ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES (AUTONOMOUS)

Affiliated to Andhra University

Academic Regulations Curriculum & Syllabi (First Year [I & II Sem], Second year [I & II Sem])

ACCREDITED BY NBA & NAAC WITH‘A’GRADE

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES (AUTONOMOUS)

VISION

ANITS envisions to emerge as a world-class technical institution whose products represent a good blend of technological excellence and the best of human values.

MISSION

To train young men and women into competent and confident engineers with excellent communicational skills, to face the challenges of future technology changes, by imparting holistic technical education using the best of infrastructure, outstanding technical and teaching expertise and an exemplary work culture, besides moulding them into good citizens.

QUALITY POLICY

ANITS is engaged in imparting quality technical education. It constantly strives towards achieving high standards of teaching, training and development of human resources by encouraging its faculty and staff to work as a team and to update their knowledge and skills continually to match the needs of industry.

Foreword

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES (ANITS) was founded by Anil Neerukonda Educational Society (ANES) in the fond memory of Anil Neerukonda, son of Dr. B R Prasad Neerukonda.

Its humble journey started in 2001 with an intake of 220 students into four undergraduate B.Tech programmes. Within 14 years of its establishment, the institute registered phenomenal growth and is accredited by NAAC with 'A' and by NBA for the second time. It is permanently affiliated to Andhra University and has achieved autonomous status in 2015. Further, the institute has been currently ranked as 4th among the private engineering colleges in Andhra Pradesh by APSCHE. It has been recognised as "Centre for Excellence" by Infosys and is accorded by Andhra University as "Centre for Research".

Today, the institute offers seven B.Tech. programmes and four M.Tech. programmes with an annual total intake about 1100 students. The institute offers amenities like separate hostels for boys and girls, indoor and outdoor games, transport covering all the major locations of Visakhapatnam and medical aid provided by Anil Neerukonda hospital and NRI Institute of Medical Sciences, another educational institution of ANES.

Apart from the State-of-the-Art laboratories, well established teaching methodology and implementation of the best practices, the wonderful co- ordination of the Management, Faculty and Parents has so far played a crucial role in shaping the future of the ANITIANS and has been the talisman of the Institute's phenomenal growth.

The success stories of our champions at several qualifying exams for the higher studies like GRE, TOEFL, CAT and GATE, the impressive track record of the placements with highest known packages in MNCs like Google, Oracle, Infosys, TCS and so on are the sweetest fruits of our efforts.

PRAGNANAM BRAHMA, the motto of ANITS, is truly practiced by all the members of ANITS family, a direct effort to serve the society, nation and the mankind as well.

Hearty welcome to ANITS family.

Prof. T. V. HANUMANTHA RAO
PRINCIPAL

Achievements & Highlights

- Autonomous since May 2015
- NAAC with ‘A’ Grade
- Accredited and reaccredited by NBA, New Delhi
- UGC recognition under 2(f) and 12(B)
- Permanent affiliation to Andhra University, Visakhapatnam
- Among top 3 most preferred colleges in A.P.
- “AAA” rating accorded by "Careers Digest 360"
- Recognized as a Research Center by Andhra University
- Selected as Skill Development Center (SDC) by Govt. of A.P.
- First institute to be accorded “Center for Excellence” by Infosys
- Ranked 5th among the Promising Private Engineering Colleges for excellence as per Competition Success Review (CSR) magazine in 2011
- Recognized as "Silver Partner" of Keane India (Chennai) for the year
- 2007-2008
- Collaborated with "Mission (R&D)" funded by Wipro
- "On Campus Training" by IBM for the students
- Collaboration with Unisys Global Solutions India (Bangalore) for internship
- Highest package offer around 2 crores including perks – highest offer in South India
- 8 lacs to 10 lacs packages –for majority ANITIANS

Contents

Department Profile

The Department of **Electronics and Communication Engineering** was started with B.E programme (UG) with an intake of 60 seats in the year 2001, subsequently enhanced to 90 seats in 2003, to 120 seats in 2005 and to 180 seats in the year 2014 and M.Tech programme (PG) in Communication Systems with an intake of 18 seats from 2011-2012. Department was recognized as Research Center by Andhra university for guiding Ph.D scholars from 2014-15. The Department was accredited twice by NBA.The institute attained autonomous status from the academic year 2015-2016 and accredited with 'A' grade by NAAC.

At present, the department has 28 qualified and dedicated faculty members with specializations of Wireless & Mobile Communications, EMI/ EMC, Antennas, Microelectronics & VLSI Design, Radar & Microwave Engineering, Signal Processing, Image Processing & Computer Vision, Electronic Instrumentation, Digital Electronics & Communication Systems, 6 technical staff and 4 supporting staff supplements the teaching staff. The department has successfully completed one Research Promotion Scheme (RPS) project funded by AICTE. The faculty members are actively involved in research and are publishing papers in reputed national and international conferences/ journals.

The department has well equipped laboratories namely, Electronic Devices and Circuits Lab, Linear Integrated Circuits and Pulse Circuits Lab, Communications Lab, Digital ICs & Microprocessors Lab, Microwave and Antennas Lab, Digital Signal Processing Lab and Project/Research Lab. The laboratories are equipped with special hardware and software tools useful to train the students to meet the needs of industry such as Color TV Training module, Universal multi vendor development kit, latest configured computer systems, Microwave Benches(X-band), Spectrum Analyzer, Antenna and Optical Fiber Training module, DSP trainer module, Lab VIEW software, MATLAB software, Tanner tools Software, Hyper-Lynx 3D EM super structure Designer for antenna design, XILINX and VLSI design software, etc.

All the faculty members are easily accessible to the students for advice, counseling and guidance on curricular, co-curricular and extra-curricular (NSS, Sports, etc.) activities. The department organizes annual student technical symposiums, in which students from various colleges across the country participate and exhibit their talents in events like paper presentation, poster presentation, hardware exhibition, technical quiz, and mock parliament. The department has student forums of professional national and international professional bodies like IETE, IEEE, etc.

ECE department has an excellent placement record which has been consistently above 85 % and the students are placed inreputed IT and core industries. The students constantly get admissions in IITs, NITs, IIMs, reputed Indian universities and foreign universities for higher studies.

DEPARTMENT OF
ELECTRONICS & COMMUNICATION ENGINEERING

VISION

To become a centre of excellence in Education and Research and produce high quality engineers in the field of Electronics and Communication Engineering to face the challenges of future technology changes.

MISSION

The Department aims to bring out competent young Electronics & Communication Engineers by achieving excellence in imparting technical skills, soft skills and the right attitude for continuous learning.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

I. To prepare graduates for successful career in Electronic industries, R&D organizations and/or IT industries by providing technical competency in the field of Electronics & Communication Engineering.

II. To prepare graduates with good scientific and engineering proficiency to analyze and solve electronic engineering problems.

III. To inculcate in students professionalism, leadership qualities, communication skills and ethics needed for a successful professional career.

IV. To provide strong fundamental knowledge in men and women students to pursue higher education and continue professional d evelopment in core engineering and other fields.

PROGRAMME OUTCOMES (POs)

PO-1 An ability to apply knowledge of mathematics, science and engineering with adequate computer knowledge to electronics and communication engineering problems.

PO-2 An ability to analyze complex engineering problems through the knowledge gained in core electronics engineering and interdisciplinary subjects appropriate to their degree programme.

PO-3 An ability to design, implement and test an electronic based system.

PO-4 An ability to design and conduct scientific and engineering experiments, as well as to analyze and interpret data.

PO-5 An ability to use modern engineering techniques, simulation tools and skills to solve engineering problems.

PO-6 An ability to apply reasoning in professional engineering practice to assess societal, safety, health and cultural issues;

PO-7 An ability to understand the impact of professional engineering solutions in societal and environmental contexts;

PO-8 An ability to develop skills for employability/ entrepreneurship and to understand professional and ethical responsibilities;

PO-9 An ability to function effectively as an individual on multi- disciplinary tasks.

PO-10 An ability to convey technical material through oral presentation and interaction with audience, formal written papers /reports which satisfy accepted standards for writing style;

PO-11 An ability to succeed in university and competitive examinations to pursue higher studies;

PO-12 An ability to recognize the need for and engage in life-long learning process.

ACADEMIC REGULATIONS

ACADEMIC REGULATIONS FOR B.TECH PROGRAMME UNDER AUTONOMOUS STATUS

(W.E.F. THE ADMITTED BATCH OF 2015-16)

I. Admissions:

Admissions into first year of B.Tech.Programme and admissions into second year (lateral entry) of B.Tech.Programme of the Institute will be as per the norms stipulated by Andhra University & Andhra Pradesh State Council for Higher Education (APSCHE), Govt. of Andhra Pradesh. The academic regulations of Autonomous status mentioned herewith will be applicable from 2016-17 in case of Lateral Entry admissions.

II. Programmes Offered:

The following are the B.Tech. Programmes offered by the Institute.

1 Chemical Engineering

2 Civil Engineering

3 Computer Science & Engineering

4 Electrical & Electronics Engineering

5 Electronics & Communication Engineering

6 Information Technology

7 Mechanical Engineering

III. Structure of the B. Tech. Programme:

The programme of instruction will consist of Humanities, Basic Sciences, Engineering Sciences and Technology. The complete programme is distributed over eight semesters with two semesters per academic year. Every branch of B.Techprogramme will have a curriculum and syllabi for the courses recommended by the Board of Studies and approved by the Academic Council. The academic programmes of the Institute follow the credit system. The curriculum of B.Techprogramme is designed to have a total of about 189 credits of which a student should acquire a minimum of
180 credits to get the degree awarded. If a student earns all the total credits, then the best 180 credits are considered to determine the final CGPA. The lateral entrants shall have a total of about 146 credits of which one should acquire a minimum of 137 credits to get the degree awarded. If a student takes all the credits, then the best 137 credits are considered to determine the final CGPA. However, the credits which a student can forego will be in accordance with the mandatory courses and electives offered by the individual departments.

IV. Duration of the Programme:

The duration of the programme is four academic years consisting of two semesters in each academic year. A student is permitted to complete the programme in a stipulated time frame of 8 consecutive academic years from the date of initial admission. Students joining the programme in the 2^{nd} year through lateral entry scheme shall have to complete the programme in a stipulated time frame of 6 consecutive academic years from the date of initial admission.

V. Medium of Instruction:

The medium of instruction and examination is English.

VI. Minimum Instruction Days:

Each semester normally consists of a minimum of 16 weeks of instruction.

VII. Academic Calendar:

The dates of all important events, such as commencement of class work, examinations, vacations, etc., during the academic year will be specified in the Academic Calendar of the Institute, as approved by the Academic Council.

VIII. Examinations & Evaluation Process:

The performance of a student in each semester shall be evaluated subject-wise with a maximum of 100 marks each for theory and practical/ drawing subjects.

(A) Theory Course:

For all lecture based theory courses, the assessment shall be for 40 marks through internal evaluation and 60 marks through external semester- end examination of three hours duration except for the subjects with 100% internal assessment in which case an internal examination will be conducted for 60 marks along with the semester-end examinations.

i) Internal evaluation:

The sessional marks shall be awarded through internal evaluation by the teachers concerned based on the continuous assessment which includes class tests, quiz, viva-voce, assignments, student regularity, two mid- examinations etc., according to a scheme notified by the department at the beginning of the semester.

Out of the 40 internal evaluation marks, 20 marks are assigned for 2 internal-mid exams, 10 marks for assignments, 5 marks for projects/ case studies /quiz/tests and 5 marks for attendance. The average of 2 internal- mid exams is considered for the 20 marks allocated.

Under any circumstances, no re-examination shall be conducted for the internal mid examinations.

ii) External evaluation:

The question paper shall be set externally and the answer scripts are valued through a double valuation system.

The average of the two valuations will be taken for the award of marks. In case, the difference of the marks obtained in the two valuations is more than 20%, then a third examiner shall value the script. Out of the three valuations, the average of marks obtained in third valuation and the marks obtained nearer to third valuation out of first two valuations shall be considered. No revaluation for any subject/course shall be entertained as already double valuation system is in existence. However, recounting is allowed on the request of the candidate on payment of specified fee. Challenge valuation shall also be entertained on payment of specified fee.

(B) Laboratory Course:

Each student will perform about 10 to 12 experiments in each laboratory course. Laboratory course will be evaluated for 100 marks, out of which 50 marks are for external examination and 50 marks are for internal evaluation. The internal marks are awarded based on continuous assessment, record work, internal lab examination and student regularity. The external examination will be conducted by two examiners, one of them being laboratory class teacher as internal examiner (nominated by the Principal on recommendation of HOD) and an external examiner nominated by the Principal from the panel of experts recommended by the HOD.

A candidate shall be declared to have passed any theory subject/ course if he secures not less than 40% in external theory examination and also a minimum of 40% of total marks of that course which assures a minimum of 'E' grade.

A candidate shall be declared to have passed any practical course if he secures not less than 50% in external laboratory examination and also a minimum of 50% of total marks of that course which assures a minimum of 'D' grade.

Only in the case of quantitative and verbal aptitude – I & II, if a candidate fails he is given an opportunity to improve to pass grade (E) irrespective of the score he gets over and above pass mark in the reexamination within one month on payment of special examination fee.

Any student appearing for the semester-end practical examination is eligible only if he submits the bonafide record certified by the laboratory class teacher and the HOD.

(C) Project Work:

The project work is evaluated for 300 marks out of which 100 through internal assessment in the IV Year I semester through continuous assessment followed by final evaluation by a committee nominated by the HOD. For the 200 marks in IV year II semester, assessment is done for 100 marks internally and for the remaining 100 marks by the committee consisting of at least one external expert nominated by the Principal. If a student fails in the fourth year first semester project he has to appear for reassessment within one month for which he has to pay the reexamination fee.

(D) Industrial Training:

The industrial training is assessed internally for 100 marks by an internal evaluation committee constituted by the HOD.

(E) Supplementary Exam:

There will be supplementary examination for the programme such that for odd semester courses the supplementary exams will be conducted during summer vacation and for the even semester courses, the supplementary exams will be conducted during the winter vacation.

IX. Attendance Regulations:

Attendance of a student is computed by considering total number of periods conducted in all courses as the denominator and the total number of periods actually attended by the student in all courses, as the numerator. It is desirable for a student to put in 100% attendance in all the subjects. However, a candidate shall be permitted to appear for the semester end examination provided he maintains a minimum of 75% overall attendance in the semester.

The shortage of attendance on medical grounds can be condoned up to a maximum of 9% provided the student puts in at least 66% attendance and provided the Principal is satisfied with the genuineness of the reasons. The Medical Certificates are to be submitted to the Head of the Department when the candidate reports to the classes immediately after the absence. Certificates submitted afterwards shall not be entertained. Condonation fee as fixed by the college for those who put in attendance between $\geq$ 66% and
<75% shall be charged before the semester-end examinations.

In the case of students who participate in co-curricular, extra-curricular activities like student seminars, N.S.S, N.C.C, Inter-collegiate tournaments and any such other activities involving the representation of the Institute, with the prior approval of the Principal, the candidate may be deemed to have attended the classes during the actual period of such activity, solely for the purpose of attendance.

A student, who could not satisfy the minimum attendance requirement of 66% in any semester, shall be declared 'Detained'. He is not eligible to appear for the semester end examinations. He will not be promoted to the next semester and shall have to repeat that semester with the next

batch(es) of students. Such students who are detained and seek readmission, should submit an undertaking/a declaration that they will abide by the regulations existing at the time of readmission.

X. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item No. IX.

A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory subject if only he secures not less than 40% marks in the semester-end examination and a minimum of 40% marks in the sum of the internal evaluation and semester-end examination taken together. In the labs/ projects, the student should secure a minimum of 50% marks in the external examination and a minimum of 50% marks in the sum of internal evaluation and external examination evaluation taken together.

A student will be promoted to the next semester, if only he satisfies the minimum attendance requirement.

A student shall be promoted from II Year to III Year only if he fulfills the academic requirement of total 50 % of all credits from regular and supplementary examinations of I Year and II Year – I Semester { i.e., total 3 semesters} examinations, irrespective of whether the candidate takes the examination in all the subjects or not.

A student shall be promoted from III Year to IV Year only if he fulfills the academic requirements of total 50% of credits from regular and supplementary examinations of I Year, II Year and III Year- I Semester {i.e., total 5 semesters}, irrespective of whether the candidate takes the examinations in all the subjects or not.

