INSTITUTE:

Vision:

To emerge as a comprehensive Institute that provides quality technical education and research thereby building up a precious human resource for the industry and society.

Mission:

- To provide a learner-centered environment that challenges individuals to actively participate in the education process.
- To empower the faculty to excel in teaching while engaging in research, creativity and public service.
- To develop effective learning skills enabling students pick up critical thinking thus crafting them professionally fit and ethically strong.
- To reach out industries, schools and public agencies to partner and share human and academic resources.

Vision and Mission of the Department

Vision:
To impart quality education and research with professional values & ethics to cater the industrial and societal needs.

Mission:

- To enhance student's skills by implementing modern curriculum through collaborative industry institute interaction.
- To provide with modern tools to enhance innovative research.
- To create human resources in electrical engineering to contribute to the nations development and improve the quality of life.
- Imbibe values and ethics for a holistic engineering professional practice.

PROGRAM EDUCATIONAL OBJECTIVES

PEO1: To inculcate basic knowledge in Humanities and Sciences, Fundamentals of Computer Programming besides essential knowledge of electrical and electronics engineering.

PEO2: To apply the principles, concepts and skills of Electrical and Electronics Engineering for research and development.

PEO3: To imbibe professional values, ethics, leadership, teamwork through co-curricular and extracurricular activities for personality development and for effective engineering practice.

PEO4: Engage in continuing professional growth through higher education or professional activity.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

PO1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

REGULATIONS FOR

FOUR YEAR BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE PROGRAM

(With effect from the batches admitted in the academic year 2013 – 14)
&
B.Tech. (Lateral Entry Scheme)
(For the batches admitted from the academic year 2014-15)

1. Minimum Qualifications for Admission :

A candidate seeking admission into first year B.Tech. Degree program should have passed the Intermediate Examination of the Board of Intermediate Education, Andhra Pradesh with Mathematics, Physics and Chemistry as optional subjects or any equivalent examination recognized by JNTUA, Anantapur).

A candidate seeking admission into second year of the four year B.Tech Degree program in engineering should have passed Diploma in Engineering conducted by the Board of Technical Education, Andhra Pradesh (or equivalent examination recognized by JNTUA, Anantapur).

Any other admission, authorized by the University and the Government of Andhra Pradesh, will be as per the eligibility criterion and procedure laid down by the said authorities.

2. Branches of Study :

2.1 The branches of study in B.Tech. Degree Program offered by the Institute are

(a) Civil Engineering
(b) Electrical & Electronics Engineering
(c) Electronics & Communication Engineering
(d) Mechanical Engineering
(e) Computer Science & Engineering

2.2 A student is required to choose the course of study (branch) at the time of admission. No change of branch shall be permitted after the closure of admissions by the competent authority, nominated by the Government of Andhra Pradesh.

2.3 The duration of the program is of four academic years. The first year of study will be of annual pattern. Semester pattern shall be followed for the Second, Third and Fourth years of study with two semesters in each academic year.

3.0 Instruction Days:

First year of B.Tech. program consists of a minimum of 180 days, including the days allotted for tests.

Each semester shall consist of a minimum of 90 days, including the days allotted for tests.

4.0 Credits:

Credit defines the quantum of contents/syllabus prescribed for a course and the number of instruction hours per week. The norms for assigning credits to a course for

duration of one semester shall be as follows :

I One credit for every one hour lecture per week/semester.

II Two credits for every three hours of drawing or practical per week/semester.

Similarly,

I Two credits for every one hour lecture per week/year.

II Four credits for every three hours of drawing or practical work per week/year.

5.0 Evaluation:

5.1 The performance of the students in first year /each semester shall be evaluated subject-wise. The distribution of marks between Sessional marks and end examination is as follows :

5.2 Sessional Marks

5.2.1 For the award of sessional marks in I year in theory courses, each test for 40 marks shall be conducted. Each test shall be of two hours duration and three tests will be evenly distributed during the year. The final sessional marks shall be taken giving a weightage of 0.40 each for the better two tests and 0.20 for the other mid examination marks.

5.2.2 For award of sessional marks for theory courses in each semester two tests each for 40 marks shall be conducted. Each test shall be of two hours duration and the test shall be evenly distributed during the semester. The final sessional marks shall be taken giving a weightage of 0.80 for the better of the two tests and 0.20 for the other mid examination marks.

5.2.3 In case of practical subjects the sessional marks will be awarded based on day-to-day class work and one test at the end of I year / semester.

5.2.4 For the subject having design and / or drawing, such as Engineering Drawing, Machine Drawing and estimation etc., the distribution shall be 40 marks for internal evaluation and 60 Marks for end examination. The Internal evaluation for sessionals will be 20 marks for day- to-day work in the class that shall be evaluated by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm exams in a Semester for a duration of 2 hrs each, evenly distributed over the syllabi, for 40 marks each and the sessional marks shall be taken as enunciated in clause 5.2.2. However, in the I year class there shall be three midterm exams and the midterm examination component of the sessional marks shall be taken as enunciated in clause 5.2.1. The sum of day-to-day evaluation for 20 marks and the half of the midterm examinations marks will be the final sessional marks for the subject.

5.2.5 The Department concerned shall constitute a three-member committee, consisting of the Head of the Department concerned, one senior faculty member and the concerned guide to assess uniformly the performance of the students by way of seminars on the project work turned out by the students. The sessional marks shall be awarded by the concerned guide for 50% and the committee for the balance 50% based on the work turned out and submitted in the form of a project report.

6.0 End Examinations

6.1 For each of the theory, practical and design/drawing courses, there shall be an end Examination of three hours duration at the end of first year/ each semester, except where stated otherwise explicitly in the detailed scheme of instruction.

6.2 Recounting

Students shall be permitted to request only for recounting of the end theory examination answer scripts within a stipulated period after payment of the requisite fee. After recounting, records are updated with changes if any, and the student shall be issued a revised memorandum of marks. If there are no changes, the student shall be intimated the same.

In the recounting process, the valued answer script will be scrutinized jointly by the HOD concerned and a faculty nominated by the Director/Principal.

6.3 Instant examinations

Instant examinations may be conducted in the theory subjects of the final year second semester only for the benefit of those outgoing students who failed in or who are absent for only one theory subject of final year second semester and who do not have any other back logs. The instant exams will be conducted normally within one month of the announcement of the final semester results.

6.4 Conduct of Examinations

Question paper setting shall be undertaken by the Institute, choosing external examiners from the panels recommended by the respective Board of Studies. Evaluation of answer scripts shall also be undertaken by the Institute by choosing external/internal examiners from the panels recommended by the respective Board of Studies.

For each practical examination, the end examination will be conducted jointly by the laboratory teacher and another examiner nominated by the Director/Principal.

Project Viva-voce examination shall be conducted by two internal examiners and one external examiner. The appointment of internal and external examiners for the conduct Viva-voce examinations shall be made by the panels recommended by the respective Board of Studies. Panel of Examiners must consist of one internal and six external examiners.

7.0 Grading, Grade Point Average (GPA), Cumulative Grade Point Average (CGPA) and Grade sheet

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

Conversion into grades and grade points assigned

Range in which the marks in the subject fall	Grade	Grade points assigned	Performance
≥ 95	A^{++}	10	Out Standing
85 – 94	A^{+}	9.0	Excellent
75 – 84	A	8.0	Very Good
65 – 74	B^{+}	7.0	Good
55 - 64	B	6.0	Fair
45 – 54	C	5.0	Average
0 – 44	D	4.0	Satisfactory
< 40	F	0	Fail

7.1 Grade Point Average (GPA)

The grade point average for each semester/year is calculated as follows:

$$GPA = \frac{\sum_1^n (C_i)(GP_i)}{TC}$$

where n = number of subjects in the year/semester

for each subject, i

C_i = credits for the subject

GP_i = the grade point for the subject

TC = Total number of credits in the year / semester

7.2 Cumulative Grade Point Average (CGPA)

The CGPA is computed for every student at the end of each semester. The CGPA would give the cumulative performance of a student from the first year up to the end of the semester to which it refers and is calculated as follows:

$$CGPA = \frac{\sum_1^m (GPA_j)(TC_j)}{\sum_1^m TC_j}$$

where m = number of year/semesters under consideration

for each year / semester, j

TC_j = Total number of credits for a particular year/semester

GPA_j = the grade point average of that year/semester

Both GPA and CGPA will be rounded off to the second place after decimal and recorded as such.

While computing GPA/CGPA, the course in which the candidate is awarded zero grade points will also be included.

7.3 Grade Sheet

The grade sheet (memorandum) will be issued to each student indicating his performance in all the courses taken in that semester in the form of grades, also indicating the GPA of that semester and CGPA up to that semester.

7.4 With holding of results

If the student has not paid the dues, if any, to the Institute or if any case of indiscipline is pending against him/her, the result of the student will be withheld and he/she will not be allowed into the next semester and his/her degree will be withheld in such cases.

8.0 Attendance Requirements

8.1 A student shall be eligible to appear for end Examinations if he acquires a minimum of 75% of attendance in aggregate of all subjects in a semester / I year

.

8.2 However, a student has to put in a minimum of 50% attendance in each course/subject, in addition to the condition laid down in clause 8.1.

8.3 Condonation of shortage of attendance may be recommended provided a student puts in at least 65% attendance in all the subjects put together as calculated in clause 8.1 above, along with a minimum of 50% attendance in each course as stated in clause 8.2. For condonation of shortage of attendance, the student shall pay the prescribed fee and submit an application in writing clearly stating the reason for shortage of attendance along with necessary documentary evidence. The final decision for condonation of attendance shall be taken by the college academic committee considering the merits of the case.

8.4 Shortage of attendance below 65% in aggregate shall in <u>NO</u> case be condoned.

8.5 Students whose shortage of attendance is not condoned in any semester/ I year are not eligible to take their end examination of that class and their registration for end examinations shall stand cancelled**.**

8.6 A student, who could not satisfy these requirements of attendance, as given in clauses 8.1 through 8.5 in first year or in any semester, shall have to repeat the first year or the semester as the case may be.

8.7 A student shall not be permitted to study first year or any semester for more than three times during the course of his / her study.

Further, a student is required to complete the course of study of B.Tech. program, satisfying all the attendance requirements in all the four years of the program within a period of eight academic years from the year of admission, failing which he/she shall forfeit his/her admission.

8.8 A student, who has satisfied the minimum attendance requirements in the first year or in any semester may repeat the first year or that semester with the permission of the Principal/Director and cancelling the previous record of attendance and sessional marks of the first year or that semester. [However, the facility may be availed of by the student not more than twice during the entire course of his/her studies and the entire course of study shall be within eight academic years, as stipulated in clause 8.7].

9.0 Minimum Academic Requirements

9.1 A candidate shall be declared to have passed in each theory, design/drawing, practical and project work, if he / she secures not less than 35% marks in the end examination and the sum total marks of 40% in the end examination plus the sessional marks secured by the student in that theory/design/drawing/practical.

9.2 A student eligible for the end examination in a subject, but absent at it or has failed in the end Examination may appear for that subject at the next examination as and when it is held.

10.0 Conditions for Promotion

10.1 A student shall be eligible for promotion to the I semester of II year B.Tech. if he/she satisfies the minimum attendance requirements for I B.Tech. as stipulated in clause 8.

