

# DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

**(4-Year B.Tech Program)**  
*WITH EFFECT FROM 2015-16 ADMITTED BATCH*

## Academic Regulations Curriculum & Syllabi



**ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES  
(AUTONOMOUS)**

(Affiliated to AU, Approved by AICTE & Accredited by NBA & NAAC with 'A' Grade)  
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**ANIL NEERUKONDA  
INSTITUTE OF TECHNOLOGY AND SCIENCES  
(AUTONOMOUS)**

**Affiliated to Andhra University**



**Academic Regulations  
Curriculum &  
Syllabi (First 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 4<sup>th</sup> 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. V S R K PRASAD**  
**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 of Excellence" by Infosys
- Ranked 5th among the Promising Private Engineering Colleges for excellence as per Competition Success Review (CSR) magazine in 2011
- Recognized silver partner of Keane India (Chennai) for the year 2007-2008
- Partnered 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

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## *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 in reputed 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.*



## **PROGRAM 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 development in core engineering and other fields.

## PROGRAM 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 program.
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 apply knowledge, skills, tools, and techniques to project activities to meet the project requirements with the aim of managing project resources properly and achieving the project's objectives.
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.Tech programme 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.Tech programme 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<sup>nd</sup> 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:

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

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**

## Course Structure - B.Tech 4 Year Degree Course

### 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
ECEAC1	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 marks	
ECE121	Engineering Mathematics II	3	1	-	4	40	60	3
ECE122	Applied Physics	3	1	-	4	40	60	3
ECE123	Environmental Science	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
ECEAC 2	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		Credits
		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 Aptitude-I	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 Laboratory	-	-	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

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

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

1. Project management
2. Industrial Safety and Hazards Management
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

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### 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 skills.
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. G.J.K. Gangal *A Practical Course for Developing Writing Skill in English* PHI

2. Mark Lester and Larry Beason *Handbook of English Grammar & Usage* Tata McGraw Hill.

3. S.M.Gupta *Current English Grammar And Usage* PHI

4. Dr. P. Prasad, Rajendra K Sharma *The Functional Aspects of Communication Skills* Katson Books
5. AbulHashem *Common errors in English* Ramesh Publishing House
6. M. Ashraf Rizvi *Effective Technical Communication* Tata Mc-Graw Hill
7. 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 Objective:

- 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 and their usage.
5.	Use the concepts of improper integrals, Gamma, Beta and Error functions which are needed in Engineering applications

## SYLLABUS

### UNIT I

#### Partial Differentiation:

12 Periods

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.

## UNIT II

### Fourier series:

12 Periods

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.

## UNIT IV

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* 43<sup>rd</sup> 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 provide an understanding on materials and their 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.	Able to distinguish different material properties to be used in the semiconductor electronic devices.
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 Electrodialysis, 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 - Tropsh 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<sub>2</sub>-O<sub>2</sub> 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* 16<sup>th</sup> edition - DhanapathiRai& Sons, Delhi

**REFERENCE BOOKS:**

1. S.S. Dara *A text book of Engineering Chemistry* 15<sup>th</sup> 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.Bandopadhyay *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 :3**

Instruction: 2 Periods & 1 Tut/Week

Sessional Marks :40

End .Exam :3 Hours

End-Exam-Marks:60

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### Course Objective:

- (i) To understand moral values and their significance.
- (ii) To draw inspiration for imbibing moral values
- (iii) To understand professional ethics and obligations
- (iv) 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 I 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 Profession 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*3<sup>rd</sup> 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. Govindrajan, S Natrajan& V.S. Senth Kumar*Engineering Ethics (including human Values)* Eastern Economy Edition, Prentice hall of India Ltd

## ENGINEERING PHYSICS

(Common for all branches)

**ECE115**

**Credits:3**

Instruction : 3 Periods & 1 Tut/Week

Sessional Marks :40

End .Exam :3 Hours

End-Exam-Marks:60

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### 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

#### 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

## UNIT II

### **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

## UNIT III

### **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

**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

### **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  $\psi$  , 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

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### 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.	Able to identify the suitable method for analyzing samples.
2.	Able to analyze different types of water samples to test quality parameters.
3.	Able to 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* 9<sup>th</sup> edition S. Chand & Company Ltd.

## **PROGRAMMING WITH C LAB**

(Common for all branches)

**ECE 117**

**Credits:3**

1Tut/Week & 3Practical / week

Sessional Marks :50

End Exam:3Hrs,

End Exam. Marks : 50

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### **Course objective:**

#### **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. Yashwant Kanetkar *Let Us C* 5th Edition.
2. V. Rajaraman *Fundamentals of Computers* 4<sup>th</sup> Edition, PHI 2005.
3. Programming Techniques through C, M.G. V. Murthy, Pearson Education, 2002
4. K.R. Venugopal, S.R. 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

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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

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- v) To evaluate the following expression
  - a)  $(ax + by) / (ax - by)$
  - b)  $a^2 + b^2 + \text{squareroot}(2ab)$
  - c)

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:  $\cos(x) = 1 - x^2/2! + x^4/4! - x^6/6! + \dots$
  - 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 (not using library functions)
  - 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)

**ECE121**

**Credits :3**

Instruction : 3 Periods & 1 Tut/Week

Sessional Marks :40

End .Exam :3 Hours

End-Exam-Marks:60

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### CourseObjectives:

- 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

##### Linear Algebra:

11 Periods

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* 43<sup>rd</sup> 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)

**ECE122**

**Credits :3**

Instruction: 3 Periods & 1 Tut/Week

Sessional Marks :40

End .Exam :3 Hours

End-Exam-Marks:60

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## 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

**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

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, Clausius – Mossotti equation, frequency dependence of electronic polarization, properties of ferroelectric materials and their applications

## UNIT III

**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 fluorescence X-Ray Diffraction-Electron Microscopy (SEM and TEM)

## UNIT IV

**Crystal structure:** Introduction, fundamental terms of crystallography – space lattice, crystal lattice, unit cell, planes, seven crystal systems – Bravais 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

**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)

**ECE123**

Instruction : 3 Periods & 1 Tut/Week

End .Exam :3 Hours

**Credits 3**

Sessional Marks :40

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

INTRODUCTION TO ENVIRONMENT AND NATURAL RESOURCES 10 Periods

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**

### **ENVIRONMENTAL POLLUTION AND WASTE MANAGEMENT**

10 Periods

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**

### **SOCIAL ISSUES AND ENVIRONMENT**

8 Periods

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**

### **LEGISLATIONS, CONVENTIONS & CASE STUDIES**

10 Periods

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 Movement, Kolleru Lake, Fluorosis, 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.

## ENGINEERING DRAWING

(Common for all branches)

**ECE124**

**Credits :3**

Instruction : 1 Periods(Theory)+3 Periods( Practical)      Sessional Marks :40

End .Exam :3 Hours

End-Exam-Marks:60

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### 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 convention
- 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.	Perform basic sketching techniques will improve.
2.	Draw orthographic projections and sections
3.	Use architectural and engineering scales will increase.
4.	Produce engineering drawing will improve.
5.	Convert sketches to engineered drawing will increase.
6.	Develop good communication skills and team work.
7.	Become familiar with Auto CAD two dimensional drawings.

## SYLLABUS

### UNIT I

Introduction to Engineering Drawing & basics of geometrical construction.

construction of conic sections-Construction of cycloidal curves, involutes & spirals.

### UNIT II

Orthographic projections – projections of points – projections of straight lines

### **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 IT,CSE& ECE branches)

**ECE125**

**Credits :3**

Instruction : 3 Periods & 1 Tut/Week

Sessional Marks :40

End .Exam :3 Hours

End-Exam-Marks:60

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### Course Objectives:

- To familiarize the students about different discrete electronic components and CRO.
- To familiarize the students with the analysis and design of Rectifier Circuits.
- To train the students with the operational principle, analysis, design and applications of different types of Diodes.
- 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).
- 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, 10<sup>th</sup> 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)

**ECE126**

Practical / week : 3

End Exam: 3 Hrs

**Credits: 2**

Sessional Marks : 50

End Exam. Marks : 50

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**Course Objectives:**

- 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 principles

**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 –Photoelectric 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)

**ECE127**

**Credits: 2**

Practical / week : 3

Sessional Marks :50

EndExam:3 Hrs

EndExam. Marks : 50

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### 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.

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.

### Course Outcomes:

## 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. Bansal and 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, Kamlesh Sadanand & 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)

ECE 128

Credits:3

Instruction : 1Tut/Week & 3Practical / week

Sessional Marks :50

End Exam:3 Hrs

End Exam. Marks : 50

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### Course Objective:

- 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 problems using 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 Bhawe , Sunil patekar *Object Oriented Programming in C++* Second edition , Pearson
2. R Rajaram, *Object Oriented Programming in C++* 2<sup>nd</sup> Edition New Age International Publishers

3. Herbert Schildt *C++ the Complete Reference* III edition, TMH 1999
4. E Balaguruswamy *Object Oriented Programming with C++* 3<sup>rd</sup> 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
  - int sameArea(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.
  1. Write the definitions for each of the above member functions.
  2. 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.
  3. 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 initialize string array to contain the following
  - i. Veena, guitar, 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
  1. Mycar is a blue wagon
  2. 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 cageNumber, weightDate, 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)

**ECE129**

Practical / week : 3

End Exam:3 Hrs

**Credits: 2**

Sessional Marks :50

EndExam. Marks : 50

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**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. Bridle 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**

### Second Year I –Semester

Code	Subject name	Category	Instruction periods per week				Max marks		Credits
			Lecture	Tutorial	Practical	Total	Sessional marks	Semester end marks	
ECE 211	Engineering Mathematics-III	BS	3	1	-	4	40	60	3
ECE 212	Electrical Machines	ES	3	1	-	4	40	60	3
ECE 213	Data structures	ES	3	1	-	4	40	60	3
ECE 214	Signals and Systems	PC	3	1	-	4	40	60	3
ECE 215	Network analysis and synthesis	ES	3	1	-	4	40	60	3
ECE 216	Electronic Circuits and Analysis-I	PC	4	1	-	5	40	60	4
ECE 217	Electronic Circuits and Analysis-I Laboratory	PC	-	-	3	3	50	50	2
ECE 218	Network & EM Laboratory	ES	-	-	3	3	50	50	2
Total			19	6	6	31	340	460	23

### Second Year II –Semester

Code	Subject name	Category	Instruction periods per week				Max marks		Credits
			Lecture	Tutorial	Practical	Total	Sessional marks	Semester end marks	
ECE 221	Engineering Mathematics –IV	BS	3	1	-	4	40	60	3
ECE 222	Electronic Circuits and	PC	3	1	-	4	40	60	3

	Analysis-II								
ECE 223	Digital Electronics	PC	3	1	-	4	40	60	3
ECE 224	Probability Theory and Random Processes	PC	3	1	-	4	40	60	3
ECE 225	Electromagnetic Field Theory & Transmission Lines	PC	3	1	-	4	40	60	3
ECE 226	Control Systems	ES	3	1	-	4	40	60	3
ECE 227	Electronic Circuits and Analysis-II Laboratory	PC	-	-	3	3	50	50	2
ECE 228	Simulation Laboratory	PC	-	-	3	3	50	50	2
	Massive Open Online Course (MOOC)*	AC	-	-	-	-	-	-	-
Total			18	6	6	30	340	460	22

\*MOOCs: Course any time during 2-2 to 4-2. But its grade will be accorded with the 4-2 courses of the program.

<b>ENGINEERING MATHEMATICS –III</b>	
<b>ECE 211</b>	<b>Credits:3</b>
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.	Understanding the concepts of Gradient, Divergence and Curl and finding scalar potential function of irrotational vector fields.
2.	Understanding the concepts of Green's Theorem, Stokes' Theorem and the Divergence Theorem and to evaluate line integrals, surface, integrals and flux integrals.
3.	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.
4.	Understand the methods to solve the Laplace, heat, and wave equations.
5.	To gain good knowledge in the application of Fourier Transforms.

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

## 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 12 Periods**

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, 43<sup>rd</sup> 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.



<b>ELECTRICAL MACHINES</b>	
<b>ECE 212</b>	<b>Credits:3</b>
Instruction: 3 Periods & 1 Tut/Week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

**Course Objectives:**

- To analyze the performance of DC Machines
- To understand basic operation of AC Machines.
- To learn 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.	Analyze the performance of Induction Motors
4.	Understand working of synchronous machine
5.	Understand basic concepts of Electric Power System

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

		PO												PSO			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO	<b>1</b>	2			-	-	-	-	-	-	-	-	-	-	-	-	2
	<b>2</b>	2			-	-	-	-	-	-	-	-	-	-	-	-	2
	<b>3</b>	2	2		-	-	-	-	-	-	-	-	-	-	-	-	2
	<b>4</b>	1			-	-	-	-	-	-	-	-	-	-	-	-	2
	<b>5</b>	1			-	-	-	-	-	-	-	-	-	-	-	-	2

**SYLLABUS**

**UNIT-I**

**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 -II**

**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-III**

**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-IV**

**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-V**

**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, 7<sup>th</sup> Edition, 2009
3. V.K.Mehta, Rohit Mehta, “Principles of Power System”, S. Chand Publications, 4<sup>th</sup> Edition, 2008

### **References:**

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

<b>DATA STRUCTURES</b>	
<b>ECE 213</b>	<b>Credits:3</b>
Instruction: 3 Periods & 1 Tut/Week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

**Course objectives:**

- 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.

		PO											PSO			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	<b>1</b>	2	2	1									2	-	-	2
	<b>2</b>	2	1	-									2	-	-	2
	<b>3</b>	1	-	1									2	-	-	2
	<b>4</b>	1	-	1									2	-	-	2
	<b>5</b>	2	2	1									2	-	-	2

## 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, Minimum Cost Spanning Trees, Graph Traversals.

#### Text Books

1. Y. Langsam, M. Augenstein 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.

<b>SIGNALS AND SYSTEMS</b>	
<b>ECE 214</b>	<b>Credits:3</b>
Instruction: 3 Periods & 1 Tut/Week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

**Course Objectives:**

- To learn the properties of continuous and discrete-time signals and systems.
- To learn the time-domain representation and analysis concepts as they relate to difference equations, impulse response and convolution, etc.
- To learn frequency-domain representation and analysis concepts using Fourier Analysis tools.
- To learn Z-transform concepts and 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

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

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

## 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 causality of LTI systems, interconnected 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 transmission 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 versions, 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.