For lateral entry students, there is no credit based restriction for promotion from II year to III year. But a lateral entry student shall be promoted from III year to IV year only if he fulfills the academic requirements of total 50% of credits from regular and supplementary examinations of II year and III year- I Semester {i.e., total 3 semesters} irrespective of whether the candidate takes the examinations in all the subjects or not.

Students, who fail to complete their B.Tech. Programme within eight academic years from the year of their admission or fail to acquire the credits stipulated for the programme shall forfeit their seat in B.Tech. Programme and their admission shall stand cancelled. For lateral entry students they have to complete the programme in six years from their year of admission.

XI. Award of Grades:

The absolute grading system is adopted as follows:

S.No.	Range of Marks {%}	Grade	Description	Grade Points
1	90-100	O	Outstanding	10
2	80-89	A	Excellent	9
3	70-79	B	Very Good	8
4	60-69	C	Good	7
5	50-59	D	Fair	6
6	40-49	E	Satisfactory	5
7	39 and below.	F	Fail	0
8	The grade 'I' represents absent (subsequently changed into pass or higher grades.)	I	Absent	0

Note: Minimum grade to pass in a laboratory course is 'D'.

The performance of a student at the end of the each semester is indicated in terms of Semester Grade Point Average (SGPA). The SGPA is calculated as below:

$$SGPA = \frac{\Sigma \text{ (Credits of a course x Grade points awarded for a course)}}{\Sigma \text{ (Credits of a course)}}$$

SGPA is calculated for the candidates who have passed in all the courses in that semester.

Cumulative Grade Point Average (CGPA) will be calculated from II semester onwards up to the final semester and its calculation is similar to that of SGPA, considering all the courses offered from the first semester onwards.

CGPA is calculated for those who clear all the courses in all the previous semesters.

XII. Award of Class:

For award of class, a total of best 180 credits are considered in case of four year programme and best 137 credits in case of lateral entry admitted students. A candidate, who becomes eligible for the award of B.Tech. Degree shall be placed in one of the following classes.

S.No.	Class	CGPA
1	First Class with Distinction	7.5 or more*
2	First Class	6.5 or more but less than 7.5
3	Second Class/Pass	5.0 or more but less than 6.5

***First class with Distinction will be awarded only to those students who clear all the subjects of the program in first attempt of regular examinations.**

The CGPA can be converted to aggregate percentage by multiplying CGPA with 10, in case of requirement by any other university or for any other purpose.

XIII. Eligibility for Award of B.Tech. Degree:

A student shall be eligible for the award of the B.Tech degree if he fulfills all the following conditions:

1) Registered and successfully completed all the components prescribed for eligibility in the Programme of study to which he/she is admitted within the stipulated period,

2) Obtained CGPA greater than or equal to 5.0 (Minimum requirement for Pass),

3) No disciplinary action is pending against him/her and

4) Has no dues to the Institute including hostels.

XIV. Malpractices:

The Controller of Examinations/Dean of Examinations shall refer the cases of suspected malpractices in mid examinations and semester-end examinations to Malpractice Enquiry Committee constituted by the Institute. Such committee shall follow the approved scales of punishment. The Principal shall take necessary action against the erring students based on the recommendations of the committee.

XV. Amendments To Regulations:

The Institute may, from time to time, revise, amend, or change the Regulations, Schemes of Examinations, and / or Syllabi and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the Institute.

XVI. General:

(i) Where the words 'he', 'him', 'his', occur in the regulations, they include 'she', 'her', 'hers'.

(ii) The academic regulation should be read as a whole for the purpose of any interpretation.

(iii) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.

CURRICULUM

First Year I –Semester

Code	Subject name	Instruction periods per week				Max marks		Credits
		Lecture	Tutorial	Practical	Total	Sessional	End marks	
ECE111	English	3	1	-	4	40	60	3
ECE112	Engineering Mathematics I	3	1	-	4	40	60	3
ECE113	Engineering Chemistry	3	1	-	4	40	60	3
ECE114	Professional Ethics & Human Values	2	1	-	3	100	-	2
ECE115	Engineering Physics	3	1	-	4	40	60	3
ECE116	Engineering Chemistry lab	-	-	3	3	50	50	2
ECE117	Programming with C Lab	-	1	3	4	50	50	3
ECEAC 1	NCC/ NSS/ Sports	-	-	3	3	-	-	-
Total		14	6	9	29	360	340	19

First Year II –Semester

Code	Subject name	Instruction periods per week				Max marks		Credits
		Lecture	Tutorial	Practical	Total	Sessional	End mark	
ECE121	Engineering Mathematics II	3	1	-	4	40	60	3
ECE122	Applied Physics	3	1	-	4	40	60	3
ECE123	Environmental Sciences	3	1	-	4	40	60	3
ECE124	Engineering Drawing	1	-	3	4	40	60	3
ECE125	Basic Electronics Engineering	3	1	-	4	40	60	3
ECE126	Engineering Physics lab	-	-	3	3	50	50	2
ECE127	Language Lab	-	-	3	3	50	50	2
ECE128	Object Oriented Programming with C++ Lab	-	1	3	4	50	50	3
ECE129	Workshop	-	-	3	3	50	50	2
ECEAC2	NCC/ NSS/ Sports	-	-	3	3	-	-	-
Total		13	5	18	36	400	500	24

Second Year I –Semester

Code	Subject name	Instruction periods per week				Max marks		Credit
		Lecture	Tutorial	Practical	Total	Sessional	End marks	
ECE211	Engineering Mathematics-III	3	1	-	4	40	60	3
ECE212	Electrical Machines	3	1	-	4	40	60	3
ECE213	Data structures	3	1	-	4	40	60	3
ECE214	Signals and Systems	3	1	-	4	40	60	3
ECE215	Network analysis and synthesis	3	1	-	4	40	60	3
ECE216	Electronic Circuits and Analysis-I	4	1	-	5	40	60	4
ECE217	Electronic Circuits and Analysis-I Laboratory	-	-	3	3	50	50	2
ECE218	Network & EM Laboratory	-	-	3	3	50	50	2
Total		19	6	6	31	340	460	23

Second Year II –Semester

Code	Subject name	Instruction periods per week				Max marks		Credits
		Lecture	Tutorial	Practical	Total	Sessional	End marks	
ECE221	Engineering Mathematics –IV	3	1	-	4	40	60	3
ECE222	Electronic Circuits and Analysis-II	3	1	-	4	40	60	3
ECE223	Digital Electronics	3	1	-	4	40	60	3
ECE224	Probability Theory & Statistics	3	1	-	4	40	60	3
ECE225	Electromagnetic Field Theory & Transmission Lines	3	1	-	4	40	60	3
ECE226	Control Systems	3	1	-	4	40	60	3
ECE227	Electronic Circuits and Analysis-II Laboratory	-	-	3	3	50	50	2
ECE228	Simulation Laboratory	-	-	3	3	50	50	2
ECE229	Massive Open Online Course (MOOC)		2	2	4	100	-	3
Total		18	8	8	34	440	460	25

Third Year I –Semester

Code	Subject name	Instruction periods per week				Max marks		Credits
		Lecture	Tutorial	Practical	Total	Sessional	End marks	
ECE311	Antennas & Wave Propagation	3	1	-	4	40	60	3
ECE312	Communication Systems Engineering	4	1	-	5	40	60	4
ECE313	Advanced Microprocessors	3	1	-	4	40	60	3
ECE314	Computer Architecture & Organization	3	1	-	4	40	60	3
ECE315	Integrated circuits and Applications	3	1	-	4	40	60	3
ECE16	Open Elective- I	3	1	-	4	40	60	3
ECE317	VHDL Laboratory	-	-	3	3	50	50	2
ECE318	IC Laboratory	-	-	3	3	50	50	2
ECE319	Quantitative Aptitude & Verbal	4	-	-	4	100	-	2
	Total	23	6	6	35	440	460	25

Open Elective- I: (for ECE, offered other departments)

1. Computer operating systems 2. Database management systems 3.Industrial Electronics 4. OOPS with JAVA
5. Software Engineering 6. Mechatronics 7. Engineering Mechanics and Strength of Mechanics

Third Year II –Semester

Code	Subject name	Instruction periods per week				Max marks		Credits
		Lecture	Tutorial	Practical	Total	Sessional	End marks	
ECE321	Microwave Engineering	3	1	-	4	40	60	3
ECE322	Digital Signal Processing	4	1	-	5	40	60	4
ECE323	Microcontrollers & Embedded Systems	3	1	-	4	40	60	3
ECE324	Professional Elective-I	3	1	-	4	40	60	3
ECE325	Digital Communications	3	1	-	4	40	60	3
ECE326	Communication Systems Engineering	-	-	3	3	50	50	2
ECE327	Microprocessor & Micro Controllers Lab	-	-	3	3	50	50	2
ECE328	Soft Skills Laboratory	-	-	3	3	100	-	2

ECE 329	Quantitative Aptitude & Verbal Aptitude-II	4	-	-	4	100	-	2
Total		20	5	9	34	500	400	24

Professional Elective-I

1. Analog IC Design
2. EMI / EMC
3. Electronic design and automation theory
4. Telecommunications and switching Networks

Fourth Year I –Semester

Code	Subject name	Instruction Periods per week				Max marks		Credits
		Lecture	Tutorial	Practical	Total	Sessional	End marks	
ECE411	Engineering Economics and Management	3	1	-	4	40	60	3
ECE412	Digital Image Processing	3	1	-	4	40	60	3
ECE413	Open Elective-II	3	1	-	4	40	60	3
ECE414	Professional Elective -II	4	1	-	5	40	60	4
ECE415	VLSI Design	3	1	-	4	40	60	3
ECE416	Microwave Engineering Laboratory	-	-	3	3	50	50	2
ECE417	Digital Communications Lab	-	-	3	3	50	50	2
ECE418	Industrial Training Seminar	-	2	2	4	100	-	4
ECE419	Project Phase - I	-	-	8	8	100	-	4
Total		16	7	16	39	500	400	28

Professional Elective-II Open Elective-II (for ECE , offered to other departments)

1. Advanced Digital Signal Processing
2. Radar Signal Processing
3. Satellite Communications & GPS
4. Cellular and Mobile Communications

1. Project management
2. Industrial Safety and Hazards
3. IT infrastructure and management
4. Multimedia concepts
5. E-Governance
6. Robotics
7. Power Electronics

Fourth Year II –Semester

Code	Subject name	Instruction periods per week				Max marks		Credits
		Lecture	Tutorial	Practical	Total	Sessional	End marks	
ECE421	Electronic Measurements and Instrumentation	3	1	-	4	40	60	3
ECE422	Professional Elective-III	4	1	-	5	40	60	4
ECE423	Professional Elective-IV	4	1	-	5	40	60	4
ECE424	Signal and Image Processing Laboratory	-	-	3	3	50	50	2
ECE425	Project Phase - II & Dissertation	-	-	20	20	100	100	8
Total		11	3	23	37	270	330	21

Professional Elective-III

1. Phased array systems
2. Bio-medical Signal processing
3. VLSI Signal processing
4. Modern Television Engineering

Professional Elective-IV

1. Signal processing algorithms and architecture
2. Design of testability
3. Wireless sensor networks
4. Introduction to Software Defined Radio

FIRST YEAR SYLLABI

I - Semester
&
II - Semester

ENGLISH

(Common for all branches)

ECE 111 **Credits : 3**

Instruction : 3 Periods & 1 Tut/Week Sessional Marks : 40

End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

To improve the language proficiency of the students in English with emphasis on Reading and Writing skills.

To enable the students to study engineering subjects with greater comprehension & cognizance.

To strengthen the vocabulary of the students.

To enable the students to write grammatically correct structures with logical flow.

To equip the students with the knowledge of different formats of business communication.

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Analyze the structure of the phrases, clauses and sentences
2.	Apply his enriched vocabulary to give better shape to his communication
3.	Effectively use different formats of business correspondence.
4.	Use idiomatic expressions and foreign phrases in his communication.
5.	Use correct structures to write sentences.

SYLLABUS

UNIT I 10 Periods

Vocabulary: One Word Substitutes **Grammar :** Noun: Noun Phrase, Gerunds

Writing Skills :

1) Formal Letter writing – format, style of letter writing and types of letters —complaint, enquiry, requesting quotations, invitation, regret and acceptance.
2) Story Building-Developing a story from the key words, giving a title and describing learning outcomes.

UNIT II 10 Periods

Vocabulary : Foreign phrases or expressions

Grammar : Adjectives : Quantifiers, qualifiers, determiners, nouns as adjectives, verbs as adjectives, adjective phrases

Writing Skills :

1. Technical Report writing – Formal reports and types: Informational reports, Analytical reports and Recommendation reports— Status, feasibility, progress, incident and project.
2. Essay writing.

UNIT III 10 Periods

Vocabulary : Idiomatic expressions- meaning and usage.

Grammar : Articles (concept and function; definite, indefinite and omission of articles)

Writing Skills :

1. Preparation of C.V. and Resume-format, style purpose and objective.
2. Précis- writing technique with suitable title.

UNIT IV 9 Periods

Vocabulary **:** Phrasal Verbs derived from the following dynamic verbs: Go, Get, Run, Take, Look, Put, Hold, Stand etc.

Grammar **:** Prepositions or prepositional phrases

Writing Skills:

1. Reading comprehension – questions based on facts, interpretation, logical deduction, vocabulary.
2. E-mail etiquette- format, style and language

UNIT V 9 Periods

Vocabulary **:** Synonyms and Antonyms (From the prescribed text only)

Grammar **:** Pronouns: Kinds of pronouns, relative pronouns – who and whom, whose, which Verbs - Aspects, moods, tenses, direct and indirect speech (active and passive voice), concord, Infinites and verb participles, verb phrase, Conditionals – probable, improbable, impossible, If-clause, Correction of sentences

TEXT BOOK:

Life through language Pearson Publication, Delhi

REFERENCE BOOKS:

1. GJ.K. Gangal*A Practical Course for Developing Writing Skill in English*PHI
2. Mark Lester and Larry Beason *Handbook of English Grammar &Usage*
3. Tata McGraw Hill.
4. S.M.Gupta *Current English Grammar And Usage* PHI
5. Dr. P. Prasad, Rajendra K Sharma*The Functional Aspects of Communication*
6. *Skills* Katson Books
7. AbulHashem *Common errors in English* Ramesh Publishing House
8. M. Ashraf Rizvi *Effective Technical Communication* Tata Mc-Graw Hill
9. Edgar Thorpe &Showick Thorpe *Objective English* Pearson

ENGINEERING MATHEMATICS-I

(Common for all branches)

ECE 112 **Credits : 3**

Instruction : 3 Periods & 1 Tut/Week Sessional Marks : 40

End Exam : 3 Hours End Exam Marks : 60

Course Objectives :

To impart knowledge in basic concepts of functions of several variables and their applications like maxima & minima.

To enable the students to study the concepts of Fourier series.

To enable the students to study the concepts of three dimensional figures like sphere, cone cylinder and conicoids.

To equip the students with the knowledge of multiple integrals and their applications.

To introduce the concepts of improper integrals like beta, gamma & error functions.

Course Outcomes:

By the end of the course, student will be able to:	
1.	Familiarize with functions of several variables
2.	Apply Fourier series in solving boundary value problems
3.	Apply the concept of three dimensional analytical geometry
4.	Use mathematical tools needed in evaluating multiple integral
5.	Use the concepts of improper integrals, Gamma, Beta and Error functions which are needed in Engineering applications

SYLLABUS

UNIT I 12 Periods

Partial Differentiation: Function of two or more variables – Partial Derivatives – which variable is to be treated as constant – Homogeneous functions – Euler's theorem – Total Derivative - Change of Variables .Jacobians – Taylor's theorem for functions of two variables – Maxima and Minima functions of two variables.

UNITII 12 Periods

Fourier series: Introduction – Euler's formula – conditions for a Fourier expansion – Functions having points of Discontinuity – Change of interval – Even and Odd functions – Half range series-Parseval's formula.

UNIT III 12 Periods

Three Dimensional Analytical Geometry: Equation of a sphere – Plane section of a sphere – Tangent Plane - Equation of a cone – Right circular cone – Equation of a cylinder – Right circular cylinder.

UNITIV 14 Periods

Multiple Integrals: Double integrals – Change of order of integration – Double integral in polar co-ordinates – Area enclosed by plane curves – Triple Integrals. Volume of Solids- Change of Variables-Area of curved surfaces, Calculation of mass.