10.2 A student shall be eligible for promotion to the next semester if he/she satisfies the minimum attendance requirement in the immediately preceding semester as given in clause 8.

11.0 Award of B.Tech. Degree

The degree of B.Tech. shall be conferred on a candidate, who has satisfied the following:

(i) The candidate must have after admission to the regular B.Tech. programme of the Institute, pursued a course of study for not less than four academic years.

(ii) The candidate must have satisfied the minimum academic requirements as in clause 9 in all the courses prescribed for the four-year programme.

12.0 Award of Class

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B.Tech. Degree he shall be placed in one of the following four classes :

Class Awarded	CGPA
First Class with Distinction	≥ 7.5
First Class	≥ 6.5 and < 7.5
Second Class	≥ 5.5 and < 6.5
Pass Class	< 5.5

13.0 Award of Rank

13.1 Ranks shall be awarded in each branch of specialization for the top three students.

13.2 Only such candidate who completes the B.Tech. program within four academic years from the year of their admission are eligible for the award of rank.

13.3 For the purpose of awarding rank in each branch, total marks, i.e. end examination and sessional marks put together of all the semesters of II, III and IV B.Tech. Secured in the first attempt only shall be taken into account. Candidates who have failed in

any course in I year/semester are not eligible for the award of Rank.

14.0 Transitory Regulations

14.1 Candidates who studied the four year B.Tech. Degree course under Old Regulations but who could not satisfy the minimum attendance requirements in any year may join the first year/appropriate semester in the New Regulations applicable for the batch for the remaining part of the course and be governed by the Regulations of that batch from then on. Any candidate, admitted under Old Regulations, who wished to join in any particular year in the New Regulations under any other circumstances shall also be governed by the New Regulations from that year onwards.

14.2 Candidates who satisfy the minimum attendance requirements in any year under Old Regulations but who are yet to pass some subjects of that year even after three chances shall appear for the equivalent subjects specified by the Board of Studies of the concerned branch.

15.0 Amendment of Regulations

N.B.K.R. Institute of Science & Technology reserves the right to amend these regulations at any time in future without any notice. Further, the interpretation of any of the clauses of these regulations entirely rests with the College Academic Committee.

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR (AUTONOMOUS)
(AFFILIATED TO JNTU ANANTAPUR:NELLORE)
SPSR NELLORE DIST

I B.TECH(yearly pattern) Scheme of Instruction and Evaluation
(Common to all branches)
(With effect from the Academic Year 2013-2014)

Course Code	Course Title	Instruction			Credits	Evaluation									Maximum Total Marks
		Hours/Week				Sessional Test-I		Sessional Test-II		Sessional Test-III		Total Sessional Marks (Max. 40)	End Semester Examination		
		L	T	D/P		Duration In Hours	Max. Marks	Duration In Hours	Max. Marks	Duration In Hours	Max. Marks		Duration In Hours	Max. Marks	100
13SH1001	English	2	-	-	4	2	40	2	40	2	40	0.4*first Best + 0.4*second best + 0.2*Least	3	60	100
13SH1002	Engineering Mathematics-I	3	1	-	8	2	40	2	40	2	40		3	60	100
13SH1003	Engineering Mathematics-II	3	1	-	8	2	40	2	40	2	40		3	60	100
13SH1004	Engineering Physics	2	-	-	4	2	40	2	40	2	40		3	60	100
13SH1005	Engineering Chemistry	2	-	-	4	2	40	2	40	2	40		3	60	100
13CS1001	Computer Programming & Data Structures	3	1	-	8	2	40	2	40	2	40		3	60	100
13EE1001	Basic Electrical Sciences	3	1	-	6	2	40	2	40	2	40		3	60	100
13SH10P1	English Language Laboratory			3	4	-	-	-	-	-	-	Day to Day Evaluation and a test (40 Marks)	3	60	100
13ME101P	Workshop			3	4	-	-	-	-	-	-		3	60	100
13CS10P1	Programming Laboratory			3	4	-	-	-	-	-	-		3	60	100
	TOTAL	18	4	9	54									600	1000

13SH1001 – ENGLISH

Course Category:	Humanities	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-0-0
Pre-requisite:	• Comprehending the basic level of comprehensions • Intermediate level of error analysis • Ability to use appropriate language in informal situations	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	1. To develop their basic communication skills in English 2. To achieve specific linguistic and communicative competence 3. To acquire relevant skills and function efficiently in a realistic working context 4. To inculcate the habit of reading	
Course Outcomes:	**CO1**	Correct the error of the sentence; improve language proficiency and face competitive exams; GATE, GRE, TOEFL, GMAT etc
	CO2	Comprehend the advanced level of reading comprehensions
	CO3	Write clear and coherent passages for social and professional contexts
	CO4	Write proposals, business letters
	CO5	Acquire considerable flair in using broad range of vocabulary.
Course Content:	**UNIT-I** **'Humour' from 'Using English' Biography –(Homi Jehangir Bhabha) from "New Horizons"** R- Reading Strategies- Skimming and Scanning. G- Parts of Speech- Noun-number, pronoun-personal pronoun, -Subject verb& Pronoun agreement. **UNIT-II** **'Inspiration' from "Using English" 'Biography-(My Struggle for an Education)' form "New Horizons"** R- Note making strategies W- Paragraph-types- topic sentences, unity, coherence, length, linking devices G- Articles-Prepositions-Tenses- Present tense, Past tense and Future tense **UNIT-III** **'Sustainable Development' from 'Using English' Short Story- (The Happy Prince) from "New Horizons"** G .Non-finite verbs, Auxiliary verbs and question tags V- Word formation and One-Word Substitutes **UNIT-IV** W- Writing Strategies- Sentence structures-Letter Writing-Dialogue Writing-Public Speaking G- Transformation of Sentences (Direct and Indirect/ Active and Passive) V- Affixes-prefix and suffix, root words, derivatives	

	UNIT-V W- Technical Report writing-strategies, formats-types-technical report writing G- Conditional clauses, Transformation of Sentences (Degrees of Comparison/Connectives) V- Collocations and Technical Vocabulary and using words appropriately- Synonyms- antonyms, homonyms, homophones, homographs, words often confused.
Text Books & Reference Books:	**Text Books:** 1.Using English published by Orient Black Swan 2.New Horizons published by Pearson **Reference Books:** 1. Raymond Murphy's English Grammar with CD, Murphy, Cambridge University Press, 2012. 2. English Conversation Practice- Grant Taylor, Tata McGraw Hill, 2009. 3. Communication skills, Sanjay Kumar & Pushpalatha Oxford University Press, 2012. 4. Techniques of Teaching English: A.L. Kohli 5. A Textbook of English Phonetics: For Indian Students: T Balasubramanian., MacMillan India Limited
E-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

13SH1002 – ENGINEERING MATHEMATICS-I

Course Category:	Mathematics	**Credits:**	8
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-1-0
Pre-requisite:	• Trigonometric , Differentiation and integration Formulas • Equation Simplifications	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	• To develop the basic mathematical knowledge and computational skills of the students in the areas of applied mathematics. • To develop the skills of the students in the areas of Differential calculus Integral calculus, Vector calculus, Curvature and Matrices. • To serve as a pre-requisite mathematics course for post graduate courses, specialized studies and research.	
Course Outcomes:	**CO1**	Understand the concepts of rank of the matrices, linear and non-linear system of equations, eigen-values and eigen-vectors, apply Caley-Hamilton theorem, diagonalizable of symmetric matrices and demonstrate the nature of quadratic forms.
	CO2	Understanding effectively the mean value theorems and Maxima and Minima of a function of two variables – Lagrange's method of multipliers.
	CO3	Understanding effectively the geometrical aspects of curvature, involutes and evolutes of plane curves, essential concepts for an engineer, as elegant applications of differential calculus.
	CO4	Demonstrate knowledge and understanding the evaluate of double integration and triple integration using Cartesian, polar co-ordinates and also understand effectively areas and volumes.
	CO5	Apply Green's theorem, Gauss' theorem and Stokes' theorem.
Course Content:	**UNIT- I** **MATRICES:**Rank of Matrix**:-**Echelon Form and Normal Form - Consistency of system of linear equations- Eigen values and Eigen vectors- Cayley – Hamilton's theorem- Diagonalization of matrix- Quadratic forms. **UNIT- II** **DIFFERENTIAL CALCULUS:** Rolle's, Lagranges and Cauchy's mean value theorems (without proofs) - Taylor's and Maclaurin's series (only one variable) - Maxima and Minima of a function of two variables – Lagrange's method of multipliers. **UNIT- III** Radius of curvature, involutes and evolutes. Beta and Gamma functions. Curve tracing (only Cartesian form) **UNIT- IV** **INTEGRAL CALCULUS**:Double and Triple Integrals- Change of order of integration- Change of variables- Simple applications to areas and volumes. **UNIT- V** **VECTOR CALCULUS**:Gradient, Divergence, Curl - Laplacian and Second Order Operators- Line, Surface and Volume integrals- Potential function- Green's theorem, Stoke's theorem and Gauss Divergence theorem (without proof)- Verification of Green's , Stoke's and Gauss Divergence theorem.	

Text Books & Reference Books:	**Text Books:** 1. Higher Engineering Mathematics – B S Grewal 2. Engineering Mathematics- B V Ramana 3. Elementary Engineering Mathematics – B S Grewal **Reference Books:** 1. Higher Engineering Mathematics- H K Das et al 2. Advanced Engineering Mathematics- N P Bali & M Goya 3. Engineering Mathematics-I S. Chand & Co.
E-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

13SH1003 – ENGINEERING MATHEMATICS-II

Course Category:	Mathematics	**Credits:**	8
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-1-0
Pre-requisite:	• Trigonometric , Differentiation and integration Formulas • Equation Simplifications • Roots finding and partial fractions	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	• To develop the basic mathematical knowledge and computational skills of the students in the areas of applied mathematics. • To develop the skills of the students in the areas of Differential Equations, Laplace Transform, Fourier series and Fourier Transfers. • To serve as a pre-requisite mathematics course for post graduate courses, specialized studies and research.	
Course Outcomes:	**CO1**	Students will be able to understand the basic theories and methods of differential equations, and to apply the fundamental techniques of differential equations to perform analysis and computation of solutions to various differential equations.
	CO2	Understanding effectively the Laplace Transformations of standard functions and their properties.
	CO3	Understanding effectively the unit step function, Dirac's delta function, convolution theorem and also the applications of Laplace transforms to differential equations.
	CO4	Understanding effectively Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems
	CO5	Understand Fourier transform and how to compute it for standard examples and also understand effectively the Fourier integral in complex form, finite and infinite Fourier transforms, Fourier sine and cosine transforms.
Course Content:	**UNIT – I** **Ordinary Differential Equations:** Linear Differential Equations of second and higher order with constant coefficients- Method of variation of parameters- Equations reducible to linear equations with constant Coefficients- Cauchy's linear equations –Legendre's linear equation. **UNIT – II** **Laplace Transformation:** Laplace Transformations of standard functions- Properties of Laplace Transformation- Transformation of derivatives and integrals- Initial and Final value theorems-Transforms of unit step function and impulse function – Transform of periodic functions. **UNIT – III** **Inverse Laplace Transformation:** Inverse transforms- Unit step function- Dirac's delta function-Convolution theorem- Transforms of periodic functions- Application to solutions of Ordinary Differential Equations. **UNIT-1V** **Fourier series:** Determination of Fourier coefficients- Fourier series- Even and Odd functions-Change of intervals- Half Range Sine and Cosine Series- Complex form of Fourier series- Parseval's formula.	