<b>NETWORK ANALYSIS AND SYNTHESIS</b>	
<b>ECE 215</b>	<b>Credits:3</b>
Instruction: 3 Periods & 1 Tut/Week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

**Course Objectives:**

- To learn analysis of D.C circuits using basic network theorems.
- To learn analysis of transients in RLC circuits in both time and S domain.
- To learn analysis of A.C circuits using basic network theorems.
- To learn concept of resonance and coupled circuits, 3-phase circuits.
- To learn synthesise of 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.

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

## **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 & COUPLED DC CIRCUITS**

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<sup>th</sup> Edition, TMH Publication.

<b>ELECTRONIC CIRCUITS AND ANALYSIS-I</b>	
<b>ECE 216</b>	<b>Credits:4</b>
Instruction: 4 Periods & 1 Tut/Week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

**Course Objectives:**

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

**Course Outcomes:**

Co Number	CO Description
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 multi-vibrators

**CO-PO-PSO mapping of ECA1 :**

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	3	2	-	2	-	-	-	-	-	-	-	2	3	1
CO2	3	3	2	-	2	-	-	-	-	-	-	-	2	3	1
CO3	3	3	3	-	1	-	-	-	-	-	-	-	2	3	1
CO4	3	3	3	-	2	-	-	-	-	-	-	-	2	3	1
CO5	3	3	2	-	2	-	-	-	-	-	-	-	2	3	1

## SYLLABUS

### Unit-I

#### **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-  $\pi$  CE transistor model, hybrid-  $\pi$  conductance, hybrid-  $\pi$  capacitances, validity and variation of hybrid-  $\pi$  parameters.

### Unit-II

#### **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-III

#### **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-IV

#### **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-V**

### **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", 2<sup>nd</sup> Edition. TMH publications.

<b>ELECTRONIC CIRCUITS AND ANALYSIS-I LABORATORY</b>	
<b>ECE 217</b>	<b>Credits:2</b>
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:

Co Number	CO Description
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 multi-vibrator circuits.

### Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	-	-	-	2	1	-	-	2	3	1
CO2	3	3	3	2	3	-	-	-	2	1	-	-	2	3	1
CO3	3	3	3	2	3	-	-	-	2	1	-	-	2	3	1
CO4	3	3	3	2	3	-	-	-	2	1	-	-	2	3	1
CO5	3	3	3	2	3	-	-	-	2	1	-	-	2	3	1

### LIST OF EXPERIMENTS

#### Hardware Experiments:

1. V-I characteristics of PN diode
2. V-I characteristics and regulation characteristics of Zener diode
3. Ripple factor calculation of Halfwave rectifier and Fullwave rectifier
4. Input & Output Characteristics of CE configuration
5. Input & Output Characteristics of CB configuration
6. Drain and Transfer Characteristics of JFET
7. Frequency response characteristics of CE amplifier
8. Linear wave shaping
9. Non-linear wave shaping
10. Bi-stable multivibrator using BJTs
11. Astable multivibrator using BJTs

#### Simulation Experiments:

12. Monostable multivibrator
13. Schmitt Trigger
14. RC coupled amplifier



**Text Books:**

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

**References:**

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

<b>NETWORK &amp; EM LABORATORY</b>	
<b>ECE 218</b>	<b>Credits:2</b>
Instruction: 3 Practical's / Week	Sessional Marks:50
End Exam: 3 Hours	End Exam Marks:50

**Course objectives:**

- To learn analysis of linear circuits by using network theorem.
- To predict the performance characteristics of DC machines, single phase transformer and induction motor.
- To 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 based on basic network theorems.
2	Predict the characteristics of D.C machines and single phase transformers
3	Predict the regulation of an alternator.

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

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

**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. W.H.Haytjr & J.E.Kemmerly , "Engineering Circuit Analysis" , 5th Edition, Mc. Graw Hill Pub.
2. J.B. Gupta, "Theory and Performance of Electrical Machines" ,S. K. Kataria& Sons, 2009

<b>ENGINEERING MATHEMATICS –IV</b>	
<b>ECE 221</b>	<b>Credits:3</b>
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:	
<b>1</b>	Understand, interpret and use the basic concepts: Analytic function, harmonic function, Taylor and Laurent Series, Singularity, Residues and evaluation of improper integrals.
<b>2</b>	Familiarize the concepts of Finite Differences and Interpolation techniques.
<b>3</b>	Familiarize the concept of Differentiation and Integration by numerical methods.
<b>4</b>	Understand the characteristics and properties of Z-transforms and its applications.
<b>5</b>	Analyze the Statistical data by using statistical tests and to draw valid inferences about population parameters.

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	<b>1</b>	2	1	-	-	-	-	-	-	-	-	-	-	2	-	1
	<b>2</b>	2	1	-	-	-	-	-	-	-	-	-	-	2	-	1
	<b>3</b>	2	1	-	-	-	-	-	-	-	-	-	-	2	-	1
	<b>4</b>	2	1	-	-	-	-	-	-	-	-	-	-	2	-	1
	<b>5</b>	2	1	-	-	-	-	-	-	-	-	-	-	2	-	1

## 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 ( $\chi^2$ ) Test – Goodness of fit.

**Text Books:**

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

**Reference books:**

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

<b>ELECTRONIC CIRCUITS AND ANALYSIS-II</b>	
<b>ECE 222</b>	<b>Credits:3</b>
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:	
<b>1</b>	Understand the relevance of negative feedback and positive feedback in electronic circuits, analyze and design different negative feedback circuits and sinusoidal oscillators.
<b>2</b>	Understand the concept Tuned voltage amplifiers and design Tuned voltage amplifiers for required resonance frequency.
<b>3</b>	Design a power amplifier circuit and calculate the distortion.
<b>4</b>	Analyze and design simple differential amplifier circuits using BJTs.
<b>5</b>	Design different circuits for various applications using op-amp
<b>6</b>	Understand the basic MOSFET amplifiers and their responses with different loads

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

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

## 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", 2<sup>nd</sup> Edition. TMG publications. [unit-3,unit-5]

#### **References:**

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

<b>DIGITAL ELECTRONICS</b>	
<b>ECE 223</b>	<b>Credits:3</b>
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:	
<b>1</b>	Understand the principle of operations of various logic families and to apply the simplification methods to simplify the given Boolean function (Boolean algebra, k-map and Tabular method).
<b>2</b>	Implement given Boolean function using logic gates, MSI circuits and/ or PLD's
<b>3</b>	Design and analyze various combinational circuits like decoders, encoders, multiplexers, and de-multiplexers, arithmetic circuits (half adder, full adder, multiplier etc).
<b>4</b>	Design and analyze various sequential circuits like flip-flops, registers, counters etc
<b>5</b>	Analyze and Design synchronous and asynchronous sequential circuits.

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

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

## SYLLABUS

### UNIT-I

**[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-II

**[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-III**

**[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-IV**

**[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-V**

**[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, 3<sup>rd</sup> 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
4. R.P Jain, Modern Digital Electronics, 3rd Edition, TMH, 2003.

<b>PROBABILITY THEORY AND RANDOM PROCESSES</b>	
<b>ECE 224</b>	<b>Credits:3</b>
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 and 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.
- To understand the mathematical concepts and analysis related to random processes 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:	
<b>1</b>	Use set–theoretic notation to describe events and compute probabilities and conditional probability
<b>2</b>	Know the main tools to describe a random variable, such as the probability density function, the cumulative distribution function and the moment generating function.
<b>3</b>	Understand the concept of various operation applied on random variables be able to apply it in decision making
<b>4</b>	Discuss the concept of random processes and determine covariance and spectral density of stationary random processes
<b>5</b>	Formulate and solve the engineering problems involving random processes in addition to demonstrating the theoretical concepts related to sampling and modulation for a band pass process.

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO</b>	<b>1</b>	2	1	1									2	1	1	2
	<b>2</b>	2	1	1									2	1	1	2
	<b>3</b>	1	3	3									2	3	1	2
	<b>4</b>	1	2	2									2	2	1	2
	<b>5</b>	1	3	3									2	3	1	2

## SYLLABUS

### UNIT-I Probability and Random Variable

12Periods

**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****12 periods**

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****12 periods**

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.



<b>ELECTROMAGNETIC FIELD THEORY &amp; TRANSMISSION LINES</b>	
<b>ECE 225</b>	<b>Credits:3</b>
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:	
<b>1</b>	Apply vector calculus to static electric fields in different engineering situations
<b>2</b>	Solve the problems related to magnetostatic fields with proper knowledge of law's and equations and theorems
<b>3</b>	Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems.
<b>4</b>	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
<b>5</b>	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

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

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

## SYLLABUS

### **UNIT I Electrostatics (14 periods)**

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 periods)**

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 periods)**

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 periods)**

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 periods)**

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, 2<sup>nd</sup> 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., 4<sup>th</sup> edn., 2007.
3. G. Sasi Bhushana Rao, “Electromagnetic Field Theory and Transmission Lines”, Wiley, India Pvt. Ltd, 2012.
4. Simon Ramo, et.al-, “Fields and waves in communication electronics”, Wiley India Edn., 3<sup>rd</sup> Edn., 1994

<b>CONTROL SYSTEMS</b>	
<b>ECE 226</b>	<b>Credits:3</b>
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:	
<b>1</b>	Apply block reduction techniques and signal flow graphs
<b>2</b>	Apply mathematical modelling of mechanical and electrical systems
<b>3</b>	Analyze the given systems in time domain
<b>4</b>	Determine the relative and steady state stability of the systems
<b>5</b>	Analyze the systems in frequency domain

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

		PO												PSO			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO	<b>1</b>	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
	<b>2</b>	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
	<b>3</b>	2	1	-	-	-	-	-	-	-	-	1	-	1	-	-	2
	<b>4</b>	2	1	-	-	-	-	-	-	-	-	1	-	1	-	-	2
	<b>5</b>	2	2	-	-	-	-	-	-	-	-	1	-	1	-	-	2

## **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:**

1. Ogata, “Modern control engineering”, prentice hall of India.

<b>ELECTRONIC CIRCUITS AND ANALYSIS-II LABORATORY</b>	
<b>ECE 227</b>	<b>Credits:2</b>
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:	
<b>1</b>	Design and identify the applications of feedback amplifiers and sinusoidal oscillators in different electronic circuits.
<b>2</b>	Design and implement different power amplifiers and tuned voltage amplifiers.
<b>3</b>	Calculate the parameters of BJT differential amplifier.
<b>4</b>	Apply op-amps fundamentals in design and analysis of op-amps applications.
<b>5</b>	Apply the MOSFET inverter in different electronic circuits.

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO</b>	<b>1</b>	2	2	2	2	-	-	-	-	-	2	-	-	2	-	2
	<b>2</b>	2	2	2	2	-	-	-	-	-	2	-	-	2	-	2
	<b>3</b>	1	2	2	1	-	-	-	-	-	2	-	-	2	-	2
	<b>4</b>	2	2	3	2	-	-	-	-	-	2	-	-	2	-	2
	<b>5</b>	2	1	2	2	-	-	-	-	-	2	-	-	2	-	2

## 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", 2<sup>nd</sup> Edition. TMG publications.

### References:

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

<b>SIMULATION LABORATORY</b>	
<b>ECE 228</b>	<b>Credits:2</b>
Instruction: 3 Practical's /Week	Sessional Marks:50
End Exam: 3 Hours	End Exam Marks:50

**Course Objective:**

- To provides an overview of signal transmission through linear systems, convolution and correlation of signals and sampling.
- To understand the concept of Fourier and Z-Transform
- To learn the VHDL hardware description language and its application to the design of combinational, sequential, and simple digital systems.

**Course outcomes:**

By the end of the course student should be able to:	
<b>1</b>	Calculate the convolution and correlation between signals
<b>2</b>	Plot magnitude and phase spectrum of a given signal using various transformation tools.
<b>3</b>	Generate random sequences for a given distribution.
<b>4</b>	Understand the basics of VHDL and describe the logic circuit using different types of models in the architecture of the body.
<b>5</b>	Design and simulate combinational and sequential circuits using VHDL

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO</b>	<b>1</b>	2	-	-	1	3	-	-	-	-	2	-	-	2	2	1
	<b>2</b>	2	-	-	1	3	-	-	-	-	2	-	-	2	2	1
	<b>3</b>	2	-	-	1	3	-	-	-	-	2	-	-	2	2	1
	<b>4</b>	2	-	-	1	3	-	-	-	-	2	-	-	2	2	1
	<b>5</b>	2	-	3	1	3	-	-	-	-	2	-	-	2	2	2



## LIST OF EXPERIMENTS

Sl.No	Name of the Experiment	Page No.
<b>CYCLE-I (Signal &amp; System)</b>		
A	<i>Introduction to MATLAB</i>	7
B	<i>Introduction to VHDL</i>	15
1	Basic Operations on Matrices.	19
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.	23
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.	30
4	Write a program for finding the even and odd parts of the signal / sequence and real and imaginary parts of the signal.	37
5	Write a program to perform convolution between signals and sequences.	40
6	Write a program to perform autocorrelation and cross correlation between signals and sequences.	43
7	Write a program for verification of linearity and time invariance properties of a given continuous/discrete system	46
8	Write a program for computation of unit samples, unit step and sinusoidal response of the given LTI system and verifying its physical realizability and stability properties.	51
9	Write a program to find the Fourier transform of a given signal and plotting its magnitude and Phase spectrum.	54
10	Write a program for locating the zeros and poles and plotting the pole-zero maps in Z-plane for the given transfer function.	56
11	Write a program for Sampling theorem verification.	59
<b>CYCLE-2 (Digital Electronics)</b>		
1	Write VHDL code for basic gates	65
2	Write a VHDL code to describe the functions of Half adder & Full Adder	67

3	Write a VHDL code to describe the functions of Half Subtractor and Full Subtractor.	71
4	Write a VHDL code to describe the functions of 4:1 & 8:1 Multiplexer	75
5	Write a VHDL code to describe the functions of 1:4m & 1:8 Demultiplexer	79
6	Write VHDL code to describe the functions of 3:8 decoder & 8:3 priority encoders.	83
7	Write VHDL code to describe the functions of SR-Flipflop, D-FlipFlop & JK-FlipFlop	7
8	Design of 4 Bit Binary to Gray code Converter.	94
9	Write VHDL for Serial for simulating SISO & PISO shift registers	96
10	Write a program to design a 4bit Up-counter	104