UNIT V 10 Periods **Beta & Gamma functions :**Beta function – Gamma function relation between Beta and Gamma functions – results and problems, error function.

TEXT BOOK:

1. Dr. B.S. Grewal, Higher *Engineering Mathematics*43rd edition, Khanna Publishers, New Dehli.

REFERENCE BOOKS:

1. N.P. Bali, Dr . Ashok Saxena,Dr.N.Ch.S. Narayana, *A Text book on Engineering Mathematics*Laxmi pub.(p)Ltd. New Dehli
2. H.K.Dass, *Advanced Engineering Mathematics,*S.chand and company Ltd
3. Dr.M.K. Venkataraman, *Higher Engineering Mathematics* National Pub.Co.Madras.
4. Erwin kreyszig. *Advanced Engineering Mathematics* John Wiley and sons Newyork

ENGINEERING CHEMISTRY

(Common for all branches)

ECE 113 **Credits : 3**

Instruction : 3 Periods & 1 Tut/Week Sessional Marks : 40

End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

To provide knowledge on problems associated with impure water and various water treatment technologies

To enable the students to know the importance of semiconducting materials and preparation techniques

To provide basic knowledge on conventional energy resources, developments in batteries and fuel cells

To understand the corrosion of metals, various methods to prevent and control of corrosion

To create awareness on advanced concepts like nano materials, green chemistry and eco-friendly technologies for future development

Course Outcomes:

By end of the course, student will be able to:	
1.	Adopt suitable technologies for domestic and industrial water
2.	Identify & generalize the properties of semi conducting materials used in various engineering fields
3.	Design suitable batteries for different applications.
4.	Select and design of suitable material to prevent corrosion and protecting metals from corrosion.
5.	Develop green technologies for industrial processes.
6.	Solve scientific problems related to various engineering works

SYLLABUS

UNIT I 10 Periods

Water Chemistry: Impurities in water, Hardness of water - units and calcium carbonate equivalents, -estimation of hardness (EDTA method) - disadvantages of hard water, boiler troubles- Scale & Sludge formation - prevention- Internal treatment - (Phosphate, Carbonate and Calgon conditioning) -Caustic embrittlement

Water treatment techniques: Softening of water -lime-soda process -numerical problems on LS process -Zeolite, -ion exchange methods, Desalination of water –Reverse osmosis and Eelectrodialysis, Municipal water treatment - Screening, sedimentation, coagulation, Sterilization- Chlorination-Break Point chlorination.

UNIT II 10 Periods

Solid State Chemistry: Classification of Solids, Band theory of solids. Chemistry of Semiconductors – Intrinsic, extrinsic, compound and defect semiconductors, Organic semiconductors, Purification and preparation of Semiconductor by zone refining – Single crystal growth(Czochralski method) – epitaxial growth. Liquid crystals, LCD, LED and OLED.

Ceramic Materials: Cement-Manufacture of Portland cement - Setting and hardening of cement -Cement concrete - RCC, Refractories - Classification - properties, Ceramics and its Engineering applications.

UNIT III 10 Periods

Thermal Energy: Fuel –types of fuels -Calorific value and its determination (Bomb calorimeter method) Coal- Ranking of coal - analysis (proximate and ultimate) – COKE – Manufacture (Otto Hoffmann's process). Petroleum – refining of Crude oil; Synthetic petrol – Fisher - Tropsch and

Bergius methods, Knocking in Petrol and Diesel engine – Octane number - Cetane number, LPG and CNG.

Chemical Energy: Electrode potential, electro chemical series – Reference electrodes – SHE, Calomel electrode – Galvanic cells – primary cells (Dry cell) secondary cells (Lead acid, Ni-Cd, Li ion batteries) H -O fuel cells.

Solar Energy: Construction and Working of Photovoltaic cell

UNIT IV 08 Periods

Corrosion Chemistry: Origin and theories of corrosion – Types of corrosion - Galvanic corrosion, concentration cell corrosion, pitting corrosion, stress corrosion, inter granular corrosion; Factors affecting corrosion – Corrosion

Prevention & Control of Corrosion: Cathodic protection; Corrosion inhibitors; Protective coatings –Galvanization & Tinning –Anodized coatings - paints & special paints

UNIT V 10 Periods

Nanochemistry: Introduction, growth of nanoparticles (Sol-gel process), Fullerenes and Carbon nanotubes

Green chemistry: Principles of Green chemistry, Alternative Solvents used in green synthesis.

Lubricants: Concept of Tribology -Mechanism of lubrication- Blended oils - properties of lubricating oils -Viscosity Index -Fire & Flash Point -Cloud &Pour Point -Aniline point.

High Polymers &Composites- Basic concepts of Polymers, Effect of polymer structure on properties. Plastics-Thermoplastic and Thermosetting resins, Composites -types- Fiber Reinforced Plastics -Particulate composites -Layer composites, engineering applications of composites.

TEXT BOOK:

1. P.C. Jain and M. Jain *Engineering Chemistry* 16th edition - DhanapathiRai& Sons, Delhi

REFERENCE BOOKS:

1. S.S. Dara*A text book of Engineering Chemistry* 15 the edition, S. Chand & Co. New Delhi
2. O.G.Palanna*Engineering Chemistry* Tata Mcgraw Hill Education pvt ltd, New Delhi.
3. B.K. Sharma *Engineering Chemistry* - Krishna Prakashan Meerut
4. A.K.Bandopadhayay*Nanomaterials* new age international publishers.
5. V.K. Ahluvalia*Green solvents for organic synthesis*Narosa publications.

PROFESSIONAL ETHICS AND HUMAN VALUES

(Common for All Branches)

ECE114 **Credits:2**

Instruction: 2 Periods & 1 Tut/Week Sessional Marks :100

Course Objectives :

To understand moral values and their significance.

To draw inspiration for imbibing moral values

To understand professional ethics and obligations

To know the code of ethics of relevant Professional societies

Course Outcomes:

By end of the course, student will be able to:	
1.	Understand the right code of conduct.
2.	Assess his/her roles as a proactive member of the society
3.	Solve moral dilemmas and issues
4.	Implement Code of ethics of relevant Professional societies

SYLLABUS

UNIT-1

Introduction : Philosophical basis for human values- Human values as enshrined in the Gita, Bible and khoran; Religion- Values propounded in various religions- Need for Religious harmony

UNIT II

Human Values: Inspiration : Inspiration for human values- Mahatma Gandhi, Dr.SarvepalliRadha Krishnan, Swami Vivekananda, Rabindranath Tagore, Mother Theresa- Benefits of Human values- Harmony between Self-interest and human values

UNIT III

Basics of Professional Ethics : Ethical Human Conduct – based on acceptance of basic human values; Humanistic Constitution and Endersal human order – skills, sincerity and fidelity; Scope and characteristics of people-frily and eco-frily production system, Technologies and management systems.

UNIT IV

Professional Ethics in practice : Profession and Professionalism – Professional Accountability, Roles of a professional, Ethics and image of profession; Engineering

rofession and Ethics - Technology and society, Ethical obligations of Engineering professionals, Roles of Engineers in industry, society, nation and the world; Professional Responsibilities – Collegiality, Loyalty, Confidentiality, Conflict of Interest, Whistle Blowing

UNIT V

Indian Constitution, Code of Ethics and Global Issues : Indian Constitution: Fundamental Rights and duties, Freedom, Equality, Fraternity, Justice, Directive principles of state policy. Sample code of Ethics by Professional Societies such as ASME, ASCE, IMEC, IETE, Institution of Engineers (India), Indian Institute of Materials Management etc.

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership.

TEXT BOOKS:

1. K.R. Govindan and S.SenthilKumar*Professional Ethics & Human Values*Anuradha Publications.
2. Mike Martin and Roland Schinzinger*Ethics in Engineering*3rd edition, McGraw Hill. New York (2012).

REFERENCE BOOKS:

1. R. Subramanian*Professional Ethics* Oxford Endersity Press.
2. A.N. Tripathy*Human values* 2003, New Age International Publishers
3. S.B. Srivasthva*Professional Ethics & Human Values* SciTech Publications (India) Pvt. Ltd. New Delhi.
4. Prof. D.R. Kiran*Professional Ethics & Human Values* TATA McGraw Hill Education.
5. M. Govindrajran, S Natrajan& V.S. Senthi Kumar*Engineering Ethics (including human Values)* Eastern Economy Edition, Prenti

ENGINERING PHYSICS

(Common for all branches)

ECE 115 **Credits : 3**

Instruction : 3 Periods & 1 Tut/Week Sessional Marks : 40

End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

To impart knowledge in basic concepts of physics relevant to engineering applications

To introduce advances in technology for engineering applications

Course Outcomes:

By the end of the course, student will be able to:	
1.	Design and conduct simple experiments as well as analyse and interpret data in engineering applications
2.	understand advanced topics in engineering
3.	Identify formulae and solve engineering problems
4.	Apply quantum physics to electrical phenomena

SYLLABUS

UNIT I 10 Periods

Thermodynamics : Heat and work, first law of thermodynamics and its applications, reversible and irreversible processes, heat engine, Carnot cycle and its efficiency, Carnot's theorem, second law of thermodynamics, entropy – entropy change in reversible and irreversible processes, entropy and second law, entropy and disorder, entropy and probability, third law of thermodynamics

UNITII 10 Periods

Electromagnetism : Faraday's law of induction , Lenz's law, Integral and differential forms of Faraday's law , self-inductance, energy stored in electric and magnetic fields, Poynting vector, displacement current, Maxwell's equations in integral form (no derivation), wave equation, propagation of electromagnetic waves in free space

Ultrasonics: Properties of ultrasonic waves, production of ultrasonic waves by magnetostriction and piezoelectric methods, applications of ultrasonics

UNITIII 10 Periods

Optics

Interference: Introduction, principle of superposition, coherence, Young's double slit experiment, conditions for interference, interference in thin films by reflection, wedge shaped film and Newton's rings

Diffraction: Introduction, Fresnel and Fraunhofer diffraction, diffraction at a single slit

Polarisation: Introduction, types of polarized light, double refraction in uniaxial crystals, Nicol's prism, quarter and half-wave plate, production and detection of plane , circular and elliptically polarized light

UNIT IV 10 Periods

Lasers: Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, semiconductor laser, applications of lasers

Fibre optics: Introduction to optical fibers, principle of propagation of light in optical fibers,, acceptance angle and acceptance cone, numerical aperture, types of optical fibers, modes of propagation and refractive index profiles, attenuation in optical fibers, advantages of optical

fibers in communications, fiber optics communication system, applications of optical fibers, fiber optic sensors

UNIT V 10 Periods

Quantum Mechanics:

Planck's hypothesis, wave-particle duality, introduction to quantum theory, de- Broglie concept of matter waves, Heisenberg's uncertainty principle, Schrodinger's time independent and time dependent wave equations, physical significance and properties of the wave function ψ , application of Schrodinger wave equation for a particle in one dimensional well – eigenwavefunctions and energy eigen values of the particle

Elements of Statistical Mechanics: Elementary concepts of Maxwell-Boltzman , Bose-Einstein and Fermi-Dirac statistics (no derivation)

TEXT BOOKS:

1. S.L Gupta and SanjeevGupta*Engineering physics*DhanpatRai publications.
2. M.N. Avadhanulu&P.G.Kshirasagar*A text book of engineering physics*, S.Chand publication
3. Resnick&Halliday*Physics* - Volume II

REFERENCE BOOKS:

1) V. Rajendran*Engineering physics*McGrawHill Education Private Ltd
2) S.O.Pilai, Sivakami*Engineering Physics* New Age International Publishers
3) Young & Freedman *University Physics* Pearson Education
4) A.Marikani*Engineering Physics* PHI Learning Private Limited

ENGINEERING CHEMISTRY LAB

(Common for all branches)

ECE 116 | **Credits : 2**

Practical / week : 3 | Sessional Marks : 50

End Exam : 3Hrs | End Exam Marks : 50

Course Objectives:

To provide clear idea over quantitative chemical analysis.

To improve skills in analyzing samples through titration procedures.

To familiarize with Instrumental methods of analysis for more accuracy.

To introduce various methods of analyzing the ore samples.

Course Outcomes:

By end of the course, student will be able to:	
1.	Identify the suitable method for analyzing samples.
2.	Analyze different types of water samples to test quality
3.	Use different types of instruments in estimating the composition of materials in samples related to Soil, Water.

List of Experiments (any 10 experiments are to be completed):

1. Preparation of standard solution
2. Estimation of sodium carbonate present in soda ash.
3. Estimation of amount of calcium present in the Portland cement by titrimetrically.
4. Estimation of amount of Copper present in the Copper ore by Iodometrically.
5. Determination of total Hardness present in the given water sample.
6. Estimation of amount of Zinc by titrating with EDTA.
7. Determine the strength of acid by titrating with strong base using pH meter.
8. Estimate the individual strength of acids present in the acid mixture by titrating with strong base using conductivity meter.
9. Estimate the amount of Mohr's salt present in the given solution by titrating with potassium dichromate using potentiometer.
10. Determination of viscosity of the given liquid by Ostwald viscometer.
11. Determination of rate constant of acid catalyzed hydrolysis of ester.
12. Determination of partition coefficient of iodine distributed between Water and Carbon tetra chloride.

Demonstration

13. Estimation of amount of dissolved oxygen (D.O) present in the given water sample.
14. Synthesize the Phenol-Formaldehyde resin.

TEXT BOOKS:

1. S.K. Bhasin and SudhaRani*Laboratory manual on Engineering chemistry*, third edition DhanpatRai Publishing Company.

REFERENCE BOOKS:

1. S.S. Dara*Experiments and calculations in Engineering chemistry* 9th edition S. Chand& Company ltd.

PROGRAMMING WITH C LAB

(Common for all branches)

ECE 117 **Credits : 3**

Practicals/week : 3 Periods & 1 Tut/Week Sessional Marks : 50

End Exam : 3 Hrs End Exam Marks : 50

Course Objectives: To enable students to

Understand the program development steps using compilers.

Strengthen the problem solving skills using programming techniques.

Design programs using various control structures.

Develop programs using structures, unions and files.

Course Outcomes:

By the end of the course, student will be able to:	
1.	Gain a working knowledge on programming.
2.	Learn and use the fundamentals of a programming language (such as language-defined data types (int, float, char, double), control constructs (sequence, selection, repetition), program modules (including functions, modules, methods)).
3.	Exhibit the ability to formulate a program that correctly implements the algorithm.
4.	Demonstrate the effective use the programming environment used in the course.

SYLLABUS

1. Overview
2. Introduction to Unix
3. Data Types, Constants
4. Operators, Expressions
5. Control Structures
6. Arrays & Strings
7. Pointers
8. Functions.
9. Structures & Unions
10. Files

REFERENCE BOOKS:

1. YashwantKanetkar*Let Us C* 5th Edition.
2. V.Rajaraman*Fundamentals of Computers* 4th Edition, PHI 2005.
3. Programming Techniques through C, M.G. V. Murthy, Pearson Education, 2002
4. KRVenugopal, SR Prasad *Mastering C* Tata McGraw Hill.
5. B.W. Kernighan, Dennis M. Ritchie *The C – Programming Language* PHI

LIST OF SAMPLE PROGRAMS

1. Write a C program for any three of the following
   - i) To accept the distance between two cities and convert the distance in meters, feet, inches and centimeters. (Note: Input distance in Kilometers).
   - ii) To accept the marks obtained by a student in five different subjects, calculate the total marks and percentage obtained by the student (The maximum marks for each subject is 100).
   - iii) To accept a 3-digit number and calculate the sum of its digits.

iv) To accept quantity, product code, unit price of five products and calculate the total price for each product and the SUBTOTAL, TAX, TOTAL and print the details in the following format

Qty	Product code	Unit price	Total price
xx	1	400.00	xxxx.xx
xx	2	20.00	xxxx.xx
xx	3	200.00	xxxx.xx
xx	4	100.00	xxxx.xx
xx	5	200.00	xxxx.xx
		SUB TOTAL	xxxxx.xx
		TAX	xxxx.xx
		TOTAL	xxxxx.xx

v) To evaluate the following expression

a) (ax + by) / (ax – by)

b) $a^2 + b^2$ + squareroot (2ab)

2. Write a C program for any three of the following

i. To find the maximum and minimum of three numbers.

ii. For the above experiment in 1-ii) find and display the grade of the student as prescribed below:

Percentage	Grade
>90	A
>80 and <=90	B
>70 and <=80	C
>60 and <=70	D
>=50 and <=60	E
< 50	F

iii) To find the roots of a quadratic equation.

iv) To find the area of a triangle when

a) Sides are given

b) Base and height are given

c) Co-ordinates are given

v) To accept an alphabet and convert into its opposite case.(Do not use library functions)

3. Write a C program for any four of the following

i) To print prime numbers between the specified range (eg. 100 to 200)

ii) To generate Pascal triangle format

iii) To compute cosine series: $\cos(x)= 1- x^2/2! + x^4/4! – x^6/6! + \ldots$

iv) To check whether number is palindrome or not.

v) To print set of Armstrong numbers in a specified range. (eg. 100 to 200)

vi) To convert the numbers from the following

a) Binary to decimal

b) Decimal to binary

4. Write a C program to perform the following operations in a given array of ’n’ numbers

i) Sum of all the numbers

ii) Minimum and maximum in the array

iii) Searching an element

iv) To generate random real numbers in the range of 10 to 20 and sort them.