	UNIT-V **Fourier Transforms:** Fourier Integral Theorem- Fourier Sine and Cosine integral- Fourier integral in complex form – Finite and Infinite Fourier Transforms- Fourier Sine and Cosine transforms properties- Inverse transforms.
Text Books & Reference Books:	**Text Books** 1**.**Higher Engineering Mathematics –B S Grewal 2.Engineering Mathematics- B V Ramana **Reference Books** 1.Higher Engineering Mathematics- H K Das et al 2.Advanced Engineering Mathematics- N P Bali and M Goyal.
E-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

13SH1004– ENGINEERING PHYSICS

Course Category:	Sciences	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-0-0
Pre-requisite:	• Electromagnetism and optics • Electromagnetic field and Waves	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	• Describe the concept of wave particle duality , Schrodinger wave equation and behaviour of electrons in metals. • Explain and provide the knowledge about semiconductors and their use in electronic devices. • Basic properties of magnetic Materials and the uses in Science &Technology. • Describe the characteristics of lasers , their construction and applications in Science & Technology • Describe basic idea about optical fibers, their construction and uses in communication field. • Explain the fundamental idea about semiconductor and their limited uses.	
Course Outcomes:	**CO1**	Understanding the wave particle behaviour of matter Schrodinger wave equation and electronic behaviour in metals.
	CO2	Understand the structure of crystalline solids and their applications in X-ray diffraction
	CO3	Know the properties of semiconductor materials by projecting the view of energy bands and know the concept of magnetization and applications of magnets in various disciplines.
	CO4	Understand the utilization of laser technology in various disciplines. Basic Understands of Acoustics.
	CO5	Understand the concept of optical fiber and its applications. Basic ideas about super conductor and their uses in different fields.
Course Content:	**UNIT – I** **QUANTUM MECHANICS AND FREE ELECTRON THEORY :** **Quantum Mechanics** : Wave – Particle duality - de'Broglie hypothesis of Matter waves –Properties of matter waves Heisenberg's uncertainty principle and its applications–Schrodinger's time independent and time dependent wave equation –Significance of wave function –Particle in a one dimensional infinite potential well. **Free Electron Theory**: Classical free electron theory- Sources of electrical resistance –Equation for electrical conductivity – Quantum free electron theory- Fermi level and Fermi –Dirac distribution– Bloch theorem -Kronig – Penny model (qualitative) Origin of bands in solids –Classification of solids into conductors, semiconductors and insulators. **UNIT – II** **SEMI CONDUCTORS AND MAGNETIC MATERIALS :** **Semiconductor Physics**: Introduction – Intrinsic and extrinsic semiconductors carrier concentration in intrinsic and extrinsic semi conductors - Drift and diffusion currents Einstein's equation–Continuity equation-Hall effect-direct and indirect bandgap semiconductors. **Magnetic Materials** : Introduction and basic definitions –Origin of magnetic moments –Bohr magneton –Classification of magnetic materials into dia, para, ferro, antiferro and ferri magnetic materials –Hysteresis –Soft and hard magnetic materials and applications	

	UNIT – III **CRYSTALLOGRAPHY AND X-RAY DIFFRACTION AND DEFECTS IN CRYSTALS:** **Crystallography** : Introduction–Space lattice–Unit cell–Lattice parameters–Bravias lattice crystal systems–Packing fractions of SC,BCC and FCC structures–Structures of NaCl and Diamond –Directions and planes in crystals–Miller indices –interplanar spacing in cubic crystals **X-ray diffraction and defects in crystals** : X-ray diffraction–Bragg's law–Laue and Powder methods –Defects in solids : point defects, line defects (qualitative)-screw and edge dislocation, burgers vector. **UNIT – IV** **LASERS AND ULTRASONICS** **Lasers** : Introduction – Characteristics of laser –Spontaneous and simulated emission of radiation-Einstein's coefficients–Population inversion–Excitation mechanisms and optical resonator–Ruby laser –He Ne laser–Semi conductor laser-Applications of lasers. **Ultrasonics** : Introduction Production of ultrasonics by piezoelectric method and magneto striction method – Detection and Applications of Ultrasonics . **UNIT – V** **FIBER OPTICS AND SUPERCONDUCTIVITY** **Fiber Optics :** Introduction-Construction and working principle of optical fiber–Numerical aperture and acceptance angle–Types of optical fibers–Attenuation and losses in fibers–Optical fiber communication system–Applications of optical fibers in communications, sensors and medicine **Superconductivity**: Introduction–Meissner effect–properties of superconductors–Type I and II superconductors–Flux quantization–London penetration depth–ac and dc Josephson effects–BCS theory (qualitative)-–Applications of superconductors
Text Books & Reference Books:	**Text Books:** 1.P. K. Palaniswamy ,Scietech Publications 2.V.Rajendran and K.Tyagarajan,Tata Mc Graw Hill Publications – III Edition 3.R.K. Gaur and G.L.Guptha,Danapati Rai Publications **Reference Books** 1.A.J.Dekkar ,Mcmillan Publications –Latest Edition 2012 2.M.Arumugam,Anuradha Publications II Edition 3.Rama Chandra B & Subramanyam SV ,Hitech Publications 4.S.O.Pillai ,New age International Publications 5.Puri RK and Babbar VK ,Chand & Co Publications 6.M.N.Aaravindhanulu and P.G.Krishi sagar ,Chand & CO Publications Revised Edition 2013
E-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

13SH1005 – ENGINEERING CHEMISTRY

Course Category:	Sciences	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-0-0
Pre-requisite:	fundamentals chemistry	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	• To strengthen the fundamentals of Chemistry and then build an interface of theoretical concepts with their industrial/engineering applications. • The extension of fundamentals Electrochemistry to energy storage devices such as batteries and fuel cells is one such example. • To design engineering materials and solve problems related to them. • To understand the chemistry involved in the fuels. • To understand water chemistry and polymers and their application	
Course Outcomes:	**CO1**	Understand the electrochemical sources of energy
	CO2	Understand industrially based engineering materials
	CO3	Differentiate between soft and hard water
	CO4	Understand the disadvantages of using hard water and apply suitable treatments
	CO5	Understand the basics of polymers and their uses in engineering field
Course Content:	**UNIT – I** **ELECTRO CHEMISTRY** Single electrode potential – explanation and measurement-Reference electrodes: Hydrogen gas electrode-calomel electrode-glass electrode Electrochemical cells-Numerical calculations-Batteries: Rechargeable cells and batteries (Lead-Acid storage cells, Al-Air Batteries)-Fuel Cells : Hydrogen - Oxygen fuel cell Corrosion: Definition-classification-Factors affecting the corrosion-Prevention methods of corrosion – metallic coatings (Electroplating) and cathodic protection. **UNIT-II** **CHEMISTRY OF ENGINEERING MATERIALS** Electrical insulators: Definition-classification-Characteristics-Application of electrical insulating materials (solid, liquid and gaseous insulators) Refractories: Classification-properties and applications Lubricants: Lubricant -Lubrication-Theory of lubrication-Properties and applications of lubricants. **UNIT – III** **FUEL TECHNOLOGY** Classifications of Fuels -Characteristics of fuels -Calorific value – determination – Bomb calorimeter - Boys gas calorimeter - Theoretical calculation of calorific value. Solid fuels-coal-analysis of coal - metallurgical coke Liquid fuels: Petroleum – refining of petroleum - Synthetic petrol – Fischer Tropch's synthesis Gaseous fuel – Flue gas analysis by Orsat's apparatus **UNIT – IV** **WATER TREATMENT** Impurities in water-Hardness of water-disadvantages of water-Estimation of hardness by EDTA method-Estimation of dissolved oxygen-alkalinity-chlorides in water Industrial use of water: For steam generation-troubles of boilers-scale and	

	sludge-priming and foaming-caustic embrittlement-boiler corrosion Softening methods of hard water: Lime-soda process- Zeolite process-Ion exchange method **UNIT - V** **POLYMERS** Introduction to polymers-Polymerization process-types of polymerization Elastomers: natural rubber – volcanization of rubber – compounding of rubber-Synthetic rubbers: preparation, properties and engineering applications of Buna – N, Neoprene, Thiokol and silicon rubbers Plastomers: Thermosetting and thermoplastics-Moulding constituents of plastics-Preparation, properties and engineering applications of PVC, Bakelite, Nylons and Urea-Formaldehyde
Text Books & Reference Books:	**Text Books:** **1.**Engineering Chemistry by KNJayaveera, GVSubba Reddy and C. Ramachandraiah, McGraw Hill Higher Education, Foruth Edition, New Delhi 2.A Text book of Engineering Chemistry by SS Dhara, S. Chand Publications, New Delhi **Reference Books**: 1.A Text Book of Enigneering Chemistry, Jain and Jain, DhanapathiRai Publications, New Delhi 2. Engineering Chemistry by K.B.ChandraSekhar, UN.Das and Sujatha Mishra, SCITECH Publications India Pvt Limited. 3.Concepts of Engineering Chemistry- AshimaSrivastavaf and N.N. Janhavi 4.Text Book of Engineering Chemistry – C. Parameswara Murthy, C.V.Agarwal and Andra Naidu 5.Chemistry of Engineering Materials, C.V.Agarwal ,C.Parameswaramurthy and Andranaidu 6.Text Book of Engineering Chemistry, Shashichawla, Dhanapathirai Publications.
E-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

13CS1001 – C PROGRAMMING & DATA STRUCTURES

Course Category:	Computing	**Credits:**	8
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-1-0
Pre-requisite:	• knowledge of computer operation • MS-office • Text editor	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	1. To describe fundamentals of C programming such as variables, conditional and iterative execution, methods, etc. 2. Arrays, Strings, Functions 3. Storage classes, pointers, structures 4. Data structures, stacks and queues 5. Graphics and trees, searching and sorting	
Course Outcomes:	**CO1**	Describe fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
	CO2	Analyze and solve programming problems using a procedural and algorithmic approach with functional decomposition.
	CO3	Apply knowledge of computing and mathematics using simple data structures.
	CO4	Develop skill to use pointers, memory allocation and data handling through files in 'C'.
	CO5	Understand the process of compiling, linking, and running a program using a computing tool.
Course Content:	**UNIT – I** Algorithms, flow charts, Program Development Steps, Introduction To C Language: Basic Structure of C Program, Identifiers, Basic data types, Variables, Operators. Operator Precedence and Associativity, Expression Evaluation, Type conversions. **Selection Statements**: Various forms of if statements, switch statement, **Iteration**: while, do-while, for statements, other control altering statements– break, continue, goto and exit. **UNIT – II** **Arrays**: Declaration, initialization, accessing elements, storing elements, two-dimensional and multi-dimensional arrays, applications of arrays. **Strings**– Declaration, initialization, Built-in and user-defined String handling Functions **Functions**: Basics, call by value and reference, recursive functions, Scope rules. **UNIT – III** **Storage Classes**: auto, register, static, extern. Type qualifiers, Pre-processor Directives. **Pointers**: Initialization of pointers, Address Arithmetic, Dynamic memory allocation functions, array of pointers, pointers to functions, command–line arguments. **Structures**: Declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, pointers to structures, self-referential structures, unions, bitfields. **UNIT – IV** **Data Structures**: Overview of Data Structures, Linked lists – implementation of Operations in singly linked list, **Stacks & Queues**: Basic Operations, representations of stacks and queues using arrays and linked lists, Applications.	