**Text Books:**

1. Rudra Pratap, "Getting Started with MATLAB: A Quick Introduction for Scientists & Engineers" Oxford 2010.
2. J Bhaskar,"VHDL Primer" 3<sup>rd</sup> Edition ,Prentice Hall 1999

**References:**

1. J G Proakis, VK Ingle, "Digital signal processing using MATLAB", 3<sup>rd</sup> Edition, Cengage learning.

## **THIRD YEAR SYLLABI**

**I - Semester**

**&**

**II - Semester**

### Third Year I –Semester

CODE	SUBJECT NAME	Category	Instruction periods per Week				MAX MARKS		CREDITS
			LECTURE	TUTORIAL	PRACTICAL	TOTAL	SESSIONAL MARKS	SEMESTER END MARKS	
ECE 311	Open Elective- I	OE	3	1	-	4	40	60	3
ECE 312	Communication Systems Engineering	PC	4	1	-	5	40	60	4
ECE 313	Microprocessors and Applications	PC	3	1	-	4	40	60	3
ECE 314	Computer Architecture & Organization	ES	3	1	-	4	40	60	3
ECE 315	Integrated circuits and Applications	PC	3	1	-	4	40	60	3
ECE 316	Antennas & Wave Propagation	PC	3	1	-	4	40	60	3
ECE 317	Microprocessors & Applications Laboratory	PC	-	-	3	3	50	50	2
ECE 318	IC Laboratory	PC	-	-	3	3	50	50	2
ECE 319	Quantitative Aptitude & Verbal Aptitude-I	HS	4	-	-	4	100	-	2
Total			23	6	6	35	440	460	25

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

### Third Year II –Semester

CODE	SUBJECT NAME	Category	Instruction periods per Week				MAX MARKS		CREDITS
			LECTURE	TUTORIAL	PRACTICAL	TOTAL	SESSIONAL MARKS	SEMESTER END MARKS	
ECE 321	Microwave & Radar Engineering	PC	3	1	-	4	40	60	3
ECE 322	Digital Signal Processing	PC	4	1	-	5	40	60	4
ECE 323	Microcontrollers & Embedded Systems	PC	3	1	-	4	40	60	3
ECE 324	Professional Elective-I	PE	3	1	-	4	40	60	3
ECE 325	Digital Communications	PC	3	1	-	4	40	60	3
ECE 326	Communication Systems Engineering	PC	-	-	3	3	50	50	2

	Laboratory								
ECE 327	Microcontrollers & Embedded Systems Laboratory	PC	-	-	3	3	50	50	2
ECE 328	Soft Skills Laboratory	HS	-	-	3	3	100	-	2
ECE 329	Quantitative Aptitude & Verbal Aptitude-II	HS	4	-	-	4	100	-	2
Total			20	5	9	34	500	400	24

Professional Elective-I

- |  |  |
|--|--|
| 1. Analog IC Design                            | 2. EMI / EMC                                 |
| 3. Electronic Measurements and Instrumentation | 4. Telecommunications and switching Networks |

**Industrial Training during summer vacation after Third Year II –Semester. But its grade will be accorded with the 4-1 courses of the program**

<b>INTRODUCTION TO EMBEDDED SYSTEMS</b>	
<b>ECE 311(a)</b>	<b>Credits:3</b>
Instruction: 3 Periods & 1 Tut/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

**Prerequisites: Nil**

**Course Objectives:**

- To introduce the student to the basics of embedded systems
- To learn about the components of embedded systems
- To familiarize the student with embedded systems by providing examples from various fields

**Course Outcomes:**

By the end of the course, the student will be able to:	
1.	learn about the general principles of computer architecture
2.	learn about the working of a simple embedded system and embedded system applications
3.	learn the hardware aspects of embedded systems
4.	understand the sensors, ADCs and actuators used in embedded systems
5.	understand the real world examples of embedded systems

**Mapping of Course Outcomes with Program Outcomes:**

		<b>PO</b>											
		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>
<b>CO</b>	<b>1</b>	2	-	-	-	-	-	-	-	-	-	-	1
	<b>2</b>	2	-	-	-	-	-	-	-	-	-	-	1
	<b>3</b>	2	-	-	-	-	-	-	-	-	-	-	1
	<b>4</b>	2	1	-	-	-	-	-	-	-	-	-	2
	<b>5</b>	3	2	-	-	-	-	-	-	-	-	-	2

## **SYLLABUS**

### **UNIT I**

**8 Periods**

#### **Basics of computer architecture and the binary number system**

Basics of computer architecture, computer languages, RISC and CISC architectures, number systems, number format conversions, computer arithmetic, units of memory capacity

### **UNIT II**

**8 Periods**

#### **Introduction to embedded systems**

Application domain of embedded systems, desirable features and general characteristics of embedded systems, model of an embedded system, microprocessor Vs microcontroller, example of a simple embedded system, figure of merit for an embedded system, classification of MCUs: 4/8/16/32 bits, history of embedded systems, current trends

### **UNIT III**

**10 Periods**

#### **Embedded systems-The hardware point of view**

Microcontroller unit(MCU), a popular 8-bit MCU, memory for embedded systems, low power design, pull up and pull down resistors

### **UNIT IV**

**12 Periods**

#### **Sensors, ADCs and Actuators**

Sensors: Temperature Sensor, Light Sensor, Proximity/range Sensor; Analog to digital converters: ADC Interfacing; Actuators Displays, Motors, Opto couplers/Opto isolators, relays.

### **UNIT V**

**12 Periods**

#### **Examples of embedded systems**

Mobile phone, automotive electronics, radio frequency identification (RFID), wireless sensor networks(WISENET), robotics, biomedical applications, brain machine interface

**Text Books:**

1. Lyla B Das, *Embedded systems: An Integrated Approach*, 1<sup>st</sup> Ed., Pearson, 2013

**Reference Books:**

1. Shibu, K.V., *Introduction to Embedded Systems*, 1<sup>st</sup> Ed., TMH, 2009
2. Kanta Rao B, *Embedded Systems*, 1<sup>st</sup> Ed., PHI
3. Frank Vahid & Tony Givargis, *Embedded System Design*, 2nd Edition, John Wiley,



<b>ELECTROMAGNETIC INTERFERENCE AND COMPATABILITY</b>	
<b>ECE 311(b)</b>	<b>Credits : 3</b>
Instruction : 3 periods & 1 Tutorial/Week	Sectional Marks : 40
End Exam : 3 Hours	End Exam Marks: 60

**Prerequisites: Nil**

**Course Objectives:**

- To introduce the concepts of electromagnetic interference and electromagnetic compatibility
- It presents different kinds of electromagnetic interference coupling principles.
- To study the electromagnetic interference control techniques
- To discuss electromagnetic interference measurements and standards

**Course Outcomes:**

<b>By the end of the course the student will be able to :</b>	
1.	Gain enough knowledge to understand the concept of EMI / EMC related to product design & development.
2.	Analyze the different EM coupling principles and its impact on performance of electronic system.
3.	Know how to bring down the electromagnetic interference highlighting the concepts of both susceptibility and immunity
4.	Acquire broad knowledge of various EM radiation measurement techniques
5.	Gain enough knowledge to understand the present leading edge industry standards in different countries

**Mapping of Course Outcomes with Program Outcomes:**

		<b>PO</b>											
		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>
<b>CO</b>	<b>1</b>	2		1			1						2
	<b>2</b>	1	2	1									1
	<b>3</b>	3	2	3			2						2
	<b>4</b>	3	2	3	1			1	1				1
	<b>5</b>	3	2	3									2

## **SYLLABUS**

### **Unit I EMI / EMC Concepts**

**12periods**

EMI-EMC definitions and Units of parameters; Sources and victim of EMI; Conducted and Radiated EMI Emission and Susceptibility; Transient EMI, ESD; Radiation Hazards.

### **Unit II EMI Coupling Principles**

**12periods**

Conducted, radiated and transient coupling; Common ground impedance coupling; Common mode and ground loop coupling; Differential mode coupling; Near field cable to cable coupling, cross talk ; Field to cable coupling ; Power mains and Power supply coupling.

### **Unit III EMI Control Techniques**

**12periods**

Shielding- Shielding Material-Shielding integrity at discontinuities, Filtering- Characteristics of Filters-Impedance and Lumped element filters-Telephone line filter, Power line filter design, Filter installation and Evaluation, Grounding- Measurement of Ground resistance-system grounding for EMI/EMC-Cable shielded grounding, Bonding, Isolation transformer, Transient suppressors, Cable routing, Signal control. EMI gaskets

### **Unit IV EMI /EMC Measurements**

**12periods**

Open area test site; TEM cell; Anechoic chamber; Tx /Rx Antennas, Sensors, Injectors / Couplers, and coupling factors; EMI Rx and spectrum analyzer.

### **Unit V EMI /EMC and Standards**

**12periods**

Civilian standards-CISPR, FCC, IEC, EN; Military standards-MIL461E/462. Frequency assignment - spectrum conversation. British VDE standards, Euro norms standards in Japan - comparisons. EM Emission and Susceptibility standards and Specifications.

### **References:**

1. V. P. Kodali, "Engineering EMC Principles, Measurements and Technologies", IEEE Press, New York, 2000.
2. R. C. Paul, "Introduction to Electromagnetic Compatibility", John Wiley and Sons, Inc, 1992.

<b>COMMUNICATION SYSTEMS ENGINEERING</b>	
<b>ECE 312</b>	<b>Credits: 4</b>
Instruction: 4 Periods & 1 Tutorial/Week	Sessional Marks: 40
End Exam : 3 Hours	End Exam Marks: 60

**Prerequisites:**

Engineering Mathematics, Signals and Systems, Electronic Circuit Analysis.

**Course Objectives:**

- To understand basic concepts of modulation, demodulation and design of major building blocks of Communication system and to understand how Fourier analysis can be used in communication Systems.
- Modulation techniques will be analyzed both in time and frequency domains.
- To understand the design of practical AM & FM transmitters and Receivers.
- To understand effect of noise on different modulation techniques and different noise reduction techniques.
- To provide knowledge about the overview of satellite systems in relation to other terrestrial systems & its contribution to overall technical growth.

**Course Outcomes:**

By the end of the Course, the students will be able to:	
1.	Analyze about various blocks in a Communication System.
2.	Analyze and design the analog modulator and demodulator circuits.
3.	Apply the concepts to explain about various blocks in Transmitters and Receivers.
4.	Analyze and design the pulse analog modulation techniques and evaluate the performance of analogue communication systems in the presence of noise.
5.	Gain knowledge of satellite orbits, its launching methods, Link design, earth segment and space segment components.

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO</b>	1.	3	2	3	-	-	-	-	-	-	1	-	2	3	2	3
	2.	3	3	3	-	-	-	-	-	-	1	-	3	3	3	3
	3.	3	3	3	-	-	-	-	-	-	1	-	2	3	3	2
	4.	3	3	3	-	-	-	-	-	-	1	-	3	3	2	2
	5.	3	3	1	-	-	-	-	-	1	1	-	3	3	1	3

## SYLLABUS

### UNIT I

**15 periods**

#### **Introduction to Communication Systems:**

Basic Block Diagram of Communication Systems; Principles of Analog and Digital Communication; Linear Modulation Systems: Need for Modulation, Frequency Translation, Method of Frequency Translation, Amplitude Modulation, Modulation Index, Spectrum of AM Signal, Square law modulator and diode detector, DSB-SC Signal and its Spectrum, Balanced Modulator, Synchronous Detectors, Costas loop, Hilbert transform , properties & applications, SSB Signal, SSB Generation Methods, Power Calculations in AM Systems, VSB, Applications of AM Systems.

### UNIT II

**15 periods**

#### **Non Linear Modulation Systems:**

Angle Modulation, Phase and Frequency Modulation and their Relationship, Phase and Frequency Deviation, NBFM, WBFM, Spectrum of an FM Signal, Bandwidth of Sinusoidal Modulated FM Signal, Carson's rule, Effect of the Modulation Index on Bandwidth, Comparison of FM and PM; Generation of FM Waves: Direct Method-Varactor diode, Indirect Method-Armstrong Method; Detection of FM Waves: Balanced Frequency discriminator, Phase locked loop, Comparison of FM and AM.

### UNIT-III

**10 periods**

#### **Radio Transmitters & Receivers:**

Radio

Transmitters: AM and FM Transmitters, SSB Transmitters; Radio receiver: Tuned radio frequency receiver, Superhetrodyne receiver, AM Receivers – RF Section, Frequency Changing and Tracking, Intermediate Frequency and IF Amplifiers, Automatic Gain Control (AGC); FM Receivers – Amplitude Limiting.

### UNIT-IV

**15 periods**

#### **Noise & Noise performance of AM & FM systems:**

Thermal noise, shot noise, Flicker Noise and Transition Noise, Signal to Noise ratio, Noise equivalent bandwidth, Noise equivalent temperature , Noise figure , Figure of merit, Noise in AM Systems: DSB-SC, SSB-SC, AM with carrier (Envelope Detector); Noise in FM, pre-emphasis & De-emphasis, threshold effect, problems.**Analog Pulse Modulation Techniques:**Pulse modulation and its types, PAM, PWM, PPM, concepts of Time Division Multiplexing, Frequency Division Multiplexing.

## UNIT-V

10 periods

### Satellite Communications:

Introduction, History of Satellites, Kepler's laws, Satellite orbits, Geosynchronous Satellites, Launch vehicle, Antenna look angle, Satellite system link models- Uplink, Transponder, Down link model, Cross-Links, satellite system parameters, satellite system Link equations, satellite system Link Budget.

### Text Books

1. B. P. Lathi, "*Modern Digital and Analog Communication Systems*," 2<sup>nd</sup> Edition, Oxford University Press, 2010.
2. Simon Haykins, "*Communication Systems*," Wiley, Fifth edition, 2009.
3. P.Ramakrishna Rao, "*Analog communications*" Tata McGraw Hill Education Private Limited. 2011.