5. Write a C Program to perform the following on the matrices
   i) Transpose of a matrix and check the symmetry
   ii) Trace and norm of a matrix
   iii) Addition of matrices
   iv) Multiplication of two matrices
6. Write a C program to perform any two of the following operations on strings

.

   i. To check whether the given string is palindrome or not.
   ii. To find the length of the string
   iii. To concatenate two strings.
   iv. To check whether the given substring exists in a text and display the frequency

7. i. Write a C program to create a structure for a student with the details name, roll no five subject marks, total marks, percentage and sort the records according to the percentage.

   ii. Write a C program to add two complex numbers using structures.

   iii. Write a C program to illustrate difference between union and structure.

8. i. Write a program to calculate the sum of an array using pointers.

   ii. Write a program to search a name in a given list of names using pointers

9. Write a C program using functions

   i) To illustrate call by value and call by reference
   ii) To accept a string and character and pass them as parameters to a function, the function shall replace the character in the string with any other specific character and return the modified string.
   iii) To pass the employee record as a structure to the function. The function shall compute the gross salary (include DA and HRA Calculation), take the savings as input and compute the tax payable as per the prescribed table.

Gross Salary	Tax
Less than 2 Lakhs	NIL
2 Lakhs to 5 Lakhs	10
5 Lakh to 10 Lakh	20
10 Lakhs to 50 Lakhs	30
Above 50 lakhs	50

Note: The employee record shall contain employee name, employee id, hire date, basic salary, DA, HRA.

10. Write a C program for any one program for the following to illustrate recursion
    i. Factorial of a number
    ii. GCD and LCM of two numbers
    iii. Fibonacci series
11. Write a C program to perform any three of the following on files
    i. To count the number of alphabets, numbers, words, lines in a given file.
    ii. To merge two files into third auxiliary file and display the content.
    iii. To print every even position character in a given file.
    iv. To separate alphabets and integers into two files from the given source file.

12. Write a C program to update the record of a person in a file by accepting person ID.

Hint:

1. Create the file with few records.
2. The fields in a record
    a. Name of the person
    b. Identity (ID) of the person
    c. Age
    d. Gender
    e. Occupation
    f. Salary

ENGINEERING MATHEMATICS-II

(Common for all branches)

ECE 121 **Credits : 3**

Instruction : 3 Periods & 1 Tut/Week Sessional Marks : 40

End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

To impart knowledge in basic concepts of solving linear system of equations.

To enable the students to study the eigen values and eigen vectors of matrix.

To introduce the concepts of ordinary differential equations and their applications to engineers.

To enable the students to solve any higher order differential equations and to solve differential equations related to simple electric circuits, Newtons law of cooling.

To introduce the students to Laplace Transforms and their applications.

Course Outcomes:

By the end of the course, student will be able to:	
1.	Solve linear system equations using of matrix algebra techniques
2.	Determine the Eigen values and vectors of a matrix
3.	Apply different techniques in solving differential equations that model engineering problem
4.	Use the application of Differential equations like simple electric circuits, Newtons law of cooling and to solve any higher order linear ordinary differential equation with constant coefficients
5.	Solve linear differential equations and Network analysis using Laplace transforms.

SYLLABUS

UNIT I 11 Periods

Linear Algebra: Rank of matrix-Elementary Transformation of a matrix- Gauss Jordan Method of finding the inverse – Normal form of the matrix- PAQ form – Consistency of linear system of equations – System of homogeneous and non- homogeneous equations .

UNIT II 12 Periods

Linear transformations – Orthogonal transformations- Vectors (Linearly Independent & Dependent) ,Eigen values , Eigen Vectors, Properties of Eigen values – Cayley Hamilton theorem (without proof).Reduction to diagonal form – Reduction of Quadratic form to canonical form – Nature of quadratic form,.

UNIT III 10 Periods

Differential Equations of first order: First order Linear differential equations , Bernoulli's equations , Exact Differential Equations –Equations reducible to exact Equations - Orthogonal trajectories – Simple Electric circuits-Newton law of cooling.

UNIT IV 10 Periods

Higher order Linear Differential Equations : Definitions – Rules for finding the complementary function, rules for finding the particular integral, method of variation of parameters, equations reducible to linear equations with constant coefficient - Cauchy's homogeneous linear equation, Legendre's linear equation.

UNIT V 17 Periods

Laplace Transforms: Introduction – definitions- Transforms of elementary functions - Properties of Laplace transforms- Transforms of Periodic functions –Transforms of Derivatives – Transforms of Integrals- Multiplication by t^n - division by t -Evaluation of integrals by Laplace transforms.

Inverse Laplace transforms – Other methods of finding inverse transforms (Excluding Residue method) Convolution theorem – Application's to Differential Equations – Unit Step function- Unit Impulsive functions.

TEXT BOOK:

1. Dr. B.S. Grewal*Higher Engineering Mathematics*43rd edition, Khanna Publishers, New Dehli.

REFERENCE BOOKS:

1. N.P. Bali, Dr . Ashok Saxena,Dr.N.Ch.S. Narayana, *A Text book on Engineering Mathematics*Laxmi pub.(p)Ltd. New Dehli.
2. H.K.Dass, *Advanced Engineering Mathematics,*S.chand and company ltd
3. Dr.M.K. Venkataraman, *Higher Engineering Mathematics* National Pub.Co.Madras.
4. Erwin kreyszig. *Advanced Engineering Mathematics*John Wiley and sons, Newyork.

APPLIED PHYSICS

(for ECE, EEE & Mech)

ECE 122 **Credits : 3**

Instruction : 3 Periods & 1 Tut/Week Sessional Marks : 40

End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

To enhance student's knowledge of theoretical and modern technological aspects in physics and to introduce fundamentals of physics relevant to engineering applications

To introduce advances in technology for engineering applications

Course Outcomes:

By end of the course, student will be able to:	
1.	Correlate the theoretical principles with experimental observations
2.	Identify engineering materials for specific engineering applications
3.	Apply the knowledge of advanced materials for engineering applications

SYLLABUS

UNIT I 12 Periods

Magnetic materials: Definition of magnetic permeability, magnetization and magnetic susceptibility, origin of magnetic moment, classification of magnetic materials, properties of diamagnetic and paramagnetic materials, ferromagnetic materials - hysteresis curve , domain theory of ferromagnetism, soft and hard ferromagnetic materials, anti-ferromagnetic and ferrimagnetic materials , ferrites and its applications

Superconductivity: Introduction, properties of superconductors, effect of temperature and magnetic field, Meissner effect, flux quantization , type – I and type – II superconductors high temperature superconductors, applications of superconductors, BCS theory (qualitative)

UNIT II 10 Periods

Dielectric materials: Definition of electric dipole moment, dielectric polarization and dielectric constant, types of polarization – electronic, ionic and oriental polarization, expression for polarisability, internal fields in solids, Classius – Mossotti equation, frequency dependence of electronic polarization ,properties of ferroelectric materials and their applications

UNIT III 10 Periods

Nanophase materials: Introduction to nanophase materials, properties of nanophase materials, synthesis of nanophase materials – chemical vapour deposition, sol-gel method, MEChanical attrition method, applications of nanophase materials. Principles of X-Ray florescence X-Ray Diffraction- Electron Microscopy (SEM and TEM)

UNIT IV 10 Periods

Crystal structure: Introduction, fundamental terms of crystallography – space lattice, , crystal lattice, unit cell, planes, seven crystal systems – Bravias lattices, cubic lattices, crystal directions and planes, Miller indices, interplanar spacing and interatomic distance , some simple crystal structures, body-centered cubic crystals, face-centered cubic crystals

UNIT V 12 Periods

Semiconductor Physics: Intrinsic and extrinsic semiconductors, Fermi level, carrier concentration in intrinsic semiconductor, continuity equation, direct and indirect band gap semiconductors. Lorentz force, Hall effect and its applications.

Physics of semiconductor devices: open circuited p-n junction diode, energy diagram of p-n diode, working of a diode, volt-ampere characteristics of p-n junction, diode as a rectifier, light emitting diode (LED), liquid crystal display (LCD), photodiode

TEXTBOOKS:

1. S.L Gupta and SanjeevGupta *Engineering physics* DhanpatRai publications.
2. M.N. Avadhanulu&P.G.Kshirasagar *A text book of engineering physics*, S.Chand publication

REFERENCE BOOKS:

1. V.Rajendran *Engineering physics* Tata McGraw Hill Education Private Limited
2. DattuRamanlal Joshi *Engineering Physics* Tata McGraw Hill Education Private Limited
3. A.Marikani *Engineering Physics* PHI Learning Private Limited

ENVIRONMENTAL SCIENCES

(Common for all branches)

ECE 123 **Credits : 3**

Instruction : 3 Periods & 1 Tut/Week Sessional Marks : 40

End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

To gain knowledge on the importance of environment and ecosystems.

To acquire knowledge with respect to biodiversity, its threats and its conservation and appreciate the concept of interdependence.

To acquire knowledge about environmental pollution- sources, effects and control measures of environmental pollution

To understand the treatment of wastewater and solid waste management.

To be aware of the national and international concern for environment for protecting the environment

Course Outcomes:

By the end of the course, student will be able to:	
1.	Understand the natural environment and its relationships with human activities.
2.	Characterize and analyze human impacts on the environment.
3.	Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems
4.	Design and evaluate strategies, technologies, and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments

SYLLABUS

UNIT I 10 Periods

Introduction to Environment and Natural Resources :

Introduction: Definition, Multidisciplinary nature, Scope and Importance of Environmental Sciences- R & D in environment, green advocacy, green marketing, green media and environment consultancy. Need for public awareness.

Natural Resources: Forest resources-use and overexploitation, deforestation, Big Dams effects on forests and tribal people. Water resources-sources, use and over utilization of surface and ground water, conflicts over water, dams-benefits and problems.Food resources-environmental impact of modern agriculture-fertilizer and pesticides.Land resources-land degradation- landslides, soil erosion and desertification.Energy resources- renewable and non-renewable energy resources and use of alternate-energy sources.

UNIT II 10 Periods

Ecosystem & Bio Diversity

Ecosystem: Concept of an ecosystem-structure and function of an ecosystem Food chains, food webs and ecological pyramids, Energy flow in an ecosystem, Ecosystem regulation, Ecological succession. Types, characteristic features, structure and function of forest, grass land, desert and aquatic ecosystems.

Biodiversity: definition, types, India as a Mega diversity Nation, Values of biodiversity, Hot spots of biodiversity, Threats to biodiversity-habitat loss, poaching, human-wildlife conflicts, Endangered and endemic species, Conservation of biodiversity.

UNIT III 10 Periods

Environmental Pollution And Waste Management : Sources, effects and control measures of Air pollution, Noise Pollution, Soil Pollution, Marine pollution, Thermal pollution, Radio Active Pollution. Water Pollution (Sources, Effects, Control measures, DO, BOD, COD, sewage treatment), Green house effect, Ozone depletion, Acid rain –causes and adverse effects.

Solid waste management: Sources and effects of municipal waste, bio-medical waste, Industrial waste, e-waste, Process of waste management-composting, sanitary landfills, incineration.

UNIT IV 8 Periods

Social Issues And Environment : Social Issues and the Environment: From unsustainable to sustainable development, Environmental Impact Assessment, Water conservation, Rain water harvesting, water shed management. Resettlement and rehabilitation of people, Environmental ethics.

Urbanization, Industrialization, Transportation, Human population and the environment-population growth, role of information technology in environment and human health.

UNIT V 10 Periods

Legislations, Conventions & Case Studies : Environmental protection act-Air (prevention and control of pollution) act, Water (prevention and control of pollution) act, Wildlife protection act, Forest conservation act.

International Conventions: Stockholm Conference, Brundtland Commission, Rio declaration, Vienna Convention, Kyoto protocol, Johannesburg Summit.

Case Studies: Chipko Moment, Kolleru Lake, Flourosis, Silent valley project, Narmada BachoAndolan, Ralegeon siddhi, Tehri dam, Madhura refinery and Tajmahal

TEXT BOOK:

1. AnubhaKaushik&C.P.Kaushik*Principles of Environmental Studies* New Age International Publications.

REFERENCE BOOKS:

1. B.K. Sharma *Environmental chemistry*Goel publishing house, Meerut, 2001.
2. G. S. Sodhi*Fundamental concepts of Environmental Chemistry*, Narosa publishing house, New Delhi
3. S .S.Dara*A text book of Environmental Chemistry and pollution control*S.Chand and Company Ltd, New Delhi, 2002.

ENGINERING DRAWING

(Common for all branches)

ECE 124 **Credits : 3**

Instruction : 1 Theory&3 Practical Periods/week Sessional Marks : 40

End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

To increase ability to communicate with people and learn to sketch and take field dimensions.
To make the student familiar to the drawing practices and convection
To familiarize the student about various engineering curves used in industry
To enable the student draft simple engineering components and analyze different views of components.
To introduce basic Auto CAD skills.

Course Outcomes:

By the end of the course, student will be able to:	
1.	Draw various engineering curves and understand the basic geometrical constructions.
2.	Prepare orthographic projections of points and lines
3.	Produce orthographic projections of plane surfaces
4.	Draw orthographic projections of solids in various orientations.
5.	Prepare isometric projections and understand basics of Computer Aided Drafting.

SYLLABUS

UNIT I

Introduction to Engineering Drawing & basics of geometrical construction. Construction of conic sections, Construction of cycloidal curves (cycloid, epicycloid, and hypocycloid), involutes (over circles and polygon) & Archimedian spiral.

UNIT II

Orthographic projections – projections of points – projections of straight lines (lines parallel to both HP&VP, lines parallel to one and inclined to other, lines inclined to both the planes)

UNIT III

Projections of planes – perpendicular planes – oblique planes

UNIT IV

Projection of solids – Prisms – Cylinder– Pyramids &Cones

UNIT V

Isometric projections – Plane solids, Combination of solids Demonstration & Practice: Computer aided drafting of lines, planes solids and Dimensioning.

TEXT BOOK:

1. N. D. Bhatt *Engineering Drawing* Charotar Publishing House Pvt. Ltd, 53rd Edition : 2014

REFERENCE BOOKS:

1. K. L. Narayana& P. Kanniah *Engineering Drawing*
2. R. B. Choudary *Engineering Graphics* with Auto CAD
3. TrymbakaMurty *Computer Aided Engineering Drawing*

BASIC ELECTRONICS ENGINEERING

(for ECE branch)

ECE 125 **Credits : 3**

Instruction : 3 Periods & 1Tut/week Sessional Marks :40

End Exam : 3Hrs End Exam Marks : 60

Course Objectives:

1. To familiarize the students about different discrete electronic components and CRO.
2. To familiarize the students with the analysis and design of Rectifier Circuits.
3. To train the students with the operational principle, analysis, design and applications of different types of Diodes.
4. To train the students the operational principle, analysis, design and application of different field effect transistors (FET) and circuits using FETs & bipolar junction transistor (BJT).
5. To familiarize the students about Analog ICs.

Course Outcomes:

At the end the student will be able to	
1.	Analyze different types of diodes, operation and its characteristics.
2.	Design different types of voltage rectifiers.
3.	Design and analyze the DC bias circuitry of BJT and FET and set up required bias point
4.	Design simple electronic circuits to accomplish a specific function, e.g. DC power supplies, Electronic switches etc.

SYLLABUS

UNITI: Electronic Components 8 periods

Resistors: Types of Resistors- The resistor color code, Variable resistors, Rheostat and Potentiometers, Resistance, Tolerance, Resistivity, Power Ratings of Resistors, Resistor troubles, Ohms Law: Linear proportion between V and I, Choosing a resistor for a circuit, Electric Shock,, Open circuit and Short circuit troubles.

