Shivaji University
Vidya Nagar, Kolhapur, Maharashtra 416004

School of Engineering and Technology
(Department of Technology)

As per NEP2020 guidelines

Second Year B. Tech (Electronics and Telecommunication Engineering), Detailed 40:60 Curriculum 2026-27 onwards

A. Definition of Credit

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
2 Hr. Practical(Lab) per week	1 Credit

B. Credits for award of Degrees

a) A total of **176 credits** are required for all the students to get entitled for **Under Graduate Degree in Engineering (Major) with a Multidisciplinary Minor (MDM).** This feature is the **fourth vertical (Level 6.0)** from the National Credit Framework. For such a candidate the degree offered would be: B.Tech in Major Degree Title with Multidisciplinary Minor. The routine fees will be charged for award of the degree with multidisciplinary minor**.** There will be a pool of multidisciplinary minors for each major UG Program.

b) A student will be entitled to acquire this 'MDM featured' **Under Graduate Degree** with **Honors,** if the candidate earns an **additional 17 credits.** Out of these 17 credits, 15 credits will be against 5 different theory courses (3 credits each) pertaining to the Major Discipline while 2 credits will be against an advance laboratory practice in the respective discipline of studies. These theory credits could be acquired preferably through MOOCs the title of which will be well declared to the aspirants. This particular feature is the **fifth vertical (Level 6.0)** from the National Credit Framework. For such a candidate the degree offered would be: B.Tech Honors in Major Degree and Multidisciplinary Minor. For this option of Honors, the interested candidates have to pay the separate fees as decided by the institute.

c) A student will be entitled to acquire this 'MDM featured' **Under Graduate Degree having an option of Honors with Research**. For the same, the candidate, in addition to those **17** credits allotted to the Honors, has to earn an **additional of 3 credits against an extra research project.** (As regards this extra project work, it is mandatory to be successful in publishing at least one research paper based on the research topic.) This feature is the **sixth vertical (Level 6.0)** from the National Credit Framework. For such a candidate the degree offered would be: B.Tech Honors with Research in Major Degree and Multidisciplinary Minor. The interested candidates for this option will have to pay the separate fees as decided by the institute.

d) A student will be entitled to acquire this 'MDM featured' **Under Graduate Degree** with **additional Specialization Minor,** if the candidate earns an **additional 14 credits against one more minor from the specialization.** These will be a separate pool of the specialization minors for choice. (The courses under minors could be through MOOCs also). This is the case of double minors and it is the **seventh vertical (Level 6.0)** from the National Credit Framework. For such a candidate the degree offered would be: B.Tech in Major Degree with double minors. (Multidisciplinary Minor and Specialization

minor.) For this option of additional specialization minor, the interested candidates will have to pay the separate fees as decided by the institute.

C. Component wise distribution of credits

(Expected range of credits as per AICTE & NEP2020 guidelines is 160-176)

Sr. No.	Category Suggested	Course Code	No. of Credits	Components %
1.	Humanities and Social Sciences including Management & Environment Courses	HSMEC	04	2.27
2.	Indian Knowledge System	IKS	05	2.84
3.	Ability Enhancement Course	AEC	03	1.70
4.	Value Education Courses	VEC	02	1.14
5.	Basic Science courses	BSC	27	15.34
6.	Engineering Science Courses including workshop, drawing, basics of civil/electrical/mechanical/computer etc.	ESC	34	19.32
7.	Professional Core Courses	PCC	54	30.69
8.	Professional Elective Courses relevant to chosen specialization/branch	PEC	06	3.41
9.	Open subjects – Electives from other technical and /or emerging subjects	OEC	12	6.82
10.	Project , Seminar and Internship	PSI	15	8.52
11.	Multidisciplinary Minor	MDM	14	7.95
11.	Vocational and Skill Enhancement Courses	VSEC	Audit Courses	-
12.	Project Based Learning	PBL		
13	Mandatory Audit Courses [Some other courses Decided at the Institute level but that do not get fit in the credits]	MAC (HSMEC)*		
	Total		176	**100**

* Please note that most of the courses under HSMEC have been covered under audit courses.

D. Course code and Definition

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
MDM	Multidisciplinary Minor
SPM	Specialization Minor
ISE	In Semester Examination
ESE	End Semester Examination
IE	Internal Evaluation
EE	External Evaluation
BSC	Basic Science Course
ESC	Engineering Science Course
HSMEC	Humanities and Social Sciences including Management , Environmental Course
PCC	Professional Core Course
PEC	Professional Elective Course
OEC	Open Elective Courses
VSEC	Vocational and Skill Enhancement Courses
IKS	Indian Knowledge System
AEC	Ability Enhancement Course
VEC	Value Education Courses
MAC	Mandatory Audit Course
PSI	Project, Seminar, Internship
PBL	Project Based Learning
PBL, PBI	Project Based Learning Program Based Internship
MN , HN, HNR	Minor , Honors, Honors with Research
CC, DC	Certificate Course, Diploma Course
CHE, CE,CST	Chemical Engineering, Civil Engineering, Computer Science and Technology
ETC, FT, ME	Electronics and Telecommunication Engineering, Mechanical Engineering, Food Technology

Mandatory Induction Program at FY B. Tech First Term Commencement
(3 Weeks Duration)

a) Physical activity
b) Creative Arts
c) Universal Human Values
d) Literary
e) Proficiency Modules
f) Lectures by Eminent People
g) Visits to local Areas
h) Familiarization to Dept./Branch & Innovations

Note: On the campus, besides the curriculum structure, as co-curricular activities, National Cadet Corps (India) i.e. NCC is available for the interested & selected students while National Service Scheme i.e. NSS unit is for all the volunteer students who will contribute as and when necessarily called for the services.

E. Academic Rules and Regulations for MDM featured Four-Year B. Tech. Degree

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Glossary

B. Tech.: Bachelor of Technology, an Under Graduate Degree awarded from the Shivaji University, Kolhapur

Director: Director, Department of Technology, Shivaji University, Kolhapur

Program: The specialization in B.Tech (Particular Major Branch)

Program Head: The Head of the Specialized Branch of B.Tech studies

DC: Department Committee

DEC: Departmental Examination Coordinator

Semester: The academic year will be divided into two regular semesters of approximately 20 weeks' duration each. Typically, the odd semester will be from the first week of July to last week of November while the even semester will be from the first week of January to the last week of May.

This will include the period of academic delivery (14 to 15 weeks), Internal Evaluation (CIE) i.e. In Semester Examination and Assignments, End Semester Examination (ESE) assessment and declaration of results.

R.B.T.: Rule B.Tech

Course: Subject

Course Coordinator: Subject teacher

Course Credit: Weighted sum of the number of Lecture hours (L), Tutorial hours (T), and Practical hours (P) associated with the course.

Credits Earned: The sum of course credits for credit courses in which a student has passed.

Grade: Assessment of the student's performance in a course indicated by the letters, “AA”, “AB”, “BB”, “BC”, “CC”, “CD”, “DD”, “FF”, “XX”, “ABSENT”, “PP”, “NP”.

Grade Point: Number equivalent of the letter grades given by 10, 9, 8, 7, 6, 5, 4 corresponding to grades “AA”, “AB”, “BB”, “BC”, “CC”, “CD”, “DD” respectively. “FF” and “XX” carry zero grade points.

Instructor: Member of faculty who will be assigned to teach a specific course.

Semester Grade Points: The sum of the products of credits and Grade Points for each course registered by a student in a semester.

SGPA: Semester Grade Point Average

CGPA: Cumulative Grade Point Average

ATKT: Allowed to Keep Terms.

R.B.T. 1 Admission:

At the Department of Technology, Shivaji University, candidates are admitted to all the available specialized B. Tech Programs according to norms and conditions prescribed as per AICTE, New Delhi and DTE, Mumbai, Maharashtra.

R.B.T. 2 Award of Degree:

Following rules prevail for the award of degree:

1. B. Tech Degree will be awarded to the student, who has registered and earned all the credits of prescribed courses under the general departmental requirements.
2. In addition to the credit requirement prescribed above for the Degree award, each student will have to complete the requirements of Audit Course (AC) during the programme. All the students will receive certification as PP *(for Passed),* and NP *(for not passed)* in AC, in the mark sheet. While obtaining certification as PP is a mandatory requirement for the Degree award of a student, this will not be taken into account for computing the final Cumulative Grade Point Average.
3. A student has obtained CGPA ≥ 4.5.
4. A student has paid all the institute dues and satisfied all the requirements prescribed.
5. A student has no case of indiscipline pending against him/her.
6. University authorities will recommend the award of B. Tech. Degree to a student who is declared to be eligible and satisfies the said norms.

R.B.T. 3 Attendance Rule:

All students must attend every lecture, tutorial and practical class. However, to account for late registration, sickness or other such contingencies, the attendance requirement will be a minimum of 75% of the classes actually held. A student with less than 75% attendance in a course during the semester, in lectures, tutorials and laboratories taken together (as applicable), will be awarded an 'XX' grade in that course irrespective of his/her performance in the tests.

Attendance record will be maintained based upon roll calls (or any equivalent operation) in every scheduled lecture, tutorial and practical class. The course coordinator will maintain and consolidate attendance record for the course (lectures, tutorials and laboratories together, as applicable).

R.B.T. 4 Academic Progress Rules (ATKT Rules)

1. If a candidate fails in any number of courses (subject heads) of Semester I, will be allowed to proceed to Semester II.
2. A candidate, who earns 50% of total credits of Level 4.5 (FY B.Tech), will be allowed to keep terms in Level 5.0 (SY B.Tech).
3. If a candidate fails in any number of courses (subject heads) of Semester III, will be allowed to proceed to Semester IV.
4. A candidate, who earns 50% of total credits of Level 5.0 (SY B.Tech), will be allowed to keep terms in Level 5.5 (TY B.Tech).
5. No candidate will be allowed to proceed to Semester V (TY B.Tech), unless candidate has passed in all courses of Level 4.5 (FY B.Tech).
6. If a candidate fails in any number of courses (subject heads) of Semester V, will be allowed to proceed to Semester VI.
7. A candidate, who earns 50% of total credits of Level 5.5 (TY B.Tech), will be allowed to keep terms in Level 6.0 (Final Year B.Tech).
8. No candidate will be allowed to proceed to Semester VII (Final Year B.Tech), unless candidate has passed in all courses of Level 5.0 (SY B.Tech).
9. If a candidate fails in any number of courses (subject heads) of Semester VII, shall be allowed to proceed to Semester VIII.

10. In case, if the rules of any Apex body differ from these rules, then the rules of that apex body will be applicable. However under the National Education Policy, the rules extended by University from time to time regarding ATKT will be applicable.

11. While considering the passing heads, for a year (both the semesters), 45 % aggregate score is mandatory failing to which the same will be considered as one more passing head. Any such student needs to improve the score in either of the courses to maintain 45 % aggregate for the year through appearing in re-examination or rEEated examination. In such cases, the award of grade for calculation of SGPA and CGPA will be as per the table no.3 from clause R.B.T 12 with the consideration of one grade penalty as mentioned under the clause R.B.T 15, f.

12. A student who has obtained 'FF' grade in ESE of a regular semester and has obtained 'FF' grade in 2nd attempt of ESE will be eligible to choose one of the two options below to clear the backlog:

i. Re-registration for the next regular semester course whenever that course is offered.

ii. Application for REEated Examination.

13. A student who has been detained in a regular semester and obtained 'XX' grade can Re-register for the next regular semester whenever it is offered.

14. The maximum duration for getting B. Tech. degree for students admitted in the first semester of U.G. program will be 16 semesters (eight academic years) while for lateral entry students admitted in the third semester will be 14 semesters (seven academic years) from their date of admission. The maximum duration of the program includes the period of withdrawal, absence and different kinds of leaves permissible to a student but excludes the period of rustication of a student from the department.

15. If a student is unable to gain all credits of first year in three years from the date of the admission, then the candidate will be declared as "Not Fit for Engineering" leading to discontinuation of candidate's registration with the department.

16. DEEnding upon the academic progress of a student, department may take a decision regarding continuation or discontinuation of candidate's registration with the institute.

R.B.T. 5 Academic Flexibility

1. Flexibility in deciding curriculum structure and contents of curriculum with reasonable frequency for changes in the same.
2. Continuous assessment of student's performance with newly adopted NEP 2020 Credit system based on Award of Grade.
3. Credits are quite simply a means of attaching relative values to courses different components. These are a currency of learning, and in general regarded as a measure of the time typically required to achieve a given curricular outcome.
4. All courses (year-wise) under each program/discipline are unitized

R.B.T. 6 Credit system:

Education at the Institute is organized around the semester-based credit system of study. The prominent features of the credit system are a process of continuous evaluation of a student's performance/progress and flexibility to allow a student to progress at an optimum pace suited to candidate's ability or convenience, subject to fulfilling minimum requirements for continuation.

A student's performance/progress is measured by the number of credits that the candidate has earned, i.e. completed satisfactorily. Based on the course credits and grades obtained by the student, grade point average is calculated. A minimum grade point average is required to be maintained for satisfactory progress and continuation in the program. Also a minimum number of earned credits and a minimum grade point average should be acquired in order to qualify for the degree. All programs are defined by the total credit requirement and a pattern of credit distribution over courses of different categories.

R.B.T. 7 Features of Credit System at Department of Technology, Shivaji University, Kolhapur:

Every course is allotted credits based on its academic importance/weightage.

1. All courses may not have same credits.
2. 21 credits / semester for First Year B.Tech while 20 credits /semester for remaining 6 semesters. Thus there are 162 credits against the B.Tech Major plus additional 14 credits against the chosen Multidisciplinary Minor. So the total credits of this

Multidisciplinary Minor (MDM) Featured B.Tech Degree is 176. The particular Degree falls under the **fourth vertical** (Level 6.0) as per the National Credit Framework.

3. Absolute grading System with 7 passing Grades viz. AA, AB, BB, BC, CC, CD, DD and FF for failure.
4. Standardization of courses; with few exceptional cases, each course is of 6 units.
5. In Semester Examination (ISE) and End Semester Examination (ESE), both having (40:60) weightage in the student's performance in course work/laboratory work and other activities. A student's performance in a subject will be judged by taking into account the results of In Semester Examination and End Semester Examination together. Students must score 40% marks in ESE irrespective of the ISE marks.

   (Note: The ISE will be conducted as In Semester Exam and assignments throughout the semester on dates announced in advance by the department and its results to be made known to the students from time to time. However, the dates for the ESE will be fixed at the University level.)
6. Continuous internal evaluation consists of 'In Semester Examination' of 20 marks and assignment of 10 marks handled by Department of Technology and setting of question papers should be done by course coordinator. Assignments may be of varied nature for each course based on the need of the course coordinator.
7. End Semester Examination (ESE) to be conducted by the Department of Technology however setting of question papers will be as per University Rules. The ESE will include a written examination for theory courses and practical/design/drawing examination with built-in oral part for laboratory/ design/drawing courses.

   7.1 End Semester Examination (ESE) of the courses offered for the MOOCs will be conducted by MOOC offering Institute. The credits earned by the students will be communicated to the University and to be converted as per the weightage of the said course in the structure. Student may get failure in the said MOOC or the examination may get delayed by the MOOC offering institute, in either cases, ESE of the said course will be conducted as per the University rules.
8. In case the candidate is absent on the scheduled ISE, request for separate In Semester Examination for the students representing in co-curricular, extracurricular activities or

on medical grounds will only be considered. On receipt of application from the student, the DC will take decision for the conduct of the In Semester Examination.

9. Care will be taken to ensure that the total numbers of days for academic work are ≥180 per year.
10. Academic schedule prescribed will be strictly adhered and applicable to all the UG Programs.

R.B.T. 8 Course credits assignment:

Each course, except a few special courses, has a certain number of credits assigned to it dEEnding upon its lecture, tutorial and laboratory contact hours in a week. This weightage is also indicative of the academic expectation that includes in-class contact and self-study outside of class hours.

Lectures and Tutorials: One lecture or tutorial hour per week per semester is assigned one credit.

Practical/Laboratory: One laboratory hour per week per semester is assigned half credit.

Sample Example: Course: Fluid Flow Operations: 05 credits (3-1-2)

The credits indicated for this course are computed as follows:

3 hours/week lectures = 3 credits

1 hours/week tutorial = 1 credit

2 hours/week practical = 2 × 0.5 = 1 credit

Also, (3-1-2) **5** credit course = (**3** hr. Lectures + **1** hr. Tutorial + **2** hr. Practical) per week

= **6** contact hours per week = **5** credits

R.B.T. 9 Detailed Evaluation Scheme:

1. Out of total 100% theory weightage, 30% weightage is allotted for In Semester Examination (ISE). Appearing for ISE is must and student must submit the assignments to become eligible for End Semester Examination (ESE) of respective course.

   ISE (30% weightage) includes:

   a. In Semester Examination of 20 Marks of one Hour
   b. Assignments of 10 Marks during entire semester

2. For the End Semester Examination (ESE), 70 marks question paper will be set in which student must secure 40% (28 Marks out of 70) as university examination pass head

and candidate must be appeared for ISE to become eligible for ESE of respective course.