### Reference Books

1. H P Hsu, "*Analog and digital communications*" Schaum's outlines, McGraw-Hill Education; 2 edition, 2002.
2. Wayne Tomasi, "*Electronic Communications Systems: Fundamentals Through Advanced*,"- Pearson Education, Fifth Edition, 2011.
3. Robert J. Schoenbeck, *Electronic Communications Modulation and Transmission*, PHI N. Delhi, 1999.
4. G. Kennedy, "*Electronic Communication Systems*," McGraw Hill, 2<sup>nd</sup> Edition, 1977.

<b>MICROPROCESSORS AND APPLICATIONS</b>	
<b>ECE 313</b>	<b>Credits:3</b>
Instruction: 3 Periods & 1 Tut/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

**Prerequisites:** Digital Electronics.

**Course Objectives:**

- To understand the internal architecture of 8085 microprocessor & Instruction Set
- To understand the internal architecture of 8085 microprocessor
- To program the 8086 microprocessor to meet the requirements of the user
- To interface memory and peripherals through various interfacing IC's to 8086 microprocessor

**Course Outcomes:**

By the end of the course, the student will be able to:	
1.	Acquire knowledge of the architecture of 8-bit Microprocessors, its interrupt structure and Instruction set
2.	Acquire knowledge of the architecture of 8086 Microprocessor, its interrupt structure, Stack operation, modes and timing.
3.	Understand instruction set of 8086 & apply them to write assembly language programs.
4.	Interface 8086 microprocessor to semiconductor memory devices and different peripheral devices

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

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

## **SYLLABUS**

### **UNIT I**

**16 Periods**

#### **Overview of 8085 (Architecture & Instruction Set):**

Introduction to Microprocessors and Microcomputers, Internal Architecture and Functional Description of INTEL 8085 Microprocessor, Interrupt Structure of 8085, Instruction Set of 8085  $\mu$ P and Sample programs.

### **UNIT II**

**08 Periods**

#### **8086 Architecture:**

Architecture of 8086, Register organization, Memory segmentation. Physical memory organization. signal description of 8086, Minimum mode 8086 system and timings, Maximum mode 8086 system and timings.

### **UNIT III**

**15 Periods**

#### **Instruction Set and Assembly Language Programming of 8086:**

Addressing modes, instruction set, assembler directives(Significant), macros and operators. Simple programs involving arithmetic, logical, branch and string manipulation instructions.

### **UNIT IV**

**09Periods**

#### **Interfacing – I:**

Memory interfacing to 8086 (Static RAM & EPROM).

Methods of parallel data transfer, 8255A Internal block diagram and system connections, 8255A operational modes and initialization, constructing and sending 8255A control words, interfacing to 8086. Interfacing Stepper motor, D/A and A/D converters

### **UNIT V**

**08 Periods**

#### **Interfacing – II:**

8086 Interrupts and response, Interrupt vector table, Types of Interrupts, 8259 PIC Architecture and interfacing, cascading of interrupt controller to 8086, 8253/8254, modes of 8253 & Interfacing.

Serial data transfer schemes: Asynchronous and Synchronous data transfer schemes. 8251  
USART architecture and interfacing to 8086. RS-232.

**Text Books:**

1. Ramesh S. Gaonkar, *Architecture Programming and Applications*, 3<sup>rd</sup> Edition, Penram International Pvt. Ltd.
2. D. V. Hall, *Microprocessors and Interfacing*, Revised 2<sup>nd</sup> edition 2006, TMH,.
3. A.K. Ray and K.M. Bhurchand, *Advanced Microprocessors and Peripherals*, 2<sup>nd</sup> edition, 2006, TMH.

**Reference Books:**

1. John Uffenbeck, *The 8086/8088 Family: Design, Programming And Interfacing*, PHI
2. N. Senthil Kumar, M. Saravanan, and S. Jeevananthan, *Microprocessors and Microcontrollers*, OUP India



<b>COMPUTER ARCHITECTURE AND ORGANIZATION</b>	
<b>ECE314</b>	<b>Credits:3</b>
Instruction: 3 Periods & 1 Tut/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

**Prerequisites:** Digital Electronics.

**Course Objectives:**

- To learn how computers work, how to analyze their performance, how computers are designed.

**Course Outcomes:**

By the end of the course, the student will be able to:	
1.	Understand the typical assembly language instructions of a computer
2.	Understand the hardware involved in the CPU of a computer
3.	Design CPU & control unit of a basic computer
4.	Use computing resources such as memory and I/O in an effective manner to improve the performance of a computer
5.	Understand the concept of pipelining and multiprocessors

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

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

## **SYLLABUS**

### **UNIT I**

**9 Periods**

#### **Register Transfer and Microoperations :**

Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Microoperations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit

### **UNIT II**

**12 Periods**

#### **Basic Computer Organization :**

Instruction Codes, Computer Registers, Computer Instructions, hardwired control unit, Instruction Cycle, Memory Reference Instructions

#### **Microprogrammed Control :**

Control Memory, Address Sequencing, Microinstruction Formats, Micro program Example, Design of Control Unit

### **UNIT III**

**9 Periods**

#### **CPU Organization**

Introduction, General Register Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, , Stack Organization. Reduced Instruction Set Computer(RISC) and CISC architectures

### **UNIT IV**

**9Periods**

#### **Memory Organization**

Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory

### **UNIT V**

**11 Periods**

#### **Input - Output Organization**

Peripheral Devices, Input - Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA),Introduction to pipelining, multiprocessors

### **Text Book**

1. M. Morris Mano, *Computer System Architecture*, 3rd Ed., PHI, 1996

### **Reference Books**

1. V. Carl Hamacher, Zvonko G. Vranesic and Safwat G. Zaky, *Computer Organization*, 5th Ed., McGraw Hill International, 2011
2. Sivarama P. Dandamudi, *Fundamentals of computer Organization and design*, Springer, 2002
3. William Stallings, *Computer Organization & Architecture - Designing for performance*, 8th Ed., Pearson Education India, 2013
4. John D. Carpinelli, *Computer Systems Organization & Architecture*, 1st Ed., Pearson Education India, 2000
5. Sajjan G. Shiva, *Computer design and architecture*, 3rd Ed., Marcel Dekker, 2000
6. Hennessy- Patterson, *Computer Architecture: A quantitative approach*, 5 th edition, Morgan Kaufmann, 2011

<b>INTEGRATED CIRCUITS AND APPLICATIONS</b>	
<b>ECE315</b>	<b>Credits:3</b>
Instruction: 3 periods & 1 Tut/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

**Prerequisites:**

Network Theory and Synthesis, Electronic Circuits and Analysis-II

**Course Objectives:**

- To provide the students strong fundamentals in the field that is relevant for engineers to design Linear circuits using Op-amps.
- To teach active filter using operational amplifiers and their comparison
- To introduce the theory and applications of PLL and Analog multiplier
- To familiarize the students conversion of data from Analog to Digital and Digital to Analog
- To introduce concepts of sine wave generation and some special function ICs

**Course Outcomes:**

By the end of the course, the student will be able to:	
1.	Understand the DC and AC characteristics of operational amplifiers and its effect on output and their compensation techniques.
2.	Design and analyze active filters of an op-amp
3.	Understand concept of PLL and analog multiplier ICs and demonstrate different applications based on them.
4.	Differentiate D/A and A/D convertor, understand their types and analyze their applications
5.	Demonstrate the applications of sine wave generators, timers and Voltage regulators

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

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

**SYLLABUS**

**UNIT I**

**12 Periods**

**Digital Circuits:**

CMOS logic, electrical behavior of CMOS circuits-Static and Dynamic, Low -Voltage CMOS logic and interfacing, CMOS/TTL interfacing

**UNIT II**

**12 Periods**

**Voltage regulators & Active Filters:**

IC Voltage regulators - Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator

Filter Fundamentals: Filter types, Realizing Practical Filters: Sallen-Key LPF and HPF Realizations-BPF Realization-Notch Filter (Band Reject) Realization - All Pass Filters, Switched Capacitor filter

**UNIT III**

**Timer, Phase Locked Loop and Analog Multiplier:**

**12**

**Periods**  
IC 555 Timer: Functional block diagram and description, Monostable, Astable operation and their applications, 556 Voltage Controlled Oscillator - -Phase Locked Loop-Operation of 565 PLL-Closed loop analysis of PLL- PLL Applications: Frequency Synthesis - Frequency Translation - AM and FM detection, analog multiplier ICs.

## UNIT IV

12 Periods

### Analog to Digital and Digital to Analog Converters :

Digital to Analog converters - Binary weighed and R-2R Ladder types - Analog to digital converters - Continuous - Counter ramp, successive approximation, single, dual slope and parallel types

## UNIT V

12 Periods

Combinational Logic ICs - Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs, Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers

**Sequential Logic ICs:** Familiarity with commonly available 74XX & CMOS 40XX Series ICs - All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.

### Text Books:

1. Millman J. and Halkias C.C., " Integrated Electronics ", McGraw Hill, 2001
2. Roy Choudhury and Shail Jain, "Linear Integrated Circuits", New Age Science, 2010
3. John F Wakerly, "Digital Design-Principles and practices", 4<sup>th</sup> Ed., Pearson, 2008

### Reference Books:

1. Ramakant A. Gayakwad, "OP - AMP and Linear IC's ", Prentice Hall, 2002.
2. Sonde, B.S, "Introduction to System Design using Integrated Circuits", Second Edition, Wiley Eastern Limited, New Delhi, 1994
3. Michael Jacob J., "Applications and Design with Analog Integrated Circuits ", Prentice Hall of India, 1996.
4. Robert F Coughlin and Fedrick F Driscoll —Operational amplifiers and linear Integrated Circuits, 6th edition, Prentice Hall of India, New Delhi, 2006.
5. Richard J. Higgins "Electronics with Digital and Analog Integrated Circuits, Prentice Hall of India, New Delhi, 1983.
6. George Clayton and. Steve Winder - Operational Amplifiers, 5th edition. Elsevier, 2003
7. Sergio Franco - Design with operational amplifiers and analog integrated circuits, 3rd ed., McGraw-Hill Education, 2001

<b>ANTENNAS AND WAVE PROPAGATION</b>	
<b>ECE 316</b>	<b>Credits : 3</b>
Instruction : 3 periods & 1 Tutorial/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks: 60

**Prerequisites:** EMFT

**Course Objective:**

- Students will be introduced to antennas – their basic radiation mechanism, their principle of operations, design, analysis and their applications. It provides a platform to introduce concepts of wave propagation over ground, through troposphere and ionosphere, propagation effects in radio frequencies.

**Course Outcome:**

By the end of the course, the students will be able to:

1. Understand the basic concepts of radiation and reception mechanism & analyze the basic antenna parameters.
2. Analyze, synthesize and Design antenna arrays.
3. Develop the basic skills necessary to design and analyze a wide variety of practical antennas which operate at various frequencies.
4. Perform measurements of various antenna parameters.
5. Identify characteristics of radio wave propagation.

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO</b>	1	2	2	2	-	-	-	-	-	-	-	-	1	1	2	2
	2	3	3	2	-	-	-	-	-	-	-	-	2	3	3	2
	3	3	3	3	-	-	-	-	-	-	-	-	2	3	3	1
	4	1	2	2	-	-	-	-	-	-	-	-	1	1		
	5	1	2	2	-	-	-	-	-	-	-	-	1	1	1	3

**SYLLABUS**

**UNIT I**

**12 Periods**

**Radiation Mechanism and Antennas Basics**

Antenna definition, Functions of antennas , Network theorems, Properties of antennas, Antenna parameters. Radiation mechanism, Radiation fields of alternating current element, Radiated power and radiation resistance; Radiation, induction and electrostatic fields. Different current distributions in linear antennas, Radiation from half-wave dipole, quarter wave mono pole and their characteristics. Radiation patterns of alternating current element, dipoles and monopoles.

## **UNIT II**

**12 Periods**

### **Types of Antennas & Applications**

Introduction, Isotropic radiators, Directional antennas, omnidirectional antennas, Resonant antennas, Non-resonant antennas, LF, HF, VHF and UHF antennas. Folded dipole, V-Antennas, Inverted V-antennas, Rhombic antenna, Yagi-Uda antenna, Log-periodic antennas, Loop antenna, Helical antennas. Microwave Antennas: Rod reflector, Plane reflector, Corner reflector, Parabolic reflector, Types of parabolic reflectors, Feed systems for parabolic reflectors, Shaped beam antennas, Horn antennas, Corrugated horns, Slot antennas, Slots in the walls of rectangular waveguides, Babinet's principle, Lens antennas, Microstrip antenna and feeding techniques.

## **UNIT III**

**12 Periods**

### **Analysis & Synthesis of Linear Arrays**

Two-element uniform array, Uniform linear arrays, Field strength of a uniform linear array, First sidelobe ratio (SLR), Broadside and End-fire arrays, Patterns of array of non-isotropic radiators, Multiplication of patterns, Generalized expression for principle of pattern multiplication, Radiation pattern characteristics, Binomial arrays. Transmission loss between transmitting and receiving antennas - Friis formula, Antenna temperature and signal-to-noise ratio. Schelkunoff Synthesis methods, Fourier transform method, Linear array design by Woodward-lawson method, Dolph-chebychev method (Tschebyscheff distribution), Taylor method, Laplace transform method, Standard amplitude distributions. Introduction to planar & phased arrays.

## **UNIT IV**

**12 Periods**

### **Antenna Measurements**

Introduction, Drawbacks of measurements of antenna parameters, Methods to overcome drawbacks in measurements, Methods for accurate measurements, TEM cell, GTEM cell, Anechoic chamber, Measurement ranges, Indoor and outdoor ranges, Antenna impedance measurements, Measurement of radiation resistance, Gain measurements, Measurement of antenna bandwidth, Directivity measurement, Measurement of sidelobe ratio, Measurement of radiation efficiency, Measurement of antenna aperture efficiency, Measurement of polarization of antenna, Phase measurement.

## **UNIT V**

**12 Periods**

### **Wave Propagations**

Propagation characteristics of EM Waves, Factors involved in the propagation of radio waves, Ground wave propagation, Ground wave field strength by Maxwell's equations, Reflection of radio waves by the surface of the earth, Roughness of earth, Reflection factors of earth, Wave tilt of the ground wave, Tropospheric wave propagation, Atmospheric effects in space wave propagation, Duct propagation, Radio horizon, Troposcatter, Fading of EM waves in Troposphere, Line of sight (LOS), Ionospheric propagation, Characteristics of



ionosphere, Refractive index of ionosphere, Phase and group velocities, Mechanism of Ionospheric propagation, reflection and refraction, Characteristic parameters of Ionospheric propagation, Sky wave field strength, Fading and diversity techniques, Faraday's rotation, Effect of earth's magnetic field.

