MATURI VENKATA SUBBA RAO ENGINEERING COLLEGE

(An Autonomous Institution)

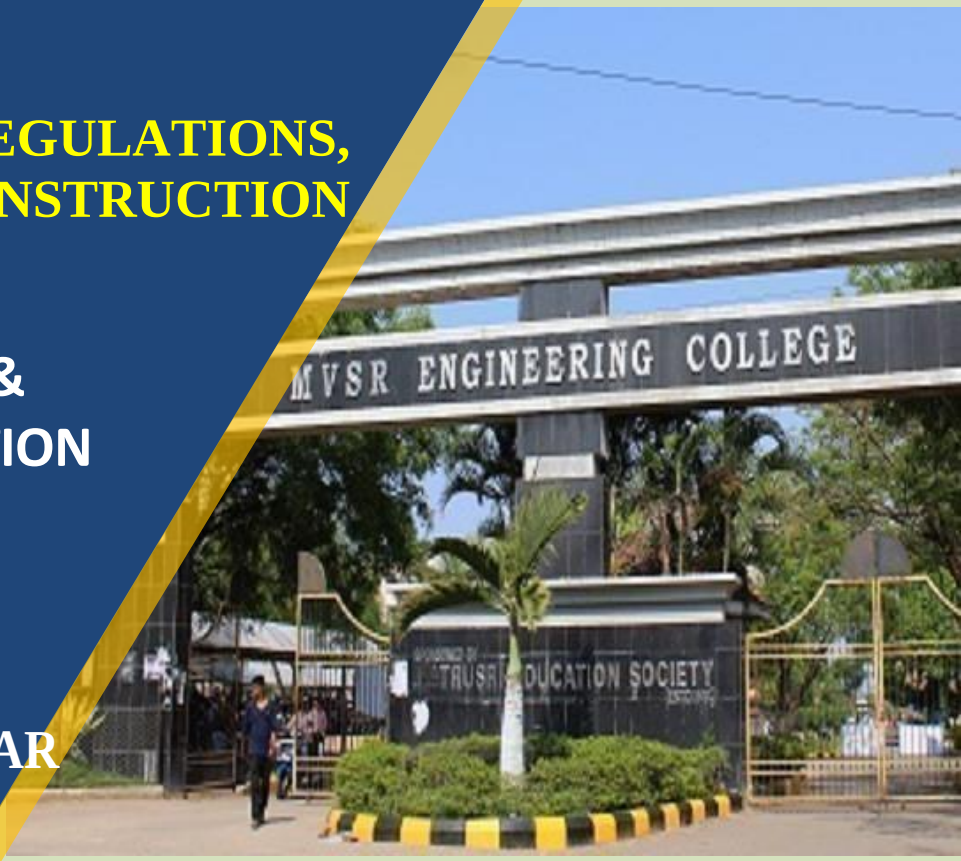
BACHELOR OF ENGINEERING

ACADEMIC REGULATIONS, SCHEME OF INSTRUCTION & SYLLABI (R-21)

ELECTRONICS & COMMUNICATION ENGINEERING

(I,II,III & IV Semesters)

ACADEMIC YEAR 2022-23



(Sponsored by Matrusri Education Society, Estd.1980)

ACADEMIC RULES AND REGULATIONS
for
Four Years

BACHELOR OF ENGINEERING
DEGREE PROGRAMMES

Maturi Venkata Subba Rao(MVSR) Engineering College

(An Autonomous Institution)

(Sponsored by Matrusri Education Society, Estd.1980)

Approved by AICTE, Affiliated to Osmania University
Accredited by NAAC and ISO 9001:2015 Certified Inst.
NBA Accreditation: CIVIL, CSE, ECE, EEE, IT and MECH.

website: www.mvsrec.edu.in

Counseling Code: TSEAMCET/TSECET/TSICET: MVSR

PGECET: MVSR1

(For the batch admitted in 2022-23 (R-21))

B.E. PROGRAMMES
(Full-time)

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of
ACADEMIC RULES & REGULATIONS

ACADEMIC RULES AND REGULATIONS

For Four Year Degree Programme in Engineering

of

Maturi Venkata Subba Rao (MVSR) Engineering College

(With effect from the academic year 2022 - 2023)

PREAMBLE: All the Rules and Regulations, hereinafter specified shall be read as a whole for the purpose of interpretation. Any reference to college in these Rules and Regulations stands for Maturi Venkata Subba Rao (MVSR) Engineering College. In case of arising a doubt, the interpretation of the Academic Council, the Statutory Body constituted as per UGC regulations of the college is final. The Academic council has the powers to make amendments to these regulations whenever necessary and shall be approved by Governing Body(GB).

ABBREVIATIONS:

AC	Academic Council
AICTE	All India Council for Technical Education
BE	Bachelor of Engineering
BoS	Board of Studies
GB	Governing Body
C	Credits
CGPA	Cumulative Grade Point Average
CIE	Continuous Internal Evaluation
CP	Credit Point
D	Drawing
GO	Government Order
GP	Grade Point
L	Lecture
MOOC	Massive Open Online Course
MVSREC	Maturi Venkata Subba Rao Engineering College
NPTEL	National Programme on Technology Enhanced Learning
P	Practical
SEE	Semester End Examination
SGPA	Semester Grade Point Average
SWAYAM	Study Webs of Active Learning for Young and Aspiring Minds
T	Tutorial
UG	Under Graduate
UGC	University Grants Commission

NOMENCLATURE:

S. No.	Keywords	Definition
1	**Governing Body**	Highest administrative body of the Institute. GB is an authority as per the AICTE/ UGC regulations and responsible to perform functions as may be necessary and deemed fit for the proper development ofthe institution.
2	**Academic Council**	Highest academic body of the Institute and is responsible for the maintenance of standards of instruction, education and examination within the Institute. Academic Council is an authority as per the AICTE / UGC regulations and has the right to take decisions on all academic matters including academic research.
3	**Academic Year**	A period that is necessary to complete courses of study. It consists oftwo consecutive (one odd + one even) semesters.
4	**Autonomous Institute**	An Institute designated as 'Autonomous' by University Grants Commission (UGC), New Delhi in concurrence with the affiliating University i.e., Osmania University, Hyderabad and Telangana State Government.
5	**Board of Studies**	An authority, as defined in UGC regulations, constituted by the Principal for each of the department separately. The board is responsible for curriculum design and update in respect of all the programmes offered by a department.
6	**Course**	Usually referred to, as „papers" is a component of a programme. All courses need not carry the same weightage. The learning objectives and learning outcomes are defined for each course. A course is designed to comprise lectures/ tutorials/ laboratory work/ field work/ outreach activities/ project work/ vocational training/viva/ seminars/ term papers/ assignments/ presentations/self-studyetc. or a combination of some of these.
7	**Course Evaluation**	Continuous Internal Evaluation (CIE) in the Semester & Semester End Examination (SEE) constitutes the main assessment prescribed for each course.
8	**Continuous Internal Evaluation (CIE)**	To be normally conducted by the course instructor which includes class tests, problem solving exercises, group discussions, assignments, quizzes, mini-projects & seminars conducted anytime throughout the semester.
9	**Credit**	A unit by which the course work is measured. One credit is equivalent to one lecture hour of teaching (lecture or tutorial) or two hours of practical / field work per week.
10	**Grade Point**	It is a numerical weight allotted to each letter grade on a 10-point scale. A+ =10, A = 9, B = 8, C = 7, D = 6, E = 5 and F = 0.
11	**Credit Point**	A product of grade point and number of credits for a course.

12	**Cumulative Grade Point Average (CGPA)**	It is a measure of overall cumulative performance, of a student in all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters of the program. It is expressed upto two decimalplaces.
13	**Programme**	A programme or specialization of a degree programme like Civil Engineering, Mechanical Engineering etc.
14	**Curriculum**	Curriculum incorporates all the courses that are offered in a specific programme. It also indicates the planned interaction of students with instructional content, materials and resources.
15	**Degree**	A student who fulfills all the programme requirements is eligible to receive a degree.
16	**Grading**	To be normally done using Letter Grades as qualitative measure of achievement in each Course like: A+ (Outstanding), A (Excellent), B (Very Good), C (Good), D (Average), E (Pass), F (Fail) based on the marks (%) scored in (CIE+SEE) of the course and conversion to grade done byrelative/absolute grading.
17	**Mandatory Courses**	Compulsory non-credit courses that a student need to study as prescribed in the programme.
18	**Massive Open Online Courses (MOOC)**	Open access online courses aimed at providing ways to learn new skills.
19	**Revision of Regulations, Curriculum and Syllabi**	The institution, from time to time may revise, amend or change the regulations, scheme of examinations, curriculum and syllabi with the approval of the academic council.
20	**Semester End Examination (SEE)**	To be normally conducted at the institutional level which will cover the entire course syllabi. The SEE questions are to be set from each unit. The questions are to be based on Blooms Taxonomy
21	**Semester**	Each year of study is divided into two semesters. Semester shall consist of 16 weeks of academic work excluding Semester End Examination and Evaluation.
22	**Semester Grade Point Average (SGPA)**	It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various theory and lab courses offered in each semester and the total course credits taken during that semester. It shall be expressed upto two decimal places.

I. ADMISSION PROCEDURE

1. A candidate for admission to the Four Year Degree Programme in Engineering must have passed the Intermediate Examination of the Board of Intermediate Education, Government of Telangana with Mathematics, Physics and Chemistry as optional courses, or any other examination recognized bythe Government of Telangana as equivalent thereto.

2. A candidate will be admitted strictly in accordance with the guidelines issued by State Government of Telangana fromtime to time.

II. DURATION AND PROGRAMMES OF STUDY

The duration ofthe programme is eight semesters (four years) such as I, II, III, IV, V, VI, VII and VIII. Each academic year shall comprise oftwo semesters.

Instruction per semester --- 16 weeks

Preparation holidays (includes practical exams) --- 02 weeks

No admission/ readmission/ promotion are entertained after four weeks of the commencement of instruction of semester in I, II, III and IV years.

In case there are any court cases consequent to which the authorities are compelled to admit any candidate after the announced last date of admissions, the admission (seat) of such a student would be reserved for the subsequent year on a supernumerary basis.

No refund of Tuition fee will be made after the commencement of instruction for students who wish to cancel their admission.

1. The following programmes of study are offered by the college.

S. No	Programme
i).	Automobile Engineering
ii).	Civil Engineering
iii).	Computer Science and Engineering
iv).	Electrical and Electronics Engineering
v).	Electronics and Communication Engineering
vi).	Information Technology
vii).	Mechanical Engineering

The schedule of study of all programmes is regulated by the Academic council of Maturi Venkata Subba Rao (MVSR) Engineering College.

2. Candidate who fails to fulfill all the requirements for the award of the degree as specified here in after within (N+2) academic years from the time of admission, *as per the UGC Guidelines on determination of uniform span period (UGC Letter No. F-12-1/2015 (CPP-II) dated and 15.10.2015 and Osmania University letter No.336/M/Acad.I/2016 dated 21.03.2016)*, will forfeit his/her seat in the programme and his/her admission will stand cancelled, where „N" is the number of years of programme of study. For four year regular B.E. degree programme maximum durationofstudy is (N + 2) = 4 + 2 = 6 years.

   Candidate admitted to the second year under lateral entry scheme shall fulfill all the requirements for the award of the degree as specified here in after within (N+2=3+2=5) five academic years from the time of admission failing which he/she will forfeit his/her seat and his/her admission will stand cancelled.

III. RULES AND REGULATIONS OF ATTENDANCE

1. Candidates admitted to a particular programme of study are required to pursue **Regular programme of study** before theyare permitted to appear for the Semester End Examination.

2. **A regular programme of study** means putting in attendance of not less than 75% in each semester.

3. In special cases and for sufficient cause shown, the Academic Council (AC) may condone the deficiency in attendance to the extent of 10% on medical grounds subject to the submission of medical certificate (signed by Competent Authority) along with the payment of condonation fee too.. However, in respect of women candidates who seek condonation of attendance due to pregnancy, the Academic Council (AC) on the specific recommendations may condone the deficiency in attendance to the extent of 15% (as against 10% condonation for others) on medical grounds(Valid Medical certificate) subject to submission of medical certificate to this effect. Such condonation is permitted onlyonce during the programme of study.
   Medical certificate along with the fitness is to be submitted within a week days on reporting to the class work.
   * **Shortage of attendance below 65 % shall in no case be condoned.**

4. The fee for condonation of attendance on medical grounds shall be Rs. 2000/- (Rupees Two Thousand only) payable through DD/ Banker Cheque drawn in favour of Principal, Maturi Venkata Subba Rao (MVSR) Engineering College.

5. Attendance of N.C.C / N.S.S Camps or Inter collegiate or Inter-University or Inter State or International matches or debates or Educational Excursions or such other Inter University activities as approved by the authorities involving journeys outside the city in which the college is situated will not be counted as absence.

   (i) Such absence shall not exceed four weeks per semester of the total period of instructions.

   (i) Such leave should be availed with prior permission from the Principal and not be availed more than twice during the programme of study.

   (**i**) Without anyprior permission, such leave shall be treated as absence.

   (iv) While calculating the attendance, the number of classes not attended in each subject shall be added to the numerator.

6. The attendance shall be calculated on the aggregate of courses from the date of commencement of classes/ date of readmission in case of detained candidates as per the almanac.

7. In case of candidates who fail to put in the required attendance in a programme of study, he/she shall be detained in the same semester and will not be permitted to appear for the Semester End Examination. Such candidates shall have to seek readmission into the same semester during the subsequent year in order to appear for the examination after fulfilling the attendance requirements and on payment of requisite tuition fee.

IV. SCHEME OF INSTRUCTIONS AND EXAMINATION

1. Instructions in various courses in each semester of all four years shall be provided by the college as per the scheme of instruction and syllabi prescribed. All students have to register for the courses offered in the Semester before starting of that particular semester.

2. The total number of credits for alleight semesters is 160 as per AICTE Model Curriculum

3. The distribution of marks/grade* based on Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE) shall be as follows:

Subject	Continuous Internal Evaluation (CIE)	Semester End Examination (SEE)
Each theorysubject	**30 ****	**70 ******
Each practical or drawing Subject for which less than 6 periods / week are provided in the scheme of instruction	**25 ****	**50**
Each practical or drawing Subject for which 6 or more Periods/week are provided in the scheme o instruction	**50 *****	**100**
Project I	**50 #**	**---**
Project II	**50 #**	**100 ##**

Total marks = CIE + SEE

***** Grades are allotted based onthe marks secured in CIE and SEE as per the following criteria.

Academic Performance	Grade		Grade points
	Letter	Description	
90% ≤ Marks ≤ 100%	**A +**	Outstanding	10
80% ≤ Marks < 90%	**A**	Excellent	9
70% ≤ Marks < 80%	**B**	Very Good	8
60% ≤ Marks < 70%	**C**	Good	7
50% ≤ Marks < 60%	**D**	Average	6
40% ≤ Marks < 50%	**E**	Pass	5
0% ≤ Marks < 40%	**F**	Fail	0
	AB	Absent	

** Out of 30 CIE marks for theory, 10 marks are allotted for Assignments/Tutorials/Quizzes etc. (At least two assignments and two quizzes are to be conducted) in the course. The rest of the 20 marks are allotted to internal tests. Two internal tests will be conducted in each semester. Each test will carry 20 marks, out of which 6 marks for PART-A (compulsory), consisting of three short answer questions and from Part- B two questions consisting of subjective questions are to be attempted from the remaining three questions and each question carries 7 marks. Average of two tests plus marks obtained in assignments/tutorials/quizzes etc. will be taken as CIE marks.

*** Out of25/50 CIE marks for Practical/drawing, 10/ 20 are allotted for viva- voce exam / Quiz test, 15/30 marks for laboratoryrecord/drawing sheets and observations.

**** The SEE question paper consists of seven questions and each question carries 14 marks. The first question is compulsory and covers the entire syllabus as part A. Student has to answer four questions from the remaining six questions that cover the entire syllabus as part B.

The CIE evaluation of BE Project (Project - I & II) consists of a maximum of 50 marks which will be distributed as per the guidelines given below:

(i) **30 Marks** are allocated for qualityof the project work covering
- (a) Literature review
- (b) Innovation/ Originality
- (c) Methodologyand
- (d) Relevance / Practical application which will be awarded bythe supervisor.

(i) 20 Marks are allocated to candidate's performance in terms of viva-voce examination and overall subject knowledge. Marks will be awarded by the committee constituted bythe HoD.

The evaluation of BE Project (Project II) for Semester End Examination consists of a maximum of 100 marks which will be distributed as per the guidelines given below:

(i) **50 Marks** are allocated for qualityof the project work covering
- (a) Literature review
- (b) Innovation / Originality
- (c) Methodologyand
- (d) Relevance/ Practical application, which will be awarded jointly by the internal and external examiners.

(i) 50 Marks are provided for candidate's presentation and performance in terms of viva-voce examination and overall subject knowledge. Out of 50 Marks 30 marks will be awarded by the internal examiner and 20 marks by the external examiner concerned.

