutectic, peritectic, eutectoid and peritectoid reactions. Cooling curve of pure iron, Lever Rule, Gibbs Phase Rule.

UNIT -II**FERROUS METALS AND ALLOYS:**

STEELS: Introduction, Extraction of steel, basic furnaces to make Iron and Steel. Classification and Influence of constituents on steel; Structure, properties and applications of plain carbon steels; Alloy steels-Purpose and effect of alloying elements; Properties of Stainless steels.

CAST IRON: Introduction, comparison with steels and Classification-Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, S.G. cast iron.

UNIT - III

HEAT TREATMENT OF ALLOYS: Purpose of heat treatment; Process and applications of Annealing, Normalizing, Hardening and tempering; TTT diagrams, Hardenability and factors affect hardening; Surface Hardening of Steels- Carburizing, Nitriding, Cyaniding.

UNIT - IV

NON-FERROUS METALS AND ALLOYS: Introduction, Structure and properties of copper, Aluminium, Titanium and their alloys.

UNIT – V

CERAMICS: Introduction; Glasses, Abrasive materials.

COMPOSITE MATERIALS: Introduction, types - particle reinforced, fiber reinforced and structural composites.

POWDER METALLURGY: Introduction, preparation, industrial applications, advantages and limitations.

TEXT BOOKS:

1. Introduction to Physical Metallurgy by Sidney H. Avener, TataMcGraw Hill
2. Material Science and Metallurgy by V.D.Kodgire, Everest Publishing House

REFERENCES:

1. Materials Science and engineering by Callister and Baalashubrahmanyam, Wiley India
2. Material science and Engineering by V. Rahghavan, P.H.I Publications
3. Material Science and Metallurgy by A V K Suryanarayana, B S Publications
4. Material Science and Metallurgy by U. C. Jindal by Pearson Publications

WEB REFERENCES:

1. <http://nptel.ac.in/courses/Webcourse>
2. [contents/IIScBANG/Material%20Science/pdf/Lecture Notes/ MLN_02.pdf](http://contents/IIScBANG/Material%20Science/pdf/Lecture%20Notes/MLN_02.pdf)
3. <http://nptel.ac.in/courses/113105023/Lecture7.pdf>
4. [http://nptel.ac.in/courses/Webcourse-contents/IIScBANG/Material%20Science/pdf/PPTs/ MTS_07_m.pdf](http://nptel.ac.in/courses/Webcourse-contents/IIScBANG/Material%20Science/pdf/PPTs/MTS_07_m.pdf)
5. http://nptel.ac.in/courses/IITMADRAS/Design_Steel_Structures_I/1_introduction/3_properties_of_steel.pdf
6. http://nptel.ac.in/courses/112108150/pdf/Lecture_Notes/MLN_10.pdf

E-Books:

1. <https://www.ebooks.com/en-us/subjects/technology-metallurgy-ebooks/1211/>
2. http://www.digitalbookindex.org/_search/search010mmetallurgya.asp
3. <https://www.pdfdrive.com/metallurgy-books.html>
4. <https://www.elsevier.com/books/fundamentals-of-metallurgy/seetharaman/978-1-85573-927-7>
5. <https://ebooks.benthamsience.com/book/9781681085708/>

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
Code: R20CC12L7	ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGG. LAB (Common to ME and CE)						

COURSE OBJECTIVES:

- To expose the students to the operation of DC motor, Transformer and rectifiers give them experimental skill.

COURSE OUTCOMES:

After completion of the course, the students will able to

CO1: Determine the efficiency and regulation of 1-phase transformer

CO2: Compute the performance characteristics of transformers and DC machines through suitable tests.

CO3: Calculate the ripple factor of half-wave & full-wave rectifiers.

CO4: Gain practical experience related to electronics circuits; stimulate more interest and Motivation for further studies of electrical circuits.

LIST OF EXPERIMENTS

Any 5 of the following experiments to be conducted from each PART:

PART-A: Electrical Experiments:

- Verification of Kirchhoff's law.
- Swinburne's test and Predetermination of efficiencies as Generator and Motor
- Brake test on DC shunt motor. Determination of performance curves
- Speed control of D.C shunt motor by a) Armature voltage control b) Field flux control method.
- OC & SC tests on single phase transformer (predetermination of efficiency and regulation).
- Load test on three-phase induction motor.

PART-B: Electronics Experiments:

- PN junction diode characteristics a) Forward bias b) Reverse bias
- Transistor CE characteristics (input and output).
- Half wave rectifier characteristics with and without filter
- Full wave rectifier characteristics with and without filter
- Characteristics of CE Amplifier.
- Characteristics of CC Amplifier.

Virtual lab:

- Verification of Kirchhoff's law.
- Brake test on DC shunt motor. Determination of performance curves
- Full wave rectifier characteristics with and without filter

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
Code: R20CC12L5	ENGINEERING PHYSICS LAB (Common to CE and ME)						

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

CO1: Understand the principle of physics and interpret them in engineering field and compares the results with theoretical calculations.

CO2: Ability to use modern engineering physics techniques and tools in real time applications in engineering studies.

CO3: The student will be enabled to know about the characteristics and the behaviour of materials in a practical manner and gain knowledge and its usage.

LIST OF EXPERIMENTS:

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

TEXT BOOKS:

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

Web References:

- <https://www.youtube.com/watch?v=NDsSPtL9dyQ>
- <https://www.youtube.com/watch?v=9agoJRCnu4w>
- <https://www.youtube.com/watch?v=bv-ILJreyCU>
- <http://vlab.amrita.edu/index.php>

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	15	35	50	1.5
Code: R20CC12L4	ENGINEERING WORKSHOP						

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:

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

- 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 different components using Tin Smithy and black smithy tools.
- CO 4:** Demonstrate the various house wiring connections for different house wiring connections.
- CO 5:** Demonstrate the need of PC hardware components, applications and software.

LIST OF EXPERIMENTS:**ENGINEERING WORKSHOP TRADES FOR EXERCISE:****CARPENTRY**

1. Cross-Lap joint
2. Dove tail joint

FITTING

1. V-fit
2. Square fit

TINSMITHY

1. Square box without lid
2. Tapper tray

HOUSE WIRING

1. Two lamps series connection & parallel connection
2. Fluorescent Tube Wiring & Stair Case Wiring

BLACK SMITHY

1. S-Hook
2. Round rod to square rod

IT WORKSHOP: (Minimum 7 tasks need to be completed)

PC Hardware:

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

Internet & World Wide Web:

Different ways of hooking the PC on to the internet from home and workplace and effectively 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.

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

PC Hardware

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

Task 2: (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, and Installation of MS windows on a PC

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

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

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

Internet & Networking Infrastructure

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

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

Task 7: Search Engines & Netiquette:

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

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

WORD

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

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

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

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	0	0	-	-	-	0
Code: R20CCMC2	CONSTITUTION OF INDIA (MC)						

COURSE OUTCOMES:

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

- 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:** 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 Publication.
2. Constitution of India by PROFESSIONAL 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