**Text Book**

1. C.A. Balanis, *Antenna Theory*, John Wiley & Sons, NY, 3<sup>rd</sup> edn., 2005.
2. G.S.N. Raju, *Antennas and Wave Propagation*, Pearson Education (Singapore) Pvt., Ltd., New Delhi, 2007.

**Reference Books:**

1. E. C. Jordan and K. G. Balmain, *EM Waves and Radiation Systems*, PHI – N. Delhi, 2<sup>nd</sup> Edn., 2000.
2. J.D. Kraus, *Antennas*, McGraw Hill, NY, 2<sup>nd</sup> Edn., 1988.

<b>MICROPROCESSORS &amp; APPLICATIONS LABORATORY</b>	
<b>ECE 317</b>	<b>Credits:2</b>
Instruction: 3 Lab periods	Sessional Marks:50
End Exam: 3 Hours	End Exam Marks:50

**Prerequisites:**

Microprocessors and Applications

**Course Objectives:**

- To program both 8085 and 8086 to meet the requirements of the user.
- To interface various peripherals
- To handle interrupts
- To design a microcomputer to meet the requirement of the user

**Course Outcomes:**

By the end of the course, the student will be able to:	
1.	Program 8085 & 8086 microprocessor to meet the requirements of the user.
2.	Interface peripherals like switches, LEDs, stepper motor, Traffic lights controller, etc.,
3.	Handle interrupts
4.	Design a microcomputer to meet the requirement of the user

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

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

## List of Experiments

### Experiments using 8085 Microprocessor trainer:

- 1) Write a program, which loads Registers, A, B, C, and D with the same constant. Try to optimize the program in such a way that the smallest numbers of program bytes are used. Test the program in single step mode. After each step, test the register of interest.  
  
Assume that 4 bytes of data are stored at consecutive locations of the data-memory starting at (x). Write a program, which loads Register E with (x), D with (x+1), C with (x+2) and A with (x+3).
  - a. Assume that 1 byte of data is stored at data memory location (x). Write a program which tests bit 5 of (X). Write 'FF' in (x+1), if bit 5=0 and write '00' at the same location if bit 5=1.
  - b. Write a program which tests the zero-condition of a data byte specified at data memory location (x). If it is zero '00' should be stored at (x+1) location, if non-zero 'FF' should be stored at the same location.
  - c. A binary number is stored at data-memory location (x) Compute the number of its logical 1's and store the result at y.
  - d. Comment on the instructions used in the above three programs and write about the effect of flags with the instructions used.
- 2) Two unsigned binary numbers are stored at data-memory locations (x) and (x+1).
  - a. Compute the sum of the two numbers and store the result at y, ignoring the possible overflow.
  - b. Write a program to compute (x+1) - (x). The magnitude of the result should be stored at (y) and the sign (00 if positive, 01 if negative) at (y+1). Understand the 2's complement Arithmetic.
- 3) N binary numbers stored at consecutive data memory locations starting at (x) where N is defined at data memory location 'NUMBER'.
  - a. Find the largest number and display it in the data field and arrange them in ascending order.
  - b. Find the smallest number and display it in the data field and arrange them in descending order.
- 4) Two 8-bit binary numbers are stored at data memory locations (x) and (x+1) compute product of the two numbers using, a). Successive addition method. b). Shifting and adding method store the result in (y) and (y+1).

### Experiments using 8086 Microprocessor trainer/TASM/MASM:

- 5) Addition of a) 16-bit numbers b) 32-bit numbers
- 6) Factorial of a number, Fibonacci series
- 7) Hexadecimal and decimal counters
- 8) Sorting of numbers

Interfacing experiments with 8086 Microprocessor trainer:

- 9) Interfacing of D/A converter
- 10) Interfacing of A/D converter
- 11) 8255 Study Card – Interfacing I/O Devices
- 12) Interfacing of stepper motor
- 13) Interfacing of 7-segment display/Traffic light controller

**Note:** A student has to perform a minimum of 10 experiments.

**Text Books:**

1. Ramesh S. Gaonkar, *Architecture Programming and Applications*, 3<sup>rd</sup> Edition, Penram International Pvt. Ltd.
2. D. V. Hall, *Microprocessors and Interfacing*, Revised 2<sup>nd</sup> edition 2006, TMH,.
3. A.K. Ray and K.M. Bhurchand, *Advanced Microprocessors and Peripherals*, 2<sup>nd</sup> edition, 2006, TMH.

<b>INTEGRATED CIRCUITS LABORATORY</b>	
<b>ECE318</b>	<b>Credits:2</b>
Instruction: 3 Lab periods	Sessional Marks:50
End Exam: 3 Hours	End Exam Marks:50

**Prerequisites:**

Digital Electronics, Integrated Circuits and Applications

**Course Objectives:**

- To understand the linear and non-linear applications of operational amplifiers(741)
- To familiarize with theory and applications of 555 timers.
- To design and construct waveform generation circuits using Op-Amp
- To design multivibrator circuits using IC555
- To design and analyze combinational and sequential logic circuits

**Course Outcomes:**

By the end of the course, the student will be able to	
1.	Design the circuits using op-amps for various applications like adder, subtractor, integrator, differentiator and Schmitt trigger
2.	Design active filters for the given specifications and obtain their frequency response characteristics.
3.	Design and analyze multivibrator circuits using op-amp and 555Timer
4.	Design and analyze various combinational circuits like multiplexers, and de-multiplexers, binary adder, subtractor, etc
5.	Design and analyze various sequential circuits like flip-flops, counters etc

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

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

**List of Experiments:**

- 1) Application of Operational Amplifiers
- 2) Design and testing of Active LPF & HPF using op-amp
- 3) Design of Schmitt Trigger using op-amp
- 4) Design of Astable multivibrator using a) op amp b) IC 555
- 5) Line and load regulation of three terminal IC Voltage Regulator.
- 6) Operation of R-2R ladder DAC and flash type ADC
- 7) Simulation of any 4 Experiments 1, 2, 3, 4, 5 and 6 using Multisim software
- 8) Minimization and Realization of a given Function using Basic Gates (AND, OR, NOR, NAND, EXOR).
- 9) Design and implementation of code converters using logic gates (i) BCD to excess-3 code (ii) Gray to binary
- 10) Design of binary adder and subtractor
- 11) Design and implementation of Multiplexer and De-multiplexer using logic gates.
- 12) Implementation and Testing of RS Latch and Flip-flops – D, JK and T.
- 13) Design of synchronous counters
- 14) Design of asynchronous counters

**Note:** A student has to perform a minimum of 12 experiments.

**Text Books:**

1. Millman J. and Halkias C.C., " Integrated Electronics ", McGraw Hill, 2001
2. Roy Choudhury and Shail Jain, "Linear Integrated Circuits", New Age Science, 2010
3. John F Wakerly, "Digital Design-Principles and practices", 4<sup>th</sup> Ed., Pearson, 2008
4. Ramakant A. Gayakwad, "OP - AMP and Linear IC's ", Prentice Hall, 2002.

<b>QUANTITATIVE APTITUDE - I</b>	
<b>ECE 319</b>	<b>Credits: 2</b>
Instructions: 4 Periods/week	Sessional Marks: 100

**Prerequisites:** Nil

**Course Objectives:**

Quantitative Aptitude -I

- To prepare the students on various principles related to numerical computations.
- To explain concepts related to numerical estimation.
- To illustrate and explain the fundamentals related to geometry and mensuration.

Verbal Aptitude-I:

- To categorize and explain principles of grammar in order to minimize errors in English.
- To list and quote high frequency words by giving relevant examples.
- To categorize, apply and use data as per the requirement.
- To construct and make use of idioms, phrasal verbs and other expressions used in professional contexts.
- To critically evaluate reading material for better comprehension

**Course Outcomes:**

Quantitative Aptitude –I

By the end of the course student will be able to :	
1.	Solve problems related to numerical computations in company specific and other competitive tests
2.	Recall and use the concepts to solve problems numerical estimation with respect to company specific and competitive tests.
3.	Apply basic principles related to geometry and mensuration & solve questions in company specific and competitive tests.

Verbal Aptitude-I:

By the end of the course student will be able to :	
1.	Detect grammatical errors in the text/sentences and rectify them while answering their competitive company specific tests and frame grammatically correct sentences while writing.
2.	Answer questions on synonyms, antonyms, hyponyms, hypernyms and other vocabulary



	based exercises while attempting company specific and other competitive tests.
3.	Use their logical thinking ability and solve questions related to reasoning based exercises.
4.	Choose the appropriate word/s/phrases suitable to the given context in order to make the sentence/paragraph coherent
5.	Analyze the given data/text and find out the correct responses to the questions asked based on the reading exercises; identify relationships or patterns within groups of words or sentences.

## SYLLABUS

### Section –A (Quantitative Aptitude –I)

#### UNIT I

**6 Periods**

#### Numerical computation:

Applications based on Numbers, Chain Rule, Ratio Proportion

#### UNIT II

**6 Periods**

#### Numerical estimation - I

Applications Based on Time and work, Time and Distance

#### UNIT III

**4 Periods**

#### Numerical estimation – II

Applications based on Percentages, Profit Loss and Discount, Simple interest and Compound Interest Partnerships, Shares and dividends

#### UNIT IV

**4 Periods**

#### Data interpretation

Data interpretation related to Averages, Mixtures and allegations, Bar charts, Pie charts, Venn diagrams

#### UNIT V

**4 Periods**

Application to industry in Geometry and Mensuration

### **Books for practice**

1. Quantitative aptitude by RS Agarwal, S Chand Publications
2. Verbal and non verbal Reasoning by RS Agarwal from S Chand publications

### **References**

1. Barron's by Sharon Welner Green and Ira K Wolf (Galgotia Publications pvt. Ltd.)
2. Quantitative Aptitude by U Mohan Rao Scitech publications
3. Quantitative Aptitude by Arun Sharma McGrawhill publications
4. Quantitative Aptitude by Ananta Asisha Arihant publications
5. Quantitative Aptitude by Abhijit Guha
6. Quantitative Aptitude by Pearson publications
7. Material from 'IMS, Career Launcher and Time' institutes for competitive exams.
8. Elementary and Higher algebra by HS Hall and SR knight.

### **Websites:**

[www.m4maths.com](http://www.m4maths.com)

[www.Indiabix.com](http://www.Indiabix.com)

800score

Official GRE site

Official GMAT site

## **Section –B (Verbal Aptitude –I)**

### **UNIT I**

**7 Periods**

#### **Grammar:**

Parts of speech( with emphasis on appropriate prepositions, co-relative conjunctions, pronouns-number and person, relative pronouns), articles(nuances while using definite and indefinite articles), tenses(with emphasis on appropriate usage according to the situation), subject – verb agreement ( to differentiate between number and person) , clauses (use of the appropriate clause , conditional clauses), phrases(use of the phrases, phrasal verbs), degrees of comparison(comparing apples and oranges, comparison and number), modifiers(misplaced and dangling modifiers, absence of modifiers), determiners, parallelism in structure(symmetry in two part sentences), word order, subjunctive mood, redundancy, special types of sentences, miscellaneous types, identifying errors in a given sentence, correcting errors in sentences.

### **UNIT II**

**4 Periods**

#### **Vocabulary:**

Synonyms and synonym variants (with emphasis on high frequency words), antonyms and antonym variants (with emphasis on high frequency words), homonyms, hyponyms, hypernyms and General idioms.

### **UNIT III**

**5 Periods**

#### **Reasoning:**

Critical reasoning (understanding the terminology used in CR- premise, assumption, inference, conclusion), Sequencing of sentences (to form a coherent paragraph, to construct a meaningful and grammatically correct sentence using the jumbled text), to use logical reasoning and eliminate the unrelated word from a group.

### **UNIT IV**

**4 Periods**

#### **Usage:**

Sentence completion (with emphasis on signpost words and structure of a sentence), contextual meanings (to use the appropriate word according to the situation), supplying a suitable beginning/ending/middle sentence to make the paragraph coherent, idiomatic

language (with emphasis on business communication), punctuation depending on the meaning of the sentence, run on errors, sentence fragments, coma splices.

## **UNIT V**

**4 Periods**

### **Reading Comprehension:**

Types of passages (to understand the nature of the passage), types of questions (with emphasis on inferential and analytical questions), style and tone ( to comprehend the author's intention of writing a passage), strategies for quick and active reading(importance given to skimming, scanning), summarizing ,reading between the lines, reading beyond the lines, techniques for answering questions related to vocabulary (with emphasis on the context), supplying suitable titles to the passage, identifying the theme and central idea of the given passages.

### **Books for Practice**

1. Practical English Grammar A. J. Thomson, A. V. Martinet by Oxford University press
2. Remedial English Grammar for Foreign Students by FT wood published by Macmillan Publishers
3. Objective English-Edgar Torpe, Showick Thorpe-Pearson Education
4. Cambridge and Oxford Dictionaries

### **Reference Books and websites:**

1. Barron's by Sharon Welner Green and Ira K Wolf (Galgotia Publications Pvt.Ltd.)
2. Websites: Indiabix, 800 score, official CAT, GRE and GMAT sites
3. Material from 'IMS, Career Launcher and Time' institutes for competitive exams.
4. Collins Cobuild English Grammar by Goyal Publishers
5. Word Power Made Easy by Norman Lewis-Goyal Publishers

<b>MICROWAVE &amp; RADAR ENGINEERING</b>	
<b>ECE 321</b>	<b>Credits : 3</b>
Instruction : 3 periods & 1 Tutorial/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks: 60

**Prerequisites:** Nil

**Course Objectives:**

- To Understand the theoretical principal underlying in the operation of microwave devices and circuits
- To understand the principles behind the measurement of various microwave parameters and required bench setup
- To understand different microwave sources and amplifiers
- To understand the basics of the Radar Engineering

**Course Outcomes:**

At the end of the course the student will be able to
1. Understand and use the microwave components in design of different microwave setup
2. Analyze and design microwave circuits using S- Parameters
3. Understand the principles involved in generating /amplifying microwave signals and different devices there of.
4. Carry out microwave measurements for the designed gadgets.
5. Understand the basic of Radar Engineering that includes range equation radar block diagram and different types of radars

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

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

**SYLLABUS**

**UNIT I****12 periods****Microwave Components:**

Introduction to Microwaves, advantages and applications; Coaxial Line Components; Theory of Guided Waves- Waves in between parallel plates parallel plate, Wave Guide – Derivation of Field Equations, Modes of Propagations, and their parameters, Types of Wave-guides; Excitation methods for different TE and TM modes, Evanescent mode, Wave impedance in waveguide; Attenuators; Ferrite Devices - Isolators, Circulators; Cavity Resonators, Re-entrant Cavities, Wave-meters, Waveguide Iris, posts, screws, Microwave Filters, Detectors.