Note:

(i) A course that has CIE but no SEE as per scheme is treated as Pass/ Fail for which pass marks are 40% of CIE marks.

(i) Mandatory courses shall not carry any credits but, securing **40% of total marks**, shall be **necessary requirement** for the student to qualify for the **award of Degree.**

1. The details of instruction period, examination schedule, vacation etc. shall be notified by the Principal, Maturi Venkata Subba Rao Engineering College.

2. The mediumof instruction and examination shall be English.

3. At the end of each semester, SEE shall be held as prescribed in the respective Schemes of Examination. The examinations pertaining to the semester just ended, will be called, regular examinations and the examinations pertaining to the other semesters will be called supplementary examinations. To enable the B.E. Final Year students to complete the program requirements in time, there shall be a Make-up / Supplementary Exam for VIII semester only, which will be scheduled within one month of publication of results of VIII semester regular examinations.

4. The examinations prescribed may be conducted by means of written papers, practical and viva-voce, inspection of certified CIE work in Drawing and Laboratories and Workshop, or by means of any combination of these methods as may be deemed necessary. Candidates will be required to produce complete Lab Records of the Practical work done by them in each practical examination, along with other materials prepared or collected as part of Laboratory work/

Project.

5. All the general rules for examinations (given under itemno. X) shall be adhered to.

6. A candidate shall be deemed to have fully passed a course, if he/she secures

   - A minimum of 40% marks for each theorycourse in the Semester End Examination (SEE)
   - A minimum of 40% marks (E – Grade) for each theory course considering both CIE and SEE.
   - A minimum of 50% marks for each Practical/ Drawing/ Project work in the Semester End Examination (SEE)
   - A minimum of 50% marks (D – Grade) for each Practical/ Drawing/ Project work considering both CIE and SEE.

   Important note: The candidate has to mandatorily appear at the SEE in all the Practical/Laboratory/Drawing Courses irrespective of marks secured under CIE.

7. In case of hearing impaired, orthopedically handicapped and visually challenged candidates, 10% reduction in pass marks in each subject is admissible as per G.O. Ms. No.150, dated 31-08-2006.

8. If a candidate desires to have his/her answer scripts revaluated, he/she can apply for it as per the college norms and notification ofthe College Examination Branch.

9. A candidate can also obtain a photocopy of the corrected answer book of the theory courses of SEE only against payment. For more details in this regard, the press note of the College Examination Branch after the declaration of results may be referred.

V. RULES OF PROMOTION

S. No.	Semester / Class	Conditions to be fulfilled	
1.	From I-Semester to II-Semester	Regular programme of studyof B.E. I-Semester	
2.	From II-Semester to III-Semester	a)	Regular programme of studyof B.E. II-Semester
		b)	Must have earned at least 50% of credits (rounded to the next nearest integer) prescribed for B.E. I-Semester and II-Semester.
3.	From III-Semester to IV-Semester	Regular programme of studyof B.E. III-Semester	
4.	From IV-Semester to V-Semester	a)	Regular programme of studyof B.E. IV-Semester
		b)	No. of backlog credits, if any of B.E. I, II, III and IV Semester put together shall not exceed 50% (rounded to the next nearest integer) of the total number of credits prescribed for the B.E. III & IV-Semester

5.	From V-Semester to VI-Semester	Regular programme of studyof B.E. V-Semester
6.	From VI- Semester to VII-Semester	a) Regular programme of studyof B.E. VI-Semester b) Number of backlogs, if any of B.E. I, II,III, IV, V and VI Semester put together shall not exceed 50% (rounded to the next nearest integer) of the total number of credits prescribed for the B.E. V & VI-Semester
7.	From VII-Semester to VIII-Semester	Regular programme of studyof B.E. VII-Semester

Note: 1. If a candidate has more than permitted number of credits as backlogs, he/she will be detained.

2. The candidate who wishes to take readmission into the year in which he/she is detained will have to paythe total tuition fee of that year and all the credits earned during that year shall become null and void.

VI. GRADING SYSTEM

1. Candidates who have passed all the examinations of the B.E. Degree Programme shall be awarded Cumulative Grade Point Average (CGPA) in accordance with the grade secured by them in all eight Semesters taken together, including the CIE marks secured in those semesters. The grade secured shall be shown in the memorandum of marks as per the performance in CIE and SEE.
A minimum CGPA of 5 is required for the award of Degree. The consolidated memorandum of marks will reflect the credits/ grade scored in each course.

1. Semester Grade Point Average (SGPA) & Cumulative Grade Point Average (CGPA)

Calculation:

a) $$\text{SGPA} = \frac{\sum_{i=1}^{p} (\text{Letter Grade Point}_i \times \text{Credits}_i)}{\sum_{i=1}^{p} \text{Credits}_i}$$

Where i = 1, 2, …..p represent the number of courses in a particular semester. SGPA is calculated upto second decimal point and it is calculated only when all courses in that semester are Cleared/ Passed.

b) $$\text{CGPA} = \frac{\sum_{j=1}^{m} [(\text{SGPA})_j \times (\text{Total Credits})_j]}{\sum_{j=1}^{m} \text{Total Credits}_j}$$

where j= 1, 2, ….mrepresent the number of semesters of the entire programme.
CGPA at a given point of Semester is calculated upto second decimal point. It is calculated only when total credits earned are equal to total credits prescribed as per scheme upto a semester in which the candidate has last appeared for SEE.

c) Courses in which the candidate has failed are not included in computing SGPA/ CGPA.

VII. AWARD OF DEGREE

The degree of bachelor of engineering will be conferred on candidate who has pursued a regular programme of study of four academic years (three academic years for candidates admitted in II-Year under lateral entry scheme), as hereinafter prescribed in the scheme of instruction and has passed all the examinations as prescribed in the scheme of examinations.

Note: For **mandatory and audit courses (non-credit),** student shall be awarded a Grade without anycredit. This shall not be counted for the computation of SGPA/CGPA.

VIII. AWARD OF GOLD MEDAL

(i) A student securing highest CGPA in **single attempt** is eligible for award of Gold Medal.

(**i**) A readmitted student is not eligible for Gold medal.

IX. IMPROVEMENT OF OVERALL SCORE

1. A candidate who wishes to improve his/her overall score may do so within one academic year immediately after having passed all the examinations of the B.E. degree programme, by reappearing in not more than two semesters (all courses pertaining to the semester taken together) examinations without violating the rule mentioned in the item II.3.

2. For the award of the overall score, he/she will have the benefit of the higher SGPA secured in the corresponding semester(s).

X. GENERAL RULES OF EXAMINATIONS

1. Application for permission to appear in any examination shall be made available online through college website (www.mvsrec.edu.in) as per the notification.

2. When a candidate's application is found in order and he/she is eligible to appear in Semester End Examination (SEE), the College Examination Branch shall furnish him with a Hall-Ticket, enabling the candidate to appear in the Semester End Examination. The Hall-Ticket shall have to be produced by the Candidate before he/she is admitted to the premises where the Examination is likely to be held.

3. A candidate who does not present himself/herself for examination for any reason whatsoever, excepting shortage of attendance, shall not be entitled to claim refund of the whole or part of the examination fee, for subsequent Examination(s).

4. A candidate after he/she has been declared successful in the all examinations, shall be given a provisional certificate stating the year of examination, the branch in which he/she was examined and, the overall grade secured. However, the candidates have to obtain degree certificate (convocation) fromthe Examination Branch, Osmania University, Hyderabad.

5. No candidate shall be allowed to put in attendance for a programme or appear at examinations for different degrees and different faculties simultaneously.

6. Students who have appeared once in any examination of the programme need not put in fresh attendance, if they wish to reappear at the corresponding examination, notwithstanding the fact that the college may have introduced new courses. They will, however, have to appear at the examinations according to the scheme of examination anysyllabi in force.

XI. TRANSITORY REGULATIONS

1. Whenever a course or scheme of instruction is changed in a particular semester/year, two more examinations immediately following thereafter shall be conducted according to the old syllabus/regulations, provided the content in the course has changed more than 40%.

2. Candidates not appearing at the examinations or failing in them shall take the examination subsequently according to the changed syllabus/regulations.

XII. RANGE OF CREDITS

1. A regular student will be eligible to get an Under Graduate degree in Engineering if he/she secures the credits as specified in the Scheme of Instruction and Examinations.

   A lateral entry student shall be declared eligible to get an Under Graduate degree in Engineering if he/she

   a) Secures required credits as specified in the Scheme of Instruction and Examinations from Semester - III to Semester - VIII
   b) Qualifies bridge courses and mandatory courses specified if any during Semester - I and Semester – II

XIII. MALPRACTICE AND AWARD OF PUNISHMENT

Schedule on the Nature of Malpractice and Award of Punishment

"Examination" in this context refers to all the papers taken bythe candidate on the same hall-ticket.

MALPRACTICE AND AWARD OF PUNISHMENT

S. No	Malpractice	Award of Maximum Punishment
1	Possession of the prohibited (written or printed) papers, books, notes during the examination period but which were not used.	Only that exam shall be cancelled. No reference either to the previous or future exams.
2	Matter relevant to the examination being written on any part of the body or on the clothes worn, or in the instrument, wrapping, etc.	-do-
3	Attempting to take help from any prohibited papers, notes, written or printed matter, writings on the walls, furniture and attempting to take help from or giving help to other regarding answer to any question or questions of the examination paper.	-do-
4	Taking help from or consulting of prohibited written or printed material; consulting and/or taking help from or helping other examinee during the examination period inside the examination hall or outside it; with or without their consent, or helping other candidate to receive help from anyother.	-do-
5	An examinee who attempts to disclose his/her identity to the paper valuer by writing his/her roll number at a place other than the place prescribed for it, or by writing his/her name or any coded message or an	-do-

	examinee who makes an appeal to the paper valuer in the answer book.	
6	Writing such as invocation of God‟s name in any form.	To be ignored
7	Writing on the question paper or other papers; the answer to questions, rough work, etc., with no intention of passing it on to another examinee.	To be warned not to do so.
8	Using abusive and obscene language in the answer book.	To warn and assess on the basis of content.
9	Examinee allowing or destroying prohibited material found in his possession or acting in any other manner with a view to destroy evidence.	Only that exam shall be cancelled. No reference either to the previous or future exams.
10	Refusing to obey instructions of the Chief Superintendent/Invigilator.	Only that exam shall be cancelled. No reference either to the previous or future exams.
11	Smuggling an answer book/ additional answer book/ matter into or out of the examination hall.	Only that exam shall be cancelled. No reference either to the previous or future exams.
12	Inserting in or removing from the answer book/additional answer book of any sheet.	-do-
13	Substituting wholly or partly an answer book/additional answer book.	-do-
14	Impersonation even at a single examination.	To be dealt with as per Law.
15	Cases of examinees when conspiring to interchange in Roll Nos.	Only that exam shall be cancelled. No reference either to the previous or future exams.
16	Creation of disturbance or otherwise misbehaving in and around the examination hall during or before the examination.	Only that exam shall be cancelled. No reference either to the previous or future exams.
17	Guilty of assaulting/abusing intimidating any person connected with the examination work any time before, during or after the examination.	Only that exam shall be cancelled. No reference either to the previous or future exams.
18	Punishments for malpractices not defined here would be recommended on the merits of the individual cases bythe malpractices committee.	

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Maturi Venkata Subba Rao (MVSR) Engineering College (Autonomous)
Department of Electronics and Communication Engineering

Scheme of Instructions for B.E. (E.C.E.) for 8 Semesters

S. No	Course Work – Subject Area	Credits/ Semester								Credits Obtained/ Required
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Sciences (HS)	-	3	2	3	-	-	-	-	8/12
2	Basic Sciences (BS)	10	8	3	-	-	-	-	-	21/25
3	Engineering Sciences (ES)	10	6	5	2	-	-	-	-	23/24
4	Professional Subjects –Core (PC)	-	-	11	17	20	12	8	-	68/48
5	Professional Subject-Electives (PE)	-	-	-	-	-	6	6	6	18/18
6	Open Subjects – Electives (OE)	-	-	-	-	-	3	3	3	9/18
7	Project Work, Seminar and/or Internships (PW)	-	-	-	-	1	-	4	8	13/15
8	Mandatory Courses (MC) (Non-Credit)	-	-	-	-	-	-	-	-	-
	TOTAL	20	17	21	22	21	21	21	17	160/160
	Contact Hours/ Week	27	23	26	25	28	24	25	25	

B.E. (E.C.E.) I – SEMESTER

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs/ week	CIE	SEE	Duration of SEE (Hrs)	
Theory Courses										
1	U21BSN01MT	Engineering Mathematics-I	3	1	-	4	30	70	3	4
2	U21BSN01PH	Engineering Physics	3	-	-	3	30	70	3	3
3	U21ESN01EE	Basic Electrical Engineering	3	-	-	3	30	70	3	3
4	U21ESN01CS	Programming for Problem Solving using C	3	-	-	3	30	70	3	3
Practical/ Laboratory Courses										
5	U21BSN81PH	Physics Lab.	-	-	4	4	25	50	3	2
6	U21BSN81MT	Computational Mathematics Lab.	-	-	2	2	25	50	3	1
7	U21ESN81EE	Basic Electrical Engineering Lab.	-	-	2	2	25	50	3	1
8	U21ESN81CS	Programming for Problem Solving using C Lab	-	-	4	4	25	50	3	2
9	U21ESN82CE	Engineering Drawing Practice	-	-	2	2	25	50	3	1
Total			**12**	**01**	**14**	**27**	**245**	**530**	**-**	**20**

* **3 Weeks** induction program will be organized before commencement of the coursework of Semester – I

BS: Basic Science,
ES: Engineering Science
HS: Humanities and Social Sciences

L: Lecture
T: Tutorial
P: Practical
D: Drawing

CIE: Continuous Internal Evaluation
SEE: Semester End Evaluation

Note:
1. Each contact hour is a clock hour
2. The duration of the practical class is two hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

Course Code	Course Title						Core/Elective
U21BSN01MT	**Engineering Mathematics - I**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**1**	**-**	**-**	**30**	**70**	**4**

Course Objectives

The objectives of this course is to

- Introduce the concepts of sequences, series and their properties
- Introduce the concepts of mean value theorems and curvature
- Introduce the concepts of multiple integrals
- Study vector differential and vector integral calculus

Course Outcomes

After completing this course, the student will be able to:

- Determine the convergence of infinite series using various tests of convergence
- Solve problems based on the fundamental theorem of differential calculus, find radius of curvature, evaluate and envelopes and expand functions using Taylor & MacLaurin series
- Evaluate Double and Triple integrals in Engineering Problems
- Solve problems based on vector differentiation.
- Solve problems based on vector integration

UNIT-I:

Infinite Series: Introduction to sequences, Infinite series, general properties of infinite series, geometric series, series of positive terms, Harmonic series(p-series),Comparison test, D' Alembert's ratio test, Raabe's test, Cauchy's nth root test, Alternating series, absolute and conditional convergence

UNIT-II:

Differential Calculus: Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem(without proofs) and their applications, Taylor and Maclaurin series, Curvature, Radius of curvature(Cartesian form),Centre of Curvature, Evolute and Involute, Envelope of a family of curves

UNIT-III:

Multiple Integrals: Introduction to functions of two and three variables, Double integrals, Change of order of integration, Change of variables from Cartesian to Plane Polar coordinates, Triple integrals(Cartesian)

UNIT-IV:

Vector Differentiation: Scalar and vector point functions, Vector operator del, Gradient, Unit normal vector, Directional derivative, Angle between surfaces, Divergence, solenoidal vector, Curl, Irrotational vector, Laplace operator applied to scalar and vector point functions.

UNIT-V:

Vector Integration: Line integral-work done, Surface integral, Volume integral, Green's theorem in a plane, Stoke's theorem, Gauss divergence theorem(without proofs) and their verifications.

Text Books:

1. R. K. Jain &S. R .K. Iyengar, *Advanced Engineering Mathematics*, Narosa Publications, 5th Edition 2016.
2. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publications, 44th Edition, 2018.

Reference Books:

1. B.V. Ramana, Higher Engineering Mathematics, 23rd reprint, 2015.
2. N. Bali, M. Goyal, *AtextbookofEngineeringMathematics*, Laxmi publications, 2010
3. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley, 9th Edition, 2012.
4. B. Thomas Jr. and Ross L. Finney *Calculus and Analytic Geometry*.
5. M. Tom. Aposta, l *Calculus: One -Variable Calculus with An Introduction to Linear Algebra*, Vol 1

Course Code	Course Title						Core/Elective
U21BSN01PH	**Engineering Physics**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The objectives of this course is to

- To introduce principles of Wave Mechanics and Electromagnetic theory
- To explain the properties and applications of semiconducting materials
- To explain the properties and applications of Magnetic and Superconducting materials
- To explain the principles of Laser technology, Optical fibers and their applications in various disciplines
- To introduce Nano Science and Nanotechnology

Course Outcomes

After completing this course, the student will be able to:

- Recall the principles of Wave Mechanics and apply them to solve particle in a box, list the fundamental laws of electricity and magnetism and make use of these laws to derive Maxwell's Electromagnetic wave equation and Poynting theorem.
- Explain and illustrate Semiconducting materials along with their applications.
- Classify Magnetic Materials and explain properties, Identify applications of Ferro Magnetic Materials and Superconducting Materials.
- Explain the principle of Laser and Optical Fiber; Summarize different types of Laser sources and optical fibers; identify the applications of Laser and Optical Fiber.
- Summarize various types of Nanomaterials, their preparation methods and list out various Characterization Techniques and applications of Nanomaterials.