	UNIT –V **Graphs And Trees**: Representation and Traversals. **Searching And Sorting**: Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort. Searching – linear and binary search methods.
Text Books & Reference Books:	**Text Books:** 1.C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning. 2.Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Ed. **Reference Books:** 1.The C programming language: Kernighan B W and Ritchie D M. 2.An Introduction to Data structures with applications: Tremblay J P and Sorenson P G.
E-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

13EE1001 – BASIC ELECTRICAL SCIENCES

Course Category:	Professional core	**Credits:**	6
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-1-0
Pre-requisite:	Concept of e.m.f, potential difference, current, ohm's law, resistance, resistivity, series and parallel connections, power dissipation in resistance, effect of temperature on resistance Capacitors, with uniform and composite medium, energy stored in capacitor, R-C time constant. Magnetic field, Faraday's laws of Electromagnetic induction, Hysteresis and eddy current losses, energy stored in an inductor, time constant in R-L circuit.	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	• To understand the basic concepts of circuit analysis. • To understand Single Phase A.C Circuits • To understand Resonance concept. • To understand the concepts of Network topology. • The course intends to provide an overview of the principles, operation and application of the analog building blocks like diodes, BJT, FET etc.	
Course Outcomes:	**CO1**	Able to understand the basic concepts of D.C circuits, Coupled coils and Network topology.
	CO2	Able to fundamental concepts of single phase A.C circuits.
	CO3	Able to understand the basic concepts of Resonance and perform Steady state analysis of A.C circuits.
	CO4	Able to understand the basic properties of semi-conductor materials..
	CO5	Able to understand the characteristics of semi-conductor devices.
Course Content:	**UNIT – I** **Concept of Electric Circuits**: Active and passive elements, Ideal & Practical Sources, Source Transformation, V-I Characteristics of R, L and C elements, Kirchhoff's laws , Network reduction techniques, Star-Delta transformation, Mesh & Nodal analysis, Concept of Super mesh and Super node. **Graph theory:** Network topology, Cut set and Tie set matrices. Duality & Dual circuits-Concept of mutual inductance, Concept of coupling and dot convention. **UNIT – II** **Fundamentals of AC circuits:** Periodic wave forms – average and effective values of different wave forms, Form factor and crest factor, Phase and phase difference – phase notation, Concept of reactance, impedance, susceptance and admittance, Active & re-active power, Power factor-power triangle, Response of R, L and C elements for sinusoidal excitation.	

	UNIT – III **Steady state analysis**: RL, RC and RLC circuits for sinusoidal excitation, Phasor diagrams. **Resonance:** Series and parallel Resonance, Half power frequencies, Bandwidth and Q factor, Relation between half power frequencies- Bandwidth – Quality factor. **UNIT-IV** **Junction diode:** Band structure of PN- junction – current components- Volt ampere characteristics and its temperature dependence – diode resistance and capacitance- Zener diode and tunnel diode. **Opto Electronic Devices:** Photo emission, principle of operation of photo conductors, photo diodes, transistors, LED and LCD. **UNIT-V** **Bipolar Junction Transistor:** Transistor action- PNP and NPN transistors. CB, CE, CC configurations and their characteristics analytical expressions for transistor characteristics- Specifications of BJT- Determination of h- Parameters from BJT characteristics. **Field Effect Transistor:** Construction and operation -- Characteristics and applications of JFET.
Text Books & Reference Books:	**Text Books:** 1. Circuits & Networks:A.Sudhakar and Shyam Mohan – TMH 2. Circuit Theory: A.Chakarabarti - Dhanpat Rai 3. Electronic devices and circuits by Boylestad, Louis Nashelsky, 9ed..,2008 PE 4. Engineering Circuit Analysis:William Hayt & Kemmerly, TMH 5. FLOYD - "Electronic devices ", Pearson education. **Reference Books:** 1.Network Analysis: Vanvalkenberg 3ed, PHI 2.Mottershed, "Electronic devices and circuits", Prentice Hall of India. 3. Millman and Halkias, "Integrated Electronics" MC Graw Hill & Co., 4.David.A.Bell. "Electronic Devices and circuits", PHI. 5.Adel S.Sedra,Kenneth C.Smith, "Micro Electronic Circuits", Holt Sander's Japan
E-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

13SH10P1 – ENGLISH LANGUAGE LABORATORY

Course Category:	Humanities	**Credits:**	4
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	• Ability to understand English language • Ability to use language in informal situations • Minimum ability to perceive things around	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	• To equip with listening to comprehend the speech of people of different backgrounds • To enable to express fluently and appropriately in social and professional contexts • To help to overcome inhibitions and self- consciousness while speaking in English and to build confidence • Write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical and analytical writing. • Read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation	
Course Outcomes:	**CO1**	Comprehends confidently and respond appropriately to the speech of multiple speakers
	CO2	Express ideas and views without any hesitation
	CO3	Communicate and converse with general clarity using proper pronunciation which allow for overall intelligibility.
	CO4	Narrate with ease logically and gracefully
	CO5	Comprehend information in data and represent in pictorial format and graphs
Course Content:	I. Listening Skills: • Listening for Pleasure • Listening for Details • Listening for Information II. Speaking Skills: • Introducing Themselves • Phonetics 1. Introduction of Sounds- Vowels & Consonants 2. Syllables 3. Inflections 4. Stress & Intonation • Jam • Extempore • Role Plays/ Situational Dialogues & Telephonic Conversations • Presentations	

	• Debates III. Reading Skills: • News Paper Reading IV. Writing Skills: • Story Writing • Description 1. Object 2. Place 3. Person 4. Situation • Information Transfer • Giving Directions & Instructions • Email Writing

13ME101P – WORKSHOP

Course Category:	Sciences	**Credits:**	4
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	• Physical strength • General knowledge • Knowledge on dimensions	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	• Types of carpentry, fitting tools & types of joints. • Sheet metal – definition, working tools, operations - forming & bending. • Types of foundry tools and their usage in moulding process. • Types of welding tools, machine tools, cutting tools (Lathe, Drilling). • To impart knowledge in various AC & DC circuit parts. • To impart the basic knowledge of desk top computers& power point presentation.	
Course Outcomes:	**CO1**	Able to explain the different tools of usage in carpentry and fitting sections.
	CO2	Able to gain the basic knowledge in the manufacturing process of metal forming ,casting process & usage of tools in their respective sections.
	CO3	Able to make the circuits of household wiring.
	CO4	Able to explain the different tools which are using in machine shop, welding shop and black smithy.
	CO5	Students are able to learn the physical recognition of different electrical components like Resistances, Inductances, Capacitances and their ratings. And, gain the knowledge of computer peripherals working, sharing& power point presentation.
Course Content:	**LIST OF EXPERIMENTS** CARPENTRY 1. Planning sawing and grooving 2. Half lap joint 3. Half Lap Dovetail Joint 4. Mitre Faced Bridle Joint 5. Mortise and Tenon Joint FITTING Straight fitting 1. V-fitting 2. Square fitting 3. Semi-circular fitting 4. Dovetail fitting FOUNDRY 1. Stepped block 2. Dumb bell 3. Flanged pipe TINSMITHY 1. Square tin 2. Circular tin 3. Funnel DEMO	

	(a) Metal cutting (b) Welding (c) Black smithy ELECTRICAL WIRING 1. (a) One lamp controlled by one switch (b) Two lamps controlled by one switch in Series and Parallel (c) Two lamps controlled by one switch in Series and Parallel combinedly 2. (a) Two lamps controlled by two switches independently (b) One lamp controlled by two two-way switched (staircase connection) IT WORK SHOP 1. Assembling a desk top computer 2. Connecting two computers using wire and without wire 3. Preparation of a power point presentation ELECTRONICS 1. (a) Identification of components (b) Calculation of values of components like (i) Resistance (ii) Capacitance (iii) Inductance 2. Soldering Practice 3. Operation of CRO (a) Measurements of Parameters (b) Lijjajous Figure

13CS10P1 – PROGRAMMING LABORATORY

Course Category:	Computing	**Credits:**	4
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	• knowledge of computer operation • MS-office • Text editor	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	• To describe fundamentals of C programming such as variables, conditional and iterative execution, methods, etc. • Arrays, Strings, Functions • Storage classes, pointers, structures • Data structures, stacks and queues • Graphics and trees, searching and sorting	
Course Outcomes:	**CO1**	Plan a solution for a problem by writing a program.
	CO2	Develop searching and sorting algorithms using loop statements
	CO3	Write telephone directory program using files concepts.
	CO4	Develop stacks and queues programs using structures and pointers concepts.
	CO5	Develop trees programs using structures and pointers concepts.
Course Content:	**LIST OF EXPERIMENTS** 1) Write a C program to implement the following i) Convert Centigrade to Fahrenheit and vice versa (f=(9/5)*c+32) ii) Sum of the n natural numbers ((n(n+1))/2) iii) Sum of the squares of the n natural numbers ((n(n+1)(2n+1))/6) iv) Slope and midpoint of line using its end points (slope = (y2-y1)/(x2-x1),midpoint -> x=x1+x2/2, y=y1+y2/2) v) Quotient and remainder based on two integers i and j. (q = i/j, r = i-q*j) vi) Area and circumference of a circle (πr2& 2πr) 2) Compute all possible roots of a quadratic equation of the form ax2+bx+c=0. 3) Write a C program to arrange three numbers in ascending order using i) Ternary operator ii) if statement . 4) Write a C program to i) Find the grade of a student by reading marks ii) Convert the given digit into word. 5) Write a C program to implement the arithmetic operations (+,-,*, %) using switch case statement. 6) Write a C program to find the i) Factorial of a number ii) G.C.D of two numbers. 7) Write a C program to i) To find the sum of individual digits of a given number ii) Reduce the number to a single digit. 8) Write a C program to print i) Prime numbers from 1 to n ii) Pascal triangle.	

	9) Write a C program to find i) The largest and smallest number in a list of integers ii) Sum of 1! +2! +3! +-----+n! using while loop. 10) Write a C program to evaluate 1-1/2! +1/3!-1/4! +-----+1/n! using for loop. 11) Write a C program to implement Fibonacci series using do while loop. 12) Write a C program to evaluate the sum of series $1+x/1! +x^2/2! +x^3/3!...n!$. 13) Write a C program to implement the following i) Length of the given string ii) Reverse of the given string iii) Copy one string into another iv) Comparison of two strings v) Concatenation of strings vi) String handling functions (any five) 14) Write a C program to check whether the given string is a palindrome or not. 15) Write a C program to implement i) Matrix addition ii) Matrix multiplication. 16) Write a C program to implement factorial of a given number using recursion. 17) Write a C program to implement i) Employ salary calculation ii) Student percentage Calculation. 18) Write a function that returns a union with values of say Basic, DA, HRA etc. at different times based on the argument passed. Compute the salary of the employee in main function after calling the above function repeatedly. 19) Write a C program to implement pointer arithmetic. 20) Write a C program for i) Call by value ii) Call by reference. 21) Write a C program to find minimum and maximum values in a given array using pointers. 22) Write a C program to display i) Five arguments from command line arguments ii) Addition of two numbers using command line arguments. 23) Write a C program to implement stacks using arrays. 24) Write a C program to implement Single Liked List operations. 25) Write a C program to i) Convert infix to postfix expression. ii) Evaluate Postfix expression. 26) Write a C program to implement i) Linear search ii) Binary search. 27) Write a C program to implement i) Bubble sort ii) Selection sort. 28) Write a C program to implement Single Liked List operations.