**UNIT II****12 periods****Microwave Circuits:**

Scattering Matrix and its Properties. Scattering Matrix of E Plane Tee, H plane Tee and Magic Tee, Directional coupler & its types, Scattering Matrix of Circulator, Isolator, Applications.

**UNIT III****12 periods****Microwave Signal Generators and Amplifiers:**

Resonant Cavity Devices, Reflex Klystron, Two – Cavity Klystron, Multi – Cavity Klystron, Slow – Wave Devices, TWT, Crossed Field Devices, Magnetrons, Semiconductor Devices, Microwave BJTs, FETs, Tunnel Diodes, Gunn Diode, IMPATT, TRAPATT Diodes, Crystal Diode.

**UNIT IV****12 periods****Microwave Measurements:**

Introduction to Microwave bench setup, Measurement of Frequency, Wavelength, VSWR, Unknown impedance, attenuation. Coupling, Isolation and Directivity measurements of Directional coupler. Microwave power measurement, dielectric constant measurement, .

**UNIT V****12 periods****Radar Engineering :**

Radar Range Equation, Radar Block Diagram and Operation, Prediction of Range, Minimum Detectable Signal, Receiver Noise, Radar Cross-section, Transmitter Power, PRF and Range Ambiguities, Radar Antenna Parameters, System Losses and Propagation Effects. Types of radars- MTI & Pulse Doppler Radar, Tracking Radar –Principles; Synthetic Aperture Radar, Phased Array Radar Semi Active and Active Array Radars – Introduction.

**Text Books:**

1. Simon Kingsley and Shaun Quegan, “*Understanding Radar Systems*”, SciTech Publishing, 1999.
2. G.S.N. Raju, “*Microwave Engineering*”, 1<sup>st</sup> ed., IK International Publishers,
3. G. Sasibhushan Rao, “*Microwave & Radar Engineering*”, 1<sup>st</sup> ed., Pearson Education, 2014.

**Reference Books:**

1. G.S.N Raju, “*Radar Engineering and Fundamentals of Navigational Aids*”, 1<sup>st</sup> ed. IK International Publishers, 2008
2. R. R. Collin, “*Foundations for Microwave Engineering*”, 2<sup>nd</sup> ed., McGraw Hill. 2015.
3. M.I. Skolnik, “*Introduction to Radar Systems*”, McGraw Hill, 2007.

<b>DIGITAL SIGNAL PROCESSING</b>	
<b>ECE 322</b>	<b>Credits : 4</b>
Instruction : 4 periods & 1 Tutorial/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks: 60

**Prerequisites:** ECE 214

**Course Objectives:**

- Use the DFT and FFTs which are popular frequency transformation techniques in Digital Signal Processing.
- Learn about the various design procedures in IIR and FIR Digital filter techniques.
- Learn about DSP processors which can be used for practical applications.
- Explore applications of digital signal processing methods.

**Course Outcomes:**

By the end of the course, the student will be able to:
1. Design new digital signal processing systems.
2. Design and realize FIR, IIR filters.
3. Design of interpolator and decimator for sampling rate conversions.
4. Program a DSP processor to filter signals.

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

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

**SYLLABUS**

**UNIT I**

**12 Periods**

**Introduction to Digital Signal Processing & Applications of Z-Transforms :**  
 Classification of signal & systems – linear shift invariant systems – stability and causality –

Sampling of continuous signals, signal reconstruction – linear constant coefficient difference equations – frequency domain representation of discrete time signals and systems.

Review of Z-Transforms, Applications of Z – Transforms, Solution of difference equations – block diagram representation of linear constant coefficient difference equations- basic structure of IIR systems – basic structures of FIR systems – system functions - Finite Word Length Effects.

## **UNIT II**

**12 Periods**

**Discrete Fourier Series & Fourier Transforms and FFTs:** Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear convolution of sequences using DFT, Computation of DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

## **UNIT III**

**16 Periods**

**IIR & FIR Digital Filter Design Techniques:** Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters, Frequency transformations, Bilinear Transformations method, Impulse and Step invariance method. Design Examples: Analog-Digital transformations, Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques, Frequency Sampling technique, Comparison of IIR & FIR filters.

## **UNIT IV**

**08 Periods**

**Multirate Digital Signal Processing:** Decimation, interpolation, sampling rate conversion, Implementation of sampling rate conversion. Digital Filter Banks, sub band coding of speech signals.

## **UNIT V**

**12 Periods**

**Introduction to DSP Processors & DSP Applications:** Introduction to programmable DSPs - Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSPs, Multiple Access Memory - Multiport memory - VLSI architecture – Pipelining - Special addressing modes - On-Chip Peripherals - Architecture of TMS 320C5X - Introduction, Bus Structure - Central Arithmetic Logic Unit - Auxiliary Register - Index Register - Block Move Address Register - Parallel Logic Unit - Memory mapped registers - program controller - Some flags in the status registers - On-chip registers, On-chip peripherals.



DSP Applications: Application of DSP in Speech Processing – DSP applications in Bio-Medical Engineering.

**Text Books:**

1. John G. Proakis, Dimitris G. Manolakis, *Digital Signal Processing, Principles, Algorithms, and Applications*: Pearson Education / PHI, 2007.
2. K Raja Rajeswari, *Digital Signal Processing* I.K. International Publishing House.
3. A.V. Oppenheim and R.W. Schaffer, *Discrete Time Signal Processing*, PHI.
4. B. Venkataramani, M. Bhaskar, *Digital Signal Processors – Architecture, Programming and Applications*, TATA McGraw Hill, 2002.

**Reference Books:**

1. Alan V. Oppenheim and Ronald W. Schaffer, *Digital Signal Processing*, PHI.
2. Sanjit K. Mitra, *Digital Signal Processing “A – Computer Based Approach”*, Tata McGraw Hill.
3. C. Britton Rorabaugh, *DSP Primer* Tata McGraw Hill, 2005.
4. Robert J. Schilling, Sandra L. Harris CL *Fundamentals of Digital Signal Processing using Matlab* Engineering;

<b>MICROCONTROLLERS &amp; EMBEDDED SYSTEMS</b>	
<b>ECE 323</b>	<b>Credits:3</b>
Instruction: 3 Periods & 1 Tut/week	Sessional Marks:40
End Exam: 3 Hours	End Exam Marks:60

**Prerequisites:**

Digital Electronics, Computer Architecture & Organization, Microprocessors and Interfacing

**Course Objectives:**

- In the current World, all types of Electronic Gadgets are becoming Smart / Intelligent i.e. each of them do possess some sort of inherent processing and storage capabilities. Several types of Microcontrollers embedded into these so called Smart Devices are providing this Smartness. This course aims to introduce the architecture, programming, interfacing and applications of Microcontroller Intel 8051.
- To develop an understanding of the technologies behind the embedded systems and learn about hardware/software tradeoffs involved in the design.
- To acquire knowledge about various advanced embedded architectures and protocols.

**Course Outcomes:**

By the end of the course, the student will be able to:	
1.	Acquire knowledge of architecture, hardware and operation of microcontroller - 8051
2.	Understand instruction set of 8051 and apply them to write assembly language programs
3.	Interface 8051 with various peripherals
4.	Understand and apply the hardware/software tradeoffs involved in the design of embedded systems.
5.	Acquire knowledge of advanced embedded architectures and protocols

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

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

**SYLLABUS**

**UNIT I**

**12 Periods**

**8051 Microcontroller:**

Introduction to Microcontrollers, comparing Microprocessors and Microcontrollers, Architecture of 8051 Micro controller, Register organization of 8051, SFRs, Addressing modes of 8051.

Pin configuration of 8051, Input/Output Ports and Circuits, External Memory, Counters/Timers and modes of Timers, Serial data Input/Output, Interrupts.

**UNIT II**

**12 Periods**

**Assembly Language Programming of 8051**

Programming the 8051. Data Transfer and Logical Instructions. Arithmetic Operations, Decimal Arithmetic. Jump and Call Instructions.

**UNIT III**

**16 Periods**

**Interfacing 8051**

Interfacing with Keyboards, Displays, D/A and A/D converters, Multiple Interrupts, Serial Data Communication.

## UNIT IV

10 Periods

### Introduction To Embedded Systems

Embedded systems overview, design challenge, Processor technology, IC technology, Design Technology, Trade-offs.

## UNIT V

12 Periods

### Introduction to advanced architectures

ARM and SHARC, Processor and memory organization and Instruction level parallelism;

Networked embedded systems: Bus protocols, I2C bus and CAN bus; Internet-Enabled Systems, Design Example-Elevator Controller.

#### Text Books:

1. Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D Mc Kinlay , *The 8051 Microcontroller and Embedded Systems Using Assembly and C*, 2nd Edition, Pearson Education, 2008.
2. Frank Vahid, Tony Givargis, *Embedded System Design*, 2nd Edition, John Wiley.
3. Rajeshwar Singh, Dr.D.K.Singh, *Embedded System Design*, 1<sup>st</sup> Ed., Dhanpat Rai, 2010

#### Reference Books:

1. Kenneth. J. Ayala, Dhananjay V. Gadre, *The 8051 Microcontroller & Embedded Systems Using Assembly and C*, 1st edition, Cengage learning, 2010
2. David E. Simon, *An Embedded Software Primer*, Pearson Education
3. Satish Shah, *8051 Microcontrollers: MCS 51 Family and Its Variants*, 1/e, Oxford University Press, 2010
4. B. Kanta Rao, *Embedded Systems*, 1<sup>st</sup> Ed., PHI, 2011
5. Wayne Wolf, *Computers as Components-principles of Embedded computer system design*, Elsevier

<b>ANALOG IC DESIGN</b>	
<b>ECE 324(a)</b>	<b>Credits : 3</b>
Instruction : 3 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

**Prerequisites:**

Network Analysis and Synthesis, Electronic Circuits Analysis-I, Electronic Circuits Analysis-II

**Course Objective:**

- To lay good foundation on the design and analysis of analog integrated circuits.

**Course Outcomes:**

By the end of the course, the student will be able to:
1. Understand the basic MOS device physics and models
2. Analyze and design single stage amplifiers and differential amplifiers
3. Analyze and design current sources/sinks/mirrors
4. Analyze and design basic operational amplifiers

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	<b>1</b>	3	2	1	-	-	-	-	-	-	-	-	2	3	-	1
	<b>2</b>	3	2	2	-	-	-	-	-	-	-	-	1	3	-	1
	<b>3</b>	3	2	2	-	-	-	-	-	-	-	-	1	3	-	1
	<b>4</b>	3	2	1	-	-	-	-	-	-	-	-	1	3	-	1
	<b>5</b>	3	2	2	-	-	-	-	-	-	-	-	2	3	-	1

## SYLLABUS

### UNIT-I

12 Periods

#### Basic MOS Device Physics:

MOSFET as a switch, MOSFET structure and symbols, Threshold voltage, Derivation of I-V characteristics, second order effects.

### UNIT-II

12 Periods

#### Device Modeling:

DC Models, Small signal models, use of device models in circuit analysis, DC MOSFET model, and small signal MOSFET model, High frequency MOSFET Model, Measurement of MOSFET Model parameters.

### UNIT-III

12 Periods

#### Single stage amplifiers:

Basic concepts, CS stage with resistive load, CS stage with diode connected load, CS stage with Current-Source load, CS stage with Triode load, CS stage with Source degeneration, Source follower, Common gate stage, Cascode stage

### UNIT-IV

12 Periods

#### Differential amplifiers:

Single ended and differential operation, qualitative and quantitative analysis of Basic differential pair, common mode response, differential pair with MOS Loads

**Passive and Active current mirrors:** Basic current mirrors, Cascode current mirrors, Active current mirrors.

## UNIT-V

12 Periods

### Operational amplifiers:

Performance parameters, one stage op-amps, two stage op-amps, gain boosting, common mode feedback, input range limitations, slew rate, power supply rejection.

### Text books:

1. Behzad Razavi , *Design of Analog CMOS Integrated Circuits*, Tata McGraw-Hill, 1st edition, 2002.
2. Randall Geiger, Phillip Allen, Noel Strader, *VLSI Design Techniques for Analog and Digital Circuits*, Tata McGraw-Hill, 1st edition, 2010.

### References:

1. Douglas R. Holberg, P. E. Allen Phillip E. Allen, *CMOS Analog Circuit Design*, 2nd edition, 2002

<b>ELECTROMAGNETIC INTERFERENCE / COMPATABILITY</b>	
<b>ECE 324(b)</b>	<b>Credits : 3</b>
Instruction : 3 periods & 1 Tutorial/Week	Sectional Marks : 40
End Exam : 3 Hours	End Exam Marks: 60

**Prerequisites:** Nil

**Course Objectives:**

- To understand and apply the basics of EMI & EMC including the emission and susceptibility
- To understand the problem in interference and compatibility and model the same
- To understand the concepts of hardening of electronic systems
- To explore the EMC methodology environment and measurements and standards.

**Course Outcomes :**

By the end of the course, students will be able to :
1. Understand the concept of EMI / EMC, related to product design & development.
2. Analyze the different EM coupling principles and its impact on performance of electronic system.
3. Ensure that a designed system conforms itself to certain standard through a thorough understanding of various standards in different countries.
4. Have broad knowledge of various EM radiation measurement techniques.
5. Model a given electromagnetic environment/system so as to comply with the standards.

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

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

**SYLLABUS**

**UNIT I**

**12 Periods**

**Introduction to overview of EMI/EMC/ESD/EMP:** EM environment, Historical Notes, Problems of EMI, Frequency Conservation, Assignment & spectrum, practical experiences, Occurrence of EMI, Concepts of EMI/EMC-definitions, Sources of noise, Natural and



Nuclear Sources of EMI, Conducted and Radiated Emissions and Susceptibility. Introduction - EMI Testing and Compliance Tests, ESD, EMP.