UNIT-I:

Wave Mechanics And Electromagnetic Theory: De-Broglie's hypothesis, Wave function and its physical significance, Schrodinger's time independent wave equation, Schrodinger's time dependent wave equation, Particle in 1D potential box. Gauss's laws in electrostatics and magnetostatics, Faraday's law and Ampere's law in Electromagnetic induction, Maxwell's equations in Integral and differential forms, Conducting current and Displacement current, Electromagnetic wave equation in dielectric medium, Poynting theorem.

UNIT-II:

Semiconductors And Devices: Introduction to Semiconductors - Intrinsic and Extrinsic Semiconductors, Concept of hole, Expression for Carrier concentration and conductivity in Intrinsic Semiconductors, Hall Effect and its applications. Semiconductor devices P-N junction diode, LED, Thermistor.

UNIT-III:

Magnetic Materials And Super Conductors: Introduction- Basic definitions of magnetism- Origin of Magnetic moment, Classification of Magnetic materials- Dia, Para, Ferro, Anti-ferro and Ferri Magnetic materials Types of magnetic materials and their properties, Weiss molecular field theory of Ferromagnetism, Hysteresis of Ferromagnetic material based on domain theory, Soft and Hard magnetic materials, Ferrites and their applications.

Superconductors and their properties, Meissner effect, Type-I and Type-II Superconductors, BCS Theory, High Tc superconductors, Applications of Superconductors.

UNIT-IV:

Modern Optics: Introduction to LASERs, Characteristics of Lasers, Spontaneous and Stimulated emissions, Components of LASERs, LASERs operating in UV- Vis-IR Regions, Types of LASERS- Solid State LASER(RUBY LASER), Gas LASER(He-Ne Laser), and Semiconductor LASER, Applications of LASERs.
Introduction to Optical fibre, Basic principle – Total internal reflection, Propagation of light through the fibre - Numerical Aperture and Acceptance angle, Step-Index and Graded- Index optical fibres, Applications of Optical fibres.

UNIT-V:

Nano Materials And Experimental Techniques: Origin of Nano Science- Bulk and Nano materials, types of nanomaterials, Surface to volume ratio and Quantum confinement effect, properties of nanomaterials, fabrication of nanomaterials- Top-down approach and Bottom-up approach, Ball milling method, and Sol-Gel methods, Elementary ideas of Carbon nanotubes (CNT'S). Material characterization techniques- X- Ray diffraction, RAMAN Spectroscopy, SEM and TEM, Applications of nanomaterials

Text Books:

1. M.S. Avadhanulu and P.G. Kshirasagar, A text book Engineering Physics, S. Chand and Co., 9th edition, 2010.
2. R.K. Gaur and S.L. Gupta, Engineering Physics, Dhanpat Rai publications, 8th edition, 2001.
3. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning India(P) Ltd., 2012
4. R. Murugesan and K. Sivaprasath, Modern Physics, S. Chand & Company, 13th edition, 2007.
5. A. Goswami, Thin Film Fundamentals, New Age International, 2007.
6. A.K. Bandopadhyay, Nano Materials, New Age International, 1st edition, 2007.
7. Engineering Physics by M. Armugam
8. Engineering Physics by K.J. Pratap, et. al.

Course Code	Course Title						Core/Elective
U21ESN01EE	**Basic Electrical Engineering**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**1**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The objectives of this course is to

- Provide an understanding of basics in Electric circuits
- To explain the working principles of Electrical Machines and single phase transformers.

Course Outcomes

After completing this course, the student will be able to:

- Apply network theorems to solve DC and AC circuits.
- Analyze DC and AC circuits.
- Illustrate the construction, operation and performance of DC machines.
- Comprehend construction and working principles of AC Machines.
- Identify the Electrical Installation, Switchgear, Safety measures

UNIT - I:

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws, analysis of simple circuits with dc excitation, Superposition, Thevenin and Norton Theorems.

UNIT - II:

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, and RL, RC, RLC combinations (series only). Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT - III:

Transformers and 3-ph Induction Motors:, Transformers: Electromagnetic induction, Faradays laws, statically induced emf, Lenz law, BH characteristics, ideal and practical transformer, losses and efficiency, Auto-transformer and three-phase transformer connections. **Three Phase Induction motor:** Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, squirrel cage IM, slip-ring IM, Applications.

UNIT - IV:

Single-phase induction motor & DC Machines, Single-phase induction motor: Construction and principle of operation, Capacitor start & capacitor run motor, applications.

DC Generators: Dynamically induced emf, Fleming's Right and Left hand rules, Construction and principle of operation of DC generator, EMF equation, Types of DC Generators, OCC characteristics, applications. **DC Motors:** principle of operation of DC Motor, Types of DC motors, applications.

UNIT - V:

Electrical Installations: Components of LT Switch gear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries, Elementary calculations for energy consumption, power factor improvement and battery backup.

Text Books:

1. N. K. De, "*Basic Electrical Engineering",* Universities Press, 2015.
2. J. B. Gupta, "*Fundamentals of Electrical Engineering and Electronics"* S.K .Kataria & Sons Publications, 2002.
3. J. B. Gupta, *"Utilization of Electric Power and Electric Traction" S*.K. Kataria & Sons Publications, 2010.
4. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, "*Basic Electrical Engineering"* TMH - 2009.
5. Hughes, *"Electrical Technology",* VII Edition, International Student-on, Addison Welsey Longman Inc., 1995.

Course Code	Course Title						Core/Elective
U21ESN01CS	**Programming for Problem Solving Using C**						**Core**
Prerequisite	Contact Hour s per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The objectives of this course is to impart knowledge of

- To introduce the concept of computing environment, number systems, algorithms, flowcharts and implementation using variables with various data types and selection statements.
- To introduce the logic building techniques using control statements and arrays
- To understand modular and structure programming using functions and strings
- To learn the alternative to iteration using recursion and familiarization with structures and macros
- To understand memory management using pointers and dealing with files

Course Outcomes

After completing this course, the student will be able to:

- Formulate simple algorithms/flowcharts there by translating them into programs using variables with various data types and selection statements.
- Implement logic building techniques using control statements and arrays
- Apply modular and structure programming using functions and strings
- Analyze the iteration with recursion and implementation of structures and macros.
- Illustration of memory management techniques using pointers and implement the file handling approach

UNIT-I:

Introduction to computers: Introduction to components of a computer system, Operating system, Number system: Decimal, binary, octal, hexa decimal systems.
Algorithms/Flowcharts: Logical and Numerical problem solving
Introduction to C Programming: Structure of C, Execution phases in C (Compiler, interpreter, Linker, loader), C-tokens, syntax & semantics in compilation, Identifiers, variables, keywords, Data Types, Operators, precedence & associativity rules, Expression evaluation, Type conversion.
Selection statements: simple if, if-else, else-if ladder, nested if-else, switch

UNIT-II:

Iteration statements: while, do-while, for, **Unconditional statements:** break, continue, goto, return
Arrays: 1-D arrays, **Searching Techniques:** Linear, binary search, **Sorting algorithms:** bubble sort and selection sort,2-D arrays: Matrices

UNIT-III:

Strings: Defining & initializing strings, String manipulation functions (predefined, user-defined)
Functions: Taxonomy of functions, built-in functions, parameter passing techniques: call by value, Passing arrays to functions: Idea of call by reference
Storage classes: auto, register, static, extern

UNIT-IV:

Recursive functions: Recursion definition, Iteration vs Recursion, Example programs: GCD, Factorial, sum of digits, fibonacci
Structures: Defining & accessing structured data, Array of structures, passing structure to function, nested structures, Difference between structure & union
Preprocessor directives: Macros, #define, #if, #elif

UNIT-V:

Pointers: Introduction to pointers, Defining pointers, pointer arithmetic, Array of pointers, pointer to array, Null pointer, generic pointer, double pointers, passing pointer to function: call by address, Accessing structure using pointer, self-referential structure, Dynamic memory allocation

File Handling: I/O streams, File operations, file modes, Sequential/Random accessing files, command line arguments.

Text Book:

1. B.A. Forouzan and R. F. Gieverg, "A structured Programming Approach in C" language learning 2013.

Reference Books:

1. Paul Deitel & Harvey Deitel, *"C How to program"* 7th edition,PHI
2. A.K. Sharma,, *"Computer Fundamentals and Programming in C"* - Universities Press,2nd edition,2018
3. E. Balagurusamy, *"Programming in ANSI C"* -, TMH, 2008
4. Byron Gottfried - "*Theory and practice of Programming with C",* Schaum's Outline McGrawHill,1990
5. Pradip Dey, Manas Ghosh, *"Programming in C"*- Oxford University Press, 2nd edition
6. Brian W Kernighan and Dennis M Ritchie, *"The C programming Language",* Prentice Hall of India,1988

Course Code	Course Title						Core/Elective
U21BSN81PH	**Physics Lab**						**Core**
Prerequisite	Contact Hour s per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**4**	**25**	**50**	**2**

Course Objectives

During the course the student is expected to

- To analyze a Semiconducting device and determine its temperature Coefficient of Resistance, Energy Gap, Electrical Conductivity, Mobility, concentration of charge carriers and its efficiency.
- To determine the wavelength of given laser source, Sodium vapour lamp by using diffraction grating.
- To explain the principle of Optical Fiber and determine its Numerical Aperture, Acceptance Angle and losses.
- To demonstrate Torsional Pendulum, LCR Series and Parallel Circuit and calculate Rigidity Modulus of a given wire and frequency of LCR Series and Parallel Circuit.
- To examine the nature of Ferro Magnetic Materials, Dielelctric Materials and Calculate their related parameter
- To explain Seebeck Effect and Determine Seebeck Coefficient of thermoelectric device.

Course Outcomes

After completing this course, the student will be able to:

- Analyze a Semiconducting device and determine its temperature Coefficient of Resistance, Energy Gap, Electrical Conductivity, Mobility, Concentration of charge carriers and efficiency.
- Determine the Wavelength of Laser source, Sodium Vapour lamp using diffraction grating.
- Explain the principle of Optical Fiber and determine its Numerical Aperture, Acceptance angle and losses.
- Demonstrate Torsional Pendulum, LCR series and Parallel circuit and calculate the Rigidity Modulus of given metallic wire, resonant frequency of LCR Series & Parallel circuit.
- Examine the nature of ferromagnetic materials, dielectric materials and calculate their related parameter
- Explain Seebeck Effect and determine Seebeck Coefficient of thermoelectric device

List of Experiments:

1. To Determine the Numerical aperture (NA), Acceptance Angle of the Optical Fiber, and To study the various losses of that occur in optical fiber.
2. To determine the wave length (λ) of the given Laser source.
3. To determine V-I characteristics of the given LED.
4. To draw the V-I characteristics of a Solar Cell and calculate the Fill Factor and Series Resistance.
5. To draw the I - V Characteristics of P-N Junction diode and to evaluate the resistance for forward biasand revers bias.
6. To determine the constants of A, B and α using Thermistor characteristics.
7. To find the values of Electrical conductivity and energy gap of Ge crystal.
8. To determine the wave length of radiation emitted by Sodium vapour lamp using Diffraction Grating.
9. To study the behavior of Series LCR Resonant circuit and to estimate the resonant frequency and Q factor.
10. To study the variation in currant and voltage in parallel LCR Circuit and to find the resonant frequency of parallel LCR Circuit.
11. Determination of rigidity of modulus of Torsional pendulum.
12. To determine the Dielectric constant ofthe given Dielectric samples.
13. To draw the curve between the magnetizing field and the intensity of magnetization of the specimen (soft iron rod) and to find out i) Coercivity ii) Retentivity and iii) Hysteresis loss.
14. To calculate Seebeck Coefficient of the given sample.
15. To determine the Hall coefficient, Carrier concentration and mobility of charge carriers of semi conducting material.
16. To determine the velocity of the Ultrasonic Waves

Course Code	Course Title						Core/Elective
U21BSN81MT	**Computational Mathematics Lab**						**Core**
Prerequisite	Contact Hour s per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives

The objectives of this course is to

- know the history and features of Math tools like SCI LAB/MATLAB
- know the local environment of MATLAB/SCI LAB
- study the concept of definite integrals, differential equations and system of equations using MATLAB/SCI LAB
- study the concept of Eigenvalues and Eigenvectors using MATLAB/SCI LAB.
- study simple mathematical functions using 2D and 3D plots

Course Outcomes

After completing this course, the student will be able to:

- understand the main features of the MATLAB/SCI LAB program development environment to enable their usage in the higher learning
- evaluate definite integrals using MATLAB/SCI LAB.
- solve linear differential equations with constant coefficients using MATLAB/SCI LAB .
- solve system of linear equations using MATLAB/SCI LAB.
- find Eigenvalues and Eigenvectors using MATLAB/SCI LAB
- Interpret and visualize simple mathematical functions using 2D and 3D plots.

List of Programs:

1. Introduction to MATLAB and GUI
2. Basic operators of MATLAB/ SCI LAB
3. Finding roots of algebraic equations.
4. Determinant of matrices.
5. Rank of a matrix
6. Solving system of linear equations using matrices.
7. Eigenvalues.
8. Eigenvectors.
9. Solutions of first order linear differential equations.
10. Solutions of second order linear homogeneous differential equation with constant coefficients.
11. Evaluating definite integrals
12. Data plotting for 2D and 3D

Reference Books:

1. Computational Mathematics Lab Manual.

Course Code	Course Title						Core/Elective
U21ESN81EE	**Basic Electrical Engineering Lab**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
U21ESN01EE	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives

The objectives of this course is to

- To impart the practical knowledge and analysis of electrical circuits, theorems and transformers.
- To impart the practical knowledge on testing of DC and AC Machines and the usage of common electrical measuring instruments.

Course Outcomes

After completing this course, the student will be able to:

- Get an exposure to common electrical components and their ratings.
- Analyze the performance of DC and AC Circuits.
- Analyze the performance of DC and AC Machines.
- Comprehend the usage of common electrical measuring instruments.
- Test the basic characteristics of transformers and electrical machines.

List of Laboratory Experiments/ Demonstrations:

1. Demonstration of Basic safety precautions. Introduction and use of measuring instruments–voltmeter, ammeter, multi-meter, oscilloscope, Real-life resistors, capacitors and inductors.
2. Verification of KVL and KCL, superposition theorem (with DC excitation)
3. Verification of Thevenin's and Norton's theorems (with DC excitation)
4. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification of phase differences between current and voltage and Power factor calculation.
5. Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics).
6. Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
7. Three-phase transformers: Star and Delta connections, Voltage and Current relationships (line- line voltage, phase-to-neutral voltage, line and phase currents).
8. Measurement of phase voltage/ current, line voltage/ current and power in a balanced three-phase circuit connected in star and delta.
9. Demonstration of cut-out sections of machines: DC machine, induction machine (squirrel-cage rotor), synchronous machine (field winding- slip-ring arrangement) and single-phase induction machine.
10. OC characteristics of DC Generator
11. Synchronous speed of two and four-pole, three-phase induction motors, Direction reversal by change of phase-sequence of connections.
12. Power factor improvement of Induction Motor using static capacitors
13. Load Test of DC Motor

Note: Minimum eight experiments should be conducted in the semester

Text Books:

1. J. B. Gupta, *"Fundamentals of Electrical Engineering and Electronics"* S.K .Kataria & Sons Publications, 2002.
2. J. B. Gupta, "*Utilization of Electric Power and Electric Traction"* S.K. Kataria & Sons Publications, 2010.
3. Satish Kumar Peddapelli, G.Sridhar, *"Electrical Machines – A Practical Approach",* De Gruyter Publications, 2020.
4. Hughes, *"Electrical Technology",* VII Edition, International Student-on, Addison Welsey Longman Inc., 1995.

Course Code	Course Title						Core/Elective
U21ESN81CS	**Programming for Problem Solving Using C Lab**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**4**	**25**	**50**	**2**

Course Objectives

The objectives of this course is to impart knowledge of

- Understand the fundamentals of programming in C Language.
- Write, compile and debug programs in C.
- Formulate solutions to problems and implement them in C.
- Effectively choose programming components to solve computing problems
- To apply the sorting and searching techniques on given set of data

Course Outcomes

After completing this course, the student will be able to:

- Choose appropriate data type for implementing programs in C language.
- Design and implement modular programs involving input output operations, decision making and looping constructs.
- Implement search and sort operations on arrays.
- Apply the concept of pointers for implementing programs on dynamic memory management and string handling.
- Design and implement programs to store data in structures and files.