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY:: VIDYANAGAR (AUTONOMOUS)
(AFFILIATED TO JNTU ANANTAPUR:NELLORE)
SPSR NELLORE DIST
II YEAR OF FOUR YEAR B.TECH DEGREE COURSE – I SEMISTER
ELECTRONICS AND COMMUNICATIONS ENGINEERING
SCHEME OF INSTRUCTION AND EVALUATION
(With effect from the academic year 2014-2015)
(For the batch admitted in the academic year 2013-2014)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation							
							Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Duration In Hours	Max. Marks	Duration In Hours	Max. Marks		Duration In Hours	Max. Marks	100
1	13SH2101	Engineering Mathematics-III **	3	1	-	4	2	40	2	40	0.8*Best of two+0.2*least of two	3	60	100
2	13EC2101	Signals&Systems**	4	-	-	4	2	40	2	40		3	60	100
3	13EC2102	Electronic Devices & Circuits**	3	1	-	4	2	40	2	40		3	60	100
4	13EC2103	Electromagnetic Fields	3	1	-	4	2	40	2	40		3	60	100
5	13EE2103	Circuits & Networks**	4	-	-	4	2	40	2	40		3	60	100
6	13EE2120	Electrical Technology	3	1	-	4	2	40	2	40		3	60	100
		PRACTICALS												
7	13EC21P1	Electronic Devices Lab	-	-	3	2	--	-	-	-	Day to Day Evaluation and a test (40 Marks)	3	60	100
8	13EE21P8	Electrical Technology Lab	-	-	3	2	--	-	-	-		3	60	100
		TOTAL	24	-	06	28	-	-	-	-		-	480	800

13SH2101 – ENGINEERING MATHEMATICS-III
(Common to EEE and ECE)

Course Category:	Mathematics	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	4-0-0
Pre-requisite:	Engineering maths	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	1. To solve partial differential equations. 2. To understand special mathematical functions and their application. 3. Apply analytical functions to solve flow problems. 4. To learn about residue theorem and evaluate definite integrals. 5. To understand and apply Z transforms to indefinite integrals.	
Course Outcomes:	**CO1**	Understand the applications to the solution of partial differential equations, one dimensional wave equation, one dimensional heat equation and two dimensional Laplace equation to solve initial and boundary value problems in a physical situations satisfying the conditions
	CO2	Understand the solutions of differential equation, linear differential variable coefficients, Bessel functions and Legendre functions.
	CO3	Understand the complex analytical, Cauchy-Riemann equations & Elementary complex functions
	CO4	Understand the complex integration, Cauchy's integral theorem, Taylor's and Laurent's equations..
	CO5	Understand the Z-Transformations of standard functions and their properties, Convolution theorem and the applications of Z- transforms to difference equations.
Course Content:	**UNIT-I** **APPLICATION OF PARTIAL DIFFERENTIAL EQUATIONS**: Methods of Separation of Variables – One dimensional Wave equation – One dimensional Heat flow equation – Two dimensional Laplace equations. **UNIT-II** **SPECIAL FUNCTIONS:** Bessel functions – Properties– Recurrence formulae for Bessel function – Generating function for Jn(x) – Orthogonally of Bessel Functions. Legendre functions – Rodrique's formula – Recurrence relation for Pn(x) – Generating function for Pn(x) – Orthogonality of Legender polynomials. **UNIT-III** **COMPLEX ANALYSIS-I:** Analytical functions, Cauchy - Riemann equations, Construction of Analytic function, Applications to flow problems. Conformal mapping–Bilinear transformations. **UNIT-IV** **COMPLEX ANALYSIS-II:** Complex integration – Line integral – Cauchy's theorem – Cauchy's integral formula – Taylor's theorem and Laurent's theorem (without proof) – Singularities – Poles – Residues – Residue theorem – Evaluation of real definite integrals. **UNIT-V** **Z-TRANSFORMS AND DIFFERENCE EQUATIONS:** Z – Transform of some standard functions- Properties of Z-Transforms – Shifting properties – Initial value theorem and final value theorem – Inverse Z- Transform – Convolution theorem – Inversion by partial fractions – Region of Convergence – Applications to difference equations.	

Text Books & Reference Books:	**Text Books :** 1. Higher Engineering Mathematics-B.S.Grewal, Khanna Publishers. 2. Engineering Mathematics – B.V.Ramana-TMH. 3. Advanced Engineering Mathematics-Erwin kreyszing. **Reference Books:** 1. Higher Engineering Mathematics- H K Das et al. 2. Engineering Mathematics-III –TKV Iyengar, S.Chand. 3. Engineering Mathematics-III - M K.Venkataraman.
E-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

13 EC 2101 – SIGNALS AND SYSTEMS

Course category:	Program core	**Credits:**	4
Course Type:	Theory	**Lecture - Tutorial - Practical:**	4 - 0 - 0
Prerequisite:	The prerequisite to the basic signals and systems course is Ordinary Differential Equations.	**Sessional Evaluation :** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	1. To understand & analyze the different types of Continuous Time Signals. 2. To understand Fourier series and Fourier transform of various signals. 3. Analysis and Design of different types of Continuous Time Systems. 4. To provide mathematical background and sufficient experience so that the student can read, write, and understand various problems involved in Discrete Time Signals and Systems. 5. To teach students how to write a Matlab program and its execution.	
Course Outcomes		Upon successful completion of the course , the students will able to:
	CO1	Define the signals and a systems with examples.
	CO2	Define the Fourier Transform and its properties.
	CO3	Explain the inter connections of LTI systems.
	CO4	Explain the operations on discrete time signals.
	CO5	Know the predefined key words and some control flow statements in MATLAB.
Course content	**UNIT-I** **Continuous Time Signals** : Signal classification – Dirac delta-types of signals unit sep, ramp, sign and exponential functions – Operations on signals- Analogy between vectors and signals – Orthogonality – Mean square error – Computation of moments, energy power, periodicity - power and energy spectral densities – Auto and cross correlation signals. **UNIT-II** **Fourier Series**: Definition-Dirichlet's conditions –classification of Fourier Series-properties of Fourier Series. **Fourier Transform :** Existence of Fourier Transform- Properties of Fourier Transform-Inverse Fourier transform. Parseval's Theorem of Energy and Power signals. **UNIT-III** **Continuous Time Systems:** Classification of systems – Linearity and time invariance – Transmission of signals through LTI systems – Convolution – Impulse response – Frequency response – Ideal filters – Distortion less transmission – Band Width – Rise time – Hilbert transform – Pre and complex envelopes – Band pass signals through band pass systems. **UNIT-IV** **Discrete Time Signals and Systems:** Unit impulse, step, ramp, and exponential signals – Periodicity of signals – Operations of signals – Linear Shift Invariant(LSI) system – Stability – Causality – Convolution and Correlation –Linear constant coefficient difference equation – Impulse response – Discrete time Fourier transform – Properties – Transfer function – System analysis using DTFT. **UNIT-V** **MATLAB:** Introduction –Basic operations on matlab –generation of signals –correlation-Convolution-	

	Computation of Fourier Transform-Solving difference equations. Computation of Z-Transform
Text Books and reference Books:	**TEXT BOOKS:** 1. Linear Systems and Signals : B.P.Lathi – Oxford University Press 2. Signals & Systems : A Anand Kumar - PHI **REFERENCES:** 1. Signals & Systems : J.S.Chittode – Technical Publications 2. Signals & Systems : A.V.Oppenhiem & A.S.Welslly with S.Hamid Naweb - PHI
E-Resourses	1. https://nptel.ac.in/courses 2. https://iete-elan.ac.in 3. https://freevideolectures.com/university/iitm

13 EC 2102 – ELECTRONIC DEVICES AND CIRCUITS

Course category:	Program core	**Credits:**	4
Course Type:	Theory	**Lecture - Tutorial - Practical:**	4 - 0 – 0
Prerequisite:	To provide students with the fundamentals of electronic circuits including design, construction and testing of experimental electronic circuits.	**Sessional Evaluation :** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	1. To understand the operation of operation of SCR, DIAC, TRIAC, UJT, Half-wave, Full-wave and Bridge rectifiers, Analysis of filters with full wave rectifier. 2. To understand the BJT biasing schemes, Hybrid model, Small signal analysis of single stage BJT amplifiers, Comparison of CE, CB and CC amplifiers. 3. To study the Hybrid- π model at high frequencies, types of coupling, Darlington and Bootstrap circuits. 4. To understand the FET biasing schemes, high frequency response. 5. To understand different types of feedback circuits, Sinusoidal oscillators: Barkhausen criterion, RC phase shift, Wien Bridge, Hartley, Colpitt's and Crystal oscillator.	
Course Outcomes		Upon successful completion of the course , the students will able to:
	CO1	Understand the operation and sketch the transfer characteristics of SCR, DIAC and UJT.
	CO2	Define small signal single stage BJT amplifier.
	CO3	Define hybrid- π model of BJT amplifier with their typical values.
	CO4	Design different methods to bias FET amplifier.
	CO5	Explain the concept of Negative feedback.
Course content	**UNIT-I** **OptoElectronic Devices :** Photo Emission, Principle of operation of photo conductors, photo diodes, photo transistors, LED and LCD. **Special semiconductor devices:** operation of SCR, DIAC, TRIAC and UJT. **Rectifiers:** Diode equivalent circuit, Half-wave, Full-wave and Bridge rectifiers, Analysis of filters with full wave rectifier. **UNIT-II** **BJT Amplifiers :** BJT biasing schemes, Stability(Ico,VBE and β), Hybrid model, Small signal analysis of single stage BJT amplifiers, Comparison of CE, CB and CC amplifiers, Approximate model analysis, Effects of coupling and bypass capacitors on low frequency response. **UNIT-III** **BJT High frequency analysis:** Hybrid-π model at high frequencies, Parameters f_β and f_T. **Multistage Amplifiers:** Types of coupling, Analysis of multistage amplifiers, overall voltage gain and Bandwidth of n-stage amplifier, Darlington and Bootstrap circuits.	