## **UNIT II**

**12 Periods**

### **Elimination/Reduction Methodologies:**

Grounding Techniques, Shielding Techniques, Electrical Bonding Techniques, Cabling Techniques, Power Supply Filters, Power Supplies, Connectors and Components/Accessories.

## **UNIT III**

**12 Periods**

### **EMC Regulation/ Standards:**

Introduction to different commercial and defense Standards like FCC, CISPR/IEC, VDE, IEEE/ ANSI, MIL-STD

## **UNIT IV**

**12 Periods**

### **EMI/EMC Measurement Technologies:**

Introduction to various instruments used in the measurements and their characteristics, Radiated Interference Measurements, Conducted Interference Measurements, Pitfalls in EMI Measurements, Measurements of pulsed EMI, Introduction of Measurement Environment – OATS, Anechoic Chamber, TEM, GTEM cell. Software in EMI/EMC Measurements, Different EMI Test Instruments and their comparisons.

## **UNIT V**

**12 Periods**

### **EMI/EMC Modeling:**

Modeling of filter for suppression of EMI in the design, choice of various electronic components, Pulse Interference Immunity, EMC computer modeling and Simulation, Signal Integrity EMC design, Guidelines, Probabilistic

### **Text Book**

1. IMPACT, *EMI/EMC for Engineering Colleges*, RSTE ,1997.
2. Kodali, V.P., “*Engineering EMC- Principles, Measurements, Technologies and Computer Models*”, 2<sup>nd</sup> Ed., IEEE Press, NY, 2000.

### **Reference Books:**

1. Paul, R.C, “*Introduction to EMC*”, 2<sup>nd</sup> Ed., John Wiley & Sons Inc., 2006.

<b>ELECTRONIC MEASUREMENTS AND INSTRUMENTATION</b>	
<b>ECE 324(c)</b>	<b>CREDITS: 3</b>
Instruction: 3 Periods & 1 Tutorial/Week	Sessional Marks: 40
End Exam : 3 Hours	End Exam Marks: 60

**Prerequisites:** Nil

**Course Objective:**

- To learn the different terms used for characterizing the performance of an instrument/ measurement system and to identify the various types of errors in measuring instruments
- To study about the functioning of different meters associated with measurements of signal characteristics
- To introduce the basic concepts related to the operation of electronic measuring instruments
- To study in detail about different bridges employed for electronic measurements
- To acquire knowledge in different types of transducers with their operation

**Course Outcomes:**

At the end of the course, the student will be able to:	
1.	Measure various parameters with accuracy, precision and resolution and understand the operation of PMMC and EMMC with their applications
2.	Understand the principle of operation, working of different electronic instruments
3.	Apply the knowledge of cathode ray oscilloscopes and understand the functioning, specification, applications of signal analyzing instruments
4.	Understand principles of measurement associated with different bridges
5.	Select appropriate passive or active transducers for measurement of physical phenomenon

### Mapping of course outcomes with POs and PSO's:

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

## SYLLABUS

### UNIT-I

[10 periods]

#### Basic measurement concepts:

Objectives of engineering measurement, performance characteristics-static and dynamic. Errors in measurement, sources of error, types of errors, statistical analysis, classification of standards, permanent magnet moving coil(PMMC) meter, DC ammeter, DC voltmeter, voltmeter sensitivity, series ohmmeter, shunt ohmmeter, Electrodynamicometer, problems

### UNIT-II

[15 periods]

#### Basic electronic instruments:

Instruments for measuring basic parameters-Amplified DC meter, AC voltmeter using rectifier, true RMS responding voltmeter, electronic multimeter, Q-meter, vector-impedance meter, vector voltmeter, rf and power measurement

**Digital instruments:** digital voltmeters and its different types-ramp, stair case ramp,integrating, continuous balance, successive approximation, resolution and sensitivity of digital meters, Digital multimeter, digital frequency meter, digital measurement of time, phase meter

### UN IT-III

[15 periods]

### **Oscilloscopes and signal analysis:**

Introduction, oscilloscope block diagram cathode ray tube, crt circuits, vertical deflection system, delay line, horizontal deflection system, oscilloscope probes and transducers, Measurement of amplitude, time, frequency and phase (Lissajous method). Principle of sampling oscilloscope, digital storage oscilloscope

**Signal analysis**-basic wave analyzer, heterodyne wave analyzer, harmonic distortion analyzer, spectrum analyzer

### **UNIT-IV Bridge measurements:**

**[10 periods]**

Wheatstone bridge, Kelvin bridge, digital read-out bridges, microprocessor controlled bridge  
AC bridges: Measurement of inductance-Maxwell's bridge, hay bridge, Anderson Bridge.  
Measurement of capacitance- Schering Bridge, measurement of frequency-Wien bridge, wagners earth connection

### **UNIT-V**

**[10 periods]**

#### **Transducers**

Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples, and Thermistors), Velocity, Acceleration, vibration, pH measurement signal conditioning circuits, data acquisition systems, telemetry systems, IEEE 488 standard bus

#### **Text Books:**

1. A.D.Helfrick and W.D.Cooper, "modern Electronic Instrumentation and Measurement Techniques", PHI, 5<sup>th</sup> edition, 2002
2. Electrical and Electronic Measurements and Instrumentation by A.K.Sawhney, 2002 edition

#### **Reference Books:**

1. H.S.Kalsi,"Electronic instrumentation", second edition, TMH, 2004.
2. Oliver and Cage,"electronic measurements and instrumentation, TMH

<b>TELECOMMUNICATION SWITCHING AND NETWORKS</b>	
<b>ECE 324(d)</b>	<b>CREDITS: 3</b>
Instruction: 3 Periods & 1 Tutorial/Week	Sessional Marks: 40
End Exam : 3 Hours	End Exam Marks: 60

**Prerequisites:**

Digital Electronics, Signals and Systems, Electronic Circuit Analysis.

**Course Objectives:**

- To understand the characteristics of various switching systems
- To introduce and classify various types of time division switching
- To introduce the field of traffic engineering
- To study the motivation and need for ISDN
- To outline the various layers involved in data transmission in networks

**Course Outcomes:**

By the end of the Course, the students will be able to:	
1.	Understand and describe the concepts of multiplexing and switching.
2.	Apply probability related concepts to resolve traffic and network related issues
3.	Analyze and solve problems in traffic engineering
4.	Recognize the significance of ISDN and outline its architecture
5.	Obtain an overview of end to end transmission in data networks

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

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

## **SYLLABUS**

### **UNIT-I**

**10 Periods**

#### **Telecommunication Switching Systems :**

Basics of Switching Systems, Principles of Cross Bar Switching. Electronic Space Division Switching: Stored Program Control, Centralized SPC, Distributed SPC, Two Stage Networks, Three Stage Networks.

### **UNIT-II**

**10 Periods**

#### **Time Division Switching :**

Basic Time Division Space Switching, Basic Time Division Time Switching, Time Multiplexed Space Switching, Time Multiplexed Time Switching, Combination Switching, Three Stage Combination Switching.

### **UNIT-III**

**20 Periods**

#### **Telephone Networks :**

Subscriber Loop Systems, Switching Hierarchy and Routing, Transmission Plan, Signaling Techniques: In Channel Signaling, Common Channel Signaling.

**Traffic Engineering :** Network Traffic Load And Parameters, Grade Of Service, Blocking Probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking Models and Loss Estimates, Delay Systems

### **UNIT-IV**

**10 Periods**

#### **Integrated Services Digital Network (ISDN) :**

Motivation For ISDN, Network & Protocol Architecture, Transmission Channels, User Network Interfaces, Numbering, Addressing, ISDN Standards, Broadband ISDN.

### **UNIT-V**

**15 Periods**

#### **Data Networks :**

Data transmission in PSTNs, Switching techniques for data transmission, Data communication architecture, Link-to-link layers, End-to-End layers, Local Area Networks, Metropolitan Area Networks, Data Network Standards, Protocol Stacks, Internetworking.

#### **Text Book:**

1. Thyagarajan Viswanath, "*Telecommunication Switching Systems and Networks*" PHI, 2000.

**Reference Books:**

1. J. Bellamy, "*Digital telephony*", 2nd edition, 2001, John Wiley.
2. B.A. Forouzan, "*Data Communication & Networking*", 3rd Edition, 2004, TMH.
3. J E Flood, "*Telecommunication switching, Traffic and Networks*", 2002, Pearson Education.

<b>DIGITAL COMMUNICATIONS</b>	
<b>ECE 325</b>	<b>CREDITS: 3</b>
Instruction: 3 Periods & 1 Tutorial/Week	Sessional Marks: 40
End Exam : 3 Hours	End Exam Marks: 60

**Prerequisites:**

Digital Electronics, Communication Systems, Electronic Circuit Analysis.

**Course Objectives:**

- To understand the basic building blocks of digital communication system
- To understand and analyze the signal flow in a digital communication system
- To analyze error performance of a digital communication system in presence of noise and other interferences
- To understand the concept of spread spectrum communication system
- To understand the fundamental concepts of information theory and error control coding.

**Course Outcomes:**

By the end of the Course, the student will be able to:	
1.	Learn the elements of digital communications systems, analyze the various methods of digital modulation and can acquire the knowledge of different M-Array modulation techniques
2.	Calculate probability of error for various digital modulation techniques to analyze the performance of DCS in the presence of noise.
3.	Analyze the performance of spread spectrum code acquisition and tracking circuits.
4.	Evaluate the amount of information, entropy and channel capacity.
5.	Use source coding techniques and channel coding techniques.

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CO</b>	1.	3	1	3									2	2	3	3
	2.	3	1	3									2	2	3	3
	3.	3	1	2									3	3	3	3
	4.	3	1	2									3	2	1	1
	5.	3	1	3									2	3	3	2



## SYLLABUS

### UNIT-I

**15 Periods**

#### **Analog to Digital Conversion and transmission:**

Analog to digital conversion- Pulse Code Modulation, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, Noise in Pulse-Code and Delta-Modulation Systems; Digital modulation techniques- Binary Amplitude-Shift Keying, Binary Phase-Shift Keying, Differential Phase-Shift Keying, Quadrature Phase-Shift Keying (QPSK), M-ary PSK, Quadrature Amplitude Shift Keying (QASK), Binary Frequency Shift-Keying, M-ary FSK.

### UNIT-II

**15 Periods**

#### **Data Reception:**

A Base-band Signal Receiver, Probability of Error, The Optimum Filter, White Noise: The Matched Filter, Probability of Error of the Matched Filter, Coherent Reception: Correlation, Phase-Shift Keying, Frequency-Shift Keying, Non-coherent Detection of FSK, Differential PSK, QPSK, Error Probability for QPSK, MSK, Comparison of Modulation Systems.

### UNIT-III

**10 Periods**

#### **Spread Spectrum Modulation:**

Direct Sequence (DS) Spread Spectrum, Use of Spread Spectrum with Code Division Multiple Access (CDMA), Ranging using DS Spread Spectrum, Frequency Hopping (FH) Spread Spectrum, Generation and Characteristics of PN Sequences, Acquisition (Coarse Synchronization) of a DS Signal, Tracking of a DS Signal.

### UNIT-IV

**10 Periods**

#### **Information theory and coding:**

Concept of amount of information and its properties, Entropy and its properties, Information rate, mutual information and its properties; Source coding: Shannon's theorem, Shannon-Fano coding, Huffman coding, channel capacity of a Gaussian noise channel, bandwidth-S/N trade off.

### UNIT-V

**15 Periods**

**Channel Coding:**

Linear

Block Codes-Introduction, Matrix description of Linear block codes, cyclic codes, Error detection and error correction capabilities of linear block codes, Hamming codes; Convolution Codes- encoding of convolution codes, Graphical approach: state, tree and trellis diagram.

**Text Books:**

1. H.Taub and D.Schilling, "*Principles of Communication Systems*"- TMH, 2003.
2. P.Ramakrishna rao, "*Digital Communication*" – Mc,Graw Hill editon, 2011.

**Reference Books**

1. Simon Haykin, "*Digital communications*"- John Wiley, 2005.
2. B. P. Lathi, "*Modern Digital and Analog Communication Systems*," (2nd Edition).
3. K.Sam shanmugam, "*Digital and Analog Communication Systems*" - John Wiley, 2005.

<b>COMMUNICATION SYSTEMS ENGINEERING LABORATORY</b>	
<b>ECE 326</b>	<b>CREDITS: 2</b>
Practicals: 3 Periods/Week	Sessional Marks: 50
End Exam : 3 Hours	End Exam Marks: 50

**Prerequisites:**

Communication Systems, Signals and Systems, Electronic Circuit Analysis.

**Course objective:**

- To realize practical Modulator and Demodulator circuit.
- To analyse Analog modulated signals in time and frequency domain.
- To design practical filter circuits for communication system.
- To analyse the sampling and multiplexing technique.
- To Design a practical pre-emphasis and de-emphasis circuit.
- To study and measure the characteristics of practical AM Super Heterodyne Radio Receiver.

**Course Outcomes:**

By the end of the Course, the student will be able to:	
1.	Design and Simulate different Modulation schemes
2.	Design high pass and Low-pass filters used in communication system.
3.	Perform multiplexing on analog signals and Retrieve useful information by observing AM and FM in frequency domain.
4.	Design and Simulate a Practical Pre-emphasis and De-emphasis circuit.
5.	Measure the characteristics of practical AM Super Heterodyne Radio Receiver using Spectrum Analyzer, Cathode Ray Oscilloscope & Digital Multi Meter.

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

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

**SYLLABUS**

**TRAINER KIT BASED EXPERIMENTS**

- 1) Amplitude Modulation & Demodulation
- 2) Frequency Modulation & Demodulation
- 3) Balanced Modulator
- 4) Analog Time Division Multiplexing
- 5) Base band Sampling
- 6) Pulse Amplitude Modulation & Demodulation
- 7) Pulse Time Modulation & Demodulation
- 8) SSB-SC-AM Modulation
- 9) Super Heterodyne Radio Receiver Parameters
- 10) Spectral Analyses of AM using Spectrum Analyzer
- 11) Spectral Analyses of FM using Spectrum Analyzer

**SIMULATION BASED EXPERIMENTS(Open source/Matlab/Multisim)**

- 1) Amplitude Modulation & Demodulation
- 2) Frequency Modulation & Demodulation
- 3) Balanced Modulator

- 4) SSB-SC-AM Modulation
- 5) Pulse Time Modulation & Demodulation
- 6) Pre-emphasis & De-emphasis
- 7) Passive Filter Design
- 8) Attenuator
- 9) Twin T Network
- 10) Envelope Detector
- 11) Frequency Mixer/IF Amplifier/Automatic Gain Control

A student has to perform minimum of 10 experiments.