Write C programs for following:

1. Express and compute few mathematical equations in C language

Selection statements:

2. Finding roots of a quadratic equation
3. Implement arithmetic calculator using switch
4. Check whether entered year is a leap year or not

Iteration statements:

5. Find maximum and minimum value in a given set of numbers
6. Print multiplication table of value X upto Y times
7. Print prime numbers between M & N, Check for armstrong number or not
8. Convert a decimal number to binary and vice versa
9. Display pyramid of numbers and pascal triangle upto N rows

Arrays:

10. Find maximum, minimum and sum of all numbers in a 1-D array
11. Implement linear & binary search using 1-D array
12. Implement bubble sort & selection sort using 1-D array
13. Find the sum and product of two matrices using 2-d arrays
14. Check whether a matrix is an identity matrix or not using 2-d arrays
15. **Programs on Strings:** perform string manipulation functions , convert a lowercase string into uppercase
16. Demonstrate on call by value & call by reference using functions
17. **Programs on Recursion:** GCD, sum of digits, fibonacci series, factorial

Structures & Union:

18. Using an array of structures, Store 5 students information (name, roll no, subject1,subject2,subject3,total_marks), compute total_marks of each student and display details of each student.
19. Store 3 employee information (name, salary, designation) and access each employee using union.

Pointers:

20. Demonstrate on pointer arithmetic
21. Find the biggest and smallest of array using pointer to array
22. Implement dynamic memory allocation

Files:

23. Writing/reading/appending some data to a file
24. Copy the contents of one file to other file
25. Count the frequency of characters, lines and words in a given file

Text Books:

1. Paul Deitel & Harvey Deitel "*C How to program"* by 7th edition,PHI
2. A.K. Sharma, *"Computer Fundamentals and Programming in C"*-, Universities Press,2nd edition,2018
3. E. Balagurusamy, *Programming in ANSI C* TMH, 2008
4. Byron Gottfried - *"Theory and practice of Programming with C",* Schaum's Outline McGrawHill,1990
5. Pradip Dey, Manas Ghosh ,*"Programming in C"*-, Oxford University Press, 2nd edition
6. Brian W Kernighan and Dennis M Ritchie, *"The C programming Language"*, Prentice Hall of India,1988

Course Code	Course Title						Core/Elective
U21ESN82CE	**Engineering Drawing Practice**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**2**	**-**	**25**	**50**	**1**

Course Objectives

The objectives of this course is to impart knowledge

- To make students communicate effectively through a common drawing language and understand any engineering drawing
- To prepare the students to use techniques, skills and modern engineering tools necessary for engineering practice
- To prepare students to design a system, component and any desired requirement through computer drafting
- To enhance the imaginative skills of a student and thereby making them creative

Course Outcomes

After completing this course, students will be able to:

- Understand engineering drawing and its place in society
- Expose virtual aspects of engineering drawing practice
- Recognize modern technical tools of engineering drawing like AUTOCAD and apply in different fields of engineering
- Think creatively in getting alternative options to practical problems to engineering
- Communicate technical aspects through engineering drawing

Sheet No	Description of the Topic	Contact Hours Drawing
1	**Introduction to Engineering Drawing** - Principles of Engineering Drawing andtheir Significance ***Introduction to AutoCAD*** **-** Basic commands and simple drawings	**2**
2	**Construction of Scales -** Types of scales and Construction of plain scale	2
3	***Conic Sections*** **-** Construction of ellipse, parabola and hyperbola by general methodand any special method	**2+2**
4	**Concept of Quadrant System-** Understand the quadrant system with the help ofpoints and lines	**2+2**
5	**Projection of Planes -** Simple positions and plane inclined to single plane	**2+2**
6	**Projection of Solids -** Simple positions and plane inclined tosingle plane	**2+2**
7	**Isometric Drawing -** Simple planes and solids in isometric views (Combination ofSolids)	**2+2**
8	**Orthographic Projections -** Conversion of geometric figures and drawings fromisometric view to orthographic view	**2+2**

Text Books:

1. N.D. Bhatt, V. M Panchal & P. R. Ingle , *"Engineering Drawing",* Charotar Publishing House, 2014
2. M. B. Shah, & B. C. Rana , *"Engineering Drawing and Computer Graphics",* Pearson Education, 2008
3. S. N. Lal, *"Engineering Drawing with Introduction to Auto CAD",* Cengage Learning India Pvt Lid, New Delhi, 2018.
4. B. Agrawal & C. M. Agrawal, *"Engineering Graphics",* TMH Publication, 2012
5. K. L. Narayana, & P Kannaiah, *"Text book on Engineering Drawing",* Scitech Publishers, 2008
6. (Corresponding set of) CAD Software Theory and User Manuals

NOTE:

1. At least 6 sheets must be drawn.
2. Sheet number 1 to 3 (Graph sheets / drawing sheets)
3. Sheet number 4 to 8 (AutoCAD drawings)

B.E. (E.C.E.) II – SEMESTER

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs/ week	CIE	SEE	Duration of SEE (Hr.)	
Theory Courses										
1	U21HSN01EG	English	2	-	-	2	30	70	3	2
2	U21BSN02MT	Engineering Mathematics-II	3	-	-	3	30	70	3	3
3	U21BSN01CH	Engineering Chemistry	3	-	-	3	30	70	3	3
4	U21ESN04CS	Programming for Problem Solving Using C + +	3	-	-	3	30	70	3	3
Practical/ Laboratory Courses										
5	U21HSN81EG	English Lab.	-	-	2	2	25	50	3	1
6	U21BSN81CH	Chemistry Lab.	-	-	4	4	25	50	3	2
7	U21ESN84CS	Programming for Problem Solving Using C++ Lab.	-	-	4	4	25	50	3	2
8	U21ESN82ME	Basic Workshop Practice	-	-	2	2	25	50	3	1
Total			11	-	12	23	220	480	-	17

BS: Basic Science,
ES: Engineering Science
HS: Humanities and Social Sciences

L: Lecture
T: Tutorial
P: Practical
D: Drawing

CIE: Continuous Internal Evaluation
SEE: Semester End Evaluation

Note:
1. Each contact hour is a clock hour
2. The duration of the practical class is two hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

Course Code	Course Title						Core/Elective
U21HSN01EG	**English**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**30**	**70**	**2**

Course Objectives

The objectives of this course is to enhance the English language abilities of students by

- Using authentic material for language learning
- Developing appreciation to a variety of content-rich texts
- Strengthening their grammar and vocabulary
- Improving reading and comprehension skills and also encouraging them to think critically and creatively
- Honing their writing skills

Course Outcomes

After completing this course, the student will be able to:

- Demonstrate the skill of reading to summarize, paraphrase and give an accurate account of authentic texts of various genres
- Infer and make predictions based on the comprehension of a text
- Employ Academic Vocabulary appropriately with a distinction of its formal and informal use
- Apply different reading strategies to comprehend different texts and decode new words encountered
- Undertake guided and extended writing using accurate grammatical structures and vocabulary

Unit-I

Reading : A.G. Gardener – "On Saying Please"
Vocabulary : Word formation-Prefixes, Suffixes, Root Words
Grammar : Articles, Prepositions, Determiners
Writing : Guided Writing (Expanding the outline/Writing from verbal cues)

Unit –II

Reading : Fritz Karinthy – "Refund "
Vocabulary : Word formation- Compounding and Blending, Contractions
Grammar : Transitions, Connectives
Writing : Paragraph-writing

Unit- III

Reading : Narayan Murthy – "Value System"
Vocabulary : Synonyms, Antonyms, One Word Substitutes
Grammar : Voice
Writing : Letter-writing

Unit- IV

Reading : Robert Frost – "Stopping by Woods on a Snowy Evening"
Vocabulary : Homophones, Homonyms, Homographs
Grammar : Narration (Direct-Indirect Speech)
Writing : Precis writing

Unit- V

Reading	:	Stephen Leacock – "On the Need for a Quiet College"
Vocabulary	:	Inclusive Language, Euphemisms
Grammar	:	Tenses
Writing	:	Paraphrasing and Summarizing

Text Books:

1. Board of Editors. Language and Life: A Skills Approach. Orient BlackSwan, 2018.
2. Sudharshana, NP and C Savitha, English For Engineers. Cambridge University Press, 2018.
3. Kumar, Sanjay and Pushp Lata, English Language and Communication Skills for Engineers. Oxford University Press,

Course Code	Course Title						Core/Elective
U21BSN02MT	**Engineering Mathematics - II**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The objectives of this course is to

- Provide an overview of ordinary differential equations and their applications.
- Study Linear algebra and its uses in solving system of linear equations.
- Study Eigenvalue problems and Quadratic forms.
- Study the special functions Gamma and Beta functions.

Course Outcomes

After completing this course, the student will be able to:

- Solve first order differential equations.
- Solve higher order differential equations.
- Solve system of linear equations.
- Solve eigenvalue problems and Quadratic forms.
- Apply Beta and Gamma Functions to evaluate definite integrals

UNIT-I:

Differential Equations of First Order: Exact differential equations, Integrating factors, Linear differential equations, Bernoulli's and Riccati's. Applications of first order differential equations - Orthogonal trajectories of a given family of curves(Cartesian form) Newton's Law of Cooling, Growth and Decay.

UNIT-II:

Differential Equations of Higher Order: Solutions of second and higher order linearhomogeneous equations with constants coefficients, Solutions of non-homogeneous linear differential equations with constants coefficients, Method of reduction of order, Method of variation of parameters,Applications of second order differential equations-LCR circuits.

UNIT-III:

Matrices: Rank of a matrix, Elementary Row/Column operations, Echelon form, Normal form, Linear dependence and independence of vectors, System of linear equations, Linear transformation.

UNIT-IV:

Eigenvalues and Eigenvectors: Eigenvalues, Eigenvectors, properties of Eigenvalues,Cayley -Hamilton theorem(without proof), Quadratic forms, Reduction of quadratic form to canonical form, Rank, Index, Signature and Nature of quadratic forms.

UNIT-V:

Special Functions: Gamma function, Beta function, properties of Gamma and Beta functions, relation between Beta and Gamma functions, evaluation of definite integrals using Beta and Gamma functions.

Text Books:

1. R. K. Jain & S .R. K. Iyengar, *Advanced Engineering Mathematics,* Narosa Publications, 5th Edition 2016.
2. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publications, 44thEdition,2018.

Reference Books:

1. B.V. Ramana, *Higher Engineering Mathematics*, 23rd reprint, 2015.
2. N. Bali, M. Goyal, *A text book of Engineering Mathematics*, Laxmi publications,2010.
3. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley, 9th Edition, 2012.

Course Code	Course Title						Core/Elective
U21BSN01CH	**Engineering Chemistry**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The objectives of this course is to

- To relate how the basic concepts and principles of chemistry can be applied to practical utility in a broader perspective of the society.
- To distinguish the ranges of electromagnetic spectrum and its interaction with matter and to develop knowledge of various spectroscopic techniques at atomic and molecular levels.
- To identify and apply various principles of electrochemistry and corrosion which are essential for an engineer in industry
- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineerTo provide an overview of ordinary differential equations and their applications.

Course Outcomes

After completing this course, the student will be able to:

- Explain and apply the knowledge of various electrodes, electrode potentials and Nernst equation to construct electrochemical cells and thereby to calculate EMF of cell.
- Analyze different types of corrosion, mechanism, factors affecting metallic corrosion and control corrosion by various methods.
- Explain the origin of UV-Vis absorption in terms of electronic transitions in determination of structures of various molecules and Analyze microscopic chemistry in terms of atomic and molecular orbitals
- Identify and make use of various polymers as material for engineering applications.
- Classify various energy sources and illustrate the importance and applications of renewable and non-renewable energy sources.
- Relate the concepts liquid crystals, composites and green chemistry to modify engineering processes and materials.

UNIT –I:

Electro Chemistry &Corrosion and It's control: Electro Chemistry: Electrochemical Cells-Electrolytic and galvanic cells-notation. Cell Reaction and Cell EMF. Electrode potential, Standard electrode potential. Electrochemical series and Applications. Free Energy and EMF. Nernst equation and its derivation, Applications -Numerical problems. Types of electrodes-Standard hydrogen electrode, Calomel electrode Silver-Silver Chloride, Quinhydrone and glass electrodes. Determination of pH using Quinhydrone electrode coupled with saturated Calomel electrode.

Corrosion: Definition, Causes and effects. Types of corrosion, Chemical corrosion, and its mechanism. Electrochemical corrosion and its mechanism. Galvanic corrosion, Concentration cell Corrosion-Waterline and Pitting corrosion. Factors effecting rate of corrosion. Corrosion control methods- Cathodic Protection –Sacrificial anode and impressed current cathode methods. Surface Coatings-Types. Electro plating and Electroless plating of metal coatings.

UNIT–II:

Molecular Structure & Spectroscopic techniques: Regions of electromagnetic spectrum, Molecular spectroscopy. Rotational Spectroscopy: Rotation of molecules, rotational spectra of rigid diatomic molecules, selection rules. Vibrational Spectroscopy: The vibrating diatomic molecule, simple and anharmonic oscillators of a diatomic molecule, selection rules, applications of IR spectroscopy. NMR Spectroscopy: Criteria for NMR activity (Magnetic and nonmagnetic nuclei), basic concepts and principle of ^{1}H NMR spectroscopy, Chemical shift, Magnetic Resonance Imaging.

UNIT-III:

Polymeric Materials: Polymers: Basic terminology - Monomer and its functionality, Polymers, and degree of polymerization. Types of Polymerizations- Chain Growth, Step Growth Polymerization – Examples. Plastics, Fibers, Elastomers – Characteristics and Examples. Preparation, Properties & Uses of the following polymers- PVC, Bakelite, Nylon 6:6,Buna-S, Butyl Rubber and Silicone Rubber. Conducting polymers: Concept, Classification of conducting polymers with examples. Mechanism of conduction in trans Poly-acetylene. Enhancement of conduction by doping. Applications of conducting polymers. Biodegradable polymers: Concept, Preparation, Properties, and applications of polylactic acid.

UNIT-IV:

Energy Sources: Introduction-Renewable and non-renewable energy sources with Examples. Chemical fuels: Definition, Classification of chemical fuels-primary, Secondary and Solid, Liquid, Gaseous fuels -examples. Solid fuels: Coal& its composition, and its ranking Liquid fuels: Petroleum- Fractional distillation of petroleum. Cracking and its significance. Knocking, Octane Number and Cetane number. Gaseous Fuels: LPG, CNG-composition, properties and uses .Biodiesel: Concept -Transesterification- Carbon neutrality. Advantages of Biodiesel. Batteries: Definition, Types of batteries-Primary batteries; Zn-Carbon battery. Secondary batteries; Construction, working & applications of Lead-acid, Lithium -ion batteries. Fuel cells: Definition, Types of fuels cells, Construction, Applications of working of H_2-O_2fuel cellsand Methanol-O_2fuel cells. Solar cells: Concepts of photovoltaic cell and its applications.

UNIT-V:

Liquid Crystals, Composites and Green Chemistry: Liquid Crystals: Introduction, classification of liquid crystals-Thermotropic and Lyotropic liquid crystals - Chemical constitution & liquid crystalline behavior. Molecular ordering in liquid crystals- Nematic, Smectic and Cholesteric liquid crystals - Applications. Composite materials: Concept ,composition, and characteristic properties of composites. Classification of composites based on matrix, reinforcement, and ply. Advantages and applications of composites. Green Chemistry: Concept, Principles of green Chemistry with Examples.

Text Book:

1. PC Jain, M Jain Engineering Chemistry, Dhanapathi Rai and sons (16th edition), New Delhi

Reference Books:

1. Sashi Chawla, Textbook of Engineering Chemistry, Dhanapathi Rai &sons, New Delhi.
2. O.G. Palanna, Engineering Chemistry, TMH Edition.
3. Puri, Sharma and Pathania Principles of physical chemistry, Vishal Publishing Co.
4. Polymer chemistry by Gowariker.
5. Fundamentals of Molecular Spectroscopy, by C.N. Banwell, McGraw Hill Publication.
6. Fundamentals ofSpectroscopy by Y. R. Sharma.
7. Shikha Agarwal, Engineering Chemistry fundamentals and applications, Cambridge University press.

Course Code	Course Title						Core/Elective
U21ESN04CS	**Programming for Problem Solving using C + +**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The objectives of this course is to impart knowledge of

- To understand the basic concepts of Object Oriented Programming
- Perform object oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs
- Demonstrate usage of data abstraction, encapsulation, inheritance and polymorphism.
- To acquire object oriented problem solving skills and write programs in C++.