Capacitors: Capacitance, charging and discharging, Typical capacitors, Capacitor Coding, Parallel capacitances, Series capacitances, Energy stored in Electrostatic Field of Capacitance, Measuring and Testing of Capacitors.

Inductors: Self and Mutual Inductance

Semiconductors: Mass Action Law, Mobility, Conductivity, Drift current and Diffusion current, Hall-Effect

UNIT II: Electronic Instruments 8 periods

Types of wire conductors, Connectors, Printed wiring, Switches, Fuses, Wire resistance, Introduction to batteries, Introduction to CRO,CRT, Soldering Materials, Soldering Tools.

UNITIII: Diodes and Applications 8 periods

Semiconductor Materials, The PN Junction Diode, Volt-Amp characteristic curve, Diode approximations, Diode ratings, Rectifier Circuits, Special Diodes.

UNITIV: Transistors 10 periods

Transistor Construction, Transistor Operating region, Transistor Ratings, Transistor Biasing Techniques, Small signal amplify operation, CB,CC,CE configurations, JFET and their Characteristics, Biasing techniques for JFET, MOSFET and their Characteristics, MOSFET Biasing techniques.

UNITV: Integrated Circuits 14 periods

Advantages of ICs over discrete components, Introduction to Op-amp, Differential Amplifiers, Block diagram and Characteristics of Op-Amp, Inverting and Non inverting modes, Virtual ground, CMRR, Slew rate, IC 555 Timer, Block daigram, Modes of operation of IC55, OP-AMP voltage Regulators, Fixed Voltage Regulators (78/79, XX).

TEXT BOOKS:

1. Mitchel E SchultzGrob's*Basic Electronics*, Tata McGraw hill Edition, 10th Edition - (Unit I,II,III,IV)
2. RamaKant A Gayakwad, *Op-Amps and Linear Integrated Circuits*, PHI Fourth Edition- (Unit V)

REFERENCE BOOKS:

1. RG Gupta(2001) *Electronic Instruments and Systems*, Tata McGraw Hill – (Unit II)
2. David A Bell (2008) *Electronic Devices and Circuits*, Oxford University Press. (Unit I,III,IV).

ENGINEERING PHYSICS LAB

(Common for all branches)

ECE 126 **Credits : 2**

Practical / week : 3 Sessional Marks : 50

End Exam : 3 Hrs End Exam Marks : 50

Course Objective

To enable the students to acquire skill, technique and utilization of the Instruments

Course Outcomes:

By the end of the course, student will be able to:	
1.	Design and conduct experiments as well as to analyze and interpret data.
2.	Identify, solve and apply fundamental physics principlesto solve engineering problems

List of experiments (any eight to ten experiments are to be completed)

1. Determination of coefficient of thermal conductivity of a bad conductor- Lee's method.
2. Determination of radius of curvature of a convex lens - Newton's rings.
3. Determination of wavelengths of spectral lines in mercury spectrum-using diffraction grating in normal incidence position.
4. Determination of Cauchy's constants of the material of the prism using spectrometer.
5. Determination of thickness of a thin paper by forming parallel interference fringes-Wedge method.
6. Study of variation of magnetic field along the axis of a current carrying circular coil – Stewart and Gee's apparatus
7. Calibration of a low-range voltmeter using potentiometer.
8. Verification of laws of resistance and determination of specific resistance of wire by using Carey- Foster's bridge.
9. Determination of refractive indices o-ray and e-ray in quartz crystal (double refraction)
10. Determination of the frequency of an electrically maintained tuning fork - Melde's experiment.11. Determination of Rydberg constant using hydrogen discharge tube.
12. Characteristics of photo cell and determination of Planck's constant – Photoelctric effect.
13. Determination of e/m of an electron by Thomson's method
14. Determination of band gap of semiconductor.

TEXT BOOK:

1. Physics Laboratory Manual prepared by Department of Physics ANITS

REFERENCE BOOKS:

1. D.P Siva Ramaiah and V. Krishna Murthy *Practical physics*Maruti book Depot
2. A.R Vegi*Comprehensive practical Physics*Vegi Publishers Pvt.Ltd.

LANGUAGE LAB

(Common for all branches)

ECE 127	**Credits : 2**
Practical / week : 3	Sessional Marks : 50
End Exam : 3 Hrs	End Exam Marks : 50

Course Objectives:

To expose the students to a variety of self-instructional, learner-friendly modes of language learning.

To facilitate computer-aided multi-media instruction enabling individualized and independent language learning.

To improve the fluency in spoken English and neutralize mother tongue influence

To bring about a consistent accent and intelligibility in their pronunciation of English by providing an opportunity for practice in speaking.

To initiate them into greater use of the computer in resume preparation, report writing, format-making etc.

To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required facility to face computer- based competitive exams such GRE, TOEFL, GMAT etc.

Course Outcomes:

By the end of the course, student will be able to:	
1.	Handle CBT (Computer Based Tests) of the qualifying examinations.
2.	Receive, interpret, remember and evaluate information by practicing effective listening skills.
3.	Speak English with neutralized accent.
4.	Narrate, describe and report incidents and situations using appropriate terminology.

SYLLABUS

I CALL (Computer Aided Language Learning)

1. Introduction to the Sounds of English- Vowels, Diphthongs & Consonants.
2. Introduction to Stress and Intonation.
3. Short and long Reading comprehension exercises (listening skills)
4. Telephoning Skills.

II CSL (Communication Skills Lab)

5. 'Just A Minute' Sessions (JAM).
6. Describing Objects / Situations / People.
7. Video talks
8. Situational Dialogues / Role Play.
9. Oral Presentations- Prepared and Extempore.

Suggested Software

Cambridge Advanced Learners' English Dictionary with CD.

English Phonetics and Phonology – 2 CDs set

English Mastery – Alania ABC

Telephoning English

Cambridge Grammar of English (Ronald Carter and Michael McCarthy) CD

English Grammar in Use -Cambridge University Press

Communication Skills – Oxford U P (Sanjay Kumar and PushpaLatha)

REFERENCE BOOKS:

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems)

1. *Spoken English (CIEFL)* in 3 volumes with 6 cassettes, OUP.
2. Daniel Jones *English Pronouncing Dictionary* Current Edition with CD.
3. R. K. Bansaland J. B. Harrison, *Spoken English*-Orient Longman 2006 Ed.
4. Dr A Ramakrishna Rao, Dr G Natanam& Prof SA Sankaranarayanan*English Language Communication : A Reader cum Lab Manual*Anuradha Publications, Chennai
5. Krishna Mohan & NP Singh *Speaking English Effectively* (Macmillan)
6. J. Sethi, KamleshSadanand& D.V. Jindal*A Practical Course in English Pronunciation, (with two Audio cassettes)* Prentice-Hall of India Pvt. Ltd., New Delhi.
7. T. Balasubramanian*A text book of English Phonetics for Indian Students* (Macmillan).
8. *English Skills for Technical Students,* WBSCTE with British Council, OL
9. J.K. Gangal *A Practical Course in Effective English Speaking Skills* PHI.

OBJECT ORIENTED PROGRAMMING WITH C++ LAB

(Common for all branches, except for Civil & Chemical branches)

ECE 128	**Credits : 3**
Practicals/week : 3 Periods & 1 Tut/Week	Sessional Marks : 50
End Exam : 3 Hrs	End Exam Marks : 50

Course Objectives :

To introduce Object Oriented Programming (OOP) using the C++ Language.

To provide the basic concepts and techniques which form the Object Oriented Programming paradigm.

Course Outcomes:

By the end of the course, student will be able to:	
1.	Understand how to use the programming constructs of CPP.
2.	Use Object Oriented Programming concepts to develop object oriented programs.
3.	Apply various object oriented features to solve real world computing problemsusing C++ language.

SYLLABUS

List of the experiments to be done on the following topics

1. Overview (Transition from C)
2. OOP Concepts and Characteristics
3. Preprocessor , Command line arguments
4. Classes & Data Abstraction
5. Objects
6. Operator Overloading
7. Inheritance
8. Virtual Functions & Polymorphism
9. I/O Streams
10. Templates
11. File Processing
12. Exception Handling Concepts

REFERENCE BOOKS:

1. Mahesh Bhave , Sunil patekar*Object Oriented Programming in C++* Second edition , Pearson
2. R Rajaram, *Object Oriented Programming in C++* 2nd Edition New Age International Publishers
3. Herbert Schildt*C++ the Complete Reference* III edition, TMH 1999
4. E Balaguruswamy*Object Oriented Programming with C++*3rd Edition, McGraw Hill

LIST OF SAMPLE PROGRAMS

1. Write a C++ program that uses a recursive function for solving Towers of Hanoi problem.
2. Write a C++ program to find both the largest and smallest number in a list of integers.

3. Write a C++ program that uses function templates to solve problems 1 and 2 experiments

4. Write a C++ program to implement the matrix ADT using a class. Use operator overloading for implementation

5. Write the definition for a class called **Rectangle** that has floating point data members length and width. The class has the following member functions: **void setlength(float)** to set the length data member **void setwidth(float)** to set the width data member **float perimeter()** to calculate and return the perimeter of the rectangle **float area()** to calculate and return the area of the rectangle **void show()** to display the length and width of the rectangle **intsameArea(Rectangle)** that has one parameter of type Rectangle. sameArea returns 1 if the two Rectangles have the same area, and returns 0 if they don't.

   i. Write the definitions for each of the above member functions.

   ii. Write main function to create two rectangle objects. Set the length and width of the first rectangle to 5 and 2.5. Set the length and width of the second rectangle to 5 and 18.9. Display each rectangle and its area and perimeter.

   iii. Check whether the two Rectangles have the same area and print a message indicating the result. Set the length and width of the first rectangle to 15 and 6.3. Display each Rectangle and its area and perimeter again. Again, check whether the two Rectangles have the same area and print a message indicating the result.

6. Create a class called MusicIns to contain three methods string(),wind() and perc(). Each of these methods should initilialize string array to contain the following

i. Veena, guitear, sitar, sarod and mandolin under string

ii. Flute, clarinet, saxophone, nadaswaram and piccolo under wind iii. Table, mridangam, bangos, drums and tambour under perc

It should also display the contents of the arrays initialized , create a sub class call TypeIns to contain a method called get() and show(). The get() methods must display a menu as follows

- String instruments
- Wind instruments
- Percussion instruments

The show method should display the relevant details according to user choice .the base class variable must be accessible only to its derived classes.

7. Create a base class called shape. It should contain two methods getCoord(), showCoord() to accept x and y co ordinates and to display the same respectively . Create a sub class called Rect. It should contain method to display length and breadth of the rectangle called showCoord() . In main method, execute the showCoord() of Rect class by applying the dynamic method dispatch concept

8. Create a class called car. Initialize the color and body attributes to "blue" and "wagon". there should be two constructors one is a default the creates blue wagon the other constructor should take two argcolor, body and initialize. write method toString() that returns the color and body. Create a sub class funcar. In sub class there are two constructors to invoke super class constructors resp. Write a method playCD in sub class that displays the message "Beautiful music fills the passenger compartment" execute the methods to show the messages

   - Mycar is a blue wagon
   - My father's car is red convertible.

9. Create the ZooAnimal constructor function. The function has 4 parameters- a character string followed by three integer parameters. In the constructor function dynamically allocate the name field (20 characters), copy the character string parameter into the name field, and then assign the three integer parameters to cage Number, weight Date, and weight respectively.

10. Write a C++ program to perform operations on complex numbers using operator overloading

11. Write a C++ program to write number 1 to 100 in a data file NOTES.TXT

12. Write a function in C++ to count and display the number of lines not starting with alphabet 'A' present in a text file "STORY.TXT". Example:
If the file "STORY.TXT" contains the following lines, The rose is red.
A girl is playing there. There is a playground.
An aeroplane is in the sky.
Numbers are not allowed in the password. The function should
display the output as 3

WORKSHOP

(Common for all branches)

ECE 129 **Credits : 2**

Practical / week : 3 Sessional Marks : 50

End Exam : 3 Hrs End Exam Marks : 50

Course Objective:

To provide training and hands on experience to the students on basic Engineering related skills like carpentry, fitting, house wiring and tin smithy.

Course Outcomes:

By the end of the course, student will be able to:	
1.	Make simple carpentry and fitting works
2.	Understand and do different types of wiring for practical requirements
3.	Develop cross-sections of models for tin smithy and make them.
4.	It also helps in understanding of relevant skills required by the engineer working in engineering industries and workshops.

LIST OF EXPERIMENTS

Minimum of three exercises has to be conducted from each trade.

Trade:

Carpentry
1. Cross Lap Joint
2. Dovetail Joint
3. Mortise and Tennon Joint
4. Briddle Joint

Fitting
1. V Fit
2. Square Fit
3. Half Round Fit
4. Dovetail Fit

House Wiring
1. Parallel / Series Connection of three bulbs
2. Stair Case wiring
3. Florescent Lamp Fitting
4. Measurement of Earth Resistance

Tin Smithy
1. Taper Tray
2. Square Box without lid
3. Elbow
4. Funnel

SECOND YEAR SYLLABI

I - Semester
&
II - Semester

B.Tech (ECE) Second Year I-semester

CODE	*SUBJECT NAME*	*Instruction periods per Week*				*MAX MARKS*		CREDITS
		LECTURE	*TUTORIAL*	*PRACTICAL*	*TOTAL*	*SESSIONAL MARKS*	*SEMESTER END MARKS*	
ECE 211	Engineering Mathematics-III	3	1	-	4	40	60	3
ECE 212	Electrical Machines	3	1	-	4	40	60	3
ECE 213	Data structures	3	1	-	4	40	60	3
ECE 214	Signals and Systems	3	1	-	4	40	60	3
ECE 215	Network analysis and synthesis	3	1	-	4	40	60	3
ECE 216	Electronic Circuits and Analysis-I	4	1	-	5	40	60	4
ECE 217	Electronic Circuits and Analysis-I Laboratory	-	-	3	3	50	50	2
ECE 218	Network & EM Laboratory	-	-	3	3	50	50	2
Total		19	6	6	31	340	460	23

B.Tech (ECE) Second Year II-semester

CODE	*SUBJECT NAME*	*Instruction periods per Week*				*MAX MARKS*		CREDITS
		LECTURE	*TUTORIAL*	*PRACTICAL*	*TOTAL*	*SESSIONAL MARKS*	*SEMESTER END MARKS*	
ECE 221	Engineering Mathematics –IV	3	1	-	4	40	60	3
ECE 222	Electronic Circuits and Analysis-II	3	1	-	4	40	60	3
ECE 223	Digital Electronics	3	1	-	4	40	60	3
ECE 224	Probability Theory and Random Processes	3	1	-	4	40	60	3
ECE 225	Electromagnetic Field Theory & Transmission Lines	3	1	-	4	40	60	3
ECE 226	Control Systems	3	1	-	4	40	60	3
ECE 227	Electronic Circuits and Analysis-II Laboratory	-	-	3	3	50	50	2
ECE 228	Simulation Laboratory	-	-	3	3	50	50	2
ECE 229	Massive Open Online Course (MOOC)	-	2	2	4	100	-	3
Total		18	8	8	34	440	460	25

Engineering Mathematics –III

ECE 211 **Credits: 3**
Instruction: 3 Periods & 1 Tut/Week Sessional Marks: 40
End Exam: 3 Hours End Exam Marks: 60

Course Objectives:
The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Outcomes:

By the end of the course student should be able to:	
1.	To gain good knowledge in the application of Fourier Transforms.
2.	Understanding the characteristics and properties of Z-transforms and apply the concepts of Z-Transform in Digital Systems.
3.	Familiarize the formation of Difference Equations and method of solving difference equations.
4.	Understanding the concepts of Gradient, Divergence and Curl and finding scalar potential function of irrotational vector fields.
5.	Understanding the concepts of Green's Theorem, Stokes' Theorem and the Divergence Theorem and to evaluate line integrals, surface, integrals and flux integrals.

SYLLABUS

UNIT-I : VECTOR DIFFERENTIATION (12 Periods)
Differentiation of Vectors – Scalar and Vector point function – Del applied to Scalar point functions - Gradient geometrical interpretations – Directional Derivative - Del applied to vector point function – divergence - Curl – Physical interpretation of Divergence and Curl - Del applied twice to point functions- Del applied to product of point functions.