3. Final theory marks (out of 100) will be the addition of ISE (30 Marks) and ESE (70Marks).
4. Final laboratory letter grade will be awarded (100%) will be the addition of IE (50%) and EE (50%) as applicable to the course.
5. End Semester Examination (ESE) for laboratory consists of internal evaluation (IE) and External Evaluation (EE). Nature of the evaluation as viva-voce or practical will be as applicable to the course which will be well mentioned in the course description.
6. There will be no EE for laboratory courses of the First Year. The entire assessment of a student will be based on IE 100% weightage and a minimum performance of 40% in IE will be required to obtain the passing grade. IE of laboratory work will be based on turn-by-turn supervision of the student's work and the quality of the candidate's work as prescribed through laboratory journals and the candidate's performance in oral or Practical/Oral examinations uniformly distributed throughout the semester. Student must submit and secure 40% marks in the IE of the concerned course. Non submission of the term work and the IE score below 40% marks will lead to term not grant (TNG). The TNG cases must be promptly communicated by the course teacher to the examination cell of the Department of Technology. The Departmental Examination Coordinator (DEC) will communicate the same to the office of the Director, Board of Examinations and Evaluation,, Shivaji University, Kolhapur for further actions.
7. The assessment of laboratory courses from the 3rd semester onwards will be carried out in two parts.
    i. ISE of laboratory will be based on turn-by-turn supervision of the student's work and the quality of candidate's work as prescribed through laboratory journals and the performance in oral or Practical/Oral examinations uniformly distributed throughout the semester. Student must submit and secure 40% marks in the IE of the concerned course. Non submission of IE will lead to term not grant (TNG).
    ii. ESE of laboratory will be based on performing an experiment followed by an oral examination or a written examination.

iii. The relative weightage for IE and EE for assessment of laboratory courses will be 50% and 50% respectively from second year onwards and a minimum performance of 40% in both IE and EE separately will be required to obtain the passing grade.

iv. EE for laboratory course will normally be held one week before the ESE for theory courses and will be conducted by a panel of examiners consisting of external and internal examiner. This activity will be coordinated by Department Examination Coordinator (DEC) in consultation with Coordinator of the respective Program.

8. A student failed in EE of a laboratory course in a regular semester will be eligible to appear for examination conducted along with ESE of laboratory courses of the subsequent semester. Such examination will be fairly comprehensive (generally of 3 hours similar to EE i.e. External Examinations) to properly judge candidate's practical skill and theoretical knowledge for that laboratory course. The candidate will suffer a grade penalty as per Table 3.

9. Assessment of Seminar, Mini-project, Major Project, internship etc.:

i. The Seminar/Project report must be submitted by the prescribed date usually two weeks before the end of academic session of the semester.

ii. It is desirable that the topics for seminar/project be assigned by the end of previous semester.

iii. The seminar report and the presentation of seminar will be evaluated by panel of three departmental faculty members (decided by Branch Coordinator).

iv. The mini-project will be evaluated jointly by a panel of three Internal Examiners.

v. The report on field training will be evaluated by a panel of three Internal Examiners.

vi. The assessment of B. Tech major project work will be carried out in two phases as follows:

For IE, there will be

a) Departmental Committee (To approve synopsis submission based on seminar)

b) Project work assessment by Guide

(Departmental Committee constitution will be as follow:

(1) Director- Chairman

(2) Branch Coordinator from respective branch – member

(3) Senior faculty from respective branch – member

(4) Guide/Course Coordinator- member

EE consists of progress seminar and presentation to be evaluated by panel of internal and external examiners. The process will be as below:

a) Project work assessment by Guide

b) Report submission based on seminar which will be evaluated by Departmental Committee

c) EE (Viva-voce and presentations): Evaluation by panel of external and internal examiners.

vii. The evaluation of industrial internship: Students will undergo industrial internship for one semester (8th Semester). Students have to prepare a report related to the work carried out during this internship. This may include study of the new science/technology, applications of the technology/development of the technology and its implementation /designing/obtaining practical or numerical solution etc. By the Program, there will random and surprise visits to the place of internship so as to record the attendance and performance of the interns. The evaluation will be as per the university examination similar to the project evaluation.

10. The duration of End Semester Examination will be 2.5 hrs. however there might be few courses having duration of End Semester Examination as 3 hrs.

11. In respect of IE and Laboratory work, a target date will be fixed for the completion of each sheet, job, Project, experiment or assignment and the same either complete or incomplete will be collected on the target date and assessed immediately at the respective departments by the concerned teachers and % marks (or grades) will be submitted to the Co-ordinator. The Co-ordinator of the Department of Technology will communicate this % of marks (or grades) to the University.

12. In respect of IE of the audit (Non Credit) courses, the respective course in charge will organise and plan activities for the conduct of the evaluation. Preferably, the teacher will announce 5 assignments each one carrying 10 marks. So based on the assignments

submitted by the candidate, there will be evaluation out of 50 marks. The passing is for 20 marks. The passing is mandatory for every student. However, the course in charge will communicate to the examination section whether the student has passed the audit course or not. As mentioned earlier, in case of audit courses, the result will appear over the mark sheet and certificate as either PP for passed and NP for not passed.

R.B.T. 10 Earning credits:

At the end of every course, a letter grade is awarded in each course for which a student had registered. On obtaining a pass grade (≥40% minimum grade DD), the student accumulates the course credits as earned credits. A student's performance is measured by the number of credits that the candidate has earned and by the weighted grade point average.

The credit system enables continuous evaluation of a student's performance, and allows the students to progress at an optimum pace suited to individual ability and convenience, subject to fulfilling minimum requirement for continuation.

As regards earning credits against certificate or Diploma award (exit after the first year and the second respectively) also through Honors, Honors with Research, Specialization Minors, all these are the optional for the interested ones. The earning of credits for certificate and diploma is mandatory to take place immediately within 45 days from the last day of respective even End Semester Examination. In case of the credits against the Honors, Honors with Research, Specialization Minor, interested candidates need to plan for the same from SY B. Tech to Final Year B. Tech completion. As per the list of interested students to opt for these features, the Department of Technology will plan the activities regarding conduct/mentoring of the course/s by such students. Further from time to time, the Department will communicate the details of such students to the University Examination section. The students will have their respective End Semester Examination in continuation to the End Semester Examination of the Majors.

The details regarding credits assigned against all these features are elaborated in R.B.T. 19.

R.B.T. 11 CGPA Improvement Policy for award of degree:

A student getting CGPA ≤ 4.50 with grade 'DD' in any course or grade 'FF' in any course will have the possibility to rEEat one or more 'DD' graded courses along with the failed courses, /are being offered in a semester.

An opportunity will be given to a student who has earned all the credits required by the respective program with CGPA greater than or equal to 4.00 but less than 4.50, to improve his/her grade by allowing him/her to appear for SEE of maximum two theory courses of seventh and eighth semester.

R.B.T. 12 Evaluation System:

1. **Semester Grade Point Average (SGPA)**

$$= \frac{\sum(\textbf{Course credits in passed courses} \times \textbf{Earned Credits})}{\sum(\textbf{Course credits in registered courses})}$$

2. **Cumulative Grade Point Average (CGPA)**

$$= \frac{\sum(\textbf{Course credits in passed courses} \times \textbf{Earned Credits})\textbf{of all Semesters}}{\sum(\textbf{Course credits in registered courses})}$$

   i. Cumulative Grade Point Average (CGPA) will be calculated cumulatively for Sem. I to Sem. VIII for regular students.

   ii. Cumulative Grade Point Average (CGPA) will be calculated cumulatively for Sem. III to Sem. VIII for lateral entry students.

3. At the end of B. Tech Program, student will be placed in any one of the divisions as detailed below:

   Ist Division with distinction : CGPA $\geq$ 7.5 and above

   Ist Division : CGPA $\geq$ 6.0 and < 7.5

   IInd Division : CGPA $\geq$ 5.5 and < 6.0

New gradation suggested as follows.

Table 1

Grade Points	Equivalent Range
5.5	55%
6.0	60%
6.5	65%
7.0	70%
7.5	75%

Conversion of CGPA to percentage marks for CGPA **≥ 4.5** can be obtained using equation.

Percentage marks = (CGPA x 10)

An example of these calculations is given below (It's a sample calculation):

Typical academic performance calculations - I semester

Table 2

Course no.	Course credits	Grade awarded	Earned credits	Grade points	Points secured
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6 (col4 *col5)
MALXXX	5	CC	5	6	30
CSLXXX	4	CD	4	5	20
PHLXXX	4	AA	4	10	40
PHPXXX	2	BB	2	8	16
MELXXX	4	FF	0	0	00
TTNXXX	2	AB	2	9	18
Total	21		17	38	124

1. Total Points earned for this semester = 124

$$\textbf{Semester Grade Point Average (SGPA)} = \frac{124}{21} = 5.90$$

2. Cumulative Grade Point Average (CGPA) =

Cumulative points earned in all passed courses = 124 (past semesters) + 124 (this semester) = 248

Cumulative earned credits = 23 (past semesters) + 21 (this sem.) = 44

$$\textbf{Cumulative Grade Point Average (CGPA)} = \frac{\Sigma(124+124)}{\Sigma(23+21)} = 5.63$$

Table 3: System of Evaluation

Grade	Grade Points	Marks obtained (%)			Description of Performance
		Regular Semester	Re-examination	REEated Examination	
AA	10	90-100	--	--	Outstanding
AB	09	80-89	90-100	--	Excellent
BB	08	70-79	80-89	90-100	Very Good
BC	07	60-69	70-79	80-89	Good
CC	06	50-59	60-69	70-79	Fair
CD	05	45-49	50-59	60-69	Average
DD	04	40-44	40-49	40-59	Poor

DD$	04	Below 40	Below 40	Below 40	Poor (Subject to Application of Ordinance 96)
FF	00	Below 40	Below 40	Below 40	Fail
XX	--	--	--	--	Detained
ABSENT	--	--	--	--	Absent
PP	--	--	--	--	Passed (Audit Course)
NP	--	--	--	--	Not Passed (Audit Course)

Note: An equivalent certificate of CGPA to percentage of marks will be provided to student on candidate's demand after remitting prescribed fees by Shivaji University.

R.B.T. 13 Entry of Students from previous credit to new Credit Pattern

A student of Department of Technology, Shivaji University, Kolhapur admitted before academic year 2023-24 and having backlogs such student will clear back log subjects as per the equivalence given by the respective program.

R.B.T. 14 Audit Courses:

Additional courses are included as audit courses in each semester. While the performance of the student in audit courses will be included in the Grade Card, these grades do not contribute to SGPA or CGPA of the concerned student. However the passing in Audit Courses is mandatory for every student.

R.B.T. 15 Awards of Grades for Re-Examination:

a) A student who has obtained grade 'FF' in regular semester will be eligible to appear for re-examination conducted before the commencement of the next regular semester.
b) In such cases In Semester Examination performance of a student will not be wiped out.
c) A student will apply for re-examination before the last date of such application and will appear for re-examination.
d) 70% weightage similar to ESE will be given to re-examination.
e) A student who is eligible for re-examination but remains absent for re-examination will be given grade 'Absent'.
f) A student will be awarded a grade between 'AB' to 'DD', or 'FF' or 'XX' as given in Table 3 dEEnding upon the cumulative marks obtained by him/her in IE and Re-examination of ESE. Here a student has to suffer a grade penalty by accepting one grade lower as compared with the regular grades.

R.B.T. 16 Showing Evaluated Semester End Examination Answer Papers, Re-evaluation, and applying for revaluation:

The evaluated answer book will be shown to the student immediately as per the timetable prepared by the exam cell of Department of Technology before the declaration of result. The grievances regarding the incorrect total and assessment of the not assed questions will be done by the respective faculty. A student having doubt regarding the grade declared in a course can apply for the photocopy of the answer book by remitting the prescribed fee as specified; a student can also apply for rechecking of his/her SEE answer book as per Shivaji University rules. There is no provision for showing of evaluated answer book, photocopy, rechecking and revaluation of the re-examination.

R.B.T. 17 Change of Branch:

Students will be eligible to apply for Change of Branch after completing the first two semesters. The change of branch will be permitted strictly on merit basis subject to the rules and regulations prescribed by Directorate of Technical Education, Maharashtra State/Admission Regulatory authority, Maharashtra State time to time.

R.B.T. 18 Disciplines and Conduct:

i. Every student will be required to observe discipline and decorous behaviour both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the Department.

ii. Any act of indiscipline of a student reported to the Department will be referred as per Shivaji University norms.

iii. If a student while studying in the institute is found indulging in anti-national activities contrary to the provisions of acts and laws enforced by Government, the candidate will be liable to be expelled from the Department without any notice.

iv. If a student is involved in any kind of ragging, the student will be liable for strict action as per Maharashtra anti-ragging act 1999, which is in effect from 15th May 1999.

v. If any statement/information supplied by the student in connection with his/her admission is found to be false/ incorrect at any time, his/ her admission will be cancelled and the candidate will be expelled from the institute and fees paid will be forfeited.

vi. Student once admitted in the Department of Technology will follow instructions issued from time to time.

vii. If a student is found guilty of malpractice in examinations then the candidate will be punished as per the recommendations of the Shivaji University, Kolhapur.

viii. Every admitted student will be issued photo identification (ID) card which must be retained by the student while the candidate is registered at Department of Technology. The student must have valid ID card with him/her while in the Department of Technology.

ix. Any student who alters or intentionally mutilates an ID card or who uses the ID card of another student or allows his/her ID card to be used by another student will be subjected to disciplinary action.

x. The valid ID card must be presented for identification purpose as and when demanded by authorities. Any student refusing to provide an ID card will be subjected to disciplinary action.

R.B.T. 19 Details regarding B. Tech Major, Multidisciplinary Minor, Honors, Honors with Research, Specialization Minor and Multiple entry, multiple exit features:

(Major means the respective 6 UG Programs available on the Campus at the Department of Technology)

I. **B. Tech Major:** The B. Tech Major requires earning the routine no of credits i.e. 162 (First Two semesters, 21 credits each plus remaining 6 semesters @ 20 Credits=120 credits.), thus the total credits against the Major will be 42+ 120 = 162. Along with that, there will be mandatory audit courses in each semester.

II. **B. Tech Multidisciplinary Minor (MDM):** There will be at least one Multidisciplinary Minor Program for each UG Major. For that sake, extra 14 Credits are mandatory to be earned. The credit split up is as follows: 3 Courses each of 3 credits plus 3 credits against MDM based internship plus 2 credits against MDM based Mini Project.

III. With the aforesaid I & II, every enrolee under a particular UG Degree program, after the successful completion of the same will be the awardee of **B.Tech in Major Degree Title with Multidisciplinary Minor** (Minor Title Mention). *As per the National Credit Framework's mention of verticals, this particular Degree falls under the* ***fourth verticle***

(Level 6.0). Routine fees as decided by the institute will be applicable to all the enrolled students.

As usual if these graduates want to pursue PG, it will be of 2 years duration for them.

IV. The credits distribution for the MDM featured B.Tech Degree in a particular Major Program is as follows: 21+21+20+23+23+23+23+22=176. The SGPA and CGPA calculation will be as per this distribution.

V. **B. Tech (Honors):** This is purely an option to all the students. There will be additional **17** credits out of which **15** credits will be earned through successful completion of 05 courses 3 Credits each **plus 2** credits will be against a course in advanced laboratory practice from the major. (These courses could be preferably through the MOOCs. If so, these MOOCs need to be other than MOOCs of Semester VIII). The courses to be completed throughout four years starting from second year. The interested students have to pay separate fees for the same. *As per the National Credit Framework's mention of verticals, this particular case falls under the **fifth vertical (Level 6.0).*** As per NEP 2020 guidelines, such successful candidates will be eligible to enter at the Second Year of PG in the respective specialization.

VI. **B. Tech (Honors with Research):** This is also purely an option to all the students. There will be **17 credits** earned as in case of Honors **plus** there will be **3 more credits** earned against an additional Project Work with success in publishing at least one research paper based on the research topic. The interested students have to pay separate fees for the same. *As per the National Credit Framework's mention of verticals, this particular case falls under the **sixth vertical (Level 6.0)**.* As per NEP 2020 guidelines, such successful candidates will be eligible to pursue PhD studies **provided the candidate's entire CGPA is 7.5 and above.**

VII. **B. Tech Double Minor:** This is also purely an option to all the students. As mentioned in I & II, the candidate in addition to Multidisciplinary Minor (MDM) along with the Major Degree, may choose to opt for one more minor from the Pool of Specialization Minors (SPM) and earns 14 extra credits against this minor. The successful candidates will be the awardees of B.Tech in Major Degree with Double Minors. (Mention of the Multidisciplinary and Specialization Minors). The interested students have to pay

separate fees for the same. *As per the National Credit Framework's mention of verticals, this particular case falls under the* ***seventh vertical (Level 6.0)****.*

VIII. **Multiple entry and multiple exit feature:**

i. **After First year,** any candidate desiring exit from first year with a claim to be an awardee of certificate course in respective specialization, the enrolee has to complete (in addition to the First Year Credits 42 in number), two, '2 credits theory courses' and a skill based 4 credits course (i.e. 1 Month Industrial Training). These additional 08 credits to be earned by such aspirants. The details of these courses to be defined by the respective specialization and designed and well narrated to the aspirants. The interested students have to pay separate fees for the same. *As per the National Credit Framework's mention of verticals, this particular case falls under the* ***first vertical (Level 4.5)****.*

ii. **After Second Year,** any candidate desiring to exit from second year with a claim to be an awardee of Diploma in respective specialization, the enrolee must have completed the courses against the Certificate. Moreover, the enrolee has to complete (in addition to the First Year and Second Year Credits 85 in number), three, '2 credits theory courses' and a skill based 4 credits course (i.e. 1 Month Industrial Training). These additional 10 credits to be earned by such aspirants. The details of these courses to be defined by the respective specialization and designed and well narrated to the aspirants. The interested students have to pay separate fees for the same. *As per the National Credit Framework's mention of verticals, this particular case falls under the* ***second vertical (Level 5.0)****.*

iii. **After Third Year,** any candidate desiring to exit from third year will be an awardee of Bachelor's Degree in Vocation (B.Voc.) in respective specialization, provided the enrolee must have completed all the courses till T.Y B.Tech (Credits 131 in number). However, such a candidate needs to earn an additional 8 credits that include any two '2 credits theory courses' and a skill based 4 credits course (i.e. 1 Month Industrial Training). The choice of these two theory courses could be from the two courses which are listed against the exit after first year for certificate and three courses which are listed against the exit after S.Y.B.Tech with a claim for Diploma in respective specialization. *As per the National Credit Framework's mention of verticals, this particular case falls under the* ***third vertical (Level 5.5)****.*

iv. In case of multiple entry-multiple exit features, to undergo the one-month internship against the certificate and diploma, also in case of all other internships, the selection of

skill imparting industry or organisation will be preferably from the **AICTE approved SKPs (Skill knowledge Providers)** list.