Course Outcomes

After completing this course, the student will be able to:

- Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.
- Understand dynamic memory management techniques using pointers, constructors, destructor , etc
- Apply the concept of function overloading, operator overloading, virtual functions and polymorphism
- Understand and implement basic data structures such as arrays, linked lists, stacks and queues
- Demonstrate the use of various OOPs concepts

UNIT-I:

Introduction to Object Oriented Programming: Object oriented paradigm-Differences between Object Oriented Programming and Procedure oriented programming, Basic concepts of Object Oriented Programming,

Introduction to Classes & Objects: Access Control, Scope Resolution Operator, Inline functions, Default Arguments, Function overloading, Memory Allocation for Objects, Static Data Members, Static Member Functions, Objects as Function Arguments, Friend Functions.

UNIT-II:

Constructors, Destructors, Inheritance: Introduction to Constructors, Default Constructors, Parameterized Constructors, Copy Constructors, Multiple Constructors in a Class, Destructors. Inheritance: Introduction to inheritance, Defining Derived Classes, Single Inheritance, Multiple Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Hybrid Inheritance.

UNIT-III:

Pointers, Virtual Functions and Polymorphism: Introduction to Memory management, new operator and delete operator, Pointers to objects, Pointers to Derived Classes, Polymorphism, Compile time polymorphism, Run time polymorphism, Virtual Functions, Overloading- Function Overloading, Operator overloading.

UNIT-IV:

Templates and Exception handling: Introduction to Templates, Class Templates, Class Templates with Multiple Parameters, Function Templates, Function Templates with Multiple Parameters.

Exception handling: Basics of Exception Handling, Types of exceptions, Exception Handing Mechanism, Throwing and Catching Mechanism, Rethrowing an Exception, Specifying Exceptions.

UNIT-V:

Introduction to C++ Input and Output Streams: Pointers and Dynamic Memory Allocation – new and delete , Implementation of array and Linked List using Dynamic Memory allocation ,Implementation of stacks and queues using arrays and linked lists,

Textbook:

1. Herbert Schildt *"C++, The Complete Reference"*, 4th Edition, , TMH.
2. Balagurusamy "*Object Oriented Programming with C++"*

References Books:

1. Yashwant Kanitkar *Let us C++*
2. .B. Lippman and J. Lajoie, *C++* Primer, 3rd Edition, SPearson Education.
3. B.S troutstrup *"The C++ Programming Language"*, 3rd Edition, , Pearson Education

Course Code	Course Title						Core/Elective
U21HSN81EG	**English Lab**						**Core**
Prerequisite	Contact Hour s per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**2**	**20**	**50**	**1**

Course Objectives

The objectives of this course is to enhance the listening and speaking skills of students by

- Giving them sufficient practice in listening with comprehension.
- Providing them ample opportunities to improve their public speaking skills.
- Training them in the use of correct pronunciation, stress, and intonation.
- Sensitizing them to the use of verbal and non-verbal communication appropriate to the context.
- Encouraging them to learn the art of conversation to suit formal and informal situation.
- Preparing them to make formal presentations and face interviews.

Course Outcomes

After completing this course, the student will be able to:

- Listen, understand, and interpret formal and informal spoken language
- Speak English with acceptable pronunciation, stress, and intonation
- Present themselves with confidence in formal situations
- Be able to perform in fluency, accuracy and time management based activities such as JAM and Picture Perception
- Participate in individual and group activities with relative ease.

List of Activities:

1. Listening for Comprehension
2. Pronunciation, Intonation, Stress, and Rhythm
3. Conversation Skills
4. Introducing Oneself and others
5. Asking for and Giving Information
6. Making Requests and Responding to them Appropriately
7. Giving Instructions and Responding to them Appropriately
8. Making Formal Announcements and Emceeing
9. Picture Perception
10. JAM
11. Role play
12. Group Discussions
13. Interview Skills
14. Presentation Skills

Text Books:

1. Board of Editors. *Language and Life: A Skills Approach*. Orient BlackSwan, 2018.
2. Balasudbramanian, T. A Textbook of English Phonetics for Indian Students. Macmillan, 1981
3. CIEFL. *EXERCISES IN Spoken English.* Parts. I- III. Oxford University Press. Pillai,
4. Radhakrsihna G. Spoken *English For You – Level II*. 8the Edition. Emerald Publishers, 2014.
5. Sethi, J and PV Dhamija. *A Course in Phonetics and Spoken English*. 2ndEdition. Prentice Hall India Learning Private Limited, 1999.

Course Code	Course Title						Core/Elective
U21BSN81CH	**Chemistry Lab**						**Core**
Prerequisite	Contact Hour s per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**4**	**25**	**50**	**2**

Course Objectives

During the course the student is expected to

- Introduce practical applications of chemistry concepts to solve engineering problems.
- Measure the molecular or ionic properties such as conductance, redox potentials.
- To determine the rate constant of reactions from concentrations as a function of time.
- Know the laboratory practices implemented in a research and industrial chemistry laboratory setting.
- To learn to Synthesize polymers

Course Outcomes

After completing this course, the student will be able to:

- Estimate the hardness of water sample.
- Apply the principles of Electrochemistry & Colorimetry in quantitative estimations.
- Measure the properties of liquids such as surface tension and Viscosity.
- Estimate the rate constants, of reactions from concentration of reactants/ products as a function of time.
- Synthesize Polymer.

List of Experiments:

1. Estimation of Fe (II) by Permanganometry.
2. Estimation of Fe (II) by Dichrometry.
3. Estimation of hardness of water by EDTA method.
4. Estimation of HCl by Potentiometry.
5. Potentiometric estimation of Iron Fe (II) by Permanganometry.
6. Estimation of HCl by Conductometry.
7. Estimation of CH_3COOH by Conductometry.
8. Estimation of HCl & CH_3COOH in mixture by Conductometry.
9. Estimation of HCl by pH metry.
10. Verification of Beer-Lamberts Law and estimation of Manganese in $KMnO_4$by Colorimetry.
11. Determination of viscosity of liquids using Oswald's viscometer
12. Determination of Surface tension by using Stalagmometer.
13. Synthesis of nylon 6,6.
14. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.
15. Determination of Partition Coefficient of CH_3COOH in n-Butanol and Water.

Text Books:

1. Vogel's text book of Practical organic chemistry, 5thEdition.

Reference Books:

1. B.D. Khosala, A. Gulati and V. Garg, *Senior Practical Physical Chemistry*, (R. Chand & Co.,Delhi)
2. S.S.Dara, *Text book on experiments and Calculations in Engineering Chemistry*
3. K.K. Sharma and D.S. Sharma, *An introduction to practical chemistry* (Vikas Publications, NewDelhi)
4. S.K.Bhasin& Sudha Rani, *Laboratory manual on Engineering Chemistry*, (Dhanpat Rai Publishing Company.

Course Code	Course Title						Core/Elective
U21ESN84CS	**Programming for Problem Solving using C++ Lab**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**4**	**25**	**50**	**2**

Course Objectives

The objectives of this course is to impart knowledge of

- To write, compile and debug programs in C++.
- To formulate problems and implement in C++.
- To acquire skills to solve computing problems in real world.

List of Exercises:

1. Implementation of complex numbers using classes.
2. Implementation of matrix class.
3. Programs using constructors, destructors and copy constructors.
4. Implementation of Various Sorting Techniques.
5. Programs of Inheritance.
6. Programs on Function Overloading, Operator Overloading and Exception Handling.
7. Programs on Virtual Functions, Dynamic Polymorphism,
8. Programs on Function templates and Class templates.
9. Implementation of Stack using arrays and linked list.
10. Implementation of Queue using Arrays and Linked list.

Course Code	Course Title						Core/Elective
U21ESN82ME	**Basic Workshop Practice**						**Core**
Prerequisite	Contact Hour s per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	**2**	-	**25**	**50**	**1**

Course Objectives

The objectives of this course is to

- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.
- To provide hands on experience about use of different engineering materials, tools, equipment's and processes those are common in the engineering field.
- To gain a good basic working knowledge required for the production of various engineering products.
- To study different hand operated power tools, uses and their demonstration.
- Adopt safety practices while working with various tools.

Course Outcomes

After completing this course, the student will be able to:

- Demonstrate an understanding of and comply with workshop safety regulations.
- Identify and apply suitable tools for different trades of Engineering processes including material removing, measuring and chiselling.
- Undertake jobs connected with Engineering Workshop trades including sheet metal and house wiring.
- Apply basic electrical engineering knowledge for house wiring practice.

A. TRADE FOR EXERCISES:

Course Objective: To impart hands-on practice on basic engineering trades and skills.

1. **House wiring**-Exercises-Single lamp, parallel/Series connection of 2 bulbs and Stair case wiring.
2. **Sheet metal**-Forming and Bending. Model making. Exercises-Taper Tray, Open Scoop, Funnel.

B. IT WORKSHOP: Computer hardware, identification of parts, Disassembly, Assembly of computer to working condition, operating system installation.

1. System Assembling, Disassembling and identification of Parts / Peripherals
2. Operating System Installation-Install Operating Systems like Windows, Linux along with necessary Device, Drivers.
3. MS-Office / Open Office
   a) Word - Formatting, Page Borders, Reviewing, Equations, symbols.
   b) Spread Sheet - organize data, usage of formula, graphs, charts.
   c) Power point - features of power point, guidelines for preparing an effective presentation.
   d) Access- creation of database, validate data.
4. Trouble Shooting-Hardware trouble shooting, Software trouble shooting.

Reference Books:

1. Venugopal.K, "Workshop manual", Anuradha Publications, Kumbakonam, TN, 2012
2. K.C. John, "Mechanical Workshop" 2ndEdn., PHI, 2010.
3. Hajra Choudary, "Elements of Workshop Technology" Vol. 1, Asian Publishers, Edn., 1993.
4. Computer Hardware, Installation, Interfacing, Troubleshooting and Maintenance, K.L. James, Eastern. Economy Edition.

Note: At least three exercises to be done from each trade

B.E. (ECE) III– SEMESTER

S. No.	Course Code	Course Title	Scheme of Instruction			Contact Hr/ week	Scheme of Examination			Credits
			L	T	P/D		CIE	SEE	Duration of SEE (Hr.)	
Theory Courses										
1	U21HSN02EG	Effective Technical Communications in English	2	-	-	2	30	70	3	2
2	U21BSN03MT	Engineering Mathematics-III	3	-	-	3	30	70	3	3
3	U21PC301EC	Electronic Devices and Circuits	3	-	-	3	30	70	3	3
4	U21PC302EC	Network Analysis and Synthesis	3	-	-	3	30	70	3	3
5	U21PC303EC	Signal Analysis and TransformTechniques	3	-	-	3	30	70	3	3
6	U21PC304EC	Digital Electronics	3	-	-	3	30	70	3	3
7	U21MCN01CE	Environmental Science	2	-	-	2	30	70	3	-
Practical/ Laboratory Courses										
8	U21ES381EC	Programming for Problem Solving Using JAVA Lab	-	-	2	2	25	50	3	1
9	U21PC381EC	Electronic Devices and Circuits Lab	-	-	2	2	25	50	3	1
10	U21PC382EC	Networks and Signal Analysis Lab	-	-	2	2	25	50	3	1
		Total	**19**	**-**	**6**	**25**	**285**	**640**		**20**

L: Lecture **T:** Tutorial **P**: Practical **D**: Drawing

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination (Univ. Exam)

B.E. (ECE) IV– SEMESTER

S. No.	Course Code	Course Title	Scheme of Instruction			Contact Hrs/ week	Scheme of Examination			Credits
			L	T	P/D		CIE	SEE	Duration of SEE (Hr.)	
Theory Courses										
1	U21HSN01CO	Financeand Accounting	3	-	-	3	30	70	3	3
2	U21PC401EC	Computer Organization & Architecture	3	-	-	3	30	70	3	3
3	U21PC402EC	Analog Electronic Circuits	3	-	-	3	30	70	3	3
4	U21PC403EC	Electromagnetic Wave Theory & Transmission Lines	3	-	-	3	30	70	3	3
5	U21PC404EC	Pulse and Digital Circuits	3	-	-	3	30	70	3	3
6	U21PC405EC	Random Variables and Stochastic Processes	3	-	-	3	30	70	3	3
Practical/ Laboratory Courses										
7	U21ES481EC	Programming for Problem Solving Using Python Lab	-	-	2	2	25	50	3	1
8	U21PC481EC	Analog Electronic Circuits Lab.	-	-	2	2	25	50	3	1
9	U21PC482EC	Pulseand Digital Integrated Circuits Lab	-	-	2	2	25	50	3	1
10		Summer Internship -I *	**Two weeks**							
		Total	**18**	**-**	**6**	**24**	**255**	**570**	**-**	**21**

L: Lecture **T:** Tutorial **P**: Practical **D**: Drawing

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination (Univ. Exam)

*** To be conducted after the IV Semester inthe Summer Vacation and to be evaluated in V Semester**

Syllabus of B.E. III Semester Courses

Course Code	Course Title						Core/Elective
U21HSN02EG	**EFFECTIVE TECHNICAL COMMUNICATION IN ENGLISH**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**30**	**70**	**2**

Course Objectives :

To facilitate the students to learn the:

1. Features of Technical Communication
2. Aspects of data interpretation with the help of visual aids
3. Types of Official Correspondence/IOC
4. Types of Professional Correspondence
5. Techniques of Report Writing

Course Outcomes :

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

1. Handle technical communication effectively
2. Enhance their skills of information transfer using variety of visual aids
3. Use different types of Inter Office Correspondence
4. Use different types of Professional correspondence to communicate effectively
5. Use various techniques of writing to generate different types of Reports

Unit-I

Introduction to Communication: General & Technical

- General Communication: Introduction, Process, Types, Flow/Channels of communication, Barriers to Communication
- Technical Communication: Introduction, Process, Types, Features – Accuracy, Precision, Brevity, Clarity, Format, Layout& Style, Use of Visual Aids
- Differences between General writing and Technical writing

Unit- II

Technical Writing I- Information Transfer

- Information Transfer - Introduction & Types
- Verbal to Non-verbal
- Non-verbalto Verbal
- Visual Aids: Significance &Classification in Data Interpretation, Use of Graphic Organisers

Unit -III

Technical Writing I1 -Official Correspondence

- Introduction of various types of correspondence: Format, Layout, Style & Etiquette
- Emails
- Inter Office Correspondence – Circulars, Agendas, Minutes of Meetings, Memos

Unit -IV

Technical Writing III- Business Correspondence

- Business Letters – Sales Letters, Credit Letters, Cover letters/Job Applications, CV& Resume Writing

Unit -V

Technical Writing IV- Report Writing

- Drafting a Scientific Paper
- Project report
- Feasibility report
- Progress report

Text Books :

1. Raman, Meenakshi & Sharma, Sangeeta. (2015). *Technical Communication: Principles and Practice* (3rd ed.). New Delhi, OUP.
2. Rizvi, Ashraf, M.(2017). *Effective Technical Communication* (2nd ed.). New Delhi, Tata McGraw Hill Education.
3. Sharma, R.C., & Mohan, Krishna. (2017.) *Business Correspondence & Report Writing: A practical approach to business &technical Communication* (4th ed.). New Delhi, Tata McGraw Hill Education.
4. Tyagi, Kavita &Misra, Padma. (2011). *Advanced Technical Communication.* New Delhi, PHI Leaning.
5. Jungk, Dale. (2004). *Applied writing for technicians*. New York, McGraw-Hill Higher Education.

References :

1. Munter, Mary. (2011). Guide to Managerial *Communication: Effective Business Writing*
2. Andrea J. Rutherford(2006) *Basic Communication Skills for Technology.* 2nd Edition, Chennai, Pearson Publications.
3. Geraldine E.Hynes. (2010) *Managerial Communications-Strategies and Applications*. New York, McGraw Hill
4. Terry O' Brien. (2012) *Little Red Books – Modern Writing Skills.* Hydrabad, Rupa Publications.
5. Martin Cutts. (2013) *Oxford Guide to Plain English.* New Delhi, OUP.

Course Code	Course Title						Core / Elective
U21BSN03MT	**ENGINEERING MATHEMATICS- III** (Common to All Branches)						**Core**
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
-	**3**		-	-	**30**	**70**	**3**

Course Objectives :

1. To introduce the basic concepts of probability
2. To studythe concepts of discrete and continuous probability distributions
3. To introduce and studythe concepts of fitting of curves, Correlation and Regression
4. To studythe concepts oftesting of hypothesis for small samples

Course Outcomes :

1. Solve the problems by using the concepts of probability and random variables
2. Determine the statistical parameters for discrete probabilitydistributions
3. Determine the statistical parameters for continuous probabilitydistributions
4. Solve problems on curve fitting, correlation and lines of regression
5. Test the hypothesis for small samples

UNIT-I

Probability: Introduction to Probability, Conditional Probability, Theorem of Total probability, Baye's Theorem and its applications, Random variables, Types of random variables, Probability mass function and Probability density function, Mathematical expectation, variance.

UNIT-II

Discrete probability distributions: Introduction to Binomial and Poisson distributions, evaluation of statistical parameters -mean, variance, moment generating function, moments, skewness and kurtosis by central moments.