UNIT-II : VECTOR INTEGRATION (12 Periods)
Integration of vectors – Line integral – Surface – Green's theorem in the plane – Stokes theorem – Volume integral – Gauss Divergence theorems (all theorems without proofs) – Irrotational fields .

UNIT-III : PARTIAL DIFFERENTIAL EQUATIONS (12 Periods)
Introduction – Formation of Partial Differential Equations – Solution of Partial Differential Equations by Direct Integration – Linear Equations of the First order – Higher order Linear Equations with Constant Co-efficients – Rules for finding the complementary function - Rules for finding the Particular integral – Non- Homogeneous linear equations with constant coefficients.

UNIT –IV : APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS
Introduction – Method of separation of variables – Vibrations of a stretched string- Wave equation – One dimensional Heat flow - Two dimensional Heat flow – Solution of Laplace's equation.- Laplace's equation in Polar Co-ordinates.

UNIT-V : FOURIER TRANSFORMS (12 Periods)
Introduction – definition – Fourier integral theorem - Fourier sine and cosine integrals – Complex form of Fourier integrals – Fourier integral representation of a function – Fourier Transforms – Properties of Fourier Transforms – Convolution Theorem – Parseval's identity for Fourier

transforms – Fourier Transforms of the Derivatives of functions – Application of Transforms to Boundary value problems – Heat conduction – Vibrations of a string.

Text Books:

1. Dr. B.S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, New Dehli, 2014.

Reference books:

1. A Text book on Engineering Mathematics by N.P. Bali Etal, Laxmi pub.(p)Ltd , 2001.
2. Advanced Engineering Mathematics by H.K.Dass , S.Chand Publications, 2007.
3. Advanced Engineering Mathematics by Erwin kreyszig, John Wiley Publications, 1999.

Electrical Machines

ECE 212 **Credits: 3**
Instruction: 3 Periods & 1 Tut/Week Sessional Marks: 40
End Exam: 3 Hours End Exam Marks: 60

Course Objectives:

The main objectives of the course are:

- Analyse performance of DC Machines
- Understand basic operation of AC Machines.
- Elementary treatment of Power Generation, Transmission and Distribution

Course Outcomes:

By the end of the course student should be able to:	
1.	Find efficiency of DC Machine
2.	Find Regulation and Efficiency of Single phase Transformer
3.	Analyse the performance of Induction Motors
4.	Understand working of synchronous machine
5.	Understand basic concepts of Electric Power System

SYLLABUS

UNIT-1

DC Machines: **[18 Periods]**

Constructional Features, Function of Commutator, Induced EMF and Torque Expressions, Relationship Between Terminal Voltage and Induced EMF for Generator and Motoring Action, Different Types of Excitation and Performance Characteristics of Different Types of DC Machines, Starting and Speed Control of DC Motors, Losses and Efficiency, Efficiency by Direct Loading, Swinburne's Test, and Applications of DC Machines.

UNIT -2 **[12 Periods]**

Transformers:

Constructional Details, EMF Equation, Equivalent Circuit, Voltage Regulation, Losses and Efficiency, Auto – Transformers, Open/Short – Circuit Tests and Determination of Efficiency and Regulation.

UNIT-3 **[16 Periods]**

Induction Motors:

Three-phase Induction Motors: Rotating Magnetic Field, Construction of 3-ph Induction Motor, Power Flow Diagram, Torque and Torque-slip Characteristics, Condition for Max. Torque and its Value, Starting methods of 3-phase Induction Motor, Losses and Efficiency, Efficiency and Torque – Speed Characteristics.

Single-phase Induction Motors: Double Revolving Field Theory, Methods of Starting Single Phase Induction Motors, Stepper Motor.

UNIT-4 **[10 Periods]**

Three – Phase Synchronous Machines:

Generation of EMF, Constructional Details, Induced EMF, Synchronous Generator on No – Load and Load, Synchronous Impedance and Voltage Regulation, Starting of Synchronous Motors, Applications of Synchronous Machines.

UNIT-5 **[8 Periods]**

Electric Energy System (Elementary treatment only)**:**

Single Line Diagram of AC Power supply systems, Types of Power Generation sources(Conventional and Non – Conventional),Power Distribution Systems(Radial and Ring Main Systems).

TEXT BOOKS:

1. J.B. Gupta, "Theory and Performance of Electrical Machines" , S. K. Kataria& Sons, 2009
2. P.S Bimbra, "Electrical Machinery", Khanna Publications, 7th Edition, 2009
3. V.K.Mehta, Rohit Mehta, "Principles of Power System", S. Chand Publications, 4th Edition, 2008

REFERENCES:

1. Electrical Machines, S. K. Bhattacharya, TMH Publications N. Delhi.

Data structures

ECE 213 **Credits : 3**
Instruction: 3 Periods & 1 Tut/Week Sessional Marks : 40
End Exam: 3 Hours End Exam Marks : 60

Course objectives:
The main objectives of the course are:

- To acquire knowledge on several data structures like stacks, queues, linked list, trees and graphs.
- To have better insight into linear and nonlinear data structures.
- To learn various sorting and searching techniques.
- To exercise the applications of data structures.
- To have a good understanding of problem solving using data structure tools and techniques.

Course Outcomes:

By the end of the course student should be able to:	
1	Demonstrate the knowledge in problem solving techniques.
2	Write programs for different data structures
3	Implement different applications using tree structures.
4	Implement various sorting techniques
5	Apply and implement learned algorithm design techniques and data structures to solve problems using Graphs.

SYLLABUS

UNIT I:
ARRAYS AND STACKS **[12-Periods]**

Introduction: Basic Terminology, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off.

Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Sparse Matrices.

Stacks: Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of Postfix & Prefix expressions using stack, Recursion, Towers Of Hanoi Problem.

UNIT II:
QUEUES AND LINKED LIST **[12 –Periods]**

Queues: Array representation and implementation of queues, Operations on Queue: Insert, Delete, Full and Empty. Circular queue, De-queue, and Priority Queue, Applications of Queues.

Linked list: Representation and Implementation of Singly Linked Lists, Traversing and Searching of Linked List, Insertion and deletion to/from Linked Lists, Doubly linked list,

Circular Doubly linked list, Implementing priority queue using Linked List, Polynomial Representation using Linked list & addition.

UNIT III:
TREES AND SEARCHING [12-Periods]

Trees: Basic terminology, Binary Trees, Binary tree representation, Almost Complete Binary Tree, Complete Binary Tree, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees.

Searching: Sequential search, binary search, Interpolation Search, comparison and analysis, Hash Table, Hash Functions.

UNIT IV:
BINARY SEARCH TREES AND BASIC SORTING TECHNIQUES [12-Periods]

Sorting: Insertion Sort, Bubble Sort, Selection sort, Merge Sort.

Binary Search Trees: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL Trees.

UNIT V:
GRAPHS [10-Periods]

Graphs: Terminology & Representations- Graphs, Directed Graphs, Adjacency Matrices, Path OR Transitive Closure of a Graph, Warshall's Algorithm, Shortest path Algorithm-Dijkstra's Algorithm, Connected Component and Spanning Trees, Minimu m Cost Spanning Trees,Graph Traversals.

TEXT BOOKS

1. Y. Langsam, M. Augenstin and A. Tannenbaum, "Data Structures using C and C++", Pearson Education, 2nd Edition, 1995.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education.

REFERENCES:

1. E.Horowitz and Sahani, "Fundamentals of Data Structures"
2. C Programming and Data structures, P. Padmanabham, 3rd Edition, BS publications..
3. S. Lipschutz, "Data Structures", McGraw Hill, 1986.
4. Programming in C , P. Dey & M. Ghosh, Oxford Univ. Press.
5. ISRD Group, "Data Structures through C++", McGraw Hill, 2011.

Signals and Systems

ECE 214 **Credits : 3**
Instruction: 3 Periods & 1 Tut/Week Sessional Marks : 40
End Exam: 3 Hours End Exam Marks : 60

Course Objectives:

- Coverage of continuous and discrete-time signals and systems, their properties.
- Knowledge of time-domain representation and analysis concepts as they relate to Difference equations, impulse response and convolution, etc.
- Knowledge of frequency-domain representation and analysis concepts using Fourier Analysis tools.
- Z-transform Concepts of the sampling process.

Course Outcomes:

By the end of the course student should be able to:	
1	Characterize and analyze the properties of CT and DT signals and systems
2	Analyze CT and DT systems in Time domain using convolution
3	Represent CT and DT systems in the Frequency domain using Fourier Analysis tools like CTFS, CTFT, DTFS and DTFT.
4	Conceptualize the effects of sampling a CT signal
5	Analyze CT and DT systems using Laplace transforms and Z Transforms

SYLLABUS

Unit- I Introduction to Signals and Systems 10 Periods

Continuous-Time (CT) signals and Discrete-Time (DT) signals and their representation, commonly used CT and DT signals: impulse, step, pulse, ramp and exponentials, classification of CT and DT signals: periodic and aperiodic, even and odd, energy signals and power signals, operations on CT and DT signals- addition, subtraction, multiplication, differentiation and integration of CT signals, convolution and correlation of two signals (CT& DT), properties of convolution operation. Time-shifting and time-scaling of CT and DT signals, classification of CT and DT systems: static and dynamic, linear and non-linear,time-invariant and time-varying, basic concepts like causality,stability and invertability of systems.

Unit-II Linear Time-Invariant Systems 10 Periods

CT and DT type of LTI systems, impulse response function and unit-sample response sequence, Input-Output relation through convolution summation/ integral, characterization of CT and DT types of LTI systems, impulse response function/ sequence and causalitity of LTI systems, interconnectected LTI systems (CT and DT), CT type of LTI systems described by Linear constant coefficient differential equations, DT type LTI systems described by constant coefficient linear difference equations, BIBO stability of LTI systems (CT and DT types).

Unit III Analysis of CT Signals and Systems 12 Periods

Fourier series analysis of CT Signals, CT Fourier transform(FT) and its inverse; magnitude and phase spectra, FT using impulses, FT as a particular case of Laplace Transform(LT), FT and LT in CT system analysis, magnitude and phase responses of CT type LTI systems, block diagram representation of Linear Differential Equations with constant coefficients, pole-zero locations, causality (Paley- Wiener Criterion)and stability, distortionless transmission of signals through CT type LTI systems.

Unit IV Analysis of DT Signals and Systems 15 periods

Discrete –time Fourier transform(DTFT) & inverse DTFT; convergence of DTFT and IDTFT; DTFT properties and theorems, discrete Fourier transform (DFT)& inverse DFT; properties and theorems, circular convolution, Z-Transform(ZT) & its properties & theorems, inverse ZT, inversion methods power series, PFE and Residue methods, solution of difference equations using ZT, distortionless transmition through DT type of LTI systems, ROCs of right-sided, left sided and finite duration sequences, relationship between ZT, DTFT and DFT.

Application of ZT, DTFT and DFT in DT signal and system analysis, DT system function, transfer function, poles and zeros, stability, block diagram representation of difference equations, processing of CT signals using DFT.

Unit V Sampling of Lowpass and Bandpass Signals 10 periods

Lowpass sampling theorem and its proof, types of sampling: impulse sampling, natural sampling and flat-top sampling, spectra of sampled vertions, aliasing, Nyquist rate, anti-aliasing filter, reconstruction of band – limited lowpass signal from its samples, aperture effect due to flat- top sampling, reconstruction filters and zero – order hold(ZOH), sampling of bandpass signals and bandpass sampling theorem.

Text Books :

1. A.V. Oppenheim, AS Willsky and S.H. Nawab: Signals and Systems, Pearson.
2. S.Haykin and B.V Veen: Signals and Systems, John Wiley

References:

1. P. Ramakrishna Rao and Shankar Prakriya : Signals and Systems, second addition, McGraw Hill (India) pvt Ltd. 2013
2. Nagoor Kani: Signals and Systems, McGraw Hill
3. E.W Kamen and B.S.Heck: Fundamentals of Signals and Systems using the Web and Matlab, Pearson.
4. P. Ramesh Babu and R. Anandanatarajan: Signals and Systems 4/e, Scitech.
5. K. Raja Rajeswari and B. Visveswara Rao: Signals and Systems , PHI.

Network analysis and synthesis

ECE 215 **Credits : 3**
Instruction: 3 Periods & 1 Tut/Week Sessional Marks : 40
End Exam: 3 Hours End Exam Marks : 60

Course Objectives:
The main objectives of the course are:

- Analysis of D.C circuits using basic network theorems.
- Analysis of transients in RLC circuits in both time and S domain.
- Analysis of A.C circuits using basic network theorems.
- Understanding the concept of resonance and coupled circuits, 3-phase circuits.
- Able to synthesize the given transfer function.

Course Outcomes:

By the end of the course student should be able to:	
1	Apply basic network theorems and analyze both D.C and A.C. circuits.
2	Determine various parameters of two port networks.
3	Analyze circuits under resonant condition.
4	Calculate natural and forced response of RL, RC & RLC circuits
5	Measure real, reactive, apparent power in three phase circuits.

SYLLABUS

UNIT-I:
ANALYSIS OF DC CIRCUITS

Active Element, Passive Element, Reference Directions For Current and Voltage, Kirchoff's Laws, Voltage and Current Division, Nodal Analysis, Mesh Analysis, Linearity and Superposition, Thevenin's and Norton's Theorems, Source Transformation.

UNIT-II:
DC TRANSIENTS

Inductor, Capacitor, Source Free RL, RC & RLC Response, Evaluation of initial Conditions, Application of Unit-Step Function to RL, RC & RLC Circuits, Concepts of Natural, Forced and Complete Response.

UNIT-III:
SINUSOIDAL STEADY-STATE ANALYSIS

The Sinusoidal Forcing Function, Phasor, Instantaneous and Average Power, Complex Power, Steady State Analysis Using Mesh and Nodal Analysis, Application of Network Theorems to A.C. Circuits.

UNIT-IV:
RESONANCE &COUPLEDCIRCUITS

Balanced Three Phase Circuits, Resonance, Concept of Duality. Coupled Circuits: Magnetically Coupled Circuits, Dot Convention.

UNIT-V:
NETWORK SYNTHESIS

Elementary synthesis operation, LC network synthesis, Properties of RC network functions, Foster and Cauer forms of RC and RL networks.

TEXT BOOKS:

1. W.H. HAYT Jr & J.E. KEMMERLY, "ENGINEERING CIRCUIT ANALYSIS, 5th Edition, Mc. Graw Hill Pub.
2. M.E. VAN VALEKNBURG, "NETWORK ANALYSIS", 3rd Edition, PHI Learning.

REFERENCE BOOK:

1. Circuits and Networks by A. Sudhakar Shyammohan S Palli, 4^{th} Edition, TMH Publication.

Electronic Circuits and Analysis-I

ECE 216 **Credits : 4**
Instruction: 4 Periods & 1 Tut/Week Sessional Marks : 40
End Exam: 3 Hours End Exam Marks : 60

Course Objectives:

- To understand how to analyze a BJT at low and high frequencies.
- To design and analyze single stage and multistage amplifiers.
- To learn about the response of HPF and LPF for different types of inputs.
- To understand working of different clipping and clamping circuits.
- To know to design different types of multivibrators.

Course Outcomes:

By the end of the course student should be able to:	
1	Design and analyze different clipping and clamping circuits.
2	Analyze different linear wave shaping circuits
3	Understand large signal and small signal characteristics of simple amplifier circuits.
4	Estimate frequency response of single-stage amplifiers using high-frequency transistor models and derive methods to improve high frequency response of amplifiers.
5	Design different types of multivibrators.

SYLLABUS

Unit-1:

Transistor at low frequencies and high frequencies [12 periods]

Graphical analysis of CE configuration, Two port devices and hybrid model, Transistor hybrid model, h-parameters, conversion formulas of three transistor configurations, Analysis of transistor amplifier circuit using h-parameters, the emitter follower, Millers theorem and its dual, cascading transistor amplifiers, simplified CE hybrid model, high input resistance transistor circuits, hybrid- π CE transistor model, hybrid- π conductance, hybrid- π capacitances, validity and variation of hybrid- π parameters.

Unit-2

Multistage Amplifiers [8 periods]

Classification of amplifiers, Distortion in amplifiers, Frequency response of an amplifier, The RC coupled amplifier-low frequency response, high frequency response of two cascaded CE stages, Band- pass of cascaded stages, Cascode amplifiers, Multistage CE amplifier cascade at High frequencies.