	UNIT-IV **FET Amplifiers:** FET biasing scheme, Small signal model, Analysis of CS &CD amplifiers, High frequency response. **UNIT-V** **Feedback amplifiers:** Feedback concept, Classification, Effect of negative feedback on gain, Stability, Noise, Distortion, Bandwidth, Input and Output resistance. Different types of feedback circuits without analysis. **Sinusoidal Oscillators:** Barkhausen criterion, RC phase shift, Wien Bridge, Hartley, Colpitts and Crystal oscillator.
Text Books and reference Books:	**TEXT BOOKS:** 1. Mottershed, "Electronic devices and circuits", PHI. 2. Millman and Halkias, "Integrated Electronics", McGraw- Hill Co. **REFERENCES:** 1.Boylestad, Louis Nashelsky "Electronic devices and circuits" 9ed.., 2008PE. 2. David.A.Bell. "Electronic Devices and circuits", PHI.
E-Resourses	1. https://nptel.ac.in/courses 2. https://iete-elan.ac.in 3. https://freevideolectures.com/university/iitm

13 EC 2103 – ELECTRO MAGNETIC FIELDS AND WAVES

Course category:	Program core	**Credits:**	4
Course Type:	Theory	**Lecture - Tutorial - Practical:**	4 - 0 - 0
Prerequisite:	The electromagnetic field extends indefinitely throughout space and describes the electromagnetic interaction	**Sessional Evaluation :** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	1. Understand The Electrostatics, Magneto statics, Maxwell's Equations and EM Wave Characteristics. 2. Learn scientific, mathematical and engineering principles that enable them to understand forces, fields, and waves; know how devices work that use those principles and phenomena.	
Course Outcomes		Upon successful completion of the course , the students will able to:
	CO1	Use Gauss Law, Coulomb's law to find fields and potentials for a various situations.
	CO2	Derive the continuity equation and give the importance of current density.
	CO3	Explain Biot-Savart's Law and Ampere's circuital law.
	CO4	Explain Faraday's Law.
	CO5	Discuss the importance of Linear, Elliptical and circular polarization
Course content	**UNIT-I** **ELECTROSTATICS:** Coulomb's Law –Electric Field Intensity –Electric Flux Density –Gauss's Law-Electric Potential-Potential Gradient-Energy Stored in Electric Field. **UNIT-II** **CONDUCTORS AND DIELECTRICS:**Current and Current Density- Continuity Equation-Conductors-Ohms Law-Dielectrics: Dipole Moment-Polarization-bound Charge Densities-Boundary Conditions-Poisson's and Laplace's equations-Capacitance-Energy density **UNIT-III** **MAGNETO STATICS:** Biot-Savart's Law - Ampere's circuital law – Lorentz Force Law – Magnetic field intensity H-Magnetic Vector Potential-Poisson's and Laplace's Equations-Dipole Moment-Bound Current Densities-Boundary Conditions-Energy Stored in Magnetic Field. **UNIT-IV** **ELECTROMAGNETIC WAVES:** Faraday's Law – Displacement Current – Modified form of Ampere's circuital law – Maxwell's Equations -Poynting theorem. Wave Equation – UniformPlane Waves in Lossless Media and in Lossy Media. **UNIT-V** **POLARIZATION, REFLECTION AND REFRACTION:** Linear, Elliptical and circular polarization – Reflection of Plane Wave from a conductor – normal incidence – Reflection of Plane Waves by a perfect dielectric – Normal and Oblique Incidence –VSWR- Brewster angle.	
Text Books and reference Books:	**TEXT BOOKS:** 1. Matthew N.O.Sadiku: "Elements of Engineering Electromagnetics" Oxford University Press, 4thedition, 2007. 2. E.C. Jordan & K.G. Balmain "Electromagnetic Waves and Radiating Systems." Pearson Education/PHI 4thedition 2006.	

	REFERENCES: 1. Narayana Rao, N: "Elements of Engineering Electromagnetics" 6th edition, Pearson Education, New Delhi, 2006. 2.G.S.N. Raju, Electromagnetic Field Theory & Transmission Lines, Pearson Education, 2006 .
E-Resourses	1.https://nptel.ac.in/courses 2.https://iete-elan.ac.in 3.https://freevideolectures.com/university/iitm

13EE2102 – CIRCUITS & NETWORKS
(Common to EEE and ECE)

Course Category:	Professional core	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	4-0-0
Pre-requisite:	Basic concepts of Ohm's Law, Kirchhoff's Laws. Basic knowledge of calculus and trigonometric principles are required.	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	1.To provide fundamentals of Electrical circuits. 2.To understand concepts of Network theorems. 3.To understand concepts of locus diagrams for electric circuits. 4. To understand concepts of Three phase circuits and calculations. 5.To learn the concepts of electrical transients.	
Course Outcomes:	**CO1**	Understand operating principles of circuits by various theorems, possess knowledge to draw the locus diagrams of series and parallel circuits.
	CO2	Ability to analyze the basic features of three phase circuits, phase-line values for balanced & unbalanced systems and measurement of three phase power.
	CO3	They can understand how to find the hybrid and transmission network parameters from Z & Y parameters by inter-relationships.
	CO4	Ability to determine the network parameters, symmetry and reciprocity conditions of networks, complex frequencies, pole – zero plots.
	CO5	Able to Understand about transient response of circuits for different excitations using time domain and Laplace transform methods.
Course Content:	**UNIT –I** **Network theorems:** Superposition, Reciprocity, Thevenin's and Norton's theorems, Maximum power transfer theorem, Millman's theorem, Application of these theorems to DC and AC networks. Locus diagrams of RL & RC series circuits, Locus diagrams of two branch parallel circuits. **UNIT-II** **Three phase circuits:** Advantages of three phase systems - Phase sequence - Star - Delta transformation - Balanced & unbalanced three phase systems - Magnitude & phasor relationships between phase and line voltages & current in balanced star and delta circuits - Analysis of balanced and unbalanced three phase circuits- measurement of three phase power. **UNIT-III** **Two port Network Parameters** - Open circuit parameters – Short circuit parameters – Transmission parameters - inverse transmission parameters - Hybrid parameters – Inverse hybrid parameters - Inter-relationships of different parameters –Condition for reciprocity and symmetry of networks with different two port parameters - Terminated two port networks – Image parameters. **UNIT-IV** **Network functions :** Single port & multi port networks - Immitance functions of two port networks – Necessary conditions for driving point functions & transfer function – Complex frequencies – Poles and zeros – Time domain	

	response from pole zero plots – Restrictions on pole-zero locations. **UNIT-V** **Transients:** Transient response of RL , RC & RLC circuits for DC & AC excitations using time domain & Laplace transform techniques - Determination of initial conditions - Concept of time constant – Transformed circuits -Transient response of RL , RC & RLC circuits for other types of signals using Laplace transform methods.
Text Books & Reference Books:	**Text Books :** 1. "Circuits & Networks" by A.Sudhakar and Shyam mohan – TMH publishers. 2. "Circuit Theory" by A.Chakarabarti - Dhanpat Rai publishers. 3. "Circuits & Systems" by K.M.Soni – Kataria Publishers. **Reference Books:** 1. "Network Analysis" by Vanvalkenberg 3rded, PHI publishers. 2. "Engineering Circuit Analysis" by Hayt & Kemmerly, TMH publishers.
E-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

13EE2120 – ELECTRICAL TECHNOLOGY

Course Category:	Professional core	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	4-0-0
Pre-requisite:	The knowledge of principal of Electro Mechanical Energy Conversion , Fundamental concepts of magnetically coupled electric circuits	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	1. To clearly understand the basic concepts of the Electrical Machines working in the modern Power System. 2. To understand the characteristics, operation and underlying theories of DC Machines. 3. To understand the characteristics, operation and underlying theories of Transformers.	
Course Outcomes:	**CO1**	Able to identify the DC machines to meet various requirements by analyzing the load characteristics of different types of DC machines
	CO2	Able to understand the operation principle and different types of Transformers.
	CO3	Able to understand the construction, principle of operation and analyze the performance of Three phase Induction Motors.
	CO4	Able to understand the construction, principle of operation and analyze the performance of Alternators.
	CO5	Able to understand the construction, principle of operation and analyze the performance of Single phase Induction Motors.
Course Content:	**UNIT – I** **DC Machines:** Principle of operation of the Generator - EMF equation – Types of Generators, Magnetization and Load Characteristics, Principles of Operation of DC Motors, Torque equation, Speed Control Methods, Efficiency Calculations by Swinburne's test and direct load test. **UNIT – II** **Transformers:** Single phase transformers, Principle of operation & types, Constructional Details, EMF equation, Phase Diagram on no load equivalent circuit, Regulation from OC and SC tests. **UNIT – III** **Three Phase Induction Motors:** Constructional features, Principles of Torque production, Torque Equation, Slip, Torque Characteristics, Efficiency calculation, Starting Methods. **UNIT – IV** **Alternator:** Constructional Features, EMF equation, Coil span factor, estimation of regulation by Synchronous impedance method. **UNIT – V** **Single Phase Induction Motors:** Principle of Operation, Starting Methods, Types of Single phase Induction motors, Stepper Motors.	
	Text Books: **1.** B.R. Gupta "Electrical Machines" Kataria & Sons. **2.** P.S. Bimra, "Electrical Machines" Khanna Publications.	

Text Books & Reference Books:	**Reference Books:** 1. "Electrical Machines" Nagrath and Kothari 2. "Electrical Technology" B.L. Thereja.
E-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

13EC21P1 ELECTRONIC DEVICES LAB

Course Category	Program Core	**Credits**	2
Course Type	Practical	**Lecture-Tutorial- Practice**	0-0-3
Prerequisite	Basics of Electronics	**Sessional Evaluation:**	40
		Semester End Evaluation:	60
		Total Marks:	100

Course Objectives	1. Understand the characteristics of various Electronic Devices. 2. Demonstrates the uses and applications of semiconductor devices. 3. Determine the typical values of various electronic devices. 4. Plot the characteristics of various devices in terms of V & I. 5. Draw their equivalent circuits used in Electronic Circuits.	
Course Outcomes		**Upon Successful Completion of Course, Student will be able to**
	CO1	Determine the typical values of each and every electronic device
	CO2	Draw V-I characteristics of all electronic devices.
	CO3	Find out the uses and applications of these devices.
	CO4	Analyze the importance of semiconductor devices.
	CO5	Demonstrates how various parameters of the devices can be found from V-I characteristics.
Course Content	**LIST OF EXPERIMENTS** **1. P-N Junction diode characteristics (Ge & Si) .** **2. Zener Diode Characteristics.** **3. Bi-Polar Junction Transistor Characteristics (CE configuration).** **4. Junction Field Effect Transistor characteristics.** **5. Uni-Junction Transistor Characteristics.** **6. Light Emitting Diode Characteristics.** **7. Light Dependent Resistor Characteristics.** **8. Photo Transistor Characteristics.** **9. Thermistor Characteristics.** **10. DIAC Characteristics.**	

13EE21P8 ELECTRICAL TECHNOLOGY LAB

Course Category	Program Core	**Credits**	2
Course Type	Practical	**Lecture-Tutorial- Practice**	0-0-3
Prerequisite	Basics of Electrical Components and motors	**Sessional Evaluation:**	40
		Semester End Evaluation:	60
		Total Marks:	100

Course Objectives	1. To clearly understand the basic concepts of the Electrical Machines working in the modern Power System. 2. To understand the characteristics, operation and underlying theories of DC Machines. 3. To understand the characteristics, operation and underlying theories of Transformers.	
Course Outcomes		**Upon Successful Completion of Course, Student will be able to**
	CO1	Able to identify the DC machines to meet various requirements by analyzing the load characteristics of different types of DC machines
	CO2	Able to understand the operation principle and different types of Transformers.
	CO3	Able to understand the construction, principle of operation and analyze the performance of Three phase Induction Motors.
	CO4	Able to understand the construction, principle of operation and analyze the performance of Alternators.
	CO5	Able to understand the construction, principle of operation and analyze the performance of Single phase Induction Motors.
Course Content	**LIST OF EXPERIMENTS** **1. Excitation characteristics of** **(a) Separately Excited DC Generator** **(b) Self Excited DC Shunt Generator** **2. External Characteristics of DC Shunt Generator** **3. Brake Test on DC Shunt Motor** **4. Swinburne's Test** **5. Speed Control of DC Shunt Motor** **6. O.C & S.C Test on 1Φ Transformer** **7. Load Test on 1Φ Induction Motor** **8. Load Test on 3Φ Induction Motor** **9. Voltage Regulation of an Alternator By EMF Method** **10. Equivalent Circuit of 1Φ Induction Motor**	