UNIT-III

Continuous probability distributions: Introduction to Uniform, Normal distributions, evaluation of statistical parameters - mean, variance, moment generating function, moments, skewness and kurtosis bycentral moments, Central limit theorem(without proof).

UNIT-IV

Correlation and Regression: Fitting of straight line, second degree Parabola and Power curves. Correlation, regression and rank correlation.

UNIT-V

Tests of significance: Small Samples-Introduction, Test of Hypothesis, t-test for single mean, difference of means, F-test for ratio of variances, Chi-square test for goodness of fit.

Text books:

1. R. K. Jain & S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publications.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications.
3. S.C. Gupta & V. K. Kapoor, "Fundamentals of Mathematical Statistics", S. Chand Pub.

References:

1. N. P. Bali, &M. Goyal, "A text book of Engineering Mathematics", Laxmi publications, 2010.
2. P. G. Hoel, S. C. Port & C. J. Stone, "Introduction to Probability Theory", Universal Book Stall, 2003.
3. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. I, Wiley, 1968.

Course Code	Course Title						Core/Elective
U21PC301EC	**ELECTRONIC DEVICES AND CIRCUITS**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Engineering Physics	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives :

1. Studysemiconductor physics and analyze the behavior of Semiconductor diodes in Forward andReverse bias.
2. Develop half wave and full wave rectifiers with L, C Filters.
3. Explain V-I characteristics of Bipolar Junction Transistor in CB, CE & CC configurations.
4. Design DC Biasing techniques and evaluate A.C parameters for BJT in Amplifier Applications.
5. Explore V-I characteristics of FETs, MOSFETs and study IC fabrication techniques.

Course Outcomes :

1. Interpret the characteristics and apply diode models to analyse various applications of diodes.
2. Identify the merits and demerits of various filters, formulate and design rectifier circuits withfilters and calculate ripple factor, efficiency and % regulation of rectifier circuits.
3. Discriminate the BJT configurations to recognize appropriate transistor configuration for anygiven application and design the biasing circuits with good stability.
4. Analyse, Compare and design of BJT amplifiers with various biasing circuits.
5. Distinguish between he working principles of BJT and FET also JFET & MOSFET.

UNIT-I

Introduction to Semiconductor Physics (Qualitative Treatment only): Energy band diagrams in intrinsic and extrinsic semiconductors. mobility and conductivity, diffusion current, drift current; Generation and recombination of carriers, Poisson and continuity equation.

Junction Diode: PN Junction formation, biasing – band diagram ,V-I Characteristics, Diode current equation, Breakdown in diodes, Small signal diode models, Diode switching characteristics, Zener Diode, Zener voltage regulator and its limitation.

UNIT-II

PN Diode Applications: Half wave, Full wave and Bridge rectifiers – their operation, performance characteristics and analysis. Filters (L, C filters) used in power supplies and their ripple factor calculations, design of Rectifiers with and without Filters.

Special Diodes: Elementary treatment on the functioning of Light Emitting diode, Photo diode and Solar cells.

UNIT-III

Bipolar Junction Transistor: Transistor Junction formation (collector-base, base-emitter Junctions), Transistor biasing, current components, Modes of transistor operation, Input and Output characteristics in CB, CE, CC configurations, Qualitative Treatment of UJT, SCR.

UNIT-IV

Transistor Biasing: BJT as an amplifier, BJT biasing techniques, Biasing circuits design, operating point stabilization against temperature and device variations, Bias compensation techniques.

Small Signal Transistors equivalent circuits: Small signal low frequency h-parameter model of BJT, Approximate model, Analysis of BJT amplifiers using approximate model for CB, CE and CC configurations; High frequency - Π model, Relationship between hybrid - Π conductances and h – parameters.

UNIT-V

Junction Field Effect Transistors (JFET): JFET formation, operation & current flow, V-I characteristics of JFET. Low frequency small signal model of JFET. Analysis of CS, CD and CG amplifiers

MOSFETs: Enhancement & Depletion mode MOSFETs, MOS Capacitor, V-I characteristics.

Textbooks:

1. Jacob Millman, Christos C. Halkias, and Satyabratajit, *Electronic Devices and Circuits*, 3rd ed., McGraw Hill Education, 2010.
2. Robert Boylestad and Louis Nashelsky, *Electronic Devices and Circuit Theory*, 11th ed., Pearson India Publications, 2015.

References:

1. Salivahanan, N Kumar and Vallavaraj, Electronic Devices and Circuits, 2nd Edition, McGraw Hill Education, 2007.
2. D. Neamen, D. Biswas, *Semiconductor Physics and Devices*, McGraw-Hill Education.
3. G. Streetman and S. K. Banerjee, *Solid State Electronic Devices*, 7th edition, Pearson, 2014.

Course Code	Course Title						Core/Elective
U21PC302EC	**NETWORK ANALYSIS AND SYNTHESIS**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Basic Electrical Engineering	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives:

1. Discuss the Network topologies and theorems
2. Explain the concept of Two Port networks parameters and familiarize the concept of resonance
3. Describe Symmetrical & Asymmetrical networks, attenuators and equalizer circuits
4. Realize different filters
5. Demonstratethe network synthesis

Course Outcomes:

1. Analyze given electrical circuit byapplying network topologies and network theorems
2. Evaluate given electrical circuit in terms of A,B,C,D and Z,Y Parameters and understand the concept of resonance.
3. Compute the characteristic parameters of Symmetrical/Asymmetrical networks and understand the design of various attenuators, equalizers
4. Design different types of filters using passive elements
5. Synthesize RL,RC and LC networks in Foster and Cauer Forms

Unit-I

Network Topology: Graph, Tree, Tie set, cut set matrix, Bi Section Theorem, Impedance matrix formulation of node loop equations using tie-set, cut-set analysis.

Network Theorems: Concept of Nodal and Mesh analysis, Wye -Delta transformation, Maximum Power Transfer Theorem, Reciprocity Theorem using Dependent and Independent Sources.

Unit-II

Two Port networks: Z, Y, h, g and ABCD parameters, T-pi transforms, Symmetry & Reciprocity Properties, Interconnection oftwo port networks.

Resonance: DC and AC excitations of RC, RL and RLC circuits. Series and parallel resonance, Quality factor, Bandwidth of Resonant Circuits.

Unit-III

Symmetrical &Asymmetrical Networks: Characteristics of Asymmetrical Networks, Image Impedance & Iterative Impedance of Asymmetrical networks, L, T and pi networks.

Attenuators & Equalizers: Design of symmetrical attenuators- T, pi, Bridge-T and Lattice, design of full series equalizer.

Unit-IV

Filters: Concept of Dual & Duality, Types of Filters, Design and analysis of Constant k-Filters- Low pass, high pass, m-derived low pass and high pass filter design, Composite filter design, problems.

Unit-V

Network Synthesis: Concept of Driving Point and Transfer Impedance, concept of Stability, Positive real function, Hurwitz polynomial, Driving point Impedance and admittance. Synthesis ofone port RC, RL and LC networks using Foster and Cauer forms.

Text Books:

1. Van Valkenburg M.E, "Introduction to Modern Network Synthesis", Wiley Eastern
2. Joseph AEdmininster, "Electric Circuits", Tata McGraw-Hill Education.
3. A. Sudhakar and Shyammohan S. Palli, "Circuits and Networks: Analysis and Synthesis", Tata McGraw-Hill Education.

References:

1. S.P. Ghosh and A.K. Chakraborty, "Network Analysis and Synthesis", McGraw Hill
2. Samarjit Ghosh, "Network Theory: Analysis and Synthesis", PHI Learning.
3. John D. Ryder, "Networks Lines and Fields", Pearson.
4. Umesh Sinha, "Networks and Transmission Lines", Satya Prakashan Publishers.

Course Code	Course Title						Core / Elective
U21PC303EC	**SIGNAL ANALYSIS AND TRANSFORM TECHNIQUES**						**Core**
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	**30**	**70**	**3**

Course Objectives :

1. Define the concepts related to continuous & discrete time signals and systems
2. Familiarize with the frequencyrepresentation of periodic and aperiodic signals
3. Explain the concept of Laplace transform with properties to solve differential equations
4. Describe the concept of Z-transform with properties to analyze discrete time systems
5. Define Convolution, Correlation operations for continuous and discrete time signals

Course Outcomes :

1. Understand the basic definitions, operations on Continuous & Discrete time signals and systems
2. Relate the analogy between vectors and signals, estimate the Trigonometric & Exponential Fourier Series for periodic continuous time signal.
3. Understand the concepts of Fourier & Laplace Transform, apply these techniques for analyzing systems to solve differential equations.
4. Compute frequency domain representation of discrete time signals, apply various properties of z-transformto find the solution ofconstant coefficient difference equations.
5. Calculate linear convolution and correlation of continuous & discrete time signals with graphical representation.

Unit-I

Classification of Signals: Deterministic & random signals, continuous time (CT) and discrete time (DT) signals - periodic & aperiodic signals, energy& power signals.

Definitions of Standard Signals: step, ramp, pulse, impulse, signum, real and complex exponentials and sinusoids.

Mathematical Operations on Signals: addition, subtraction, multiplication and division of the signals

Classification of Systems: Continuous Time (CT) and Discrete Time (DT) - lumped-parameter & distributed –parameter systems, static & dynamic systems, causal & non-causal systems, time-invariant & time-variant systems, stable & unstable systems

Unit - II

Representation of Continuous-Time Signals: Analogy between vectors and signals, signal approximation by orthogonal functions, orthogonality and completeness and signal representation bya discrete- set of orthogonal functions.

Fourier Series Analysis of Continuous-Time Signals : Representation of Fourier series, dirichlet's conditions, trigonometric and exponential Fourier series, computational formulae, symmetry conditions and complex Fourier spectrum, LTI system response to periodic inputs.

Unit - III

Continuous-Time Fourier Transform (FT): Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, existence of FT, FT of standard signals, properties of FT, parseval's theorem, frequency spectrum, signal transmission using LTI system.

Linear Convolution of Continuous Time Signals: Impulse response characterization and convolution integral for CT- LTI System, graphical interpretation, properties of convolution, signal responses to CT-LTI system.

Correlation between Continuous-Time Signals: Auto and cross correlation, graphical interpretation, properties.

Unit-IV

Laplace Transform (LT) Analysis of Signals and Systems: Relation between Laplace transform and Fourier transform, the direct LT, existence of LT, properties of ROC, properties of LT. Laplace Transform for continuous time system, system function, poles & zeros of system function, solution to differential equations and system behavior.

Linear Convolution of Discrete Time Signals: Impulse response of DT-LTI system. Convolution sum graphical interpretation, properties of discrete convolution

Unit-V

Sampling Theorem: Graphical and analytical proof for band limited signals.

Fourier analysis of Discrete-Time Signals: Discrete-Time Fourier Transform (DTFT), properties of DTFT.

Z-Transform analysis of Signals & Systems: Concept of Z-Transform, region of convergence in Z-Transform, constrains on ROC for various classes of signals, distinction between laplace, fourier and Z-transform, Z-plane and S-plane correspondence, properties of Z-transform, inverse Z-transform. Solution to Linear difference equations, linear constant coefficient systems, system transfer function.

System Realization: Direct form-I, direct form-II structure, comparison of continuous and discrete signal analysis.

Textbooks:

1. Michel J.Robert, "Fundamentals of Signals & Systems", MGH International Edition.
2. Alan V. Oppenheim, Alan S. Wilskyand S. Hamid Nawab, "Signals and Systems".
3. Simon Haykin and Barry Van Veen, "Signals and Systems".

References:

1. B P. Lathi, "Principles of Signal Processing & Linear Systems", Oxford University Press.
2. Mahmood Nahvi, "Signals and System", Mc Graw Hill (India).

Course Code	Course Title						Core/Elective
U21PC304EC	**DIGITAL ELECTRONICS**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	**30**	**70**	**3**

Course Objectives :

1. Discuss number systems, code converters and properties of Boolean algebra
2. Analyze the minimization of logic equations using K-map and Tabular method
3. Explain the operation of combinational logic circuits
4. Describe the operation of Sequential logic circuits
5. Introduce various logic families

Course Outcome :

1. Understand the number representation, their conversion and Properties of Boolean algebra
2. Understand the Minimization of Switching Functions and optimize the implementation of logic functions
3. Design Combinational logic circuits and implement using IC‟s
4. Analyze the various flip-flops and design Synchronous/ Asynchronous sequential circuits
5. Familiarize with the characteristics of various logic families

Unit-I

Number system and Codes: Binary, Octal, Hexa Decimal numbers, Number base conversion, 1‟s Complement, 2‟s complement, BCD, Excess -3 code, Development of Gray code, Paritycode.

Boolean Algebra: Properties of Boolean algebra, Basic Laws and Theorems, DeMorgan‟s theorems, Switching Functions, definitions, simplifications, Canonical and Standard Forms, Logic Gates, Functional Properties.

Unit-II

Minimization of Switching Functions: The Karnaugh Map Method, 5-variable map, Minimal Functions and their properties. Prime implicants, Essential Prime Implicants, Quine- McCluskey Tabular Method, Don't –care combinations. AND-OR, OR-AND and NAND/NOR Realizations, Exclusive-OR and Equivalence Functions.

Unit-III

Combinational circuits & Logic design: Design with basic logic gates, Single Output and Multiple Output Combinational Logic Circuit Design, Adders and subtractors, Multiplexers, Demultiplexers, Decoders, Encoders. Code converters: BCD to 7-segment converter, Arithmetic comparator circuits. Races and hazards. Implementing Boolean functions with IC 74151, IC 74153. ROM types.

Unit-IV

Sequential Circuits & Logic Design: Memory element, S-R, J-K and D Latch operation, , Flip-Flop types: S-R, J-K, D, T, Master Slave J-K Flip Flop , Race around condition, State table, State diagram, Characteristic equation and excitation table, Flip flop conversions.

Sequential Logic Design: Asynchronous and Synchronous counters, Counter Lock – out, Shift registers and applications.

Unit-V

Logic Families: Digital IC characteristics, AND, OR gates using Diodes and Transistors, Characteristics of Logic families, TTL output configuration: Open collector, Totem pole, Tri-state logic, ECL, MOS logic family (PMOS and NMOS), CMOS logic family and characteristics. CMOS-inverter, NAND and NOR gates, Interfacing CMOS and TTL, Comparison of TTL, CMOS and ECL logic families.

Text Books:

1. Ronald J.Tocci, Neal S. Widmer & Gregory L.Moss, "Digital Systems: Principles and Applications," PHI.
2. Zvi Kohavi, "Switching and Finite Automata Theory", Cambridge University Press-New Delhi.
3. R. P Jain, "Modern Digital Electronics", McGraw Hill Education (India) Pvt. Limited, New Delhi.

References:

1. Morris Mano and Michael D Ciletti, "Digital Design", Pearson Education.
2. Anand Kumar A, "Fundamentals of Digital Circuits", Prentice-Hall of India private Limited, New Delhi.

Course Code	Course Title						Core/Elective
U21MCN01CE	**ENVIRONMENTALSCIENCE**						**Mandatory**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**30**	**70**	**0**

Course Objectives :

1. To createawareness and impart basic knowledge about the environment and its allied problems
2. To knowthe significance and functions of ecosystem
3. To understand importance of biological diversity
4. To studydifferent forms ofpollution and their impact on environment
5. To know socialand environment related issues andtheir preventive measures

Course Outcomes :

1. Develop an attitudeof concern towards the environment
2. Understand the importance of ecosystem
3. Conservation of naturalresources and biological diversity
4. Develop knowledge onEnvironmentalpollution and Environmental loss
5. Adopt environmental ethics to attain sustainable development

UNIT-I

The Multidisciplinary Nature of Environmental Studies: Definition, scope and importance, need for public awareness.

Natural Resources: Water Resources – use and over utilization of surface and ground water, flood, drought, conflicts over water, dams: benefits and problems. Food resources–world food problems, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, forest resources –use and over exploitation, deforestation & its effect on tribal people. Land resources- land degradation, soil erosion and desertification**.** Energy resources – growing energyneeds renewable and non-renewable energyresources.

UNIT-II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in ecosystem, food chains, ecological pyramids, ecological succession, types of ecosystems (marine, pond, river, forest, grassland, desert)

UNIT-III

Biodiversity: Levels of biodiversity, bio-geographical classification of India, value of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

UNIT-IV

Environmental Pollution: Definition, causes, effects and control measures of air pollution, water pollution, soilpollution, noise pollution, thermalpollution, solid waste management.

Environment Protection Act: Air, water, forest and wildlife acts, issues in the enforcement of environmental legislation.

UNIT-V

Social Issues and the Environment: Watershed management and environmental ethics, climate change, global warming, acid rain, ozone layer depletion.

Environmental Disaster Management: Types of disasters, impact of disasters on environment, infrastructure, and development. Disaster management cycle and disaster management in India.

Textbooks:

1. A.K. De, *Environmental Chemistry,* WileyEastern Ltd., 2016.
2. E.P. Odum, *Fundamentals of Ecology,* W.B. Sunders Co., USA, 2017.
3. M.N. Rao and A.K. Datta, *Waste Water Treatment,* Oxford and IBK Publications, 2020.