**Text Books**

1. B. P. Lathi, “*Modern Digital and Analog Communication Systems*,” 2<sup>nd</sup> Edition, Oxford University Press, 2010.
2. Simon Haykins, “*Communication Systems*,” Wiley, Fifth edition, 2009.
3. P.Ramakrishna Rao, “*Analog communications*” Tata McGraw Hill Education Private Limited. 2011.

<b>MICROCONTROLLER &amp; EMBEDDED SYSTEMS LABORATORY</b>	
<b>ECE327</b>	<b>Credits:2</b>
Instruction: 3 Lab periods	Sessional Marks:50
End Exam: 3 Hours	End Exam Marks:50

**Prerequisites:**

Microprocessors and Interfacing, Microcontroller & Embedded Systems

**Course Objectives:**

- To program both 8051 to meet the requirements of the user.
- To interface various peripherals
- To handle interrupts
- To design a microcomputer to meet the requirement of the user

**Course Outcomes:**

By the end of the course, the student will be able to:	
1.	Program 8051 microcontroller to meet the requirements of the user.
2.	Interface peripherals like switches, LEDs, stepper motor, Traffic lights controller, etc.,
3.	Handle interrupts
4.	Design a microcontroller development board to meet the requirements of the user

**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

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

### **List of Experiments:**

1. Study and familiarization of 8051 Microcontroller trainer kit
2. Assembly Language Program for addition of 8-bit numbers stored in an array
3. Assembly Language Program for Multiplication by successive addition of two 8-bit numbers
4. Assembly Language Program for finding largest no. from a given array of 8-bit numbers
5. Assembly Language program to arrange 8-bit numbers stored in an array in ascending order
6. Stepper motor control by 8051 Microcontroller
7. Interfacing of 8-bit ADC 0809 with 8051 Microcontroller
8. Interfacing of 8-bit DAC 0800 with 8051 Microcontroller and Waveform generation using DAC
9. Implementation of Serial Communication by using 8051 serial ports
10. Assembly Language Program for use of Timer/Counter for various applications
11. Traffic light controller/Real-time clock display
12. Simple test program using ARM 9 mini 2440 kit (Interfacing LED with ARM 9 mini 2440 kit)

### **NOTE:**

1. It is compulsory for each student to Design/Create their own Microcontroller Development Board for personal use
2. A student has to perform a minimum of 10 experiments.

### **Text Books:**

1. Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D Mc Kinlay , *The 8051 Microcontroller and Embedded Systems Using Assembly and C*, 2nd Edition, Pearson Education, 2008.
2. Frank Vahid, Tony Givargis, *Embedded System Design*, 2nd Edition, John Wiley.
3. Rajeshwar Singh, Dr.D.K.Singh, *Embedded System Design*, 1<sup>st</sup> Ed., Dhanpat Rai, 2010

<b>SOFT SKILLS LAB</b>	
<b>ECE328</b>	<b>Credits : 02</b>
Instruction: 3Periods/week	Sessional Marks: 100

**Prerequisites:**

Basic English language skills- LSRW, English theory, English Language Lab.

**Course Objectives:**

- To inculcate effective communication skills with appropriate body language.
- To produce potent leaders, productive team players and effective individuals with proper professional ethics.
- To enable students to make successful oral presentations using relevant content.
- To train students for Group discussions and job Interviews which improves their employability skills.
- To facilitate students the importance of setting realistic goals and achieving them using time management techniques.

**Course Outcomes:**

By the end of the course, the student will be able to:	
1	Comprehend the core engineering subjects using effective verbal and nonverbal communication skills.
2	Present accurate and relevant information efficiently, using suitable material aids.
3	Work effectively as an individual as well in teams and emerge as responsible leaders with appropriate professional ethics.
4	Participate in group discussions and interviews using analytical and problem solving abilities, which enhance their employability skills.
5	Set time bound goals and realize them through strategic plans for successful career.



**Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes:**

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

**SYLLABUS**

**UNIT-I**

**9 Periods**

**Art of communication**

1. Definition of Communication
2. Types of Communication
3. Non-verbal Communication
4. Listening skills
5. Feed back

**D.A.** - Practice of proper hand shake, practice of different postures and gestures and activity on giving feedback

**UNIT- II**

**6 Periods**

**Presentation Skills**

Purpose

1. Effective presentation strategies
2. Analysis of audience
3. Preparing an outline of the presentation,
4. Audio –visual aids
5. Body language.

**D.A.** -Group presentation by each team

**UNIT- III**

**9 Periods**

**Group Discussions**

Introduction- as a part of selection process-guidelines for GD

1. Types of GD

2. Nature of topics of G.D
  3. Roles to be played by participants in a GD
  4. Evaluation process
- D.A**–Group discussions

## **UNIT – IV**

**6 Periods**

### **Team Building and Leadership**

1. Importance of team work
2. Different stages of team formation
3. Good team vs. effective team
4. Team player and Team leader
5. Types of leadership
6. Decision making and negotiating skills

**D.A**-Decision making for a given situation

## **UNIT –V**

**3 Periods**

### **Time- Management**

1. Importance of time-management
2. Time-Management models
3. Prioritization
4. The art of saying ‘No’
5. Identifying Time Wasters

**D.A** -Time- Bound activities devised by the facilitator

## **UNIT- VI**

**3 Periods**

### **Goal-Setting**

Different type of Goals (Immediate and Short term)

1. ‘SMART’ Goals
2. Strategies to achieve goals

**D.A** - Prepare a chart of immediate, short term and long term goals

**UNIT- VII**

**9 Periods**

**Job- Interviews**

Preparing Resumes and C.V's

1. Preparing for the interview
2. FAQ's (Integrity, Stress management, Close- Ask questions)

**D.A** –Mock interviews

**REFERENCE BOOKS:**

1. Sanjay Kumar and Pushpalata, *Communication Skills* ,Oxford University Press , 2011.
2. Allan Pease, *Body Language*, Sheldon Press,1997.
3. John A. Kline and BhavnaBhalla, *Speaking Effectively; Achieving Excellence in Presentations*, Pearson publication, 2013.
4. Marc Mancini, *Time Management*, Tata McGraw Hill publishing Comp.Ltd.,2003.
5. Peter Veruki, *The 250 Job Interview Questions*,Adams Media Corporation Avon, Massachusetts,1999.

<b>QUANTITATIVE APTITUDE - II</b>	
<b>ECE 329</b>	<b>Credits: 2</b>
Instructions: 4 Periods/week	Sessional Marks: 100

**Prerequisites:** Nil

**Course Objectives:**

Quantitative Aptitude –II

- To Categorize, apply and use thought process to distinguish between concepts of reasoning
- To Prepare and explain the fundamentals related to various possibilities and probabilities related to quantitative aptitude.
- To Critically evaluate numerous possibilities related to puzzles.

Verbal Aptitude-II:

- To prepare the students on the various aspects of writing, organizing data, and applying their writing skills in their professional career.
- To demonstrate and recommend the techniques required when interacting in different situations.
- To apply the professional qualities/skills necessary for a productive career and to instill confidence through attitude building.
- To plan activities in order to expose students to the different abilities required for working in a team, encourage them to glean information on current affairs and promote factual reading.
- To illustrate and explain the intricacies/nuances involved in framing responses to the questions asked, reading between lines and reading beyond lines.

**Course Outcomes:**

Quantitative Aptitude –II

By the end of the course student will be able to :	
1.	Use their logical thinking and analytical abilities to solve reasoning questions from company specific and other competitive tests.
2.	Solve questions related to permutation & combinations and probabilities from company specific and other competitive tests.
3.	Understand and solve puzzle related questions from specific and other competitive tests.

Verbal Aptitude-II:

By the end of the course student will be able to :	
1.	Write paragraphs on a particular topic, essays (issues and arguments), e mails, summaries of group discussions, make notes, statement of purpose (for admission into foreign universities), letters of recommendation (for professional and educational

	purposes)
2.	Converse with ease during interactive sessions/seminars in their classrooms, compete in literary activities like elocution, debates etc., raise doubts in class, participate in JAM sessions/versant tests with confidence and convey oral information in a professional manner using reason.
3.	Prepare his/her resume, apply the business English concepts learnt in the course, and refine one's overall demeanor which would be very essential to face the corporate world
4.	Respond to their interviewer/employer with a positive mind, customize answers to the questions asked during their technical/personal interviews, exhibit skills required for the different kinds of interviews (stress, technical, HR) that they would face during the course of their recruitment process

## SYLLABUS

### Section –A (Quantitative Aptitude –II)

#### UNIT I

**8 Periods**

##### **Numerical Reasoning:**

Problems related to Number series, Analogy of numbers, Classification of numbers, Letter series, Seating arrangements, Directions, blood relations and puzzle test.

#### UNIT II

**4 Periods**

##### **Combinatorics:**

Counting techniques, Permutations, Combinations and Probability

#### UNIT III

**4 Periods**

Data sufficiency

Syllogisms

#### UNIT IV

**4 Periods**

### **Application of Base system:**

Clocks (Base 24), Calendars (Base7), Cutting of Cubes and cuboids

### **UNIT V**

**4 Periods**

### **Puzzle Solving & Time Management using various problems solving tools and techniques:**

Selective puzzles from previous year placement papers

Selective puzzles from book Puzzles to puzzle you by shakunataladevi

Selective puzzles from book more puzzles by shakunataladevi

Selective puzzles from book puzzles by George summers

### **Books for practice**

1. Quantitative aptitude by RS Agarwal, S Chand Publications
2. Verbal and non verbal Reasoning by RS Agarwal from S Chand publications
3. Puzzles to puzzle you by shakunataladevi orient paper back publication
4. More puzzles by shakunataladevi orient paper back publication
5. Puzzles by George summers orient paper back publication.

### **References:**

1. Barron's by Sharon Welner Green and Ira K Wolf (Galgotia Publications pvt. Ltd.)
2. Material from 'IMS, Career Launcher and Time' institutes for competitive exams.
3. Reasoning by BS Sijwali Arihant publications
4. Reasoning Arun Sharma McGrawhill publications

### **Websites:**

1. [www.m4maths.com](http://www.m4maths.com)
2. [www.Indiabix.com](http://www.Indiabix.com)
3. 800score

4. Official GRE site
5. Official GMAT site

## **Section –B (Verbal Aptitude –II)**

### **UNIT I**

**4 Periods**

General Essay writing, writing Issues and Arguments( with emphasis on creativity and analysis of a topic), paragraph

writing, story writing, guidance in framing a ‘Statement of purpose’, ‘Letters of Recommendation’, business letter writing, email writing, email and business letter writing etiquette, letters of complaints/responses to complaints. Information transfer is taught with the help of tables, bar diagrams, and pie charts while framing /sending lengthy data where testing is done through Reading comprehension and Critical reasoning. Contextual meanings with regard to inflections of a word, frequently confused words, words often mis-used, words often mis-spelt, multiple meanings of the same word (differentiating between meanings with the help of the given context), foreign phrases. Enhanced difficulty level in spotting errors will be taken up with reference to competitive test based exercises.

### **UNIT II**

**4 Periods**

Just a minute sessions, reading news clippings in the class, extempore speech, telephone etiquette, making requests/suggestions/complaints, elocutions, debates, describing incidents and developing positive non verbal communication. Analogies, YES-NO statements (sticking to a particular line of reasoning)

### **UNIT III**

**4 Periods**

Corporate readiness, business idioms and expressions, reading newspapers/magazines, brushing up on general awareness, latest trends in their respective branches, resume preparation, understanding business /corporate language, managing emotions, problem solving, importance of team work, goal orientation, professional grooming, positive attitude, assertiveness and inter personal skills. Data sufficiency (answering questions within the ambit of the given text), Fact-Inference-Judgment (to identify statements as FIJ), Syllogisms (with emphasis on fallacies in reasoning), strong and weak arguments.

### **UNIT IV**

**6 Periods**

Voice, direct & indirect speech, question tags, one word substitutes, and foreign phrases. An overview on group discussions, preparation for a group discussion, intricacies of a group discussion, topics for GDs (with special focus on controversial topics), structure of participation in a group discussion, roles played by the participants in a group discussion, constructive criticism, standard procedures followed whilst participating in a group discussion, frameworks that can be used for discussion, analysis of the discussion and exposure to case-based group discussions.

## **UNIT V**

## **6 Periods**

Different types of interviews (with emphasis on personal interview), preparation for an interview, areas of questioning, answering questions on general traits like strengths/weaknesses/hobbies/extracurricular activities, choosing role models, importance of non verbal communication while participating in interviews, tips to reduce nervousness during personal interviews, handling stress, suggestions for responding to tough/unknown questions, preparation on self and personality development.

**Note: The concepts learnt in Semester I will be tested in the Mid-term and Semester end exams during the II Semester as well.**

### **Reading/ Listening material:**

1. Newspapers like ‘The Hindu’, ‘Times of India’, ‘Economic Times’.
2. Magazines like Frontline, Outlook and Business India.
3. News channels NDTV, National News, CNN

### **References:**

1. Books written by Stephen Covey and Dale Carnegie-Seven Habits of Highly Effective People etc-Simon & Schuster, Running Press book publishers
2. Books written by Bertrand Russell-Oxford University Press

### **Suggested General Reading**

1. **Who Moved My Cheese?** By Spencer Johnson-GP Putnam’s Sons
2. **The art of War**-Sun Tzu by Nabla, Barnes & Noble
3. **The Monk Who Sold Ferrari**-Robin Sharma by Harper Collins, Jaico Publishers
4. **The Hobbit** and other books by JRR Tolkein-Harper Collins

### **Suggested Authors**

1. William Dalrymple
2. V.S.Naipaul



3. Kushwanth Singh
5. Charles Dickens
7. R.K. Narayan
9. Oscar Wilde

4. Ernest Hemingway
6. Leo Tolstoy
8. Amitav Ghosh