IX. **About the courses through MOOCs:** In case of the non-availability of the MOOCs, the students will prepare for the course in a self-study mode under the mentorship of a teacher assigned by the respective Program Coordinator and the Director of the Department of Technology. The students also will have option to choose to appear for the End Semester Examination either by the MOOCs organisers or that by the Shivaji University.

N.B.: All the students will be mandatorily enrolled under the academic bank of credits. As regards, multiple entries, any student from same specialization who desires to join at second, third or Final Year has to have accumulation of those minimum numbers credits in the ABC account till the candidate's last year to that of the entry year.

Note: Also one more feature of this revision is that, besides the curriculum structure, as co-curricular activities, National Cadet Corps (India) i.e. NCC and National Service Scheme i.e. NSS units are available for the interested ones the selections of whom will be as per the respective norms.

Note: All other rules and regulations will be applicable as per Shivaji University, Kolhapur.

F. Engineering Graduate Attributes

1. Domain specific Engineering Knowledge
2. Problem Analysis Ability
3. Acquiring Skills that enable them to Design & Develop Solutions to the Problems
4. Capacity to investigate Complex Problems
5. Familiarity of using Modern Tools
6. Understanding Engineer's role and connectivity towards Society
7. Awareness about Environment & Sustainability
8. Practicing ethics and values
9. Ability to work as an Individual & in a Team also
10. Acquiring Communication skills
11. Becoming well verse with task of Project management & Finance aspects
12. Developing Lifelong Learning attitude

(Note: For every program, there are its own Program Educational Objectives (PEOs) while there are 12 Program Outcomes (POs) which are aligned with these graduate attributes for the engineers.)

G. Fees structure for Multiple Entry/Exit, Minor, Honors, Honors with Research

Sr. No.	Component	Total additional Credits	Fees to be charged* INR
1.	Exit After FY B.Tech claiming Certification in respective specialization	08	8000/-
2.	Exit After SY B.Tech claiming Diploma in respective specialization	10	10000/-
3.	Exit After TY B.Tech claiming Bachelor's Degree in Vocation (B.Voc.) in respective specialization.	08	8000/-
4.	B.Tech Double minor (Only for Specialization Minor)	14	14000/-
5.	B.Tech (Honors)	17	17000/-
6.	B.Tech (Honor with Research)	20	20000/-

*For these optional features, the fees calculation is based on INR1000 Per Credit. These fees against the additional optional features are applicable to the batch enrolled in the year 2023-24. All these fees will be in addition to the management approved total tuition fees per year for the MDM featured B.Tech Majors plus the admissible and payable other fees.

Shivaji University, Kolhapur
Department of Technology

Second Year B.Tech (Electronics & Telecommunication Engineering), Semester- III
Teaching & Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Basic Science Course	BSC211	Engineering Mathematics–III	03	01	-	04	04	40:60	50:00
2.	Professional Core Courses	PCC212	Electronic Circuit Design	03	-	02	05	04	40:60	00:50
3.	Professional Core Courses	PCC 213	Digital Electronics	03	-	02	05	04	40:60	00:50
4.	Professional Core Courses	PCC 214	Network Analysis	03	01	-	04	04	40:60	50:00
5.	Engineering Science Courses	ESC211	Programming Techniques	02	-	02	04	03	40:60	00:50
6.	Ability Enhancement Courses	AEC211	Soft Skills Development	01	-	-	01	01	-	50:00
							-	**20**	**500**	**300**
7.	Humanities, Social Sciences, Management, Environment	HSMEC 211	Environmental Studies	02	-	-	02	University Exam at year end		
			Total Hours	17	02	06	**25**	**-**	**-**	**-**

Shivaji University, Kolhapur
Department of Technology

Second Year B. Tech (Electronics and Telecommunication Engineering), Semester- IV

Teaching and Evaluation Scheme

S.N.	Category	Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation scheme	
									Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	Basic Science Course	BSC 221	Measurements & Instrumentation	03	-	02	05	04	40:60	50:00
2.	Professional Core Course	PCC 221	Signals & Systems	03	01	-	04	04	40:60	50:00
3.	Professional Core Course	PCC 222	Analog & Digital Communication	03	-	02	05	04	40:60	00:50
4.	Professional Core Course	PCC 223	Analog Electronics	03	-	02	05	04	40:60	00:50
5.	Professional Core Course	PCC 224	Data Structures	02	01	-	03	03	40:60	00:50
6.	MDM Course	MDM 221	Multidisciplinary Minor Course I*	03	-	-	03	03	40:60	00:00
7.	Indian Knowledge Systems	IKS 221	Introduction to Performing Arts	01	-	-	01	01	-	50:00
							-	**23**	**600**	**300**
8.	Mandatory Audit Course	MAC 221	Aptitude Enhancement Course I	02	-	-	02	IE at Course in charge end		
9.	Humanities, Social Sciences, Management Environment	HSMEC 221	Environmental Studies	02	-	-	02	University Exam at year end		
			Total Hours	22	02	06	**30**	-	-	-

*Note: The MDM course will be from the chosen multidisciplinary title.

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Second Year B.Tech (Electronics & Telecommunication Engineering), Part 2, During Semester III</td></tr>
<tr><td>Course Code</td><td colspan="5">BSC211</td></tr>
<tr><td>Course Category</td><td colspan="5">Basic Science Course</td></tr>
<tr><td>Course title</td><td colspan="5">Engineering Mathematics-III (Theory)
(Linear Algebra and Advanced Calculus)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>01</td><td>-</td><td>04</td><td>04</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE:40</td><td colspan="2">ESE:60</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Knowledge of Matrix algebra, Differential Calculus and Integral Calculus</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course offers a mathematical understanding for engineering applications. This course produce graduates with mathematical knowledge, computational skills and the ability to deploy these skills effectively in the solution of problems, principally in the area of engineering.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. To familiarize students with Linear algebra
2. To provide knowledge of Linear differential equations and its applications
3. To study Laplace transform and its applications
4. To study Fourier series and Fourier transform
5. To Study Vector differentiation and its applications.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Apply the knowledge of Linear algebra to solve mathematical and Engineering Problems.
2. Solve linear differential equations and apply them on simple electric circuit.
3. Gain the basic knowledge of Laplace transform and their applicability in solving initial value problems.
4. Understands the new notion of Fourier series, Fourier transform and their usability.
5. Analyze and solve engineering problems using vector differentiation.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3									
CO 2	3	3	2									
CO 3	3	3	3	3								
CO 4	3	3	3	2								
CO 5	3	3	3	3								

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
1.	**Linear Algebra:** Matrix Algebra, Rank of a matrix, Normal and echelon form of a matrix, Consistency of the system of linear equations, Solution of system of linear homogeneous equations, Solution of system of linear non-homogeneous equations,Linear dEEndence and indEEndence of vectors, Eigen values and Eigen vectors, Cayley-Hamilton's Theorem (Without proof).	07
2.	**Linear Differential Equations:** Linear Differential Equations with constant coefficients, Homogenous Linear differential equations, Method of variation of parameters, Applications of LDE with constant coefficients to Electrical systems.	06
3.	**Laplace Transform**: Definition- Laplace transform, Properties of Laplace transform, Laplace transform of derivatives, Laplace transform of integral, Inverse Laplace transforms, Convolution theorem, Applications to initial value boundary problems, Laplace transform of Heaviside Unit step function, Laplace transform of Dirac delta function, Laplace transform of Periodic function.	07
4.	**Fourier Series:** Fourier series ,Fourier cosine series, Fourier sine series, Half range cosine series, Half range sine series, Full range series,	07
5.	**Fourier Transform:** Fourier transforms, Fourier sine transforms, Fourier cosine transforms, Complex form of Fourier integral, Finite Fourier sine transforms, Finite Fourier cosine transforms.	06
6.	**Vector Differentiation:** Differentiation of vectors, Gradient of scalar point function, Directional derivative, Divergence of vector point function, Curl of a vector point function, Irrotational and solenoidal vector field.	06

General Instructions:

1. Each Student has to write at least 6 assignments on entire syllabus.
2. Batch wise tutorials are to be conducted. The number of students per batch should be as per the practical batches.
3. Students must be encouraged to solve engineering mathematics problems using different mathematical software's like MATLAB, Scilab etc.

Sr. No.	Reference Books
1.	Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons.
2.	B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, Delhi.
3.	N. P. Bali, Iyengar "A text book of Engineering Mathematics by", Laxmi Publications (P)Ltd., New Delhi.
4.	C. R. Wylie, "Advanced Engineering Mathematics", McGraw Hill Publication, New Delhi.
5.	H. K. Dass, "Advanced Engineering Mathematics", S. Chand Publishing.
6.	S. S. Sastry, "Engineering Mathematics (Volume-I)", Prentice Hall Publication, New Delhi.
7.	M. D. Greenberg, "Advanced Engineering Mathematics", Pearson Education.
8.	J. N. Wartikar & P. N.Wartikar , "A text book of Applied Mathematics: Vol. I, II and III" Vidyarthi Griha Prakashan, Pune.
9.	Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi.
Sr. No.	**Important web links**

1.	https://nptel.ac.in/courses/111105121
2.	https://nptel.ac.in/courses/111105134
3.	https://nptel.ac.in/courses/111105035
4.	https://nptel.ac.in/courses/111105167
5.	https://nptel.ac.in/courses/111102133

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Second Year B.Tech (Electronics & Telecommunication Engineering), Part 2, During Semester III</td></tr>
<tr><td>Course Code</td><td colspan="5">BSC211</td></tr>
<tr><td>Course Category</td><td colspan="5">Basic Science Course</td></tr>
<tr><td>Course title</td><td colspan="5">Engineering Mathematics-III (Tutorial)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>-</td><td>01</td><td>-</td><td>01</td><td>01</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">-</td><td colspan="2">IE: 50</td><td>Total=50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Knowledge of Matrix algebra, Differential Calculus and Integral Calculus</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course offers a mathematical understanding for engineering applications. This course produce graduates with mathematical knowledge, computational skills and the ability to deploy these skills effectively in the solution of problems, principally in the area of engineering.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. To familiarize students with Linear algebra
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Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3									
CO 2	3	3	2									
CO 3	3	3	3	3								
CO 4	3	3	3	2								
CO 5	3	3	3	3								

Level of Mapping as: Low 1, Moderate 2, High 3

	Course Content	Hours
1	Introduction and Examples on Consistency of the system of linear equations	**1**
2	Examples on Linear dEEndence and indEEndence of vectors	**1**
3	Introduction to Eigen values and Eigen vectors	**1**
4	Examples on Linear Differential Equations with constant coefficients	**1**
5	Applications of LDE with constant coefficients to Electrical systems	**1**
6	Examples on Properties of Laplace transform	**1**
7.	Inverse Laplace transforms	**1**
8.	Applications of Laplace transform	**1**
9.	Examples on Fourier series	**1**
10.	Introduction of Fourier transforms	**1**
11.	Examples on Fourier transforms	**1**
12.	Examples on Divergence of vector point function	**1**
13.	Examples on Curl of a vector point function	**1**

General Instructions:

1. Minimum 8 tutorials should be carried out based on above list or syllabus.
2. Batch wise tutorials are to be conducted. The number of students per batch should be as per the practical batches.
3. Students must be encouraged to solve engineering mathematics problems using different mathematical software's like MATLAB, Scilab etc.

Sr. No.	**Reference Books**
1	Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons.
2	B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, Delhi.
3	N. P. Bali, Iyengar "A text book of Engineering Mathematics by", Laxmi Publications (P)Ltd., New Delhi.
4	C. R. Wylie, "Advanced Engineering Mathematics", McGraw Hill Publication, New Delhi.
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6	S. S. Sastry, "Engineering Mathematics (Volume-I)", Prentice Hall Publication, New Delhi.
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8	J. N. Wartikar & P. N.Wartikar , "A text book of Applied Mathematics: Vol. I, II and III" Vidyarthi Griha Prakashan, Pune.
9	Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi.
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2	https://nptel.ac.in/courses/111105134
3	https://nptel.ac.in/courses/111105035
4	https://nptel.ac.in/courses/111105167
5	https://nptel.ac.in/courses/111102133

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Second Year B.Tech (Electronics & Telecommunication Engineering), Part II, Semester III</td></tr>
<tr><td>Course Code</td><td colspan="5">PCC212</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Courses</td></tr>
<tr><td>Course title</td><td colspan="5">Electronic Circuit Design</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>02</td><td>05</td><td>04</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE:40</td><td colspan="2">ESE:60</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Prerequisites: Basic understanding of mathematics, physics and electronics components and familiarity with principles of science and engineering.</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course deals with design and implementation aspects of primitive power supply and amplifier circuits.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Understand the operation principles of half-wave, full-wave, and bridge rectifiers.
2. Design filters for unregulated power supplies.
3. Identify the need for voltage regulator circuits.
4. Understand the importance of biasing in transistor circuits.
5. Analyze clipping circuits (diode and transistor clippers) and clamping circuits.
6. Study power considerations and types of distortion in power amplifiers.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Analyze and design rectifier circuits.
2. Analyze and design the unregulated power supplies.
3. Analyze and design voltage regulator circuits.
4. Describe the transistor biasing circuits.
5. Analyze and design the passive wave shaping circuits.
6. Analyze and design power amplifier circuits.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	1	1	1								
CO 2	3	2	3	3								
CO 3	3	2	3	3	3							
CO 4	3	1	3	3								
CO 5	3	3		1								
CO 6	3	2	3	3	3							3
PSO1	3	3	3	3	2							
PSO2	2	3	1	3	2							

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
1	**Rectifier analysis and design** Half wave rectifier, full wave rectifier, bridge rectifier, analysis and comparison of different parameters like PIV, TUF, efficiency, ripple factor, regulation, etc. specifications and ratings of diodes and transformers. Design of rectifier circuits.	06
2	**Filters and unregulated power supplies** Filters, need of filters, types of filters- C filter, L filter, LC filter, CLC filter, RC filter, ripple factor and regulation-based analysis, design of all filters, advantages, disadvantages and applications of unregulated power supplies, Design of unregulated power supplies with filters	06
3	**Voltage regulator circuits** Need of voltage regulator circuits, types of voltage regulators, Zener voltage regulator, transistorized shunt voltage regulator, transistorised series voltage regulator, IC voltage regulators using ICs:78XX, 79XX, IC723, LM317, Switching regulator: Introduction and study of LM3524 IC.	06
4	**Transistor Biasing** Need of biasing, DC load line analysis, operating point, thermal runaway. Analysis of different biasing circuits: fixed bias, collector to base bias & voltage divider bias. Stability factor, General expression for stability factor, design of biasing circuits, Compensation techniques: Thermistor and diode compensation, CE, CB & CC configurations, Design of Single stage RC coupled amplifier.	07
5	**Wave Shaping Circuits** Low pass & high pass RC circuits (square & step response), High pass RC circuit as a differentiator, Low pass RC circuit as integrator. Clipping circuits: Classification, diode clippers transistor clippers, Transfer characteristics, Design & analysis of clipper circuits. Clamping circuits: Classification, clamping operations, Clamping circuit theorem, practical clamping circuits. Voltage multipliers: Doubler, Trippler & Quadruple circuits.	07
6	**Power Amplifiers** Need of Power amplifier, classification of power amplifier, Power considerations, Distortion in power amplifiers: Phase, Frequency, amplitude/ harmonic /nonlinear distortion, amplitude distortion using Three-point method. Class A single ended transformer coupled amplifier& class A Push pull amplifiers analysis and design, Class B amplifier & class B push pull amplifier analysis & design, crossover distortion, class AB Push pull amplifiers analysis and design Complementary symmetry power amplifier, class C amplifier.	07
Sr.No.	**Text Books**	
1.	J. B. Gupta, 'Electronics Devices and Circuits' , Katson Books	
Sr. No.	**Reference Books**	

1.	Robert L. Boylsted, Louis Nashelsky- 'Electronic devices & circuit theory'- 9th edition- Pearson Education
2.	vid A. Bell –'Electronic devices & circuits'- 4th Edition- Prentice- Hall India
3.	anufacturer data sheets
Sr. No.	**Important web links**
1	https://www.electronics-tutorials.ws/

<table>
<tr><td>Year, Program, Semester</td><td colspan="6">Second Year B.Tech (Electronics & Telecommunication Engineering), Part II, Semester III</td></tr>
<tr><td>Course Code</td><td colspan="6">PCC212</td></tr>
<tr><td>Course Category</td><td colspan="6">Professional Core Courses</td></tr>
<tr><td>Course title</td><td colspan="6">Electronic Circuit Design Lab</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td colspan="2">Total Credits</td></tr>
<tr><td>-</td><td>-</td><td>02</td><td>02</td><td colspan="2">01</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td colspan="3" rowspan="2"></td><td>IE</td><td>EE</td><td>Total</td></tr>
<tr><td>-</td><td>50</td><td>50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="6">Prerequisites: Basic understanding of mathematics, physics and electronics components and familiarity with principles of science and engineering.</td></tr>
<tr><td>Course Rationale</td><td colspan="6">This course deals with design and implementation aspects of primitive power supply and amplifier circuits.</td></tr>
<tr><td>Course Objectives</td><td colspan="6">1. Design of the rectifier.
2. Illustrate properties of unregulated power supply.
3. Discuss the need of regulated power supply.
4. Discuss the need of transistor biasing.
5. Discuss the need of wave shaping circuits
6. Discuss the working principle of power amplifiers.</td></tr>
<tr><td>Course Outcomes</td><td colspan="6">1. Analyze and design rectifier circuits
2. Analyze and design the unregulated power supplies.
3. Analyze and design voltage regulator circuits.
4. Design Single stage RC coupled amplifier.
5. Design the wave shaping circuits.
6. Analyze and design power amplifiers.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	1	1	1								
CO 2	3	2	3	3								
CO 3	3	2	3	3	3							
CO 4	3	1	3	3								
CO 5	3	3		1								
CO 6	3	2	3	3	3							3
PSO1	3	3	3	3	2							
PSO2	2	3	1	3	2							