References:

1. BennyJoseph, *Environmental Studies,* Tata McGraw Hill, 2005.
2. V.K. Sharma, *Disaster Management,* National Centre for Disaster Management, IIPE, 1999.

Course code	Course Title						Core/Elective
U21ES381EC	**PROGRAMMING FOR PROBLEM SOLVING USING JAVA LAB**						**Core**
Prerequisite	Contact Hours per week				CIE	SEE	Credits
	L	T	D	P			
Programming in C	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives :

1. Discuss the fundamentals of programming in Java
2. Illustrate OOPS concepts in Java
3. Demonstrate Methods, Constructors and Overloading
4. Effectivelydefine Inheritance and large data objects
5. Demonstratethe Exceptions and Applet programming

Course Outcomes :

1. Write basic Java programs
2. Implement modular programming using OOPS approach
3. Implement Methods, Constructors and Overloading
4. Demonstrate Inheritance, Exceptions and Arrays
5. Design and implement Applets

List of Programs:

1. **Basic Java**
   a) Write a program in Java to print the text "Hello World".
   b) Write a program in Java to print the area of a triangle.
   c) Write a program in Java to print Fibonacci series till number N.
2. **Classes, Objects and Constructors**
   a) Write a program in Java to create a class Student with data „name, roll_no and age" along with a method to display the data. Create the two objects to access student data.
   b) Write a program in Java to create a class with a constructor.
3. **Method & Constructor Overloading**
   a) Write a program in Java to demonstrate the method and constructor overloading.
   b) Write a program in Java to create a class Bird also declare the different parameterized constructor to display the names of Birds.
4. **Inheritance, Super & Method overriding**
   a) Write a Java programto illustrate the concept ofsingle inheritance.
   b) Write a Java program to demonstrate method overriding in Java
   c) Write a Java program to demonstrate use of super with variables, methods and constructors
5. **Interface, Final& Abstract keyword**
   a) Write a program in Java to generate an abstract class A also class B inherits the class A. Generate the object for class B and display the text "call me from B".

b) Write a Java program in which you will declare two interface sum and Add inherits these interface through class A1 and display their content.

6. Arrays

a) Write a Java Program to find the average of numbers in an array.

b) Write a Java Programto find addition oftwo matrices.

7. Exception Handling

a) Write a program in Java if number is less than 10 and greater than 50 it generate the exception out of range. Else it displays the square of number.

b) Write a program in Java to demonstrate exception generation.

8. Packages

a) Example of package that import the package name.

b) Example of package by import package.class.

c) Example of package by import fullyqualified name.

9. Multithreading

a) Write a Java program in which thread sleep for 5 sec and change the name of thread.

b) Write a Java program for multithread in which user thread and thread started from main method invoked at a time each thread sleep for 1 sec.

10. I/O and File Handling

a) Write a Java programto create a file and write the text in it and save the file.

b) Write a Java program to read a file and displaythe content on screen.

c) Write a Java program in which data is read from one file and should be written in another file line by line.

11. Applets

a) Create a Java Applet to display „Hello World".

b) Write a Java program to draw Oval, Rectangle, line and fill the color in it and display it on Applet.

Textbooks:

1. Herbert Schildt, "Java, the Complete Reference", Tata McGraw Hill,
2. E. Balagurusamy, "Programming with Java", Tata McGraw Hill.

References:

1. https://www.javatpoint.com/java-programs
2. https://www.programiz.com/java-programming/examples

Course Code	Course Title						Core/Elective
U21PC381EC	**ELECTRONIC DEVICES CIRCUITS LAB**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Engineering Physics Lab	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives :

1. Demonstrate the characteristics of PN junction diode
2. Discuss the performance characteristics ofrectifiers and filter circuits
3. Demonstrate the characteristics of BJT in CE, CB and CC configurations
4. Explain the characteristics of FET in CS and CD configurations
5. Design biasing circuits for BJT and FET.

Course Outcomes :

1. Interpret the characteristics of PN junction diode and breakdown diode and determine the parameters.
2. Analyze the performance of half wave & full wave rectifiers with & without filters.
3. Distinguish betweenthe characteristics of BJT in different configurations.
4. Differentiate the characteristics of FET in different configurations.
5. Design, Evaluate the functionalityof various biasing circuits for BJT and FET.

List of Experiments:

Part-A

1. Obtain the forward and reverse bias characteristics of silicon and germanium diodes and measure the static and dynamic resistances.
2. Obtain the Zener diode characteristics and design a Zener voltage regulator for the given specifications.
3. Design half wave/ full wave rectifiers without filters, observe its output and measure rectification efficiency and ripple factor.
4. Design half wave/ full wave rectifiers with filters (L, C, LC, π), observe its output and measure ripple factor.
5. Design power supplyunit to generate a specified dc voltage
6. Obtain the Input, Output characteristics of BJT in CB configuration and measure its h-parameters.
7. Obtain the Input, Output Characteristics of BJT in CE configuration and measure its h-parameters.
8. Obtain the transfer, drain Characteristics of JFET in CS configuration and measure JFET parameters.
9. Obtain the drain and transfer characteristics of enhancement type MOSFET
10. Design BJT biasing circuits for the given specifications and verify the stability of operating point.
11. Analyze the application of BJT as an amplifier by measuring voltage gain and current gain.

12. Obtainthe switching characteristics ofp-n junction diode and measure forward and reverse recoverytimes.
13. Obtainthe V-I characteristics ofspecial diodes (UJT/SCR).

Part-B

Using SPICE Simulator:

1. Simulate Full-wave rectifiers and studythe waveforms.
2. Simulate Full-wave rectifier with filters (LC, π) and observe the waveforms.
3. Simulate the switching characteristics of p-n junction diode and measure forward and reverse recoverytimes.

Note: A minimum of 10 experiments from PART-A and at least 2 experiments from PART-B should be performed.

Textbooks:

1. Paul B. Zbar, Albert P. Malvino, Micheal A. Miller, "Basic Electronics, A text – Lab Manual", Tata Mc Graw Hill.

References:

1. Mohammad H.Rashid, "Introduction to Pspice Using Orcad for Circuits and Electronics", Prentice Hall of India.

Course Code	Course Title						Core/Elective
U21PC382EC	**NETWORKS AND SIGNAL ANALYSIS LAB**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Basic Electrical Engineering		-	-	**2**	**25**	**50**	**1**

Course Objectives :

1. Introduce basic Electronic, Electromechanical, Electromagnetic components and display devices
2. Describe two port network parameters and impedances
3. Demonstrate the design ofconstant-K, m-derived filters and simulate resonance Circuits
4. Illustrate the generation, operation and properties of signals and systems using MATLAB
5. Familiarize with Fourier series and transformtechniques

Course Outcomes :

1. Understand the functionality of basic Electronic, Electromechanical and Electromagnetic components and displaydevices
2. Design two port network parameters and derive their impedances
3. Realize constant-Kand m-derived filters and simulate resonance Circuits
4. Assess the generation, operation and properties of continuous and discrete time signals and systems
5. Analyze Fourier series and transformtechniques

List of Experiments:

Part – A

1. Study different types of active, passive, electro mechanical components (switches, sockets, connectors) and electromagnetic components (relays, speakers, MIC, solenoids).
2. (a) Measure amplitude, time period and frequency of a signal using CRO and DSO.
   (b) Measure phase difference between two given signals using CRO.
3. Characterize the passive circuit elements (R, L, and C) and develop a circuit board using soldering techniques.
4. Derive the condition for Maximum power transfer and estimate the Maximum power delivered to the load for the given network.
5. Compute Z, Y parameters of a given network.
6. Design and verify the Image impedance of a asymmetrical L-network and characteristic impedance of a symmetrical T-network.
7. Obtain the cut-off frequency of a constant-K Low pass filter (LPF) from its transmission characteristics.
8. Obtain the cut-off frequency of an m-derived High pass filter (HPF) from its transmission characteristics.

Part – B

1. (a) Generation of various basic continuous and discrete time Signals.
   (b) Perform basic operation on signals and sequences.
2. Verify the Linearity and Time invariance properties of a given continuous and discrete time Systems.
3. (a) Obtain the output of an CT-LTI system using linear convolution operation.
   (b) Verify the convolution sum of given two sequences.
4. Determine the Trigonometric and Exponential Fourier Series coefficients of a periodic signal and plot the discrete Spectrum of the signal.
5. Analyze an aperiodic signal using Fourier transform and plot its magnitude and phase spectrum.
6. Verify the stability of system for the given transfer function using pole-zero plot.
7. Obtain the Bandwidth of a given Series resonance circuit using its frequency response.
8. Obtain the second-order transient response of a given R,L,C network.

Note: A minimum of 6 experiments must be conducted from each PART-A and PART-B. The students may use MATLAB/ Scilab software for Part-B.

Textbooks:

1. Samarjjt Gosh, Network Theory, Analysis & Synthesis, PHI Learning.
2. S.Vardharajan, Signals and Systems, Wiley.

References:

1. Paul B. Zbar, Albet P. Malvino, Michael A. Miller, Basic Electronics, a Text – Lab. Manual, TMH.

Syllabus of B.E. IV Semester Courses

Course code	Course title						Core/elective
U21HSN01CO	**FINANCE AND ACCOUNTING**						**CORE**
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	**30**	**70**	**3**

Course Objectives:

1. To provide understanding ofthe accounting aspects of business.
2. To provide understanding of financial statements.
3. To provide understanding of financial system.
4. To provide inputs necessaryto evaluate the viability of projects.
5. To provide the skills necessaryto analyze the financial statements.

Course Outcomes:

1. Evaluate the financial performance ofthe business unit.
2. Take decisions on selection of projects.
3. Take decisions o procurement of finances.
4. Analyse the liquidity, solvencyand profitabilityofthe business unit.

UNIT-I

Basics of Accounting: Financial Accounting-Definition-Accounting Cycle–Journal-Ledger -Cash Book–Bank Reconciliation Statement and Trial Balance (including problems).

UNIT-II

Final Accounts: Trading Account-Profit and Loss Account-Balance Sheet (including problems with adjustments like Closing Stock, Expenses Outstanding, Prepaid Expenses, Income earned but not received, Income received in advance, Depreciation, Bad debts, Provision for Bad and Doubtful Debts, Provision for Discount on Debtors, Provision for Discount on Creditors, Interest on Capital, (Interest on Drawings).

UNIT-III

Financial Statement Analysis: Importance-Users-Ratio Analysis-Liquidity, Solvency, Turnover & Profitability Ratios.

UNIT-IV

Capital Budgeting: Meaning – Importance - Time Value of Money-Discounting - Compounding-Financial Appraisal of Project – Payback Period, ARR, NPV, PI, IRR (Simple problems)

UNIT-V

Financial System and Markets: Financial System-Financial Markets – Financial Institutions – Financial Instruments – Financial Intermediaries – RBI, SEBI and IRDA (Functions only)

Textbooks:

1. Accountancy– I: Haneef & Mukarjee, Tata McGrahill Company.
2. Accountancy– I: SP. Jain & KL. Narang, Kalyani publishers.
3. Advanced Accountancy– I: S.N. Maheshwari & V.L. Maheswari, Vikas Publishers.

References:

1. Financial Management – I.M. Pandey, Vikas Publishers.
2. Financial Institutions & Markets – Prashanta Athma, PBP.

Course Code	Course Title						Core/Elective
U21PC401EC	**COMPUTER ORGANIZATION & ARCHITECTURE**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Digital Electronics	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives :

1. Implement the fixed-point and floating-point addition, subtraction, multiplication & division
2. Describe the basic structure and operation of a Digital computer
3. Explain the control unit and CPU organization
4. Discuss the I/O organization and modes ofdata transfer
5. Interpret the memory hierarchy and Explain the concepts of parallelism and pipelining in modern processor

Course Outcomes :

1. Comprehend the knowledge ofcomputer arithmetic for Fixed and Floating point numbers
2. Apply the knowledge of Bus structure and registers to design the basic structure of a Digital computer
3. Analyze the control unit of computer using micro programmed and hardwired approach
4. Understand the concept of I/O organization and different modes of data transfer
5. Understand the memoryhierarchy and concepts of parallelism and pipelining

Unit -I

Data Representation and Computer Arithmetic : Introduction to Computer Systems, Organization and architecture, evolution and computer generations, fixed point representation of numbers, digital arithmetic algorithms for Addition, Subtraction, Multiplication using Booth's algorithm and division using restoring and non-restoring algorithms.

Floating-Point Representation: IEEE standards and algorithms for its arithmetic operations.

Unit -II

Basic Computer Organization and Design: Register Transfer Language and Micro Operations, Instruction codes, stored program organization, computer registers and common bus system, computer instructions, timing and control unit. Instruction cycle: Fetch and Decode, Register reference instructions, Memory reference instructions. Input-output and Interrupt: configuration, I/O instructions, Program interrupt, Interrupt cycle.

Unit -III

Control Unit Design: Hardware control unit and Micro-programmed Control organization, address sequencing, micro instruction format and micro program sequencer.

Central Processing Unit: General register organization, stack organization, instruction formats, addressing modes, Data transfer and bit manipulation, Program control instructions.

Unit -IV

Input-Output Organization: IO interface, I/O Bus and interface modules, I/O versus Memory Bus. Asynchronous data transfer: Strobe control, Handshaking, Asynchronous serial transfer. Modes of Data Transfer: Programmed IO, Interrupt driven I/O, Priority interrupt; Daisy chaining, Parallel Priority interrupt. Direct Memory Access, DMA controller. Input output Processor, CPU-IOP communication.

Unit -V

Memory Organization: Memory classification, Memory hierarchy, Associative memory, Cache memory: mapping functions, Virtual memory: address mapping using pages, Page replacement algorithms, Memory Management Unit.

Advanced Computer Organization: RISC, CISC, Parallel processing, Arithmetic and Instruction Pipeline, Pipeline conflicts, Flynn‟s classification, VLIW architecture Processor.

Textbooks:

1. Morris Mano, M.,”Computer System Architecture," Pearson Education.
2. William Stallings,"Computer Organization and Architecture: Designing for performance," Pearson Education.

References:

1. John P.Hayes, “Computer Architecture and Organization”, TMH.
2. Govindarajualu, “Computer Architecture and Organization”, TMH.

Course Code	Course Title						Core/Elective
U21PC402EC	**ANALOG ELECTRONIC CIRCUITS**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Electronic Devices	**3**	-	-	-	**30**	**70**	**3**

Course Objectives :

1. Demonstrate the frequencyresponse of small signal single stage BJT and FET amplifiers
2. Illustrate the frequencyresponse of small signal Multi stage RC Coupled and Transformer Coupled amplifiers using BJT and FET.
3. Describe the characteristics of negative feedback, understand the mechanism and analyze negative feedback amplifiers.
4. Explain the condition for sustained oscillations, distinguish various types ofoscillators
5. Discuss the operation of Power amplifiers and derive the various parameters of Power amplifier.

Course Outcomes :

1. Design and analyze the frequency response of small signal single stage BJT and FET amplifiers.
2. Design and analyze the frequency response of small signal Multistage RC coupled and Transformer coupled amplifiers.
3. Identifythe type of negative feedback, Analyze and design of negative feedback amplifiers.
4. Design Audio Frequencyand Radio Frequencyoscillators.
5. Distinguish betweenthe classes of Power Amplifiers and their design considerations.

UNIT-I

Small Signal Single Stage Amplifiers: Classification of Amplifiers, Analysis of BJT CE, CB and CC Amplifiers using approximate model. Comparison of CB, CE and CC Amplifiers. Analysis of FET CS, CD and CG amplifiers.

UNIT-II

Frequency Analysis of Single stage and Multi Stage Amplifiers: Mid, Low and High frequency analysis of Single stage CE amplifier, Cascading of amplifiers and its effect on Gain and Bandwidth. Analysis of 2-stage RC coupled amplifier. Qualitative analysis of Transformer coupled amplifier with BJT, Cascoding, and Darlington pair.

UNIT-III

Feedback Amplifiers : The feedback concept, gain with negative feedback, general characteristics of Negative feedback amplifier, feedback topologies, Effect of negative feedback on Input and Output impedances, analysis of voltage-series, current-Series, voltage-shunt and current-shunt feedback amplifiers. Stability considerations, Local Versus Global feedback

UNIT-IV

Oscillators: Positive feedback, Barkhausen criteria, RC and LC Oscillators, Crystal Oscillator, Amplitude and Frequency Stabilityof Oscillator.

Regulators: Transistorized Series and Shunt Regulators

UNIT-V

Large Signal Amplifiers: Classification of power amplifiers, Non-linearity of BJT and harmonic Distortion, Power Dissipation, Efficiency calculations class-A and Class-B power amplifiers. Design considerations of series fed Transformer coupled Class-A power amplifier, Push-Pull configuration and advantages, Complementary Symmetry Class-B Power Amplifiers, Zero-crossover distortion. Elementary treatment on Class-AB and Class D power amplifiers.