Unit-3:

Linear wave shaping [12 periods]

The high pass RC circuit, High pass RC circuit as a differentiator, Double differentiation, The low pass RC circuit, Low pass RC circuit as an integrator, attenuators, RL and RLC circuits.

Unit-4:

Clipping and Clamping Circuits [12 periods]

Diode Clippers, The transistor clipper, Clipping at two independent levels, Cathode coupled and emitter coupled clipper, Compensation for temperature changes, comparators, breakaway diode and amplifier, diode differentiator comparator, accurate time delays, applications of voltage comparator, The clamping operation, clamping circuit taking source and diode resistance into account, Clamping circuit theorem, Practical clamping circuits, effect of diode characteristics on clamping voltage, Synchronized clamping.

Unit-5:

Multivibrators **[12 periods]**

Stable stages of a binary, fixed bias transistor binary, self bias transistor binary, commutating capacitors, methods of improving resolution, emitter coupled binary, Schmitt trigger circuit, the monostable multivibrator, emitter coupled monostable multivibrator, astable emitter coupled multivibrator.

Text Books:

1. Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics", 2nd Edition, McGraw Hill Publication, 2009.[unit1,unit2]
2. Jacob Millman & Herbert Taub, "Pulse Digital & Switching Waveforms" McGraw-Hill Book Company Inc.[unit3,unit4,unit5]

REFERENCES:

1. Donald A. Neamon, "Electronic Circuit Analysis and Design", 2nd Edition. TMH publications.

Electronic Circuits and Analysis-I Laboratory

ECE 217 **Credits : 2**
Instruction: 3 Practical's / Week Sessional Marks: 50
End Exam: 3 Hours End Exam Marks : 50

Course Objectives:

- To study the characteristics of a PN diode and to design various application circuits like clippers, clampers, regulators and rectifiers.
- To learn the input and output junction characteristics of BJT and FET and to calculate the required parameters.
- To analyze the frequency response of single and multistage amplifiers.
- To analyze linear wave shaping circuits for various inputs.
- To design and analyze different multivibrator circuits.

Course Outcomes:

By the end of the course student should be able to:	
1	Measure the important parameters of a PN diode and to implement for various Applications.
2	Design and construct different rectifier and voltage regulation circuits used in regulated Power supplies.
3	Design amplifier circuits for specific applications, based on their input and output Characteristics of BJT and FET.
4	Design and verify the output of linear wave shaping circuits for different inputs.
5	Design and analyze different multivibrator circuits.

LIST OF EXPERIMENTS

1. Plot the V-I characteristics of a PN diode in forward and reverse bias and find the static, dynamic resistances and the reverse saturation current.
2. Plot the V-I characteristics and regulation characteristics of a Zener diode in reverse bias.
3. Plot the output waveforms of a fullwave rectifier using 2 diodes.
4. Plot the output waveforms of a Bridge rectifier and find the ripple factor.
5. Plot the input and output characteristics of CE configured transistor and to find the h-parameter values from the characteristics.
6. Plot the input and output characteristics of CB configured transistor and to find the h-parameter values from the characteristics.
7. Verify the working of a BJT as a switch.
8. Plot the drain and transfer characteristics of a JFET.
9. Design different types of clipping and clamping circuits using PN diodes.
10. Verify the response of HPF and LPF using passive components for different types of input signals.
11. Plot the frequency response of a single stage CE amplifier and an RC coupled multistage amplifier.
12. Obtain the output wave form of a Bistable multivibrator and observe the switching action.
13. Observe the hysteresis loop of a Schmitt trigger circuit
14. Verify the working of a CC amplifier as an emitter follower and as a buffer.
15. Design and implement a DC regulated power supply.

Text Books:

3. Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics", 2nd Edition, McGraw Hill Publication, 2009.
4. Jacob Millman & Herbert Taub, "Pulse Digital & Switching Waveforms" McGraw-Hill Book Company Inc.

REFERENCES:

2. Donald A. Neamon, "Electronic Circuit Analysis and Design", 2nd Edition. TMH publications.

Network & EM Laboratory

ECE 218 **Credits : 2**
Instruction: 3 Practical's / Week Sessional Marks : 50
End Exam: 3 Hours End Exam Marks : 50

Course objectives:

The main objectives of the course are:

- Do analysis of linear circuits by using network theorem.
- Predict the performance characteristics of DC machines, single phase transformer And induction motor.
- Predict the regulation of single phase transformer & alternator.

Course outcomes:

By the end of the course student should be able to:	
1	Conduct the experiments on basic network theorems.
2	Predict the characteristics on D.C machines and single phase transformers
3	Predict the regulation Of an alternator.

LIST OF EXPERIMENTS:

CYCLE-I: Networks Lab

1. To obtain filament lamp characteristics.
2. Verification of KCL & KVL.
3. Verification of superposition theorem.
4. Verification of Thevenin's and Norton's theorem.
5. Determination of two port network parameters.

CYCLE-II: Electrical Machines Lab

1. O.C.C & Load characteristics of D.C shunt generator.
2. Swinburne's test on D.C. shunt machine.
3. Brake test on D.C. shunt motor.
4. O.C. & S.C test on a single phase transformer.
5. Brake test on 3-phase induction motor.
6. Regulation of alternator by e.m.f. method.

TEXTBOOKS:

1.ENGINEERINGCIRCUITANALYSISBYW.H.HAYTJr&J.E.KEMMERLY,5th Edition,Mc. GrawHillPub.

2. J.B. Gupta, "Theory and Performance of Electrical Machines" ,S. K. Kataria& Sons, 2009

Engineering Mathematics –IV

ECE 221 **Credits : 3**
Instruction: 3 Periods & 1 Tut/Week Sessional Marks : 40
End Exam: 3 Hours End Exam Marks : 60

Course Objective :

- The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects.
- Here our intention is to make the students acquainted with the concept of basic topics from Mathematics, which they need to pursue their Engineering degree in different disciplines

Course Outcomes :

By the end of the course student should be able to:	
1	Understand some basic techniques for solving linear partial differential equations and how to identify a partial differential equation in order to determine which technique(s) can best be applied to solve it
2	Understand the methods to solve the Laplace, heat, and wave equations
3	Understand, interpret and use the basic concepts: analytic function, harmonic function, Taylor and Laurent series, singularity
4	Study the concepts of Residues , evaluating definite integrals using technique of residues and understand the concepts of conformal mappings
5	Analyze the Statistical data by using statistical tests (based on small sample and large sample) and to draw valid inferences based on the analysis of statistical data

SYLLABUS

UNIT-I : FUNCTIONS OF A COMPLEX VARIABLE (14 Periods)

Introduction –Limit of a Complex function- Derivative of $f(z)$ – Analytic functions-Harmonic functions - Applications to Flow problems. Complex Integration- Cauchy's Theorem- Cauchy's Integral Formula –Series of Complex terms (Statements of Taylor's and Laurent's Series without proof) - Zeros of an Analytic function - Residues - Calculation of Residues - Evaluation of Real Definite Integrals (Integration around the unit circle, Integration around the small semi circle , Indenting the Contours having poles on the real axis).

Geometric representation of $f(z)$, Some standard transformation ($w = z + c, w = cz, w = \frac{1}{z}$, $w = \frac{az+b}{cz+d}$) .

UNIT-II : FINITE DIFFERENCES & INTERPOLATION (12 Periods)

Finite Differences – Forward differences – Backward differences – Central differences – Differences of a Polynomial – Factorial Notation – Other difference operators – To find one or more missing terms – Newton's Interpolation Formulae – Central Difference Interpolation Formulae - Interpolation with Unequal Intervals – Lagrange's interpolation formula – Inverse Interpolation.

UNIT-III: NUMERICAL DIFFERENTIATION AND INTEGRATION (10 Periods)

Numerical Differentiation – Formulae for derivatives – Maxima and Minima of a Tabulated Function – Numerical Integration – Newton-Cotes Quadrature Formula – Trapezoidal rule – Simpson's One-Third rule , Simpson's Three-Eighth rule.

UNIT - IV : Z – TRANSFORMS (12 Periods)

Introduction – Definition - Some Standard Z-Transforms –Linearity Property –Damping Rule – Some Standard Results - Shifting U_n to the right , Shifting U_n to the left – Two basic theorems (

Initial Value Theorem and Final Value Theorem) – Convolution Theorem – Convergence of Z-transforms – Two sided Z - transform of U_n - Evaluation of inverse Z- transforms (Power Series Method , Partial Fraction Method , Inverse integral method) - Applications to Difference equations.

UNIT-V : SAMPLING THEORY (12 Periods)

Introduction – Sampling Distribution – Testing a hypothesis – Level of Significance – Confidence Limits – Test of Significance of Large samples (Test of significance of single mean, difference of means) – Confidence limits for unknown – Small samples – Students t-distribution – Significance test of a sample mean – Significance test of difference between sample means – Chi-Square (χ^2) Test – Goodness of fit.

Text Books:

1. Dr. B.S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, New Dehli, 2014.

Reference books:

1. A Text book on Engineering Mathematics by N.P. Bali Etal, Laxmi pub.(p)Ltd , 2011.
2. Advanced Engineering Mathematics by H.K.Dass , S.Chand Publications, 2007.
3. Advanced Engineering Mathematics by Erwin kreyszig, John Wiley Publications, 1999.

Electronic Circuits and Analysis-II

ECE 222 **Credits : 3**
Instruction: 3 Periods & 1 Tut/Week Sessional Marks : 40
End Exam: 3 Hours End Exam Marks : 60

Course Objectives:

- To understand and analyze different types of negative feedback amplifiers and sinusoidal oscillators.
- To learn to design different types of Tuned voltage amplifiers and Power amplifiers.
- To understand and design simple differential amplifier circuits.
- To know various applications of operational amplifiers.
- To obtain detailed knowledge of the basic MOSFET amplifiers.

Course Outcomes:

By the end of the course student should be able to:	
1	Understand the relevance of negative feedback and positive feedback in electronic circuits, analyze and design different negative feedback circuits and sinusoidal oscillators.
2	Understand the concept Tuned voltage amplifiers and design Tuned voltage amplifiers for required resonance frequency.
3	Design a power amplifier circuit and calculate the distortion.
4	Analyze and design simple differential amplifier circuits using BJTs.
5	Design different circuits for various applications using op-amp
6	Understand the basic MOSFET amplifiers and their responses with different loads

SYLLABUS

Unit-I:

Feedback Amplifiers **[14 Periods]**

Classification of amplifiers, the feedback concept, general characteristics of negative feedback, effect of negative feedback on input and output impedance, Method of analysis of feedback amplifiers,

Oscillators

Sinusoidal oscillators, Phase shift oscillators, Resonant circuit oscillators, General form of oscillator circuit, The wien bridge oscillator, crystal oscillators, Frequency stability.

Unit-II:

Tuned voltage amplifiers **[10 Periods]**

Introduction, need for tuned voltage amplifiers, operation of single tuned, double tuned and stagger tuned amplifiers.

Power Amplifiers

Class A Large Signal amplifiers, Second Harmonic Distortion, Higher order Harmonic Distortion, The Transformer coupled audio power amplifier, Efficiency, Push-Pull amplifiers, Class B Amplifiers, Class AB operation, Class C amplifier.

Unit-III:

Differential amplifiers **[10 Periods]**

The Differential amplifier, Basic BJT differential pair, DC transfer characteristic, small signal equivalent circuit analysis, differential and common mode gain, differential and common mode impedances, Bipolar transistor current sources, two transistor current sources, improved current source circuits, Widlar current source, multi transistor current mirrors.

Unit-IV:

Applications of Operational Amplifiers: [10 Periods]

Review of basics of Op-Amp, Basic op-amp applications, Differential DC amplifier, Stable AC coupled amplifier, Analog Integration and differentiation, comparators, sample and hold circuits, Precision AC/DC converters, Logarithmic amplifiers, waveform generators, regenerative comparators, Instrumentation amplifier.

Unit-V:

FET Amplifiers [12 Periods]

MOSFET DC circuit analysis, The MOSFET amplifier - small signal equivalent circuit, Common source amplifier, source follower amplifier, Common Gate amplifier. NMOS amplifiers with enhancement load, depletion load and PMOS load, CMOS source follower and common gate amplifiers.

Text Books:

1. Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics", 2nd Edition, McGraw Hill Publication, 2009.[unit-1,unit-2,unit-4]
2. Donald A. Neamon, "Electronic Circuit Analysis and Design", 2nd Edition. TMG publications. [unit-3,unit-5]

REFERENCES:

1. Ramakanth A Gayakwad, "Op-Amps and Linear Integrated Circuits"- 4th Edition.

Digital Electronics

ECE 223 **Credits : 3**
Instruction: 3 Periods & 1 Tut/Week Sessional Marks : 40
End Exam: 3 Hours End Exam Marks : 60

Course Objectives:

- To understand the simplification methods (Boolean algebra & postulates, k-map method and tabular method) to simplify the given Boolean function.
- To understand the fundamentals of digital logic and design various combinational and sequential circuits.
- To understand the concepts of programmable logic devices
- To understand formal procedure for the analysis and design of synchronous and asynchronous sequential logic

Course Outcomes:

By the end of the course student should be able to:	
1	Apply the simplification methods to simplify the given Boolean function (Boolean algebra, k-map and Tabular method).
2	Implement given Boolean function using logic gates, MSI circuits and/ or PLD's
3	Design and analyze various combinational circuits like decoders, encoders, multiplexers, and de-multiplexers, arithmetic circuits (half adder, full adder, multiplier etc).
4	Design and analyze various sequential circuits like flip-flops, registers, counters etc
5	Analyze and Design synchronous and asynchronous sequential circuits.

SYLLABUS

UNIT-1 **[10 periods]**

NUMBER SYSTEMS: Number representation, Conversion of bases, Binary Arithmetic, Representation of Negative numbers, Binary codes: weighted and non-weighted, Error detecting and correcting codes -- Hamming codes.

BOOLEAN ALGEBRA: Basic definitions, Axiomatic Definitions, Theorems and properties, Boolean Functions, Canonical and standard forms.

UNIT-2 **[10 periods]**

LOGIC FAMILIES

Binary Logic, AND, OR, NOT, NAND, NOR, EX-OR and Equivalence gates. Introduction, Specifications of digital circuits, RTL and DTL circuits, Transistor-Transistor Logic (TTL), Emitter Coupled Logic (ECL), MOS, CMOS circuits, Performance comparison of logic families.

UNIT-3 **[14 periods]**

GATE-LEVEL MINIMIZATION

The Map Method: Two variable map, Three variable map, four variable map, Prime Implicants, Don't care conditions, NAND and NOR implementation, Exclusive-OR Function, Parity Generation and Checking, Variable Entered Mapping (VEM): Plotting Theory, Reading Theory, Quine-Mccluskey (QM) Technique.

COMBINATIONAL LOGIC

Combinational circuits, Analysis Procedure, Design procedure, Binary Adder-Subtractor, Decimal adder, carry look ahead adder, Binary Multiplier, Magnitude comparator, Decoders, Encoders, Multiplexers, ROM, PLA, PAL.

UNIT-4 **[14periods]**

SYNCHRONOUS SEQUENTIAL LOGIC

Block diagram of sequential circuit, Latches, Flip-flops, Triggering of Flip-flops, Flip-flop excitation tables, Analysis of clocked sequential circuits, State equations, state table, state diagram, analysis with D, JK and T-Flip-flops, state machines, state reduction and assignment, Design procedure.

REGISTERS AND COUNTERS

Registers, Shift registers, universal shift register Ripple counters, Synchronous counters, counter with unused states, Ring counters, Johnson counter.

UNIT-5 **[12 periods]**

ASYNCHRONOUS SEQUENTIAL LOGIC

Analysis Procedure, Circuits with latches, Design procedure, Reduction of state and flow tables, cycles, Race-Free state Assignment, Hazards, Design example.

Text Books:

1. M. Morris Mano, Digital Design, 3rd Edition, Pearson Publishers, 2001.
2. Z Kohavi, Switching and Finite Automata Theory, 2nd edition, TMH, 1978

Reference Books:

1. William I. Fletcher, An Engineering Approach to Digital Design, PHI, 1980.
2. John F. Wakerly, Digital Design Principles and Practices, 3rd Edition, Prentice Hall, 1999.
3. Charles H Roth Jr and Larry L. Kinney, Fundamentals of Logic Design, Cengage learning, 7th Edition, 2013

R.P Jain, Modern Digital Electronics, 3rd Edition, TMH, 2003.