Expt. No.	Course Content
1	Design & analysis of Half wave rectifier (HWR) with & without filter by calculating performance parameters.
2	Design & analysis of Full wave rectifier (FWR) with & without filter by calculating performance parameters.
3	Design & analysis of Bridge rectifier with & without filter by calculating performance parameters.
4	Design & analysis of C, L, LC, CLC filter.
5	Design & analysis of fixed voltage regulator.
6	Design & analysis of adjustable voltage regulator.
7	Design and analysis of single stage RC coupled CE amplifier.
8	Design and analysis of series and parallel clippers.
9	Design and analysis of positive and negative clampers.
10	Design and analysis of RC low pass filter as an integrator.
11	Design and analysis of RC high pass filter as differentiator.
12	Design and analysis of Class A power amplifier.
13	Design and analysis of Class B power amplifier.
14	Design and analysis of Class AB power amplifier.
Sr. No.	**Text Books**
1	J. B. Gupta, 'Electronics Devices and Circuits', Katson Books
Sr. No.	**Reference Books**
1	Robert L. Boylsted, Louis Nashelsky- 'Electronic devices & circuit theory'- 9th edition-Pearson Education

2	David A. Bell –'Electronic devices & circuits'- 4th Edition- Prentice- Hall India
3	Manufacturer data sheets
Sr. No.	**Important web links**
1	https://www.electronics-tutorials.ws/

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Second Year B.Tech (Electronics & Telecommunication Engineering),
Part 2, Semester III</td></tr>
<tr><td>Course Code</td><td colspan="5">PCC 213</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Courses</td></tr>
<tr><td>Course title</td><td colspan="5">Digital Electronics</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>02</td><td>05</td><td>04</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE:40</td><td colspan="2">ESE:60</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Knowledge of basic Mathematics</td></tr>
<tr><td>Course Rationale</td><td colspan="5">The Digital Electronics course is designed to provide students with a fundamental understanding of the principles, theories, and applications of digital circuits and systems. In today's technologically driven world, digital electronics form the backbone of numerous devices and systems, ranging from computers to embedded systems. This course aims to equip students with the knowledge and skills required to design, analyze, and troubleshoot digital circuits, laying the foundation for careers in fields such as electronics, computer engineering, and information technology.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Introduce fundamental concept of digital techniques.
2. Enhance basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
3. Conduct the analysis and design of various digital electronic circuits.
4. Develop a skill to build and troubleshoot digital circuits.
5. Introduce to simulation tools for digital electronics</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Understand number systems and its arithmetic operations and Illustrate use of Boolean algebra.
2. Formulate and apply Karnaugh Map to reduce Boolean expressions and logic circuits to their simplest forms.
3. Design and analyse of different combinational circuits.
4. Understand working of flip-flops and apply conversion of flip flops
5. Design and analyse of sequential circuits.
6. Understand logic families and Remembering concept of memory technology</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**1**											**3**	
CO 2	**3**	**3**	**3**	**1**									**3**	
CO 3	**3**	**3**	**3**	**1**	**1**								**3**	**3**
CO 4	**3**	**3**	**1**	**1**									**3**	**3**
CO 5	**3**	**3**	**3**	**1**	**1**								**3**	**3**
CO 6	**3**												**1**	

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
1	**Binary Codes and Boolean algebra** Binary Number System. Addition, Subtraction, Multiplication, Division of binary numbers, Subtraction using 2's complement method. Binary codes: weighted and non-weighted codes, self-complementary codes, BCD, Gray codes, Alphanumeric codes, ASCII Codes. Boolean algebra: Boolean Laws and Expression using Logic Gates, Realization of different gates using Universal gates, De-Morgan's Theorem, Duality Theorems.	**06**
2	**Boolean Function minimization Techniques** Standard forms: SOP, POS, Simplification of Switching function & representation (Maxterm & Minterm), Boolean expression & representation using logic gates, Propagation delay in logic gate. Karnaugh map: K-map, mapping and minimization of SOP and POS expression, Don't care condition, conversion from SOP to POS and POS to SOP form using K-map, Minimization of multiple output circuits	**07**
3	**Combinational Circuits Design** Adder & Subtractor (Half and Full), Parallel Binary adder, BCD Adder, Code Converters, Comparators, Decoder, BCD to 7-segment Decoder, Encoders, Priority Encoders, Multiplexers, De Multiplexers	**06**
4	**Sequential Circuits Elements** Introduction to sequential circuit, Flip-flop & Timing Circuits: SR latch, Gated latch, Tri state logic, Edge triggered flip-plop: - D, JK, T Flip-flop, flip-flop asynchronous inputs, characteristic table of Flip-flop, excitation table of Flip-flop, master slave JK flip flop, inter conversion of Flip-flop.	**07**
5	**Shift Registers and Counters** Shift registers: buffer register, controlled buffer register. Data transmission in shift resistor SISO, SIPO, PISO, PIPO, Bidirectional shift register, universal shift registers. Counter: Classification, Ripple or asynchronous counter, Effect of propagation delay in ripple counters, up-down counter, Design of Mod-n counter, synchronous counter, Ring counter, Johnson counter.	**07**
6	**Logic Families and Memory Technology** Digital IC specification terminology, Logic families: TTL, CMOS families, comparison of TTL & CMOS, Memory Technology: Memory organization, Classification of Memory.	**06**
No.	**ference Books**	

1	M. Morris Mano ‘Digital Design’ (Third Edition). PHI Publications
2	Willim I. Fletcher.’An Engineering Approach to Digital Design’ PHI
3	Norman Balabanian Bradle Carlson. ‘Digital Logic Design Principals.’ Wiley Publication.
4	Rajkamal ‘Digital Systems Principals and Design’ Pearson Education
5	A.P. Malvino, D.P. Leach ‘Digital Principles & Applicatios’ -VIth Edition-TMH publication.
6	A. Anand Kumar ‘Fundamentals of Digital Circuits’. PHI Publications
7	R.P. Jain-‘Modern Digital Electronics’ IIIrd Edition- Tata Mc Graw Hill, Publication
Sr. No.	**portant web links**
1	https://onlinecourses.nptel.ac.in/noc24_ee52/preview

Year, Program, Semester	Second Year B.Tech (Electronics & Telecommunication Engineering), Part 2, During Semester III					
Course Code	PCC 213					
Course Category	Professional Core Courses					
Course title	**Digital Electronics Laboratory**					
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**	
	-	-	02	02	01	
Evaluation Scheme				**IE**	**EE**	**Total**
				-	**50**	**50**
Pre-requisites (if any)	Knowledge of basic Mathematics					
Course Rationale	The Digital Electronics course is designed to provide students with a fundamental understanding of the principles, theories, and applications of digital circuits and systems. In today's technologically driven world, digital electronics form the backbone of numerous devices and systems, ranging from computers to embedded systems. This course aims to equip students with the knowledge and skills required to design, analyze, and troubleshoot digital circuits, laying the foundation for careers in fields such as electronics, computer engineering, and information technology.					
Course Objectives	1. Introduce fundamental concept of digital techniques. 2. Enhance basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits. 3. Conduct the analysis and design of various digital electronic circuits. 4. Develop a skill to build and troubleshoot digital circuits.					
Course Outcomes	1. Understand number systems and its arithmetic operations and Illustrate use of Boolean algebra. 2. Formulate and apply Karnaugh Map to reduce Boolean expressions and logic circuits to their simplest forms. 3. Design and analyse of different combinational circuits. 4. Understand working of flip-flops and apply conversion of flip flops 5. Design and analyse of sequential circuits. **6.** Understand logic families and Remembering concept of memory technology					

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	1	1	1								
CO 2	3	2	3	3								
CO 3	3	2	3	3	3							
CO 4	3	1	3	3								
CO 5	3	3		1								
CO 6	3	2	3	3	3							3
PSO1	3	3	3	3	2							

PSO2	2	3	1	3	2							

	List of Experiments 1. Study of basic gates 2. Study of Universal gates (NAND, NOR) 3. K map-based implementation of combinational logic 4. Half and Full Adder, Half and Full Subtractor 5. 4- bit parallel Adder / Subtractor using IC 7483 6.Code Converters (Binary to Gray, Excess 3 to Binary) 7. Comparator using IC 7485 8. Implementation of combinational logic using MUX 9. Study of Decoder and DEMUX (IC 74138) 10. Study of 7 segment decoder driver. (IC 7447) 11. Study of Flip Flops (SR FF, D FF, JK FF, T FF) 12. Design Built and test MOD N counter 13. Design Built and test Shift Register 14. Design and implementation of Johnson Counter Design 3-bit sequence detector **Minimum eight experiments should be conducted from above list or based on syllabus.**

Sr. No.	**Reference Books**
1.	M. Morris Mano ‘Digital Design’ (Third Edition). PHI Publications
2.	Willim I. Fletcher.’An Engineering Approach to Digital Design’ PHI
3.	Norman Balabanian Bradle Carlson. ‘Digital Logic Design Principals.’ Wiley Publication.
4.	Rajkamal ‘Digital Systems Principals and Design’ Pearson Education
5.	A.P. Malvino, D.P. Leach ‘Digital Principles & Applicatios’ -VIth Edition-TMH publication.
6.	A. Anand Kumar ‘Fundamentals of Digital Circuits’. PHI Publications
7.	R.P. Jain-‘Modern Digital Electronics’ IIIrd Edition- Tata Mc Graw Hill, Publication
Sr. No.	**Important web links**
1.	https://onlinecourses.nptel.ac.in/noc24_ee52/preview

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<tr><td>Year, Program, Semester</td><td colspan="5">Second Year B.Tech (Electronics & Telecommunication Engineering), Part 2, During Semester III</td></tr>
<tr><td>Course Code</td><td colspan="5">PCC214</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Courses</td></tr>
<tr><td>Course title</td><td colspan="5">Network Analysis</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>01</td><td>-</td><td>04</td><td>04</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="3">ISE:40</td><td>ESE:60</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Prerequisites for this course typically include Engineering Mathematics I and II, Electronic devices and circuits</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course will give fundamental knowledge of linear electronic circuits , the network theorems, two-port networks, filters, attenuators and their analysis.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. To introduce basic theorems used for network analysis.
2. To teach two port networks and its parameters.
3. To clarify series and parallel resonance and its use.
4. To demonstrate response of RL,RC and RLC circuits
5. To impart design methods for filters
6. To impart design methods for attenuators</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Apply appropriate network theorem to find circuit solution.
2. Understand resonant circuits.
3. Analyze circuit using different network theorems.
4. Calculate parameters of two port network.
5. Understand the step input response in RL,RC and RLC circuits
6. Design different filters and attenuator</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO2	PO3	PO4	PO	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO1	PSO2
CO 1	3	1											3	
CO 2	3	3	3	1									3	
CO 3	3	3	3	1	1								3	3
CO 4	3	3	1	1									3	3
CO5	3	3	3	1	1								3	3
CO6	3												1	

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
1	**Circuit Fundamentals** Voltage sources, Current sources, Conversion of voltage sources to current sources and vice a versa. Network terminology:- Node, Junction, Branch, Loop, Network solution by branch current method, Loop or Mesh current method, Node voltage method, Star delta connection and conversion Network Theorems:-Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Superposition Theorem, Millman's theorem	07
2	**Resonance Circuits** Series resonance circuit, Frequency response of a series resonant circuit, Effect of Q on bandwidth and selectivity, Relation between bandwidth and Q, Impedance of a series resonant circuit, Resonance by variation of L and C, Parallel resonant circuit	07
3	**Two-Port Networks** Two- port network parameters: y, z, h, A B C D Inter-conversion of two port networks, cascade connection series connection, series parallel connection, T and π network representation of a two port network.	07
4	**Network Functions** Transform of circuit elements, Network functions, Stability, Transient response: - step input response in R-L circuit, step input response in R-C circuit, step input response in R-L- C circuit	06
5	**Filters** Definitions, classification and characteristics of different filters, decibel, nEEr. Design and analysis of constant K filter (low pass, high pass, band pass, and band stop filters): T and PI sections	06
6	**Attenuators** Definitions, classification, relation between nEEr and decibel, analysis and design of T type, π type, lattice, bridged –T and L types attenuators	06

No.	Reference Books
1	A.Sudhakar, Shymmohan S. Palli, 'Circuit and Network – Analysis and Synthesis', 3rd Edition, Tata McGraw Hill Publication
2	D. Roy Choudhuri, 'Networks and Systems', New Age International Publisher.
3	A. Chakrabarti, 'Circuit theory (Analysis and Synthesis)', IIIrd edition, Dhanpat Rai and Co.
4	M.E.Van Valkenburg, 'Network Analysis', IIIrd edition, Pear sons Education/PHI.

5	Josheph Edministrar, 'Theory and Problems of Electronic Circuit (Schaum's Series) – Tata McGraw Hill Publication.
6	Soni Gupta, 'Electrical Circuit Analysis', Dhanpat Rai and Co.
Sr. No.	**Important web links**
1	https://onlinecourses.nptel.ac.in/noc22_ee07/preview
2	https://www.youtube.com/watch?v=7Nh7ISeqn6E&list=PLbRMhDVUMngfNnABo5mre45ZbHqJE2sUn

Year, Program, Semester	Second Year B.Tech (Electronics & Telecommunication Engineering), Part 2, During Semester III					
Course Code	PCC214					
Course Category	Professional Core Courses					
Course title	**Network Analysis Tutorial**					
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**	
	-	01	-	01	01	
Evaluation Scheme				**IE**	**EE**	**Total**
				50	**-**	**50**
Pre-requisites (if any)	Prerequisites for this course typically include Engineering Mathematics I and II, Electronic devices and circuits					
Course Rationale	This course will give fundamental knowledge of linear electronic circuits , the network theorems , two-port networks , filters , attenuators and their analysis.					
Course Objectives	1. To introduce basic theorems used for network analysis. 2. To teach two port networks and its parameters. 3. To clarify series and parallel resonance and its use. 4. To demonstrate response of RL,RC and RLC circuits 5. To impart design methods for filters 6. To impart design methods for attenuators					
Course Outcomes	1. Apply appropriate network theorem to find circuit solution. 2. Understand resonant circuits. 3. Analyze circuit using different network theorems. 4. Calculate parameters of two port network. 5. Understand the step input response in RL,RC and RLC circuits 6. Design different filters and attenuator					

Course Outcome and Program Outcome Mapping

	PO 1	PO2	PO3	**PO4**	PO	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO1	PSO2
CO 1	3	1											3	
CO 2	3	3	3	1									3	
CO 3	3	3	3	1	1								3	3
CO 4	3	3	1	1									3	3
CO5	3	3	3	1	1								3	3
CO6	3												1	

Level of Mapping as: Low 1, Moderate 2, High 3

Sr.No.	Title of Tutorials
1.	Problems based on star and delta connections and their conversions
2.	Problems based on energy source transformations
3.	Problems based on series and parallel resonance circuits
4.	Problems based on z parameters of two –port networks
5.	Problems based on y parameters of two –port networks
6.	Problems based on h parameters of two –port networks
6.	Problems based on ABCD parameters of two –port networks

Sr.No.	**Reference Books**
1	A.Sudhakar, Shymmohan S. Palli, 'Circuit and Network – Analysis and Synthesis', 3rd Edition, Tata McGraw Hill Publication
2	D. Roy Choudhuri, 'Networks and Systems', New Age International Publisher.
3	A. Chakrabarti, 'Circuit theory (Analysis and Synthesis)', IIIrd edition, Dhanpat Rai and Co.
4	M.E.Van Valkenburg, 'Network Analysis', IIIrd edition, Pear sons Education/PHI.
5	Josheph Edministrar, 'Theory and Problems of Electronic Circuit (Schaum's Series) – Tata McGraw Hill Publication.
6.	Soni Gupta, 'Electrical Circuit Analysis', Dhanpat Rai and Co.
Sr. No.	**Important web links**
1	https://onlinecourses.nptel.ac.in/noc22_ee07/preview
2	https://www.youtube.com/watch?v=7Nh7ISeqn6E&list=PLbRMhDVUMngfNnABo5mre45ZbHqJE2sUn

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Part 2, Semester III</td></tr>
<tr><td>Course Code</td><td colspan="5">ESC211</td></tr>
<tr><td>Course Category</td><td colspan="5">Engineering Science Courses</td></tr>
<tr><td>Course title</td><td colspan="5">Programming Techniques</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>02</td><td>-</td><td>02</td><td>04</td><td>03</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE:40</td><td colspan="2">ESE:60</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Basics of computer fundamentals, C Programming</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course intends to teach the students the basic concepts of object-oriented programming (OOP) that can be applied to solve real world problems. Because of complex nature of real world problems, programs are prone to error and programming errors can become expensive. Object-Oriented Programming offers a new and powerful way to coupe with this complexity. Its goal is clearer, more reliable, more easily maintained programs. This course will act as backbone for all other subjects that are based on Object Oriented concept.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Explain the basic concepts and techniques which form the object oriented programming paradigm.
2. Strengthen their problem solving ability by applying the characteristics of an object-oriented approach.
3. Introduce object oriented concepts in C++.
4. Elaborate fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
5. Help to implement the object oriented concepts to solve problems
6. Demonstrate to develop an application applying the object oriented concepts</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Explain what constitutes an object-oriented approach to programming and identify potential benefits of object-oriented programming over other approaches.
2. Apply an object-oriented approach to developing applications of varying complexities.
3. Take a problem and develop the structures to represent objects and the algorithms to perform operations.
4. Apply standards and principles to write truly readable code.
5. Test a program and, if necessary, find mistakes in the program and correct them.
6. Develop applications using object oriented concepts</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO2	PO3	**PO4**	PO	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO1	PSO2
CO 1	3	1											3	
CO 2	3	3	2	1									2	
CO 3	3	2	3	1	1								3	3
CO 4	3	3	1	1									2	1
CO5	3	3	2	1	1								3	3
CO6	3												1	