Tuned Amplifiers: General considerations – Selectivity, Q-factor, band-width. Analysis of single tuned amplifier, Stagger tuned amplifiers.

Text Books:

1. Electronic Devices and Circuits, David A. Bell, Oxford University Press.
2. Integrated Electronics, Jacob Millman, Christos Halkias, Chetan Parikh, McGraw Hill Education (India) Private Limited.
3. Electronic Circuit Analysis and Design, Donald A Neamen, Tata McGraw Hill.

References:

1. Microelectronic Circuits Theory and Applications, Adel S.Sedra, Kenneth C. Smith, Oxford University Press**.**

2. Electronic Devices and Circuits, S Salivahanan, N Kumar, and A Vallavaraj, McGraw Hill Education (India) Private Limited.

Course Code	Course Title						Core/Elective
U21PC403EC	**ELECTROMAGNETIC WAVE THEORY & TRANSMISION LINES**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives :

1. Discuss the fundamentalconcepts of Transmission lines
2. Describe the concepts of RF transmission Lines and its characteristics using Smith Chart, its applications
3. Define the fundamental concepts of vector analysis, electrostatics and the related laws with their applications
4. Formulate the basic laws of Magneto Static fields, Time varying fields using Maxwell's equations in differential and integral form
5. Derive the wave equations for conducting and Di-electric mediums to analyze the wave propagation characteristics of Uniform Plane Waves (UPW) in normal and oblique incidences

Course Outcomes :

1. Interpret the characteristics of Transmission Lines under various load conditions and deduce the expressions for various parameters
2. Analyze the concepts of RF & UHF lines as circuit elements, understand the properties of λ/2, λ/4 and λ/8 lines and estimate VSWR, Reflection coefficient using Smith Chart
3. Interpret the behaviour of static electric fields and estimate the potentials and capacitances for simple cases
4. Understand the basic principles of Magneto static fields using Biot - Savart law, Ampere's Law , Maxwell's equations for static and time varying fields
5. Analyze Electromagnetic wave propagation in free space and conducting media in both normal and oblique incidences

Unit-I

Introduction to Transmission Lines: Types of Transmission lines, Applications, Primary constants, General Solution, Secondary constants, Impedance, Network approximation. Lossless and Distortion less transmission line, Problems, Concept of loading and Campbell's formula.

Unit-II

Transmission Lines at High Frequencies: Introduction, Impedance calculation of a transmission line at High frequencies, Open and short circuit lines and their usage as circuit elements. Properties of λ/2, λ/4 and λ/8 lines, reflection coefficient, VSWR and Stub Matching, Problems.

Smith chart: Construction, Measurement of Impedance, VSWR, Reflection Coefficient, Stub Matching using smith chart and its Applications.

Unit-III

Electrostatics: EM Spectrum**,** Review of coordinate systems, various Charge distributions, Coulomb's Law, Electric field Intensity, Electric flux & flux density, Gauss's Law and its applications, Work, Potential, Energy and the dipole. Conductors, Dielectrics, current and current density. Concept of capacitance, Boundary conditions for electric fields, Laplace and Poisson's equations.

Unit-IV

MagnetoStatics : Magnetic field generation, Magnetic field Intensity & Magnetic flux density, Biot-Savart's law, Stokes theorem, Ampere's law, Solenoid, torrid, Scalar and vector magnetic potentials. Boundaryconditions for Magnetic fields.

Time Varying Fields: Time varying field generation - Faraday's law, Maxwell's equations for static field and time varying fields.

Unit-V

Electromagnetic Waves Generation: EM wave equation**,** Uniform plane waves, characteristics of Uniformplane waves in various media and Polarization of EM waves.

EM Wave Propagation: Characteristics of EM Waves in normal and oblique incidence on dielectric and conducting medium.

Power Flow: Instantaneous, average and complex power, poynting theorem.

Text Books:

1. John D. Ryder, "Networks Lines and Fields", Pearson.
2. Matthew N.O. Sadiku, "Principles of Electro magnetics", Oxford University Press.
3. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", Pearson.

References:

1. William H. Hayt Jr. and John A. Buck, "Engineering Electro magnetics", TataMcGraw Hill.
2. Nannapaneni Narayana Rao, Elements of Engineering Electro magnetics, 6e, Pearson Education.

Course Code	Course Title						Core/Elective
U21PC404EC	**PULSE AND DIGITAL CIRCUITS**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Electronic Devices	**3**	-	-	-	**30**	**70**	**3**

Course Objectives:

1. Demonstrate the wave shaping circuits, switching characteristics of Diodes and Transistors
2. Discuss the operation of Clipping and Clamping circuits
3. Interpret different types of Multivibrators and the design procedure.
4. Illustrate the methods of generating Time base signals
5. Describe the operation of Sampling Gates

Course Outcome:

1. Understand and analyze the responses of first order RC low pass and high pass filters for standard inputs
2. Understand the transfer characteristics of clipping circuits and the response of clamping circuits for sinusoidal and square wave signals
3. Understand the operation, analysis and design of Multivibrators using BJTs
4. Analyze the operation oftime base generators
5. Analyze different types of sampling gate circuits

Unit-I

Linear Wave Shaping: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and exponential inputs. RC network as differentiator and integrator, Attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

Unit-II

Non-linear Wave Shaping: Diode clippers, clipping at two independent levels, Comparators, applications of voltage comparators, clamping operation, clamping circuits taking source and diode resistances into account, clamping circuit theorem, practical clamping circuits.

Unit- III

Multivibrators: Switching Characteristics of Transistors, Classification of Multivibrators**,** Analysis and design of fixed bias and Self bias Bistable Multivibrator, Triggering methods, Analysis of Schmitt Trigger, Analysis and Design of Monostable Multivibrator, Voltage to time converter, Analysis and design of Astable Multivibrators, Voltage – frequency converter.

Unit- IV

Time Base Generators: General features of a Time base Signal, Methods of Generating Time Base Waveform(Using UJT), Miller and Bootstrap Time base Generators-Basic Principles, Transistor Miller Time Base generator, Transistor Bootstrap Time Base Generator, Transistor Current Time Base Generators, Methods of Linearity improvement.

Unit -V

Sampling Gates: Basic operating principles of sampling gates, Unidirectional and Bi-directional sampling gates, Reduction of the pedestal in gate circuits, Applications of sampling gates.

Text Books:

1. J. Millman and H.Taub, "Pulse, Digital and Switching Waveforms", McGraw-Hill.
2. A. Anand Kumar, "Pulse and Digital Circuits", Prentice- Hall of India Private Limited.
3. Leonard Strauss, Wave Generation and Shaping, McGraw-Hill Inc.

References:

1. Motheki S. Prakash Rao, "Pulse and Digital Circuits", McGraw-Hill.
2. Ronald J. Tocci, "Fundamentals of Pulse and Digital Circuits" Pearson.

Course Code	Course Title						Core / Elective
U21PC405EC	**RANDOM VARIABLES AND STOCHASTIC PROCESSES**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Signal Analysis And Transform Techniques	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives :

1. Understand different types of random variables their densityand distribution functions
2. Familiarize the students with the operations on a random variable
3. Introduce the concept of bivariate random variables and operations on them
4. Expose the students to the basics of random processes and their time domain characteristics
5. Familiarize the students with the spectral characteristics ofrandomprocesses

Course Outcomes :

1. Estimate the cumulative distribution function, mean, variance of various discrete and continuous random variables and their functions
2. Estimate and analyze the statistical parameters of multiple random variables and operations on multiple random variables
3. Define and classify random processes, compute temporal characteristics of randomprocesses like auto and cross correlation functions
4. Determine spectralcharacteristics ofrandom processes like power density spectrum and cross power density spectrum
5. Estimate temporaland spectralparameters of linear systemresponse to random inputs

Unit-I

Random Variables: Review of Continuous and Discrete Distribution and Density functions, Rayleigh distribution, Conditional Distribution and its properties, Methods of defining Conditional Event, Conditional Densityand its Properties.

Operations on One Random Variable: Introduction, Expected Value of a Random Variable, Function of a Random Variable g(x) and its distribution, Moments about the Origin, Central Moments, Variance and Skew, Characteristic Function, Moment Generating Function.

Unit-II

Two Random Variables and operations: Bi-variate Distributions, Joint Distribution Function and its Properties, Joint Density Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density, Sum of Two Random Variables, Sum of Several Random Variables.

Unit-III

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties.

Unit-IV

Stochastic Processes – Temporal Characteristics: Introduction to stationary (First and Second order; WSS; SSS), statistical independence, Time averages and ergodicity, random processes and independence, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance and its Properties; Gaussian and Poisson Random Processes. Linear System Response: Mean and Mean-squared Value.

Unit-V

Stochastic Processes – Spectral Characteristics: Power Spectral Density and its properties; Relationship between Power Spectrum and Autocorrelation Function; Relationship between Cross-Power Spectrum and Cross-Correlation Function; White and coloured noise, Spectral Characteristics of system response: PSD of response, cross PSD of input and output of a linear system.

Textbooks:

1. Peyton. Z. Peebles, Probability, Random Variables and Random Signal Principles, Tata McGraw Hill.
2. Athanasias Papoulis and S.Unnikrishna Pillai, Probability, Random Variables and Stochastic Processes, McGraw Hill.

References:

1. HenryStark and John W Woods, Probability and Random Processes with application to Signal Processing, Pearson Education.
2. K. L. Chung, Introduction to Probability Theory with Stochastic Processes, Springer International.

Course Code	Course Title						Core/Elective
U21ES481EC	**PROGRAMMING FOR PROBLEM SOLVING USING PYTHON LAB**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Programming in C	-	-	-	2	**25**	**50**	**1**

Course Objectives :

1. Define Python interpreter and scripts
2. Illustrate the basic Python programming constructs
3. Describe Data processing using programming
4. Demonstrate the object oriented approach in Python
5. Describe the Classes, methods and Files, Python frameworks

Course Outcomes :

1. Understand Python interpreter and scripts
2. Use basic Python programming constructs
3. Write basic Data processing programs
4. Develop programs using Object Oriented approach
5. Comprehend classes, Methods Files and Python frameworks

List of Programs:

1. Introduction to Python

a. Introduction to Python

b. Introductionto Python interpreter, Python script

c. Write basic programs in Python

2. Python Programming Constructs-1

a. Discuss Data Types, Variables, Basic Input-Output Operations, Basic Operators

b. Write a program in Python to find the factorial ofa given number

c. Write a program in Python to compute distance between two points (Pythagoras theorem)

3. Python Programming Constructs-2

a. Discuss Boolean Values, Conditional Execution, Loops, Lists and List Processing, Logical and Bitwise Operations

b. Write a program in Python to search for number from a given list of elements

c. Write a program in Python to sort a list of elements

4. Python Data Processing Elements

a. Discuss Functions, Tuples, Dictionaries, and Data Processing

b. Write a program in Python to create a dictionaryand perform search operation

c. Write a program in Python to find number of occurrences of items of list in the tuple

5. Python Object Oriented Elements-1

a. Discuss Modules, Packages, String and List Methods, and Exceptions

b. Write a program in Python to check whether a string is palindrome or not

c. Write a program in Python which uses modules and packages

6. Python Object Oriented Elements-2

a. Discuss Classes, Methods, Objects, Working with Files

b. Create a Student class and store and display the data by invoking methods

c. Write program in Python to performbasic file operations

7. Study of Python frameworks:

a. TensorFlow

b. PyTorch

c. Keras

Textbooks:

1. Yashavant Kanetkar, Aditya Kanetkar, "Let us Python", BPB publication.
2. Ashok Kamthane, Amit Kamthane, "Programming and Problem Solving with Python", McGraw Hill Education (India) Private Limited.

References:

1. www.python.org

Course Code	Course Title						Core/Elective
U21PC481EC	**ANALOG ELECTRONIC CIRCUITS LAB**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Electronic Devices Lab	-	-	-	2	**25**	**50**	**1**

Course Objectives:

1. Illustratethe design of BJT and FET amplifiers
2. Demonstrate the frequencyresponse of feedback amplifiers
3. Discuss and analyze the operation of Oscillators and voltage regulator circuits
4. Explain the design considerations of power amplifiers
5. Introduce the SPICE simulator tooland design amplifiers and oscillators

Course Outcomes :

1. Design and analyze the parameters ofamplifier circuits.
2. Design and analyze the effect of negative feedback on frequency response and amplifier parameters.
3. Design and implement oscillator circuits and compare experimentalresults with theoretical analysis.
4. Investigate the performance of class A, class B power amplifiers.
5. Design and analyze the performance of various amplifiers and oscillators using SPICE simulator.

List of Experiments

Part-A

1. Design a single stage CE amplifier, obtain frequency response, calculate Voltage Gain, Bandwidth, Input and Output impedances.
2. Obtain the performance analysis of Darlington pair by measuring its input impedance, output impedance and voltage gain.
3. Design a two Stage RC Coupled CE amplifier, obtain frequency response, calculate Voltage Gain, Bandwidth, Input and Output impedances.
4. Design a two Stage RC Coupled CS amplifier, obtain frequency response, calculate Voltage Gain, Bandwidth, Input and Output impedances.
5. Design a Voltage Shunt Feedback Amplifier, obtain frequency response, calculate Voltage Gain, Bandwidth, Input and Output impedances.
6. Design a Current series feedback Amplifier, obtain frequency response, calculate Voltage Gain, Bandwidth, Input and Output impedances.
7. Design RC Phase Shift Oscillator and compare the theoretical & practical frequency of oscillations.
8. Design Hartley & Colpitts Oscillators and compare the theoretical & practical frequency of oscillations.
9. Design Class APower amplifier and verify its efficiency.

10. Design Class B Power amplifier and verify its efficiency.
11. Design a Series / Shunt Voltage Regulator to obtain the specified voltage regulation.
12. Obtain the frequencyresponse of Single tuned Amplifier and calculate its Bandwidth.

Part-B

Using SPICE Simulator

1. Simulate Two Stage RC Coupled CS FET amplifier.
2. Simulate Voltage Series Feedback amplifier.
3. Simulate Hartley & Colpitts Oscillators.
4. Simulate Class- B Power amplifier.
5. Simulate Wein Bridge Oscillator.

Note: Minimumof 10 experiments fromPART-A and at least 3 experiments using SPICE fromPART-B should be performed.

References:

1. Basic Electronics, A text–Lab Manual, Paul B. Zbar, Albert P. Malvino, Micheal A. Miller, Tata Mc Graw Hill.
2. Introduction to PSpice Using Orcad for Circuits and Electronics, Mohammad H. Rashid, Prentice Hall of India.

Course Code	Course Title						Core/Elective
U21PC482EC	**PULSE AND DIGITAL INTEGRATED CIRCUITS LAB**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Electronic Devices Circuits LAB		-	-	2	**25**	**50**	**1**

Course Objectives :

1. Implement Linear and Non-linear Wave shaping circuit and studythe performance
2. Design and verifythe operation of Mono-stable and Astable Multi-vibrators
3. Studythe characteristics of a Schmitt trigger
4. Build sweep circuits and study it`s performance
5. Studythe various combinational and Sequential circuits using Digital ICs

Course Outcomes :

1. Design and analyze various Linear and Nonlinear Wave shaping circuits
2. Design and analyze the switching characteristics of a transistor
3. Design and analyze the characteristics of Bistable, Astable and Monostable Multivibrators
4. Understand the generation of non-sinusoidal signals using Miller and UJT sweep circuits
5. Design and Analyze the combinational and Sequential circuits using Digital ICs

List of Experiments:

Part-A

1. Design Low Pass and High Pass RC Circuits and observe their responses for various time constants.
2. Design and Analyze Clipping and Clamping Circuits for a given input signal.
3. Design Transistor as a switch and observe its Switching characteristics.
4. Design Collector Coupled Monstable Multivibrator and generate a pulse signal with required pulse width.
5. Design square wave generator using Collector Coupled Astable Multivibrator for the given frequency.
6. Design Schmitt Trigger Circuit and measure UTP, LTP and the corresponding output voltages.
7. Design relaxation oscillator using UJT, verify its output and compare with theoretical frequency.
8. Analyze the operation of Miller Time base generator and generate sawtooth waveform.

Part-B

1. Verify the truth tables of the basic logic gates and realize Binary to Gray and Grayto Binary code converters.
2. Realize half adder/subtractor and Fulladder/subtractor using logic gates.
3. Realize Full Adder using Multiplexer, Decoder and verify its truthtable.
4. Verify the truth tables of S-R, J-K Flip-Flops and construct T, D- Flip-Flop using the mentioned F/F‟s.

5. Design synchronous Counter using J-K flip flops
6. Design Asynchronous decade counter using J-K flip flops.

Note: Minimum of 12 Experiments should be done fromboth PART-A and PART-B.

Textbooks:

1. Robert Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Prentice-Hallof India Private Limited.
2. David A. Bell, "Electronic Devices and Circuits", Laboratory Manual, Prentice-Hall of India Private Limited.

References:

1. M. Morris Mano, "Digital Design", Pearson.