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY:: VIDYANAGAR (AUTONOMOUS)
(AFFILIATED TO JNTU ANANTAPUR:NELLORE)
SPSR NELLORE DIST
II YEAR OF FOUR YEAR B.TECH DEGREE COURSE – II SEMISTER
ELECTRONICS AND COMMUNICATIONS ENGINEERING
SCHEME OF INSTRUCTION AND EVALUATION
(With effect from the academic year 2014-2015)
(For the batch admitted in the academic year 2013-2014)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation							
							Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Duration In Hours	Max. Marks	Duration In Hours	Max. Marks		Duration In Hours	Max. Marks	100
1	13SH2201	Engineering Mathematics-IV**	3	1	-	4	2	40	2	40	0.8*Best of two+0.2*least of two	3	60	100
2	13EC2201	Switching Theory & Logic Design**	4	-	-	4	2	40	2	40		3	60	100
3	13EC2202	Random Signals & Stochastic Processes	4	-	-	4	2	40	2	40		3	60	100
4	13EC2203	Analog Communications	4	-	-	4	2	40	2	40		3	60	100
5	13EC2203	Pulse and Analog Circuits **	4	-	-	4	2	40	2	40		3	60	100
6	13SH2202	Economics & Accountancy **	4	-	-	4	2	40	2	40		3	60	100
		PRACTICALS												
7	13EC22P2	Electronic Circuits Lab	-	-	3	2	--	-	-	-	Day to Day Evaluation and a test (40 Marks)	3	60	100
8	13EE22P9	Circuits & Networks Lab	-	-	3	2	--	-	-	-		3	60	100
		TOTAL	23	1	06	28	-	-	-	-		-	480	800

**** Common to ECE,EEE**

13SH2201 – ENGINEERING MATHEMATICS-IV
(Common to EEE and ECE)

Course Category:	Mathematics	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	4-0-0
Pre-requisite:	Knowledge of linear and non-linear algebraic equations, differential equations and probability.	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	This course aims to equip the student with a basic understanding of concepts of determination of roots of non-linear equations, curve fitting, solution of linear and non-linear algebraic equations, solution of ordinary differential equations. Describes the numerical interpolation, differentiation and integration, probability and statistics.	
Course Outcomes:	**CO1**	Students will be able to understand the basic theories and methods of solving of non linear equations differential equations, and to apply the fundamental techniques of solving iterative methods .Bisection and Newton Raphson methods. Understanding effectively fitting of a curve by the method of least squares method. And also understand the rank correlation and Regression of lines.
	CO2	Understanding effectively Iterative methods Gauss Jordan Gauss Elimination with Pivotal condensation Triangular factorization methods Gauss- Seidel and also understand Newton – Raphson iterative methods.
	CO3	Understanding effectively Taylor's and Euler's methods of first order differential equations. To obtain more desired accuracy and also understand R-K Grill method, Miles Predictor and corrector methods. which plays an important role in engineering subjects.
	CO4	To know the definitions of Newton's forward and backward interpolation formulae. also to understand Lagrange's interpolation formula. Understand effectively by Romberg method of integration
	CO5	Students will be able to understand the discrete and continuous Random variables .Understand effectively three important theoretical distributions Binomial, Poisson and Normal distribution.
Course Content:	**UNIT-I** **DETERMINATION OF ROOTS OF NON-LINEAR EQUATIONS:** Bisection Method - Iterative methods - Falsi position method – Newton Raphson method. **CURVE FITTING**: Fitting a straight line – Second degree curve by the method of least Squares – Power Curve by the method of least Squares. Correlation: Coefficient of correlation – Rank correlation – Regression of lines. **UNIT-II** **SOLUTION OF LINEAR AND NON-LINEAR ALGEBRAIC EQUATIONS:** Iterative methods – Gaus Jordan– Gauss Elimination with Pivotal condensation –Triangular factorization methods – Gauss- Seidel and Newton – Raphson iterative methods. **UNIT-III** **SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS:** Taylor's Series method – Euler's method –Euler's modified method — Runge-Kutta Second and Fourth order methods - Runge-Kutta Grill method – Milne's Predictor and Corrector methods for first order equations.	

	UNIT-IV **NUMERICAL INTERPOLATION, DIFFERENTIATION AND INTEGRATION:** Newton's forward and backward interpolation formula – Lagrange's interpolation formula - Numerical Differentiation by Richardson's extrapolation—Numerical integration by Romberg method. **UNIT-V** **PROBABILITY AND STATISTICS:** Introduction – Random variables – Discrete and Continuous distributions – Binomial, Poisson's and Normal distributions.
Text Books & Reference Books:	**Text Books :** 1.Higher Engineering Mathematics by Dr. B.S.Grewal. 2.Higher Engineering Mathematics by H.K Das et al. 3.Numerical Methods by Balagurusamy, Tata McGraw- Hill **Reference Books:** 1.Numerical methods by S.Armugam etal, Scitech 2.Engineering Mathematical Methods by B.V.Ramana ,TMH
E-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

13EC2201 - SWITCHING THEORY & LOGIC DESIGN

(*Common for EEE & ECE*)

Course category:	Program core	Credits:	4
Course Type:	Theory	Lecture - Tutorial - Practical:	4 - 0 - 0
Prerequisite:	Basic theorems of algebra , basic gate logic functions and Semiconductor memory device	Sessional Evaluation : Univ.Exam Evaluation: Total Marks:	40 60 100

Course Objectives	1. To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions. 2. To introduce the methods for simplifying Boolean expressions. 3. To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits. 4. To introduce the concept of memories and Memory expansion. 5. To illustrate the concept of synchronous and asynchronous sequential circuits	
Course Outcomes		Upon successful completion of the course , the students will able to:
	CO1	understanding of the fundamental concepts and techniques used in digital electronics and understand and examine the structure of various number systems and its application in digital design
	CO2	Ability to identify basic requirements for a design application and propose a cost effective solution
	CO3	The ability to understand, analyze and design various combinational circuits
	CO4	The ability to understand, analyze and design various sequential circuits and The ability to identify and prevent various hazards and timing problems in a digital design.
	CO5	The ability to understand Memories
Course content	**UNIT – I** **Number Systems and codes:**Number systems, conversions, complements, arithmetic operations, signed binary numbers, BCD, Grey, ASCII, Parity bit and hamming code. **Boolean algebra and Logic Gates**:NOT, OR, AND operations, Boolean theorems,De-Morgan's theorem, logic gates,Universal gates and IEEE standard logic symbols. **UNIT – II** **Combinational logic circuits:** Standard forms of logical functions, Min-term and max-term specifications, Simplification by K-maps, Incompletely specified functions, prime implicants,essential prime implicants, Realization of logical functions using gates. **UNIT -III** **Design of combinational circuits:**Design procedure, Binary adders and sub-tractor, Serial and parallel adders, IC parallel adder, Decoders, encoders, Multiplexers, De-multiplexers and Digital magnitude comparator.	

	UNIT – IV, **Sequential circuits:** Latch, flip-flops (SR, JK, D & T), Timing problems, master-slave flip-flop and Shift registers. **Design of sequential circuits:** Asynchronous, synchronous counters, Ring and Johnson counters. **UNIT - V** **Memory Devices:** Terminology, ROM, PROM, EPROM, EEPROM, Semiconductor RAM (SRAM & DRAM) and its architecture, Memory expansion.
Text Books and reference Books:	**TEXT BOOKS:** 1. Digital design by Morris Mano,Pearson Education Asia 2. Fundamentals of logic design by Roth & Charles,2nd Edition, West *Publishing* Company, 1979 3. Ronald J.Tocci, Neal S.Widmer, "Digital systems — Principles and applications".8th edition, Pearson Education Asia, 2001. **REFERENCES:** 1. Fundamentals of logic circuits by A.Anand Kumar, PHI Learing 2. Jon M, Yarbrough, "Digital logic — applications and design", Thomson — Brooks India edition.
E-Resources	**1. http://nptel.ac.in/cources** **2. https:// iete-elan.ac.in** **3. https://freevideolectures.com/university/iitm** **4.https://www.youtube.com/watch?v=pJrqIgAM0o4&list=PLnSlSuYL9wG7C7Jk_mbXQ0LC0o7HQRsMD** **5. https://www.youtube.com/watch?v=K73N9ES_8nI**

13EC2202-RANDOM SIGNALS AND STOCHASTIC PROCESSES

Course category:	Program core	Credits:	4
Course Type:	Theory	Lecture - Tutorial - Practical:	4 - 0 - 0
Prerequisite:	Knowledge of Signals and systems (13EC2101), integrations and differential equations.	Sessional Evaluation : Univ.Exam Evaluation: Total Marks:	40 60 100

Course Objectives	1. To provide mathematical background and sufficient experience so that the student can read, write, and understand sentences in the language of probability theory, as well as solve probabilistic problems in signal processing and Communication Engineering and to introduce students to the basic methodology of "probabilistic thinking" and to apply it to problems 2. To understand basic concepts of probability theory and random variables, how to deal with multiple random variables, Conditional probability and conditional expectation, joint distribution and independence, mean square estimation. 3. To understand the difference between time averages and statistical averages. 4. Analysis of random process and application to the signal processing in the communication system. 5. To teach students how to model a noise source and design of filters for white and colored noises and maximize S/N ratio.	
Course Outcomes		Upon successful completion of the course , the students will able to:
	CO1	Explain fundamentals of probability theory, random variables and random processes
	CO2	Understand the mathematical concepts related to probability theory and random processes
	CO3	Understand the characterization of random processes and their properties
	CO4	Evaluate response of a system to random signal and noise
	CO5	Analyze the given probabilistic model of the problem and model noise sources

Course content

UNIT-I

Probability: Axioms- Joint and conditional probability - Bayes' theorem - Bernoulli trials.

Random Variable: concept — Distribution function — Density functions —conditional density functions — Expectation — Conditional expected value — Moments — Chebyshev, Markov's, and Chemoffs inequalities — Characteristics and moment generating functions - Transformation of continuous discrete random variable.

UNIT -II

Multiple Random Variables: Vector random variables — Joint distribution / Density functions — Conditional density / Distribution functions - Statistical independence — pdf and cdf for sum of random variables — Central limits theorem - Operations on multiple random variables — Expected value of function of random variables — Joint characteristic function — Joint by Gaussian random variables — Transformations of multiple random variables.