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
1	**Introduction to Object Oriented Programming Language.** Introduction to Procedural, Object oriented programming Language. Characteristics and applications of OOP, advantages of OOP over procedural programming, fundamentals of object-oriented programming: objects, classes, data members, methods, messages, data encapsulation, data abstraction and information hiding, inheritance, polymorphism. Functions in C++, Function prototype, call by value, call by reference, inline function, default & constant argument.	**06**
2	**Classes and Objects** Definition of a class, Declaring classes and object, Access specifiers: public, private, protected, defining member functions inside or outside class. Nesting of member functions, Private Member function, making outside function inline. Arrays within a Class, Memory allocation for objects. Static data member, Static member functions. Array of Objects & Passing Objects as Function Arguments in C++.	**06**
3	**Constructors & Destructors** Overview of constructors and destructors, Purpose and significance in C++ programming. Basic syntax and usage. Types of constructors: Default Constructors, Parameterized Constructors, Copy Constructors. Constructor overloading. Introduction to destructors, Role in resource management and clean-up.	**06**

4	**Polymorphism & Inheritance** Need of Polymorphism, concept, Compile time polymorphism or early binding: function over loading and operator overloading, operator overloading using member function and friend function, overloading - unary, binary, arithmetic operators, relational operators, Overloading new and delete operators, insertion and extraction operators, Run time polymorphism or late binding using Virtual function, pure virtual function, Abstract class, Type conversion. Need of Inheritance, Concept, public, private, protected inheritance, Single inheritance, Multiple and multilevel inheritance, Hybrid Inheritance, Virtual base class, overriding of member functions, static variable, static function, friend function, friend class.	**07**
5	**Pointers** Definition and purpose of pointers. Understanding memory addresses and variables. Basic syntax for declaring and using pointers. Pointer Operations: Dereferencing pointers to access data. Pointers and arrays: relationship and equivalence. Accessing array elements using pointers. Pointers basics of memory management, dynamic memory allocation using New and delete operators, Pointer to object, Pointer to data members, this pointer. Pointer to derived class.	**07**
6	**File handling & exception handling, STL** Introduction to file handling in C++ Opening and closing files, File streams: ifstream, ofstream, and fstream File modes: input, output, append. Reading from Files, Writing to Files File, Input/output Operations Exception handling: Introduction, syntax for exception handling code: trycatch-throw, Multiple Exceptions, Exceptions with arguments Exception Handling, STL: An overview, containers, vectors, lists, maps.	**07**

Sr. No.	**Text/reference Books**
1	E Balgurusamy –'Object oriented programming with C++' -, IInd Edition- Tata McGraw Hill Publication
2	Y Kanetkar- 'Let Us C++', BPB Publications
3	Herbert Schildt –'The Complete Reference C++' - IIIrd Edition - Tata McGraw Hill Publication
4	Ravichandran D.-'Programming with C++ '-IInd Edition- Tata McGraw Hill Publication
5	Robert Lafore –'C++ Programming' –. IV th Edition –Techmedia, New Delhi
Sr. No.	**Important web links**
1	https://www.geeksforgeeks.org/cpp-tutorial/
2	https://www.javatpoint.com/cpp-tutorial

<table>
<tr><td>Year,
Program,
Semester</td><td colspan="6">Second Year B.Tech (Electronics & Telecommunication Engineering), Part II, Semester III</td></tr>
<tr><td>Course Code</td><td colspan="6">ESC211</td></tr>
<tr><td>Course Category</td><td colspan="6">Engineering Science Courses</td></tr>
<tr><td>Course title</td><td colspan="6">Programming Techniques Laboratory</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td colspan="2">Total Credits</td></tr>
<tr><td>-</td><td>-</td><td>02</td><td>02</td><td colspan="2">01</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td colspan="3" rowspan="2"></td><td>IE</td><td>EE</td><td>Total</td></tr>
<tr><td>-</td><td>50</td><td>50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="6">Basics of computer fundamentals, C Programming</td></tr>
<tr><td>Course Rationale</td><td colspan="6">The C++ Object-Oriented Programming (OOP) laboratory course aims to provide hands-on experience in applying the principles and features of object-
oriented programming using the C++ language.</td></tr>
<tr><td>Course Objectives</td><td colspan="6">1. Understanding of the core concepts of object-oriented programming
2. Understanding Classes and Objects
3. Implementing Different Types of Constructors
4. Understanding Polymorphism and Inheritance
5. Understand how pointers can be used as function arguments to pass data by reference
6. Exploring File Stream Modes and Error Handling:</td></tr>
<tr><td>Course Outcomes</td><td colspan="6">1.Implement class attributes and methods to encapsulate data and behavior effectively.
2.Proficiency in Class Definition and Object Creation
3.Knowledge of Constructor and Destructor Invocation
4.Proficiency in Designing Class Hierarchies
5.Proficiency in Function Pointers
6.Practicing File Reading and Writing</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	1	1	1								
CO 2	3	2	3	3								
CO 3	3	2	3	3	3							
CO 4	3	1	3	3								
CO 5	3	3		1								
CO 6	3	2	3	3	3							3
PSO1	3	3	3	3	2							
PSO2	2	3	1	3	2							

Level of Mapping as: Low 1, Moderate 2, High 3

List of Experiments

Sr.No.	Tittle
1.	Introduction to C++ programming Setting up IDEs (Integrated Development Environments) like Code::Blocks, Visual Studio, or any other preferred IDE.
2.	Exploring different data types and variable manipulation.
3.	Understanding and implementing various operators and expressions.
4.	Manipulating arrays and strings.
5.	Defining and calling functions with different parameter passing methods.
6.	Implementing structures and classes with their member functions.
7.	Introduction to classes and objects.
8.	Implementing constructors, destructors, and member functions.
9.	Implement function overloading with different argument types and/or number.
10.	Implement inheritance types: public, private, and protected.
11.	Declare friend functions and classes to access private members of a class.
12.	Utilizing pointers and managing dynamic memory.
13.	File Handling: Reading from and writing to files.
14.	Use exception handling mechanisms in member functions.

Sr. No.	Text/reference Books
1.	E Balgurusamy –'Object oriented programming with C++' -, IInd Edition- Tata McGraw Hill Publication
2.	Y Kanetkar- 'Let Us C++', BPB Publications
3.	Herbert Schildt –'The Complete Reference C++' - IIIrd Edition - Tata McGraw Hill Publication
4.	Ravichandran D.-'Programming with C++ '-IInd Edition- Tata McGraw Hill Publication
5.	Robert Lafore –'C++ Programming' –. IV th Edition –Techmedia, New Delhi
Sr. No.	**Important web links**
1.	https://www.geeksforgeeks.org/cpp-tutorial/

Year, Program, Semester	Part 2, Semester III				
Course Code	AEC211				
Course Category	Ability Enhancement Courses				
Course title	**Soft Skill Development**				
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**
	01	-	-	01	01
Evaluation Scheme	**IE:50**			**EE: 00**	**Total=50**
Pre-requisites (if any)	H.S.C. Level English Language competency				
Course Rationale	In today's competitive professional landscape, technical skills alone are insufficient. Soft skills such as communication, teamwork, problem-solving, and adaptability are essential for engineering graduates to thrive in their careers. This course aims to equip students with the necessary soft skills to complement their technical expertise and enhance their employability and success in the workplace.				
Course Objectives	The teacher will 1. Help to enhance communication, teamwork, problem-solving skills. 2. Help to foster adaptability and resilience in engineering contexts				
Course Outcomes	At the end of the course, the students will be- 1. Proficient in oral and written communication. 2. Effective as regards teamwork and collaboration skills. 3. Able to apply critical thinking to industrial problems. 4. Able to demonstrate adaptability and resilience in profession.				

Course Outcome and Program Outcome Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	-	-	-	-	-	-	-	-	3	3	-	-
CO 2	-	-	-	-	-	-	-	-	3	-	-	-
CO 3	-	3	-	-	-	-	-	-	-	-	-	-
CO 4	-	-	-	-	-	-	-	-	-	-	-	2

Level of Mapping as: Low 1, Moderate 2 & High 3

Unit No.	Course Content	Hours
1	**Written communication** • Email Writing • Technical Report	**03**
2	**Oral Communication** • Presentation Skills	**02**
3	**Soft Skills** • Importance of Soft Skills • Overview of Various Soft Skills	**02**
4	**Team Spirit & Leadership Ability** • Understanding team dynamics and roles • Building trust and rapport within team	**02**
5	**Assessment** • Discussion on incorporating soft skills development into daily practice • Case Studies or Role-Play	**05**

Sr. No.	Text/reference Books
1	Sharma R. & Krishna Mohan (2017), Business Correspondence and Report Writing, McGraw Hill Education
2	P. D. Chaturvedi & Mukesh Chaturvedi (2013), *Business Communication: Skills, Concepts & Applications*, Pearson Publications, New Delhi, 3rd Edition, Seventh Impression

3	K. K. Sinha (2006), *Business Communication*, 2nd Edition (Reprint), Galgotia Publishing, New Delhi
4	Khera, S. (1998). "You Can Win: A Step by Step Tool for Top Achievers." New Delhi: Macmillan Publishers India.
5	Covey, S. R. (2004). "The 7 Habits of Highly Effective People." New York: Free Press.
6	Carnegie, D. (2009). "How to Win Friends and Influence People." New York: Pocket Books.
7	Bradberry, T., & Greaves, J. (2009). "Emotional Intelligence 2.0." San Diego, CA: TalentSmart.
8	Dweck, C. S. (2006). "Mindset: The New Psychology of Success." New York: Ballantine Books.

Course Assessment Method

For the internal assessment of the course, with a total evaluation is of 50 marks. Combination of different evaluation methods can be utilized to ensure comprehensive assessment of the students' performance. Following Evaluation Components are suggested:

1. **Quizzes/Tests**
   Periodic quizzes or tests to evaluate students' understanding of key concepts and their ability to apply them.

2. **Activity 1**
   Group activity focusing application of creative thinking and teamwork; designed to assess both individual and group performance

3. **Activity 2**
   Group activity focusing application of creative thinking and teamwork; designed to assess both individual and group performance

4. **Classroom Participation and Engagement**
   Demonstrating engagement with course material and Active participation in class discussions, group activities and question-answer sessions.

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">2024-25 Semester III</td></tr>
<tr><td>Course Code</td><td colspan="5">HSMEC211</td></tr>
<tr><td>Course Category</td><td colspan="5">Humanities, Social Science, Management, Environment</td></tr>
<tr><td>Course title</td><td colspan="5">Environmental Studies</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td></td></tr>
<tr><td>02</td><td>-</td><td>-</td><td>02</td><td></td></tr>
<tr><td>Evaluation Scheme</td><td colspan="5">University exam at year end</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">-</td></tr>
<tr><td>Course Rationale</td><td colspan="5">The Course is all about learning the way we should live and how we can develop sustainable strategies to protect the environment. It helps individuals to develop an understanding of living and physical environment and how to resolve challenging environmental issues affecting nature.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">The course teacher will
1. Introduce students to the fundamental concepts and principles of environmental science.
2. Describe the components of various ecosystems and their interrelationships.
3. Classify different types of natural resources and assess their availability and distribution.
4. Define biodiversity and its significance to ecosystem functioning and human well-being.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">Upon completion of this course, student should be able to –
1. Define key terms and concepts related to environmental science.
2. Analyse ecosystem services and their importance to human well-being.
3. Identify various types of natural resources and their significance.
4. Describe the levels and patterns of biodiversity and their importance.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	-	-	-	-	3	3	-	-	-	-
CO2	-	3	3	-	-	-	3	3	3	2	-	-
CO3	-	2	3	-	-	-	3	3	3	3	-	-
CO4	-	2	-	-	-	-	3	3	3	3	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
1	**Nature of Environmental Science** Definition, scope and importance. Multidisciplinary nature of environmental studies Need for public awareness. Introduction to sustainable development: Sustainable Development Goals (SDGs) -targets and indicators, challenges and strategies for SDGs.	04
2	**Ecosystem** Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession.Food chains, food webs and ecological pyramids, Introduction, types, characteristics features, structure and function of the Following ecosystem: -Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquaticecosystems (ponds, streams, lakes, rivers, oceans, estuaries) Degradation of ecosystems and its impacts.	06
3	**Natural Resources and Associated Problems** Overview of natural resources: Definition of resource; Classification of natural resources-biotic and abiotic, renewable and non-renewable. Forest resources: Use and over-exploitation, deforestation, dams and their effectson forests and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Water scarcity and stress; Conflicts over water. Soil and Mineral resources: Soil as resource and its degradation , Usage and exploitation, Environmental effects of extracting and using mineral resources., Wasteland reclamation, Energy resources: Growing energy needs, renewable and non- renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclearenergy, Role of Indian traditions and culture in conservation of the environment	08

4	**Biodiversity and its conservation** Introduction- Definition: genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, India as a mega- diversity nation. Western Ghats as a biodiversity region. Hot-spots of biodiversity, Threats to biodiversity habitat loss, poaching of wildlife, man- wildlife, Conflicts, Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation Ramsar sites; Biosphere reserves; Protected Areas; Ecologically Sensitive Areas; Coastal Regulation Zone	**07**

Sr.	**Text Books**
1	Agarwal, K. C., 2001, Environmental Biology, Nidi Publ. Ltd., Bikaner.
2	Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad, 380013, India.
3	Brunner R. C., 1989, Hazardous Waste Incineration, McGraw Hill Inc,
	Text/reference Books
1	Cunningham, W. P. Cooper, T. H. Gorhani, E. & Hepworth, M. T. ,2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai,
2	Gleick, H., 1993, Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press.
3	Hawkins R. e., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R).
4	Heywood, V. H. & Watson, R. T., 1995, Global Biodiversity Assessment, Cambridge Univ. Press.
5	Jadhav, H. & Bhosale, V. M., 1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi.
6	Mckinney, M. L. & Schocl. R. M. ,1996, Environmental Science Systems & Solutions, Web enhanced edition
	Important web links

1	https://onlinecourses.swayam2.ac.in/cec19_bt03/previewrwrr3
2	http://nitttrc.edu.in/nptel/courses/video/109105203/L41.html

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Second Year B.Tech (Electronics & Telecommunication Engineering),
Part 2, Semester IV</td></tr>
<tr><td>Course Code</td><td colspan="5">BSC 221</td></tr>
<tr><td>Course Category</td><td colspan="5">Basic Science Course</td></tr>
<tr><td>Course title</td><td colspan="5">Measurements and Instrumentation</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>02</td><td>05</td><td>04</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE:40</td><td colspan="2">ESE:60</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5"></td></tr>
<tr><td>Course Rationale</td><td colspan="5">The Measurements and Instrumentation course is designed to provide students with a foundational understanding of the principles, techniques, and instruments used in the field of measurements. In engineering and scientific disciplines, accurate and precise measurements are essential for analysis, control, and optimization of various processes. This course aims to equip students with the theoretical knowledge and practical skills needed to perform accurate measurements and effectively use instrumentation in diverse applications. Through this course, students will develop a strong foundation for pursuing advanced studies and careers in fields such as electrical engineering, physics, and related disciplines.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Introduce students to the fundamental concepts of measurements, including units, standards, and measurement errors.
2. Familiarize students with the principles of instrumentation and measurement devices.
3. Provide an in-depth understanding of sensors and transducers used for converting physical quantities into measurable electrical signals.
4. Explore techniques for conditioning signals from sensors and transducers.
5. Introduce students to data acquisition systems for capturing, storing, and processing measurement data.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Explain fundamental principles of measurement and instrumentation.
2. Identify and use different type’s transducers for various measurement applications.
3. Evaluate the selection criteria for choosing specific AC or DC Bridge in different applications.
4. Demonstrate different types of display devices and oscilloscopes and handling these instruments.
5. Demonstrate different signal generators and spectrum analyser.
6. Describe the components and functions of data acquisition systems</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	1											3	2
CO 2	3	3	3	1									3	3
CO 3	3	3	3	1	1								2	
CO 4	3	3	1	1										
CO 5	3	3	3	1	1									
CO 6	3												2	

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
1	**Introduction to Measurements Systems and Measuring Instruments** Measurements, elements of generalized measurement system, measurement system performance, static and dynamic characteristic, Errors- Types & source of error. Dual Slope Integrating type DVM, digital frequency meter, Q meter, phase measurement.	05
2	**Transducers** Definition, classification, transducer selection, different types of transducers, strain gauges, RTD, thermistor, thermocouple, LVDT, capacitive transducers, piezoelectric transducer, photovoltaic cell, LDR, Elastic pressure transducer – bellows, bourdon tubes, ultrasonic transducers – level measurement	08
3	**AC and DC Bridges** DC bridges: Introduction, wheatstone's bridge, Kelvin bridge, guarded Wheatstone bridge, AC bridges: Condition for bridge balance .Maxwell bridge, Hay bridge, Schering bridge, wein bridge.	06
4	**Oscilloscope & Display Devices** Introduction of Dual Beam and dual trace oscilloscope , Sampling, Digital storage, digital readout, measurement of phase and frequency using Lissajous pattern, CRO probes, Display devices: classification of display devices & principle: LED,LCD	07
5	**Signal Generators and Analyzers** Signal generators: Function generators, Sweep, pulse and square wave generator. Wave Analyzers: basic wave analyzer, heterodyne harmonic distortion analyzer, spectrum analyzer, logic analyser.	06
6	**Data Acquisition System and Conversion** Introduction, Objective of DAS, ,Single channel & Multichannel DAS ,DAC concepts: Binary weighted DAC, R-2R ladder circuit DAC, ADC concepts: flash, single slope, dual slope, stair case Ramp ADC, successive approximation ADC, Data Loggers	07

Sr. No.	Reference Books
1	A.K.Sawhney 'A Course in Electrical & Electronics Measurement & Instrumentation.' –11th Edition, 1996 --Dhanpat Rai & sons
2	C.S. Rangan ,G.R. Sharma , V.S.V. Mani 'Instrumentation devices and system' 2nd edition --Tata McGraw Hill Publication
3	B.C.Nakra, K.K.Choudhary 'Instrumentation, Measurement and Analysis', 2nd edition -- Tata McGraw Hill Publication
4	E.O.Doebeline.'Measurement systems application and design 'Tata McGraw Hill Publication
5	Oliver Cage 'Electronic measurement and instrumentation 'Tata McGraw Hill PublicationPublishers.
6	H .S. Kalsi 'Elecronic Instrumentation' – 2nd edition --Tata McGraw Hill Publication
7	A. D. Helfrick , W. D. Cooper ' Modern Electronic Instrumentation and Measurement Techniques'--Pearson Education
Sr. No.	**Important web links**
1	https://onlinecourses.nptel.ac.in/noc24_me12/preview

<table>
<tr><td>Year, Program, Semester</td><td colspan="6">Second Year B.Tech (Electronics & Telecommunication Engineering),
Part 2, Semester IV</td></tr>
<tr><td>Course Code</td><td colspan="6">BSC 221</td></tr>
<tr><td>Course Category</td><td colspan="6">Basic Science Course</td></tr>
<tr><td>Course title</td><td colspan="6">Measurements and Instrumentation Laboratory</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td colspan="2">Total Credits</td></tr>
<tr><td>-</td><td>-</td><td>02</td><td>02</td><td colspan="2">01</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td colspan="3" rowspan="2"></td><td>IE</td><td>EE</td><td>Total</td></tr>
<tr><td>50</td><td>-</td><td>50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="6"></td></tr>
<tr><td>Course Rationale</td><td colspan="6">This course deals with analysis and design of various digital electronic circuits with its applications.</td></tr>
<tr><td>Course Objectives</td><td colspan="6">1. Specify clear objectives for measurements based on the properties of the physical quantity being measured.