Probability Theory and Random Processes

ECE 224 **Credits : 3**
Instruction: 3 Periods & 1 Tut/Week Sessional Marks : 40
End Exam: 3 Hours End Exam Marks : 60

Course Objective:

- To understand the fundamentals of Probability Theory.
- To understand the concept of random variables and probability density and distribution functions.
- To know some important operations that can be performed on a random variable or multiple random variables.
- Understand the mathematical concepts related to random processes
- Analysis of random process and its basic applications to the signal processing in the communication system.

Course Outcomes:

By the end of the course student should be able to:	
1	Use set–theoretic notation to describe events and compute probabilities and conditional probability
2	Identify the types of random variables involved in a given problem and calculate relevant probabilities,
3	Know the main tools to describe a random variable, such as the probability density function, the cumulative distribution function and the moment generating function.
4	Understand the concept of various operation applied on random variables be able to apply it in decision making
5	Know about well-known distributions and how they are used in practice.
6	Recognize the importance of the central limit theorem.
7	Discuss the concept of random processes and determine covariance and spectral density of stationary random processes
8	Demonstrate the specific applications to Poisson and Gaussian processes
9	Formulate and solve the engineering problems involving random processes
10	Demonstrate the theoretical concept related to sampling and Modulation for a band pass process

SYLLABUS

UNIT-I: Probability and Random Variable [12 Periods]

Probability: Probability introduced through Sets and Relative Frequency, Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events.
Random Variable: Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables.

UNIT -II: Distribution & Density Functions and Operation on One Random Variable [12 Periods]

Distribution & Density Functions: Distribution and Density functions and their Properties - Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh and Conditional Distribution, Methods of defining Conditional Event, Conditional Density, and Properties.
Operation on One Random Variable: Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous

Random Variable, Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable.

UNIT-III: Multiple Random Variables and Operations [12 Periods]

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem (Proof not expected), Unequal Distribution, Equal Distributions.

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, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT-IV Random Process - Temporal Characteristics

Introduction, The Random Process Concept: Classification of Process, Deterministic and Nondeterministic Process. Stationary and Independence: Distributions and Density Functions, Statistical Independence, First-order Stationary Process, Second-Order and Wide-sense Stationary, N-Order and Strict-Sense Stationary, Time Averages and Ergodicity, Mean-Ergodic Process, Correlation-Ergodic Process. Correlation Functions: Autocorrelation Functions and Its Properties, Cross-correlation Functions and its properties, Covariance Functions, Discrete-Time Process and Sequences. Measurement of Correlation Functions, Guassian Random Process, Poisson Random Process, Complex Random Process.

UNIT-V Spectral Analysis

The Power Spectrum, Linear System, Hilbert Transform, Discrete Time Process, Modulation: Rice's Representation, Band pass processes, Band limited Processes and Sampling Theory.

Text Book:

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, 4Ed., 2001, McGraw Hill.
2. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, McGraw Hill, 4th Edition, 2002.

Reference Book:

1. Probability Theory and Random Processes, S. P. Eugene Xavier, S. Chand and Co. New Delhi, 1998 (2nd Edition).
2. Probability, Statistics, and Random Processes for Engineers- Henry Stark & John W. Woods, 4Ed, 2012, Pearson
3. Introduction to Random Signals and Noise, Davenport W. B. Jrs. and W. I. Root, McGraw Hill N.Y., 1954.

Electromagnetic Field Theory & Transmission Lines

ECE 225 **Credits : 3**
Instruction: 3 Periods & 1 Tut/Week Sessional Marks : 40
End Exam: 3 Hours End Exam Marks : 60

Course objectives:

- To provide the basic skills required to understand, develop, and design various engineering applications involving electromagnetic fields.
- To lay the foundations of electromagnetism and its practice in modern communications such as wireless, guided wave principles such as fiber optics and electronic electromagnetic structures.

Course Outcomes:

By the end of the course student should be able to:	
1	Apply vector calculus to static electric fields in different engineering situations
2	Solve the problems related to magnetostatic fields with proper knowledge of law's and equations and theorems
3	Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems.
4	Examine the phenomena of wave propagation in different media and its interfaces and in applications of microwave engineering. Analyze the nature of electromagnetic wave propagation in guided medium which are used in microwave applications
5	Able to make use of the transmission line concepts and use smith chart to find various parameters useful to design a circuit at radio frequency

SYLLABUS

UNIT I: Electrostatics (14 HRS)

Introduction to vector analysis, Fundamental of electrostatic fields, Different types of charge distributions, Coulomb's law and Electric field intensity**,** Potential function, Equi-potential surface, Electric field due to dipole; Electric flux density, Gauss's law and applications, Poisson's and Laplace's equations and its applications; Uniqueness theorem; Boundary conditions; Conductors & Dielectric materials in electric field; Current and current density, Relaxation time, Relation between current density and volume charge density; Dipole moment, Polarization, Capacitance, Energy density in an electric field.

UNIT II: Steady Magnetic Fields (12 HRS)

Introduction, Faradays law of induction, Magnetic flux density, Biot-Savart law, Ampere's circuit law, Magnetic Force, Magnetic Boundary conditions, Scalar and Vector magnetic potentials, Magnetization & Permeability in materials, Inductance, Energy density, Energy stored in inductor.

UNIT III: Maxwell's Equations (10 HRS)

Introduction, Faradays law, displacement current, Equation of continuity for the varying fields, inconsistency of Amperes circuit law, Maxwell's equations in integral form, Maxwell's equations in point form, retarded potentials Meaning of Maxwell's equations, conditions at a Boundary surfaces, Retarded potentials.

UNIT IV: Electromagnetic Waves (10 HRS)

Introduction, Applications of EM waves, solutions for free space condition ,; Uniform plane wave propagations uniform plane waves, wave equations conducting medium, sinusoidal time variations, conductors & dielectrics, Depth of penetration, Direct cosines, Polarization

of a wave, reflection by a perfect conductor – Normal incidence, Oblique incidence, reflection by a perfect dielectric-Normal incidence, reflection by a perfect insulator – oblique, Surface impedance, Poynting vector and flow of power, Complex poynting vector.

UNIT V: Transmission Lines (10 HRS)

Types of transmission lines, Applications of transmission lines, Equivalent circuit of pair of transmission lines, Primary constants, Transmission line equations, Secondary constants, lossless transmission lines, Distortionless line, Phase and group velocities, Loading of lines, Input impedance of transmission lines, RF lines, Relation between reflection coefficient, Load and characteristic impedance, Relation between reflection coefficient and voltage standing wave ratio (VSWR), Lines of different lengths - $\lambda/8, \lambda/4, \lambda/2$ lines, Losses in transmission lines, Smith chart and applications, Stubs, Double stubs.

Text Books:

1. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", PHI, 2nd Ed., 2000.
2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics", TMH, 7th Ed., 2006.

Reference Books:

1. G.S.N.Raju, Electromagnetic Field Theory And Transmission Lines, Pearson Education (Singapore) Pvt., Ltd., New Delhi, 2005.
2. M.N.O. Sadiku, " Principles of Electromagnetics", Oxford International Student edn., 4th edn., 2007.
3. G. Sasi Bhushana Rao, "Electromagnetic Field Theory andTransmission Lines", Wiley, India Pvt. Ltd, 2012.
4. Simon Ramo, et.al-, "Fields and waves in communication electronics", Wiley India Edn., 3rd Edn., 1994

Control Systems

ECE 226 **Credits : 3**
Instruction: 3 Periods & 1 Tut/Week Sessional Marks : 40
End Exam: 3 Hours End Exam Marks : 60

Course Objectives:

- Generate the transfer functions of mechanical and electrical systems.
- Can adjust the relative stability by using damping factor and undamped natural frequency of the system.
- Can find the stability by using root locus technique, polar plot, nyquist plot, bode plot or M&N circles.

Course Outcomes:

By the end of the course student should be able to:	
1	The block reduction techniques and signal flow graphs
2	The mathematical modelling of mechanical and electrical systems
3	The analysis of systems in time domain
4	The relative and steady state stability of the systems
5	The analysis of systems in frequency domain

SYLLABUS

UNIT-I: Introduction to Control Systems [12 Periods]

Transfer Functions of Linear Systems - Impulse Response of Linear Systems-Block Diagrams of Control Systems-Signal Flowgraphs (Simple Problems) - Reduction Techniques for Complex Block Diagrams and Signal Flow Graphs (Simple Examples).

UNIT-II: Modeling of Control Systems [10 periods]

Introduction to Mathematical Modelling of Physical Systems - Equations of Electrical Networks - Modelling of Mechanical Systems - Equations of Mechanical Systems.

UNIT-III: Time domain analysis [16 periods]

Time Domain Analysis of Control Systems - Time Response of First and Second Order Systems with Standard Input Signals-Steady State Performance of Feedback Control Systems-Steady State Error Constants-Effect of Derivative and Integral Control on Transient and Steadystate Performance of Feedback Control Systems.

UNIT-IV: Concept of stability in time domain [12 periods]

Concept of Stability and Necessary Conditions for Stability - Routh - Hurwitz Criterion, Relative Stability Analysis, The Concept and Construction of Root Loci, Analysis of Control Systems With Root Locus (Simple Problems to Understand Theory)

UNIT-V: Frequency domain analysis [14 periods]

Correlation Between Time and Frequency Responses - Polar Plots - Bode Plots - Log Magnitude Versus Phase Plots-All Pass and Minimum Phase Systems-Nyquist Stability Criterion-Assessment of Relative Stability-Constant M&N Circles.

TEXT BOOKS:

1. I.J. NAGRATH & M.GOPAL, CONTROL SYSTEMS ENGINEERING, WILEY EASTERN LIMITED.
2. BENJAMIN C. KUO, AUTOMATIC CONTROL SYSTEMS, PRENTICE HALL OF INDIA

REFERENCES:

OGATA, MODERN CONTROL ENGINEERING, PRENTICE HALL OF INDIA.

Electronic Circuits and Analysis-II Laboratory

ECE 227 **Credits : 2**
Instruction: 3 Practical's /Week Sessional Marks : 50
End Exam: 3 Hours End Exam Marks : 50

Course Objectives:

- To Analyze and verify the characteristics and frequency response of feedback amplifiers and sinusoidal oscillators.
- To understand and analyze different power amplifier circuits
- To design tuned voltage amplifiers for different applications.
- To verify different applications of op-amp.
- To verify the operation of a MOSFET.

Course outcomes:

By the end of the course student should be able to:	
1	Design and identify the applications of feedback amplifiers and sinusoidal oscillators in different electronic circuits.
2	Design and implement different power amplifiers and tuned voltage amplifiers.
3	Calculate the parameters of BJT differential amplifier.
4	Apply op-amps fundamentals in design and analysis of op-amps applications.
5	Apply the MOSFET inverter in different electronic circuits.

LIST OF EXPERIMENTS

1. Obtain the input and output impedance of a trans-conductance amplifier with and without feedback.
2. Obtain the frequency response of a voltage shunt negative feedback amplifier with and without feedback.
3. Generate a sinusoidal signal using Colpitts oscillator at a desired frequency.
4. Generate a sinusoidal signal using Wein bridge circuit.
5. Generate a sinusoidal signal using RC phase shift oscillator and observe the lissajous patterns at different phase shifts.
6. Plot the frequency response of a tuned voltage amplifier and find the resonant frequency.
7. Obtain the output waveforms of a class-B pushpull power amplifier and calculate the efficiency and distortion.
8. Obtain the output waveforms of a class-A transformer coupled power amplifier and calculate the power conversion efficiency.
9. Determine the gain and CMRR for the BJT differential amplifier.
10. Obtain the signals at the output junctions of multistage BJT differential pair.
11. Verify different applications of an Operational amplifier.
12. Verify different parameters of an operational amplifier.
13. Observe the working of an operational amplifier in inverting, non inverting and differential modes.
14. Plot the V-I characteristics of an n-channel enhancement MOSFET and verify its operation as an inverter.
15. Verify the working of a CMOS source follower amplifier.

TEXT BOOKS:

1. Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics", 2nd Edition, McGraw Hill Publication, 2009.
2. Donald A. Neamon, "Electronic Circuit Analysis and Design", 2nd Edition. TMG publications.

REFERENCES:

1. Ramakanth A Gayakwad, "Op-Amps and Linear Integrated Circuits"- 4th Edition.

Simulation Laboratory

ECE 228 **Credits : 2**
Instruction: 3 Practical's / Week Sessional Marks : 50
End Exam: 3 Hours End Exam Marks : 50

Course Objective:

1. To understand the operation of various filters, amplifiers and oscillator circuit
2. To understand the frequency response of different amplifiers.
3. To provides an overview of signal transmission through linear systems, convolution and correlation of signals and sampling.
4. To understand the concept of Fourier and Z-Transform

Course outcomes:

By the end of the course student should be able to:	
1	Design Low pass and High pass filtering circuit
2	Analyze any complex circuit consisting of amplifiers, rectifiers, oscillators etc
3	Understand the Use Multivibrator circuit for designing mini project
4	Calculate the convolution and correlation between signals
5	Find the Fourier transform of a given signal and plotting its magnitude and phase spectrum
6	Discuss the importance of Z-Transform
7	Generate random sequences for a given distribution.

Students have to perform at least five experiments from each cycle

Cycle-I (Electronics circuit & simulation)

1	Simulation of Low pass and High pass Filter
2	Simulation of Half–Wave and Full-Wave Rectifier
3	Simulation of Clippers and Clampers circuit
4	Frequency Response of CE and CC Amplifier
5	Frequency Response of CC Amplifier
6	Simulation of Current Series Feedback Amplifier
7	Simulation of Voltage Shunt Feedback Amplifier
8	Simulation of RC phase shift Oscillator
9	Simulation of Wein Bridge Oscillator
10	Simulation of Hartley Oscillator
11	Simulation of Colpitts Oscillator
12	Simulation of Class-C Tuned Amplifier
13	Simulation of Differential Amplifier.
14	Simulation of Astable Multivibrator
15	Simulation of Monostable Multivibrator
16	Simulation of Bistable Multivibrator
17	Simulation of Digital to Analog Converter
18	Simulation of Analog Multiplier.
19	Simulation of CMOS NOT/NAND/NOR gates
20	Simulation of Differential amplifier
21	Simulation of Voltage Regulator
22	Simulation of Class-A Power Amplifier

Cycle-II (Signal & System)

1	Basic Operations on Matrices.
2	Write a program for Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit impulse, unit step, square, saw tooth, triangular, sinusoidal, ramp, sinc.
3	Write a program to perform operations like addition, multiplication, scaling, shifting, and folding on signals and sequences and computation of energy and average power.
4	Write a program for finding the even and odd parts of signal/ sequence and real and imaginary parts of signal.
5	Write a program to perform convolution between signals and sequences.
6	Write a program to perform autocorrelation and cross correlation between signals and sequences.
7	Write a program for verification of linearity and time invariance properties of a given continuous/discrete system
8	Write a program for computation of unit samples, unit step and sinusoidal response of the given LTI system and verifying its physical realiazability and stability properties.
9	Write a program to find the Fourier transform of a given signal and plotting its magnitude and Phase spectrum.
10	Write a program for locating the zeros and poles and plotting the pole-zero maps in S plane and Z-plane for the given transfer function.
11	Write a program for Sampling theorem verification.
12	Write a program for Removal of noise by autocorrelation / cross correlation.
13	Generation of random sequence
14	Write a program to generate random sequence with Gaussian distribution and plot its pdf and CDF .
15	Write a program for verification of winer- khinchine relations.

Cycle-III (Probability Theory and Random Process)

1	Let Z be the number of times a 6 appeared in five independent throws of a die. Write a program to describe the probability distribution of Z by: Plotting the probability density function Plotting the cumulative distribution function
2.	Plot the probability mass function and the cumulative distribution function of a geometric distribution for a few different values of the parameter p. How does the shape change as a function of p?
3.	Write a program to generate 10,000 samples of an exponentially distributed random variable using the simulation method. The exponential random variable is a standard one, with mean 10. Plot also the distribution function of the exponentially distributed random variable using its mathematical equation.
4.	Write a program to determine the average value and variance of Y=exp(X), where X is a uniform random variable defined in the range [0, 1]. Plot the PDF of Y
5.	Consider the random process defined as X[n] = 2U [n] − 4U [n − 1], where U [n] is a white noise with zero mean and variance $\sigma 2 = 1$. Generate a realization of 1000 samples of X[n] by using MATLAB. Based on this realization, estimate the power spectral density and plot the estimate.