2. Choose appropriate instruments for specific measurement tasks.
3. Perform calibration procedures for various instruments.
4. Set up and configure data acquisition systems.</td></tr>
<tr><td>Course Outcomes</td><td colspan="6">1. Explain fundamental principles of measurement and instrumentation.
2. Identify and use different type’s transducers for various measurement applications.
3. Evaluate the selection criteria for choosing specific AC or DC Bridge in different applications.
4. Demonstrate different types of display devices and oscilloscopes and handling these instruments.
5. Demonstrate different signal generators and spectrum analyser.
6. Describe the components and functions of data acquisition systems.</td></tr>
</table>

	List of Experiments **1.** Study of temperature transducers: a) RTD b) Thermocouple c) Thermistor **2.** Study of displacement transducers: a) Inductive b) Capacitive c) Resistive **3.** Study of weight measurement using strain gauge: **4.** Study of speed measurement using : a) Magnetic pick up b) Photoelectric pick up **5.** Study of AC and DC bridges: a) Wheastones' bridge b) Maxwell's bridge c) Wein bridge **6.** Measurement of frequency and phase using Lissageous patterns **7.** Study of digital storage oscilloscope **8.** Study of spectrum analyzer **9.** Study of pressure measurement using bourdon tube **10.** Study of DAC using R-2R ladder network

Sr. No.	**Reference Books**
1	A.K.Sawhney 'A Course in Electrical & Electronics Measurement & Instrumentation.' – 11th Edition, 1996 --Dhanpat Rai & sons
2	C.S. Rangan ,G.R. Sharma , V.S.V. Mani 'Instrumentation devices and system' 2nd edition --Tata McGraw Hill Publication
3	B.C.Nakra, K.K.Choudhary 'Instrumentation, Measurement and Analysis', 2nd edition -- Tata McGraw Hill Publication
4	E.O.Doebeline.'Measurement systems application and design 'Tata McGraw Hill Publication
5	Oliver Cage 'Electronic measurement and instrumentation 'Tata McGraw Hill PublicationPublishers.
6	H .S. Kalsi 'Elecronic Instrumentation' – 2nd edition --Tata McGraw Hill Publication
7	A. D. Helfrick , W. D. Cooper ' Modern Electronic Instrumentation and Measurement Techniques'-- Pearson Education

Sr. No.	Important web links
1	https://onlinecourses.nptel.ac.in/noc24_me12/preview
2.	https://www.udemy.com/course/electronic-measurements-and-instrumentation/?utm_source=adwords&utm_medium=udemyads&utm_campaign=DSA_Catchall_la.EN_cc.INDIA&utm_content=deal4584&utm_term=_.ag_82569850245_.ad_533220805574_.kw_.de_c_.dm_.pl_.ti_dsa-21781902600_.li_9146233_.pd_.&matchtype=&gad_source=1&gclid=CjwKCAiAivGuBhBEEiwAWiFmYXAIWhj2TLlhm3TFFSlbmrGOXGKs3X9IchTQR8PLJ_M25NqgNyt4aRoC79cQAvD_BwE&couponCode=IND21PM

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Second Year B.Tech (Electronics & Telecommunication Engineering), Part 2, During Semester IV</td></tr>
<tr><td>Course Code</td><td colspan="5">PCC 221</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Courses</td></tr>
<tr><td>Course title</td><td colspan="5">Signals and Systems</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>01</td><td>-</td><td>04</td><td>04</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE:40</td><td colspan="2">ESE:60</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Differential Equations, Laplace Transform, z-Transform.</td></tr>
<tr><td>Course Rationale</td><td colspan="5">In typical applications of science and engineering, we have to process signals, using systems. The applications may vary from communication systems to control systems, but the basic analysis and design tools can be common. In this course, we are going to study all the fundamental mathematical signal processing tools like convolution, Fourier analysis, Laplace and Z transform. Main aim of the course is to study the use of these said tools in the analysis of linear time-invariant (LTI) systems. This course is fundamental course in the field of Signal Processing. This course builds concrete base for advanced courses like Digital Signal Processing, Audio and Speech Signal Processing, Image processing, Biomedical signal processing etc.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Explain classification of continuous and discrete time signals and systems
2. Demonstrate Analysis and Characterization of the CT and DT systems through Time domain method.
3. Discuss Spectral analysis of CT periodic and aperiodic signals using CT Fourier methods.
4. Explain Characterization of the CT systems through Laplace Transform and Fourier Transform.
5. Explain Analysis and Characterization of the DT systems through Z Transform.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Differentiate between different types of signals.
2. Identify type of Systems.
3. Analyze LTI systems in time domain.
4. Apply Fourier techniques to transform the signals in frequency domain.
5. Analyze LTI systems using Laplace transform and Z- transforms.
6. Demonstrate signals and interdEEndencies of time and frequency domain parameters.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO1	PO2	PO3		PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													3	
CO 2	3	1												3	2
CO 3	3	2	1		2									3	2
CO 4	3	3	1		2									3	2
CO 5	3	3	1		2									3	2
CO 6	3	2				1								3	2

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
1	**Introduction to Signals:** Signals, Continuous and discrete time signals, Classification of Signals , Periodic aperiodic, even & odd energy and power signals, deterministic and random signals, complex exponential and sinusoidal signals , periodicity properties of discrete time signals, complex exponential, unit impulse, unit step, impulse functions, transformation of indEEndent variable.	**05**
2	**Systems and Time domain analysis** Properties of systems: Linearity, Causality, Time invariance, Stability, Invertability. Time domain analysis of LTI systems: System modeling, Solution of Differential equation with initial conditions, Zero state response and Zero input response, representation of LTI system by impulse response (continuous and discrete Convolution), Identifying properties of system from impulse	**08**
3	**Frequency domain Analysis of systems** Fourier series representation of continuous time and discrete time periodic signals (Exponential), properties of continuous time and discrete time Fourier series. Continuous time and discrete time Fourier Transform, properties of the CT and DT Fourier Transform, Characterization using differential and difference equation, Parseval's relation, convolution in time and frequency domains, applications of Fourier transform.	**08**
4	**Sampling Theorem** Representation of continuous time signals by its sample, Sampling theorem, aliasing effect, antialiasing , methods reconstruction of a Signal from its samples, Interpolation techniques, discrete time processing of continuous time signals, sampling of band pass signals.	**03**
5	**Laplace Transform** Introduction, pole-zero plot, ROC, Properties of Laplace Transform, Inverse Laplace transform using partial fraction method, transfer function of LTI-CT system, impulse response and transfer function, convolution and de-convolution using LT, stability in S domain, system realization of LTI system in S domain. Application: solution of electronics circuit, solution of differential equation.	**08**
6	**Z-Transform** Basic principles of z-transform, z-transform definition, region of convergence, properties of ROC, Properties of z-transform, Poles and Zeros, inverse z-transform using residue Theorem, power Series expansion and partial fraction expansion, Computation of Impulse response & Transfer	**07**

	function using Z Transform, stability of LTI Systems, system realization of LTI system in Z domain. Applications: solution of difference equation.	

Sr. No.	Reference Books
1	Nagoor Kani, “Signals & Systems”, Tata McGraw Hill
2	Anand Kumar, “Signals & Systems”, PHI
3	AlanV.Oppenheim, Alan S.Willsky with S.Hamid Nawab, “Signals & Systems”, Pearson Education.
4	K.Lindner, “Signals and Systems”, McGraw Hill International, 1999.
5	Michael J. Roberts “Fundamentals of signals & systems”, Tata McGraw Hill, 2007
Sr. No.	**Important web links**
1	https://onlinecourses.nptel.ac.in/noc24_ee36/preview

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Second Year B.Tech (Electronics & Telecommunication Engineering), Part 2, During Semester IV</td></tr>
<tr><td>Course Code</td><td colspan="5">PCC 221</td></tr>
<tr><td>Course Category</td><td colspan="5">Compulsory Course for Certification in Electronics & Telecommunication Engineering</td></tr>
<tr><td>Course title</td><td colspan="5">Signals and Systems (Tutorial)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>--</td><td>01</td><td>--</td><td>01</td><td>01</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="3">---</td><td>IE: 50</td><td>Total=50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Basic programming, MATLAB.</td></tr>
<tr><td>Course Rationale</td><td colspan="5">In typical applications of science and engineering, we have to process signals, using systems. The applications may vary from communication systems to control systems, but the basic analysis and design tools can be common. In this course, we are going to study all the fundamental mathematical signal processing tools like convolution, Fourier analysis, Laplace and Z transform. Main aim of the course is to study the use of these said tools in the analysis of linear time-invariant (LTI) systems. This course is fundamental course in the field of Signal Processing. This course builds concrete base for advanced courses like Digital Signal Processing, Audio and Speech Signal Processing, Image processing, Biomedical signal processing etc.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Explain classification of continuous and discrete time signals and systems
2.Demonstrate Analysis and Characterization of the CT and DT systems through Time domain method.
3.Discuss Spectral analysis of CT periodic and aperiodic signals using CT Fourier methods.
4.Explain Characterization of the CT systems through Laplace Transform and Fourier Transform.
5.Explain Analysis and Characterization of the DT systems through Z Transform.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1.Differentiate between different types of signals.
2.Identify type of Systems.
3.Analyze LTI systems in time domain.
4.Apply Fourier techniques to transform the signals in frequency domain.
5.Analyze LTI systems using Laplace transform and Z- transforms.
6.Demonstrate signals and interdEEndencies of time and frequency domain parameters.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3												3	
CO 2	3	1											3	2
CO 3	3	2	1	2									3	2
CO 4	3	3	1	2									3	2
CO 5	3	3	1	2									3	2
CO 6	3	2			1								3	2

Level of Mapping as: Low 1, Moderate 2,

Minimum 8 Tutorials should be carried out based on following list or Syllabus

	Course Content	**Hours**
1.	Introduction to MATLAB. Different operators and commands in MATLAB.	01
2.	Generation of Different Continuous Time (CT) and Discrete time (DT) signals	01
3.	Convolution of CT and DT signals	01
4.	Generation of Exponential and Trigonometric Fourier series of Periodic Signal	01
5.	Fourier Transform and IFT of signals. Effect of Time and Frequency Domain.	01
6.	Verification of sampling theorem	01
7.	Reconstruction of Signals	01
8.	Reconstruction of Signals	01
9.	Determination of Laplace transform of signals and verification of properties of LT.	01
10.	Determination of Z- transform of signals and verification of properties of ZT.	01
11.	Pole zero plots.	01
12.	Introduction to SIMULINK.	01
Sr. No.	**Reference Books**	
1	Nagoor Kani, “Signals & Systems”, Tata McGraw Hill	
2	Anand Kumar, “Signals & Systems”, PHI	
3	AlanV.Oppenheim, Alan S.Willsky with S.Hamid Nawab, “Signals & Systems”, Pearson Education.	
4	K.Lindner, “Signals and Systems”, McGraw Hill International, 1999.	
5	Michael J. Roberts “Fundamentals of signals & systems”, Tata McGraw Hill, 2007	
Sr. No.	**Important web links**	
1	https://onlinecourses.nptel.ac.in/noc24_ee36/preview	

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Second Year B.Tech (Electronics & Telecommunication Engineering), Part 2, During Semester IV</td></tr>
<tr><td>Course Code</td><td colspan="5">PCC 222</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Courses</td></tr>
<tr><td>Course title</td><td colspan="5">Analog and Digital Communication</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>02</td><td>05</td><td>04</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE:40</td><td colspan="2">ESE:60</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Electronic Circuit Design</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course aims to enable students to be familiar with fundamental concepts and issues, to develop good understanding of basic analogue and digital communication techniques, to perform simple analysis and assessment of system performance.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. To study the fundamental concept of the analog communication systems.
2. To introduce the concepts of angle modulation.
3. To understand the working of various receivers.
4. Explain various waveform coding techniques.
5. To introduce the baseband data communication
6. To understand digital modulation techniques.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">After the completion of the course students will be able to -
1. Illustrate the principles of amplitude modulation.
2. Analyze and compare angle modulation techniques
3. Differentiate types of receivers used for particular application.
4. Analyse the performance of waveform coding techniques
5. Evaluate baseband data communication techniques.
6. Compare bandpass digital modulation techniques</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2									3	2
CO 2	3	2	1	2									3	1
CO 3	3	2	1	2									3	2
CO 4	3	2	1	2									3	
CO 5	3	2	1	2									3	
CO 6	3	2	1	2									3	

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
1	**Amplitude Modulation** Block schematic of communication system, Necessity of modulation, Types of modulation – AM, FM, PM and Pulse Modulation. Noise , Amplitude Modulation (AM) Techniques, Modulation index, % modulation, Power relations in AM,AM Generation: Low level and High Level Modulation, Modulator Circuits, Balanced modulator , SSB Principle, Vestigial sideband(VSB)	**07**
2	**Angle Modulation** Theory of Angle Modulation Techniques, FM and Phase Modulation(PM), Frequency deviation and Percentage Modulation, Deviation Sensitivity, Deviation ratio, Phase Deviation and Modulation Index, Bandwidth Requirements , FM Modulators(Direct & Indirect methods)	**06**
3	**Receivers** Types: TRF and Superhetrodyne ,Receiver Parameters: Sensitivity, Selectivity, Bandwidth, Dynamic Range, Fidelity, AM Detection : Using Diode, Practical Diode Detector FM receiver -Block diagram, Comparison with AM Receivers, Basic FM Demodulators.	**07**
4	**Waveform Coding** Sampling theorem and recovery of original signal, Quantization – Uniform & Non uniform , PCM, DPCM, need of predictors, implementation of predictors at transmitter, Bandwidth requirement in each system, Delta Modulation, limitations of DM, ADM, comparison between DM, PCM and ADM.	**07**
5	**Baseband Data Communication** Introduction, Baseband pulse shaping, Shaping of transmitted spectrum, Baseband signal receiver: Integrate and Dump filter, optimum filter, matched filter transfer function, correlate filter transfer function, Inter symbol interference.	**05**

6	**Digital Modulation Schemes** ASK, PSK, FSK, DPSK, QPSK, QAM, coherent and non-coherent detection, Probability of errors and comparison of noise performances in ASK, FSK, PSK.	**07**

Sr. No.	**Reference Books**
1	Wayne Tomasi, 'Electronics Communication Systems Fundamentals through Advanced' - Pearson Education.
2	George Kennedy, 'Electronics Communication System'--Tata McGraw Hill Publication.
3	Louis E. Frenzel, 'Principles of Electronic Communication Systems' -Tata McGraw Hill Publication.
4	Dennis Roddy, John Coolen, 'Electronics Communications '4th Edition-Pearson Education
5	Taub & Schling, "Principles of Communication System" TMH 2.
6	Apurba Das, "Digital Communication: Principles and System Modelling", Springer Publications
7	K. Sam Shanmugan, "Digital & Analog Communication systems" Wiley Publication
8	B.P. Lathi, " Modern Digital & Analog Communication System" Oxford University Press
9	Siman Haykin, "Digital Communication ", Wiley Publication
10	Bernard Scalar, "Digital Communication Fundamentals & Applications" PHI
Sr. No.	**Important web links**
1	https://onlinecourses.nptel.ac.in/noc21_ee74/preview
2	https://nptel.ac.in/courses/117101051

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Second Year B. Tech (Electronics & Telecommunication Engineering), Part 2, During Semester IV</td></tr>
<tr><td>Course Code</td><td colspan="5">PCC 222</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Courses</td></tr>
<tr><td>Course title</td><td colspan="5">Analog and Digital Communication Laboratory</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>-</td><td>-</td><td>02</td><td>02</td><td>01</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="3"></td><td>EE: 50</td><td>Total=50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Electronic Circuit Design</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course aims to enable students to be familiar with fundamental concepts and issues, to develop good understanding of basic analogue and digital communication techniques, to perform simple analysis and assessment of system performance.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1.To study the fundamental concept of the analog communication systems.
2.To introduce the concepts of angle modulation.
3.To understand the working of various receivers.
4.Explain various waveform coding techniques.
5.To introduce the baseband data communication
6.To understand digital modulation techniques.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">After the completion of the course students will be able to -
1.Illustrate the principles of amplitude modulation.
2.Analyze and compare angle modulation techniques
3.Differentiate types of receivers used for particular application.
4. Analyse the performance of waveform coding techniques
5. Evaluate baseband data communication techniques.
6. Compare bandpass digital modulation techniques</td></tr>
</table>

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2									3	3
CO 2	3	2	1	2									3	2
CO 3	3	2	1	2									3	1
CO 4	3	2	1	2									3	
CO 5	3	2	1	2									3	
CO 6	3	2	1	2									3	

Level of Mapping as: Low 1, Moderate 2, High 3

Expt. No.	**Course Content**
1	Study of Amplitude Modulation (A.M.)
2	Study of Frequency Modulation.(F.M.)
3	Study of AM Detection.
4	Study of SSB Modulation & Demodulation.
5	Study of DSB Modulation & Demodulation.
6	Study of FM Demodulation.
7	Sampling and Reconstruction.
8	Study of Pulse Amplitude Modulation & Demodulation.
9	Study of Pulse Width Modulation& Demodulation.
10	Study of Pulse Position Modulation & Demodulation
11	Experiment on ASK Modulation and Demodulation
12	Study of FSK Modulation and Demodulation
13	Study of PSK Modulation and Demodulation
14	Study of QPSK Modulation and Demodulation
15	Study of Delta Modulation and Demodulation
16	Study of Adaptive Delta Modulation and Demodulation
17	Study of TDM-PCM Modulation and Demodulation
18	Study of DPCM Modulation and Demodulation
19	Visit to radio station (AM/FM)
General Instruction: Minimum 8 experiments should be conducted from above experiment list or based on the syllabus	
Sr. No.	**Reference Books**
1	Wayne Tomasi, 'Electronics Communication Systems Fundamentals through Advanced' - Pearson Education.

2	George Kennedy, 'Electronics Communication System'--Tata McGraw Hill Publication.
3	Louis E. Frenzel, 'Principles of Electronic Communication Systems' -Tata McGraw Hill Publication
4	Dennis Roddy, John Coolen, 'Electronics Communications '4th Edition-Pearson Education
5	Taub & Schling, "Principles of Communication System" TMH 2.
6	Apurba Das, "Digital Communication: Principles and System Modelling", Springer Publications
7	K. Sam Shanmugan, "Digital & Analog Communication systems" Wiley Publication
8	B.P. Lathi, " Modern Digital & Analog Communication System" Oxford University Press
9	Siman Haykin, "Digital Communication ", Wiley Publication
10	Bernard Scalar, "Digital Communication Fundamentals & Applications" PHI
Sr. No.	**Important web links**
1	https://onlinecourses.nptel.ac.in/noc21_ee74/preview
2	https://nptel.ac.in/courses/117101051

Year, Program, Semester	Second Year B.Tech (Electronics & Telecommunication Engineering), Part 2, During Semester IV				
Course Code	PCC 223				
Course Category	Professional Core Courses				
Course title	**Analog Electronics**				
Teaching Scheme and Credits	**L**	**T**	**P**	**Total Contact Hours**	**Total Credits**
	03	-	02	05	04
Evaluation Scheme	**ISE:40**			**ESE:60**	**Total=100**
Pre-requisites (if any)	Basic knowledge of electronic Devices like R,L,C, BJT, Diode etc				
Course Rationale	Analog Circuits plays a vital role in the design of an electronic system. This course is detail study of important Analog / Linear Integrated Circuits (ICs). This course is a Circuit Design course planned to give exposure on use of operational amplifier (Op. Amp.) For Different applications and its significance in real world. It also includes other Analog ICs like Timer IC 555 and PLL.				
Course Objectives	1.Impart information about OPAMP 741 internal circuit and characteristics. 2.Explore OPAMP parameters 3.Explore OPAMP frequency response 4.Discuss OPAMP linear and nonlinear applications 5.Discuss OPAMP based filters and signal generator 6.Explore linear IC PLL and Timer 555				
Course Outcomes	1.Analyze the internal circuits of op. amp. 741. 2.Analyze the op. amp. For different Parameters. 3.Analyze linear and non-linear applications of op. amp. 4.Describe the open loop and closed loop frequency response of op. amp. 5.Design Filter and Signal generator circuits using op. amp. 6.Describe the PLL and Timer IC with application circuits.				

Course Outcome and Program Outcome Mapping

	P PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3													
CO 2	3	1											2	
CO 3	3				2									
CO 4	3	3			2								2	
CO 5	3	3			2									
CO 6	3	3			2									

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
1	**Op-Amp basics and Characteristics** Differential amplifier: common mode, differential mode, configurations, DC and AC analysis, constant current bias, current mirror circuit, cascade diff-amp stages, level shifter. Block Diagram of Op-Amp, Study of µA 741: Ideal & Practical Op-amp specifications, Transfer characteristics of Op amp.	**08**
2	**Op-Amp Parameters and basic Configurations** Op. Amp. Parameters: offset voltages and offset currents with compensation techniques, Input Bias current, slew rate, CMRR, PSRR, Thermal drift, open loop gain, closed loop gain, Comparative study of OP 07, LM 741, LM 311. Open Loop & Closed Loop Inverting, Non inverting and Differential amplifier with analysis of parameters like Av, Ri, Ro, Bandwidth.	**05**
3	**Op-Amp frequency response** Open loop and closed loop frequency response, unity gain BW, need for compensation, Internal and external compensated op amps and frequency response, effect of slew rate.	**06**
4	**Op-Amp Applications** Summing amplifier, Subtractor, Integrator, Differentiator, Instrumentation Amplifier, I to V and V to I converters. Comparators, Zero Crossing Detector, Window detector, Schmitt trigger, peak detector, log and antilog amplifier, precision rectifier, sample and hold circuit, clippers and clampers.	**08**
5	**Op-Amp Active Filters and signal generators** Filters: First & Second Order Butterworth Low Pass, High Pass, Band Pass, Band Reject and All Pass Filters. Signal generators: RC phase Shift, Wein Bridge, Hartely, Colpitts oscillators, op amp as multivibrators and triangular wave generators.	**05**
6	**PLL and Timer** Phase Lock Loop: Introduction, Operating principle, Study of Block Diagram of PLL, case study IC 565 PLL and application, Timer IC 555: block diagram, IC 555 as astable, mono-stable, bi-stable multivibrators, VCO.	**07**
Sr. No.	**Reference Books**	

1	J. Michael. Jacob —Application & Design with Analog Integrated Circuits, PHI.
2	Ramakant. A.Gayakwad — Op-Amps & Linear Integrated Circuits, 3rd Edition, PHI.
3	S.Salivahanan & Bhaaskaran —Linear Integrated Circuits, 1st Edition, Tata McGraw Hill
4	Sergio Franco —Design with op-amp & Analog Integrated Circuits, Tata McGraw Hill.
Sr. No.	**Important web links**
1	https://archive.nptel.ac.in/courses/108/108/108108111/
2	https://archive.nptel.ac.in/courses/108/108/108108114/

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Second Year B.Tech (Electronics & Telecommunication Engineering), Part 2, During Semester IV</td></tr>
<tr><td>Course Code</td><td colspan="5">PCC 223</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Courses</td></tr>
<tr><td>Course title</td><td colspan="5">Analog Electronics lab</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>-</td><td>-</td><td>02</td><td>02</td><td>01</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="3"></td><td>EE: 50</td><td>Total=50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Basic knowledge of electronic Devices like R,L,C, BJT, Diode etc</td></tr>
<tr><td>Course Rationale</td><td colspan="5">Analog Circuits plays a vital role in the design of an electronic system. This course is detail study of important Analog / Linear Integrated Circuits (ICs). This course is a Circuit Design course planned to give exposure on use of operational amplifier (Op. Amp.) For Different applications and its significance in real world. It also includes other Analog ICs like Timer IC 555 and PLL.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Demonstrate linear application of op amp.
2. Demonstrate Non-linear application of op amp.
3. Demonstrate filter circuits using op amp.
4. Demonstrate measurement of op amp parameters.
5. Demonstrate oscillator using op amp.
6. Demonstrate application circuit using 555.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Design and implement linear application of op amp.
2. Design and implement Non-linear application of op amp.
3. Design and implement filter circuits using op amp.
4. Demonstrate measurement of op amp parameters.
5. Design and implement oscillator using op amp.
6. Design and implement application circuit using 555.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	P PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO 2	3	1											2	
CO 3	3				2									
CO 4	3	3			2								2	
CO 5	3	3			2									
CO 6	3	3			2									

Level of Mapping as: Low 1, Moderate 2, High 3

Expt.No.	List of Experiments	Hours
1	Study of Inverting amplifier for DC & AC inputs using opamp	
2		
3	Study of Non-Inverting amplifier for DC & AC inputs using opamp	
4	Frequency Response of Inverting & Non-Inverting amplifier using opamp	
5	Study of op-amp as Summing, Scaling, & Averaging amplifier in Inverting & Non-Inverting	
6	Study of Instrumentation Amplifier using LM 324	
7	Study of V-I & I-V Converter	
8	Study of Schmitt Trigger using opamp & Window detector using opamp	
9	Study of Comparator & Zero Crossing Detector using opamp	
10	Study of Precision Rectifier using opamp	
11	Study of Butterworth Filter using opamp	
12	Study of Triangular & square wave generator using opamp	
13	Design of IC 555 Timer as Astable & Monostable Multivibrator	
14	Study of IC NE 565 PLL	
15	Study of Weins Bridge Oscillator using opamp	
16	Study of Function Generator using IC 8038	

Sr.No.	Reference Books
1	J. Michael. Jacob —Application & Design with Analog Integrated Circuits, PHI.
2	Ramakant. A.Gayakwad — Op-Amps & Linear Integrated Circuits, 3rd Edition, PHI.
3	S.Salivahanan & Bhaaskaran —Linear Integrated Circuits, 1st Edition, Tata McGraw Hill
4	Sergio Franco —Design with op-amp & Analog Integrated Circuits, Tata McGraw Hill.
Sr. No.	**Important web links**

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2	https://archive.nptel.ac.in/courses/108/108/108108114/

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Second Year B.Tech (Electronics & Telecommunication Engineering), Part I, Semester III</td></tr>
<tr><td>Course Code</td><td colspan="5">PCC 224</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Course</td></tr>
<tr><td>Course title</td><td colspan="5">Data Structures</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>02</td><td>01</td><td>-</td><td>03</td><td>03</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE:40</td><td colspan="2">ESE:60</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Prerequisites: Basics of computer fundamentals, Programming knowledge of C and C++ language.</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course helps student in understanding logical & mathematical models of storing & organizing data in a particular way in a processor-based system. In system programming, application programming the methods & techniques of data structures are widely used. The study of data structure helps the students in developing logical & structured programs.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Inculcate basic principles and concepts of data structures in student.
2. Familiarize students with commonly used data structures and their associated algorithms used in industry.
3. Introduce techniques for efficient storage, manipulation and retrieval of data using data structures.
4. Apply data structures and algorithms to solve programming problems efficiently.
5. Enhance problem-solving skills through practical implementation and programming assignments.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Develop knowledge of basic data structures for storage and retrieval of ordered or unordered data.
2. Implement linked list data structure to solve various problems.
3. Understand and apply linear data structure such as stacks, queues to solve various computing problems.
4. Identify problems that can be solved using tree structures and apply appropriate tree-based algorithms to solve them effectively
5. Implement basic graph operations, such as adding and removing vertices and edges, and perform operations like traversals and topological sorting
6. Analyze the time and space complexities of searching and sorting algorithms and understand factors influencing algorithm efficiency, including algorithm design, input size, and data distribution</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	P PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO 2	3	1											2	
CO 3	3				2									
CO 4	3	3			2								2	
CO 5	3	3			2									
CO 6	3	3			2									

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
1	**Introduction to Data Structures** Data types– primitive and non-primitive, Types of Data Structures, Linear & non-linear Data Structures, Arrays: Definition, One Dimensional Array and Multidimensional Arrays Strings: Definition, Library Functions of Strings, Basics of Algorithms, the time and space complexity of algorithms using asymptotic notation, Abstract Data Type (ADT).	05
2	**Linear Data Structure: Linked List** Introduction to linked list, Representation of Linked Lists in Memory, Singly Linked List, Doubly Linked List, Circular Linked List, Circular, Operations on linked list: Traversal, Searching node, Inserting node, Deleting node, Concatenation, Applications of Linked List: Representation & manipulations of polynomials using linked lists.	07
3	**Linear Data Structures: Stack and Queue** Stack: Introduction, Array Representation of Stack, Linked Representation of Stack, Applications of stack:, Expression conversion (Conversion of Infix to prefix and postfix expression) and Evaluation, Quicksort, Recursion, etc. Queue: Introduction, Array Representation of Queue, Linked list representation of Queue, Types of Queues: Circular Queue, Priority Queue, Dequeue, double ended queue, Applications of Queue.	08
4	**Nonlinear Data Structure: Tree**	06

	Introduction, Binary Tree: Binary tree representation in Memory, Binary tree traversal algorithms (Preorder, Inorder, Postorder), Threaded Binary tree, Binary Search Tree: operations (Searching, Insertion, Deletion), AVL Search Trees: Definition, Representation of an AVL search tree, Operations – Insertion, Deletion. B-Trees: Definition, Representation of B trees, Operation: Insertion, deletion and searching. Applications: Huffman coding	
5	**Nonlinear Data Structure: Graphs** Basic concepts, Sequential representation of Graph: Adjacency Matrix, Path Matrix, Linked representation of graph Operation on graphs: Traversal techniques (BFS and DFS), Searching, Insertion. Applications of Graphs -Topological sorting.	**06**
6	**Searching and Sorting Algorithms** Searching: Importance of searching, Linear Search, Binary Search, complexity of searching algorithms. Sorting: Importance of Sorting, Quick sort, Selection sort, Bubble sort, Insertion Sort, Merge Sort, Radix sort, Complexity of sorting algorithms. Hashing: Hash Functions, Overflow handling, Collision & Collision Resolution Techniques, (chaining, open addressing).	**07**

Sr. No.	**Text Books**
1	S. Lipschutz , 'Data Structures with C', Tata McGraw-Hill
2	Horowitz Ellis, Sahani –'Fundamentals of Data Structures in C++' -, Universities Press Publication
3	Richard F. Gilberg and Behrouz A. Forouzon, 'Data Structures- A Pseudocode Approach with C', Cengage Learning 2rd 2004 2 Data
4	Rajesh K. Shukla, "Data Structure Using C and C++" Wiley Dreamtech Publication
Sr. No.	**Reference Books**
1.	Michael T Goodrich –'Data Structures and Algorithms in C++' – 2nd Edition –Wiley Publication
2.	Mark Allen Weiss -' Data Structures and Algorithm Analysis in C++ '-3rd Edition - Pearson Publication
3.	J. R. Hubbard – 'SCHAUM'S OUTLINE OF DATA STRUCTURES WITH C++ '–. 1st Edition – McGraw Hill Education
4.	Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India
Sr. No.	**Important web links**
1	https://www.sanfoundry.com/cpp-programming-examples-data-structures/
2	https://www.geeksforgeeks.org/data-structures/

<table>
<tr><td>Year, Program, Semester</td><td colspan="6">Second Year B.Tech (Electronics & Telecommunication Engineering), Part II, Semester IV</td></tr>
<tr><td>Course Code</td><td colspan="6">PCC 224</td></tr>
<tr><td>Course Category</td><td colspan="6">Professional Core Course</td></tr>
<tr><td>Course title</td><td colspan="6">Data Structures Tutorial</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td colspan="2">Total Credits</td></tr>
<tr><td>-</td><td>01</td><td>-</td><td>01</td><td colspan="2">01</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td colspan="3" rowspan="2"></td><td>IE</td><td>EE</td><td>Total</td></tr>
<tr><td>-</td><td>50</td><td>50</td></tr>
<tr><td>Pre-requisites</td><td colspan="6">Prerequisites: Basics of computer fundamentals, Programming knowledge of C and C++ language.</td></tr>
<tr><td>Course Rationale</td><td colspan="6">This course helps student in understanding logical & mathematical models of storing & organizing data in a particular way in a processor-based system. In system programming, application programming the methods & techniques of data structures are widely used. The study of data structure helps the students in developing logical & structured programs.</td></tr>
<tr><td>Course Objectives</td><td colspan="6">1. Inculcate basic principles and concepts of data structures in student.
2. Familiarize students with commonly used data structures and their associated algorithms used in industry.
3. Introduce techniques for efficient storage, manipulation and retrieval of data using data structures.
4. Apply data structures and algorithms to solve programming problems efficiently.
5. Enhance problem-solving skills through practical implementation and programming assignments.</td></tr>
<tr><td>Course Outcomes</td><td colspan="6">1. Develop knowledge of basic data structures for storage and retrieval of ordered or unordered data.
2.Implement linked list data structure to solve various problems.
3. Understand and apply linear data structure such as stacks, queues to solve various computing problems.
4. Identify problems that can be solved using tree structures and apply appropriate tree-based algorithms to solve them effectively
5. Implement basic graph operations, such as adding and removing vertices and edges, and perform operations like traversals and topological sorting.
6. Analyse the time and space complexities of searching and sorting algorithms and understand factors influencing algorithm efficiency, including algorithm design, input size, and data distribution.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	1	1	1								
CO 2	3	2	3	3								
CO 3	3	2	3	3	3							
CO 4	3	1	3	3								
CO 5	3	3		1								
CO 6	3	2	3	3	3							3
PSO1	3	3	3	3	2							
PSO2	2	3	1	3	2							

Level of Mapping as: Low 1, Moderate 2, High 3

Lab No.	**Lab Title**
1	Array operations
2	Linear and Binary Search Techniques
3	Factorial and Fibonacci Series with and without Recursion
4	Insertion, deletion and traversal operations on singly linked list
5	Insertion, deletion and traversal operations on doubly linked list
6	Implementation of Stack using arrays and linked list
7	Sorting Techniques (Bubble sort, Quick sort, Merge sort)
8	Operation on Queue (Enqueue and Dequeue)
9	Binary tree traversal (Pre-order, Post-order, In-order traversal)

10	Insertion, traversal, search operations on Binary Search tree.
Sr. No.	**Text Books**
1	S. Lipschutz , 'Data Structures with C', Tata McGraw-Hill
2	Horowitz Ellis, Sahani –'Fundamentals of Data Structures in C++' -, Universities Press Publication
3	Richard F. Gilberg and Behrouz A. Forouzon, 'Data Structures- A Pseudocode Approach with C', Cengage Learning 2rd 2004 2 Data
4	Rajesh K. Shukla, "Data Structure Using C and C++" Wiley Dreamtech Publication
Sr. No.	**Reference Books**
1	Michael T Goodrich –'Data Structures and Algorithms in C++' – 2nd Edition –Wiley Publication
2	Mark Allen Weiss -' Data Structures and Algorithm Analysis in C++ '-3rd Edition - Pearson Publication
3	J. R. Hubbard – 'SCHAUM'S OUTLINE OF DATA STRUCTURES WITH C++ '–. 1st Edition – McGraw Hill Education
4	Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India
Sr. No.	**Important web links**
1	https://www.sanfoundry.com/cpp-programming-examples-data-structures/
2	https://www.geeksforgeeks.org/data-structures/

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">2024-25 Second Year B.Tech (Electronics & Telecommunication Engineering), Semester IV</td></tr>
<tr><td>Course Code</td><td colspan="5">IKS 221</td></tr>
<tr><td>Course Category</td><td colspan="5">Indian Knowledge System</td></tr>
<tr><td>Course title</td><td colspan="5">Introduction to Performing Arts</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>01</td><td>-</td><td>-</td><td>01</td><td>01</td></tr>
<tr><td rowspan="2">Evaluation Scheme</td><td colspan="2">I8SE</td><td>ESE</td><td>IE</td><td>EE</td><td>Total</td></tr>
<tr><td colspan="2">-</td><td>-</td><td>50</td><td></td><td>50</td></tr>
<tr><td>Course Rationale</td><td colspan="5">The course "Introduction to Performing Arts" seeks to broaden the horizons of engineering students by integrating the rich and diverse realm of performing arts into their curriculum. By exploring various performing arts forms, students will not only develop a deEEr understanding of human expression but also enhance their creativity, communication skills, and cultural awareness. This interdisciplinary approach aligns with NEP 2020's vision of holistic education and fosters the development of well-rounded individuals equipped to thrive in a rapidly evolving world.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">The course teacher will ensure
1. Introduce fundamental concepts, history, and theoretical frameworks of various performing arts forms.
2. Cultivate appreciation for cultural, social, and aesthetic dimensions of performing arts.
3. Develop critical thinking and analytical skills through performance analysis.
4. Enhance communication and presentation skills through practical exercises.
5. Foster creativity and imagination through exploration of diverse performing arts mediums.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">By the end of the course, students will be able to
1. Identify and analyze key elements and techniques across theater, dance, music, and visual arts.
2. Demonstrate understanding of historical, cultural, and social contexts in performing arts.
3. Critically evaluate performances using appropriate terminology.</td></tr>
</table>

	4. Apply performance principles to effectively communicate ideas and emotions. 5. Engage in creative expression through original performances.

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	2	-	2	-	2	-	-	-	-	-
CO 2	-	-	-	-	-	3	2	-	-	-	-	-
CO 3	-	-	-	-	-	-	2	-	3	3	-	-
CO4	-	-	-	-	-	2	-	2	3	3	-	-
CO5	-	-	-	-	-	-	-	-	-	-	3	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
1	Foundations of Performing Arts • Introduction to Performing Arts: Definition, scope, and significance. • Historical overview: Evolution of performing arts across cultures and civilizations.	**02**
2	Theatrical Arts • Introduction to theater: Origins, elements, and dramatic conventions. • Major theatrical movements and styles: Realism, surrealism, absurdism, etc. • Analysis of selected plays and playwrights.	**03**
3	Dance Forms • Introduction to dance: Styles, techniques, and cultural contexts. • Exploration of classical, folk, and contemporary dance forms. • Practical exercises and choreography workshops. .	**03**
4	Musical Expressions Introduction to music: Basic principles, genres, and traditions. • Appreciation of classical, folk, and popular music styles. Analysis of musical compositions and performances	**02**

5	Visual Performing Arts • Introduction to visual arts in performance: Set design, costume, and makeup. • Role of visual elements in enhancing the theatrical experience. • Case studies and practical demonstrations.	**02**
6	Performance and Presentation • Practical application of performing arts principles: Group performances and presentations. • Rehearsal techniques, stage presence, and audience engagement. Reflection and feedback on individual and group performances.	**02**

Assessment

For the internal assessment of the course, with a total evaluation is of 50 marks. Combination of different evaluation methods can be utilized to ensure comprehensive assessment of the students' performance. Following Evaluation Components are suggested:

- Written Assignments: 20 Marks
- Practical Assessments: 20 Marks
- Class Participation and Engagement: 10 Marks

Sr. No.	**Reference Books**
1	Bharata Muni, *Natyashastra*, An ancient Indian treatise on performing arts covering various aspects of classical dance, music, and drama, composed between 200 BCE and 200 CE, influencing the theory and practice of Indian performing arts for centuries.
2	Girish Karnad. (2005). Collected Plays: Volume 1. Oxford University Press.
3	Mohan Khokar. (2000). Traditions of Indian Classical Dance. Clarion Books.
4	Sunil Kothari. (2001). Kathak, Indian Classical Dance Art. Abhinav Publications. .

5	Sangeet Natak Akademi. (2005). Indian Music: Tradition and Trends. Sangeet Natak Akademi.
6	P. Sambamurthy. (2010). South Indian Music, Vol. 1. The Indian Music Publishing House.
7	Kapila Vatsyayan. (2007). Indian Classical Dance: Tradition in Transition. Publications Division, Ministry of Information and Broadcasting, Government of India.
8	Vijay Tendulkar. (2010). Collected Plays in Translation. Oxford University Press.
Sr. No.	**Important web links**
1	https://www.youtube.com/watch?v=W7bEzgZrN7s
2	https://www.youtube.com/watch?v=DQbNpx_CfJY
3	https://www.youtube.com/watch?v=eGiz50aVYWQ

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">2024-25 Second Year B.Tech (Electronics & Telecommunication Engineering), Semester IV</td></tr>
<tr><td>Course Code</td><td colspan="5">MAC 221</td></tr>
<tr><td>Course Category</td><td colspan="5">Mandatory Audit Course</td></tr>
<tr><td>Course title</td><td colspan="5">Aptitude Enhancement Course I</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>02</td><td>-</td><td>-</td><td>02</td><td>00</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="5">IE at course end</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This Aptitude Enhancement Course I aims to nurture holistic development among second-year B. Tech. Engineering students by focusing on enhancing their critical thinking, problem-solving skills, creativity, and emotional intelligence. Aligned with the NEP 2020 and Outcome-Based Education (OBE) philosophy, the course seeks to empower students with essential aptitudes required for success in both academic and professional domains.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1.The course teacher will ensure to-
2.Equip students with critical thinking skills through analytical exercises and problem-solving tasks.
3.foster creativity and innovation by engaging students in structured workshops and practical projects.
4.Develop students' emotional intelligence through self-awareness activities and stress management techniques.
5.Enhance collaborative skills and effective communication through group discussions and team-based projects.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. By the end of the course, the students will be able to
2. Demonstrate proficiency in critical thinking by analysing complex problems and proposing effective solutions.
3. Exhibit creativity through the development of innovative projects and solutions.
4. Display heightened emotional intelligence by managing stress, communicating empathetically, and resolving conflicts constructively.
5. Showcase collaborative skills by actively participating in group activities, contributing to team goals, and communicating ideas effectively.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	-	3	-	3	-	-	-	-	-	2	-	-
CO 2	-	2	-	-	2	1	-	-	-	-	-	-
CO 3	-	-	-	-	-	3	2	3	-	-	-	-
CO4	-	-	-	-	-	-	-	-	3	3	2	1

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
1	Inter-Personal & Inter-Organizational Communication	**02**
2	Creative & Critical Thinking	**02**
3	Group Dynamics & Decision-Making Techniques .	**02**
4	Emotional Intelligence & Stress Management Strategies	**03**
5	Assessment	**05**

Assessment

For the internal assessment of the course, with a total evaluation is of 50 marks. Combination of different evaluation methods can be utilized to ensure comprehensive assessment of the students' performance. The assessment will focus real-world scenarios that require the application of critical thinking, problem-solving, creativity, emotional intelligence, and teamwork. Following Evaluation Components are suggested:

1. Activity 1- Group Presentation (20 marks)

2. Activity 2- Group Discussion (20 marks)

3. Classroom Participation and Engagement (10 marks)
   Active participation in class discussions, group activities and question-answer sessions.

Sr. No.	Reference Books

1	Chakravarthi T. Kalyana and Chakravarthi T. Latha, *Soft Skills for Managers* (Biztantra Publications, 2014 (ISBN: 978-81-7722-568-6))
2	Kumar Sanjay and Pushp Lata (2015), *Communication Skills*, 2nd Edition, Oxford University Press, (ISBN: 9780199457069)
3	P. D. Chaturvedi and Mukesh Chaturvedi (2017), *The Art and Science of Business Communication- Skills, Concepts, Cases and Applications*, 4th Edition, Pearson India Education Services Pvt. Ltd., (ISBN 978-93-325-8728-1)
4	Wright, L. (2001). Critical Thinking: An Introduction to Analytical Reading and Reasoning. Oxford University Press.
5	Kallet, M. (2014). Think Smarter: Critical Thinking to Improve Problem-Solving and Decision-Making Skills. Wiley.
6	Bradberry, T., & Greaves, J. (2009). Emotional Intelligence 2.0. TalentSmart.
7	Dweck, C. S. (2007). Mindset: The New Psychology of Success. Ballantine Books.
Sr. No.	**Important web links**
1	https://www.sanfoundry.com/cpp-programming-examples-data-structures/
2	https://www.geeksforgeeks.org/data-structures/

<table>
<tr><td>Year, Program, Semester</td><td colspan="4">2024-25 Second Year B.Tech (Electronics & Telecommunication Engineering), Semester IV</td></tr>
<tr><td>Course Code</td><td colspan="4">HSMEC 221</td></tr>
<tr><td>Course Category</td><td colspan="4">Humanities, Social Science, Management, Environment</td></tr>
<tr><td>Course title</td><td colspan="4">Environmental Studies</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>02</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="4">University Exam at year end</td></tr>
<tr><td>Course Rationale</td><td colspan="4">The Course is all about learning the way we should live and how we can develop sustainable strategies to protect the environment. It helps individuals to develop an understanding of living and physical environment and how to resolve challenging environmental issues affecting nature.</td></tr>
<tr><td>Course Objectives</td><td colspan="4">The course teacher will -
1. Describe the various types and sources of environmental pollution.
2. Explore other global environmental issues, such as biodiversity loss, deforestation, and ocean acidification.
3. Explain key environmental laws and regulations at the national and international levels.
4. Explain the relationship between human society and the environment.</td></tr>
<tr><td>Course Outcomes</td><td colspan="4">Upon completion of this course, student should be able to –

1. Classify different types of environmental pollutants and their sources.
2. Analyze the interconnections between climate change and other global environmental issues.
3. Understand the legal frameworks and regulations governing environmental protection and management.
4. Describe the socio-economic drivers of environmental degradation and inequality</td></tr>
</table>

Course Outcome and Program Outcome Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	-	-	-	3	3	-	-	-	-
CO2	-	3	3	3	-	-	3	3	3	2	-	-
CO3	-	2	3	3	-	-	3	3	3	3	-	-
CO4	-	2	-	-	-	-	3	3	3	3	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
1	**Environmental Pollution** Definition: Causes, effects and control measures of: Air pollution, Water pollution: Causes, effects and control measures, Marine pollution, Soil pollution: Causes, effects and control measures, Noise pollution: Causes, effects and control measures, Thermal pollution: Causes, effects and control measures, Nuclear hazards and their effects. Solid waste Management: Causes, effects and control, measures of urban and Industrial wastes, Role of an individual in prevention of pollution.	**07**
2	**Understanding climate change and other global environmental issues** -Structure of atmosphere; greenhouse gas emissions; Projections of global climate change, Importance of 1.5 °C and 2.0 °C limits to global warming; Carbon foot print, -Impacts of climate change: on ocean and land systems; Sea level rise, changes in marine and coastal ecosystems; Impacts on forests and natural ecosystems; Impacts on animal species, agriculture, health, urban infrastructure;-Mitigation of climate change: Green House Gas (GHG) reduction, sink enhancement; Concept of carbon intensity, energy intensity and carbon neutrality; National and international policies for mitigation, net zero targets for the future; Energy efficiency measures; Renewable energy sources for carbon reduction; Carbon capture and storage, Acid Rain: Causes, effects and mitigation, Ozone Layer Depletion: Causes, effects and mitigation	**08**
3	**Environmental legislation** Introduction to environmental laws and regulation: Constitutional provisions- Article 48A, Article 51A (g), Environmental Protection Act., Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act.	**06**
4	**Social Environment**	**04**

	Environmental ethics, Environmental movements- Chipko Movement, Appiko Movement, Silent Valley Movement. Water conservation: rain water harvesting, watershed management, Disaster management: floods, earthquake, cyclone, tsunami and landslides.	
Sr. No.	**Text Books**	
1	Agarwal, K. C. 2001, Environmental Biology, Nidi Publ. Ltd., Bikaner.	
2	Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad, 380013, India.	
3	Brunner R. C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p.	
Sr. No.	**Reference Books**	
1	Cunningham, W. P. Cooper, T. H. Gorhani, E. & Hepworth, M. T. ,2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai,	
2	Gleick, H., 1993, Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press.	
3	Hawkins R. e., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)	
4	Heywood, V. H. & Watson, R. T., 1995, Global Biodiversity Assessment, Cambridge Univ. Press.	
5	Jadhav, H. & Bhosale, V. M., 1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi.	
6	Mckinney, M. L. & Schocl. R. M. ,1996, Environmental Science Systems & Solutions, Web enhanced edition.	
7	Miller T. G. Jr., Environmental Science, Wadsworth Publishing Co. (TB).	
8	Odum, E. P., 1971, Fundamentals of Ecology, W. B. Saunders Co. USA.	
9	Rao M. N. & Datta, A. K. ,1987, Waste Water Treatment, Oxford & IBH Publ. Co. Pvt. Ltd.	
10	Sharma B. K., 2001, Environmental Chemistry, Goel Publ. House, Meerut.	
11	Survey of the Environment, The Hindu (M).	
12	Trivedi R. K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media (R).	
13	Wagner K. D., 1998, Environmental Management, W. B. Saunders Co. Philadelphia, USA.	
Sr. No.	**Important web links**	
1	https://onlinecourses.swayam2.ac.in/cec19_bt03/preview	
2	http://nitttrc.edu.in/nptel/courses/video/109105203/L41.html	

SEM – III

Sr. No.	Second Year B. Tech Semester III Pre-revised syllabus	Second Year B. Tech Semester III Revised syllabus	Remark
1	Engineering Mathematics-III	Engineering Mathematics-III	Content is revised
2	Electronics Circuit Design-I	Electronic Circuit Design (Theory & Lab)	Clubbed in another course with content revision.
3	Digital Electronics (Theory & Lab)	Digital Electronics (Theory & Lab)	Content is revised.
4	Network Analysis	Network Analysis	Content revision
5	Programming Techniques	Programming Techniques	Content revision
7	Soft Skills Development	Soft Skills Development	Content is revised
8	Environmental Studies	Environmental Studies	No change as it is centrally offered by the University.
9	Aptitude and Professional communication	------	Shifted to next semester.

SEM – IV

Sr. No.	Second Year B. Tech Semester IV Pre-revised syllabus	Second Year B. Tech Semester IV Revised syllabus	Remark
1	Measurements & Instrumentation	Measurements & Instrumentation	Content revision.
2	----------	Signals & Systems	Shifted from next semester
3	Analog Communication	Analog & Digital Communication	Title change & Clubbed in a another course with content revision.
4	Linear Integrated Circuits	Analog Electronics	Title change & content revision.
5	Data Structures	Data Structures	Content revision.
6	---------	Multidisciplinary Minor Courses are introduced	Added as per the guidelines of NEP- 2020
7	Electronics Circuit Design -II	----------	Clubbed & shifted to previous semester
8	Electronics Circuit Design –II (Lab)	----------	Clubbed & shifted to previous semester
9	Introduction to Performing Arts	Introduction to Performing Arts	Made it as a Credit course with content revision.
11	------	Aptitude Enhancement Course I	Newly introduced.
12	Environmental Studies	Environmental Studies	No change.