UNIT – III

Random Processes : Concept — Stationarity — Independence — Time averages — Ergodicity — Correlation functions — Properties:Gaussian, Poisson, and Markov processes — Power spectral density and its properties — Relation between power spectral density and auto-correlation — Cross power spectral density and its properties — Power spectrum for discrete time processes and sequences — Definition of

	white and coloured noise. **UNIT-IV** **Linear Systems with Random Inputs:** Random signal response of linear system — System evaluation using random noise— Spectral characteristics of system response - Band pass, Band limited, and Narrow band processes — Properties of band limited processes. **UNIT-V** **Modeling of Noise Sources:** Classification of noise sources — Resistive (Thermal) noise — Effective noise temperature — Antenna as a noise source — Available power gain — Equivalent networks — Input noise temperature — Noise figure. **Optimum Linear Systems:** Maximization of (S/N); matched filter for coloured and white noise — Minimization of mean squared error — Wiener filter.
Text Books and reference Books:	**TEXT BOOKS:** 1. P.Z.Peebles Jr., "Probability Random Variables and Random Signal Principles". Tata McGraw-Hill, 4 edition, 2001. 2. A.Papoulis and S.Unnikrishna Pillai, "Probability Random Variables and Stochastic Processes", PHI, 4 edition, 2008 3. J.LAunon and V.Chandrasekhar, "Introduction to Probability and Random Processes", McGraw-Hill 1997. **REFERENCE:** 1. D.G. Childer, "Probability and Random Processes", McGraw Hill, 1997. 5. GR.Babu and K. Pushpa, "Probability Theory and Stochastic Processes", Premier Publishing House, 2003.
E-resources	1. http://nptel.ac.in/cources 2. https:// iete-elan.ac.in 3. https://freevideolectures.com/university/iitm 4. https://www.youtube.com/watch?v=r1sLCDA-kNY&list=PL6E780AC0DCCB175C 5. https://www.youtube.com/watch?v=ISfCifJK0IU&list=PLB3149CEE48F1460E

13EC2203-ANALOG COMMUNICATION

Course category:	Program core	Credits:	4
Course Type:	Theory	Lecture - Tutorial - Practical:	4 - 0 - 0
Prerequisite:	Knowledge in Fourier series and Fourier transforms.	Sessional Evaluation : Univ.Exam Evaluation: Total Marks:	40 60 100

Course Objectives	1. To understand the fundamentals of various modulation schemes of AM like Full AM,DSB-SC, SSB-SC and VSB. 2. To differentiate between Frequency Modulation and Phase Modulation generation and detection methods. 3. To understand the concepts of Sampling theorem and Pulse Analog modulation Schemes like PAM, PWM and PPM. 4. To evaluate the effect of noise on different modulation schemes and also to design some circuits like Pre - emphasis and De - emphasis networks. 5. To realize or implement the circuits required for modulation and demodulation of AM and FM Schemes such as Transmitters and receivers etc.	
Course Outcomes		Upon successful completion of the course , the students will able to:
	CO1	Identify the Various Modulation schemes used in communication systems
	CO2	Define a modulation and demodulation concepts used in Analog communication systems
	CO3	Calculate the Figure of Merit for conventional AM,DSB-SC,SSB-SC and VSB schemes
	CO4	Get familiarized with the behavior of AM& FM Modulators and Demodulators
	CO5	Describe the Characteristics ofAM radio receivers and Express the importance of FM Broadcast Stereo Systems

UNIT – I

ELEMENTS OF ELECTRICAL COMMUNICATION SYSTEMS : Modulation and its need and types Fundamental Physical limitations - Electromagnetic Spectrum and Areas of applications

AMPLITUDE MODULATION: Full AM DSB-SC and SSB generation and detection methods VSB, Frequency translation, FDM, Nonlinear distortion and Inter modulation.

UNIT -II

ANGLE MODULATION : Phase and frequency modulation ,NBFM, WBFM , Multitone FM Transmission bandwidth of FM , Direct and Indirect generation of FM ,Demodulation methods, Nonlinear effects ,FM versus AM.

Course content	**UNIT -III** **PULSE ANALOG MODULATION:** Sampling Theorem - Nyquist rate - Aliasing effect - Sampling of band pass signals -PDM and PPM Generation and detection, Spectra –Synchronization, TDM Asynchronous TDM-Comparison of TDM & FDM. **UNIT –IV** **EFFECT OF NOISE ON LINEAR MODULATION SYSTEMS :** Base band systems, DSB-SC, SSB Conventional AM. Carrier phase estimation with a Phase Locked Loop (PLL), Effect of additive noise on phase estimation. **EFFECT OF NOISE ON ANGLE MODULATION SYSTEMS :** Threshold effect in angle modulation, Pre-emphasis and De-emphasis.Comparison of Angle modulation systems.Effect of transmission losses and noise in analog communication systems. **UNIT-V** **CIRCUIT IMPLEMENTATION OF MODULATION SYSTEMS:** Block diagram Study of Radio Broadcast AM and FM transmitters, Super heterodyne receivers, Choice of IF, AGC, Tracking Characteristics of Radio receivers, FM stereo.
Text Books and reference Books:	**TEXT BOOKS:** 1. “Communication Systems” Simon Haykin, Wiley Eastern. 2. “Electronic communication systems” J.Kennedy TMH **REFERENCE BOOKS:** 1. “Communication Systems Engineering” John Proakis, MasoudSaleb. 2. “Principles of Communication Systems” Taub and Schilling”, McGraw-Hill ISE. 3. “Electronic Communications” Dennis Roddy and John Coolen, PHI. 4. “Modern Digital and Analog Communication Systems” B.PLathi, Oxford Univ. Press.
E- resources	1. http://nptel.ac.in/cources 2. https:// iete-elan.ac.in 3. https://freevideolectures.com/university/iitm **4. https://www.youtube.com/watch?v=yssVLZEyNis&list=PL9A4900FA347106F7** **5. https://www.youtube.com/watch?v=yssVLZEyNis&list=PLFE0C654AD8CF3A99**

13EC2204-PULSE &ANALOG CIRCUITS

(Common for EEE & ECE)

Course category:	Program core	Credits:	4
Course Type:	Theory	Lecture - Tutorial - Practical:	4 - 0 - 0
Prerequisite:	Knowledge in active & passive components and mathematical representation of different wave shapes.	Sessional Evaluation : Univ.Exam Evaluation: Total Marks:	40 60 100

Course Objectives	1. Analysis and design of wave shaping circuits, multi-vibrators and time base generators. 2. Analysis of LC tuned amplifiers. 3. To learn design of RF amplifiers using transistors.	
Course Outcomes		Upon successful completion of the course , the students will able to:
	CO1	Design the circuits for generating desired wave shapes(non-sinusoidal) for different applications like computers, control systems and counting and timing systems
	CO2	Design RC circuits for triggering
	CO3	Design free running oscillators
	CO4	Ability to understand Power Amplifiers
	CO5	Ability to understand MOS Transistor & Tuned amplifiers
Course content	**UNIT-I** **WAVE SHAPING CIRCUITS**: Types of waveforms, RC low pass and high pass circuits, rise time, tilt, Diode as a switch, Diode clipper and clamper circuits. **UNIT-II** **MULTIVIBRATORS:** BJT switch and switching times, Bistable & triggering methods, Schmitt-trigger, Mono-stable and Astable multi-vibrators using BJT. **UNIT-III** **TIME BASE CIRCUITS:** RC sweep circuits, constant current Miller and Bootstrap time base generators using BJT's, UJT relaxation oscillators, and sampling gates. **UNIT-IV** **MOS TRANSISTOR:** MOS and CMOS Structure, operation (enhancement and depletion mode), I/V Characteristics,Second Order effects - MOS Device capacitance and Small signal model. **UNIT-V** **POWER AMPLIFIERS:** Class-A, Transformer coupled Class-A, Class-B Push-pull, Complementary Class-B push-pullamplifiers. **TUNED AMPLIFIERS:**Introduction, Q-factor, small signal tuned amplifiers, effect of cascading single tuned amplifier on bandwidth and stagger tuned amplifiers.	

Text Books and reference Books:	**TEXT BOOKS:** 1. Digital design by Morris Mano,Pearson Education Asia 2. Fundamentals of logic design by Roth & Charles,2nd Edition, West *Publishing* Company, 1979 3. Ronald J.Tocci, Neal S.Widmer, "Digital systems — Principles and applications".8th edition, Pearson Education Asia, 2001. **REFERENCES:** 1. Fundamentals of logic circuits by A.Anand Kumar, PHI Learing 2. Jon M, Yarbrough, "Digital logic — applications and design", Thomson — Brooks India edition.
E- resources	1. http://nptel.ac.in/cources 2. https:// iete-elan.ac.in 3. https://freevideolectures.com/university/iitm 4. https://www.youtube.com/watch?v=aO6tA1z933k 5. https://www.youtube.com/watch?v=wN6g_q3KPtw 6. https://www.youtube.com/watch?v=x0BZeUACpK0

13SH2202-ECONOMICS & ACCOUNTANCY

(Common for EEE & ECE)

Course category:	Program S & H	Credits:	4
Course Type:	Theory	Lecture - Tutorial - Practical:	4 - 0 - 0
Prerequisite:		Sessional Evaluation : Univ.Exam Evaluation: Total Marks:	40 60 100

Course Objectives	This course aims to equip the student with a basic understanding of concepts of demand analysis, theory of production and banking, classification of markets, pricing under perfect competition, monopoly, price discrimination, types of business organizations. Describe the concepts and principles in financial accounting, journal and ledger, trail balance, final accounts, basic concepts in capital budgeting process.	
Course Outcomes		Upon successful completion of the course , the students will able to:
	CO1	It gives complete study on the demand and elasticity of demand and methods of demand forecasting.
	CO2	It gives detailed structure on the pricing strategies
	CO3	It shows clear picture methods and sources of raising finance.
	CO4	To know Types of Business Organizations
	CO5	Ability to understand Financial & Management Accounting

Course content

UNIT – I

DEMAND ANALYSIS: Definition and basic concepts of Economics – consumer's equilibrium: Marginal Utility Analysis - the concept of Demand - Law of Demand – Elasticity of Demand: Types, determinants and its importance.

UNIT – II

THEORY OF PRODUCTION AND BANKING : Production function – Cobb – Douglas production function and its properties – Law of variable proportions – Law of Returns to Scale – Cost concepts – Revenue curves – Break-Even Analysis. Money-functions of Money-Functions of Commercial Banks-Features of Indian Economy.

UNIT – III

MARKETS : Classification of markets – Pricing under perfect Competition – Pricing under Monopoly – Price discrimination – Monopolistic Competition.

UNIT – IV

TYPES OF BUSINESS ORGANIZATIONS : Sole tradership, partnership and Joint Stock Companies – Formation of companies - Shares and debentures.

UNIT – V

FINANCIAL & MANAGEMENT ACCOUNTING : Concepts and principles in Financial Accounting, Journal and Ledger, Trial Balance, Final Accounts: Trading Account, Profit and Loss

	account and Balance Sheet. Basic concepts in Capital Budgeting process and Methods – Working Capital: operating cycle, factors and sources.
Text Books and reference Books:	**TEXT BOOKS:** 1. Managerial Economics and Financial Analysis: A R Aryasri 2. Management Accounting : S N Maheswari 3. Economic Analysis : K. Sankaran **REFERENCES**: 1. Double entry book keeping : Battlibai 2. Cost Accounting : Jain and Narang 3. Managerial Economics : Maheswari and Varshaney
E- resources	1. https://www.youtube.com/watch?v=kega_QOCvxQ&list=PLRW1FgIW06IpkWmpIl_1qrXIPPzZdc7- 2. https://www.youtube.com/watch?v=51-nXPx3cw4&list=PLbMVogVj5nJTG7ahmEJc4MlcGT0hCr5ik 3. https://freevideolectures.com/university/iitm 4. https://www.youtube.com/watch?v=51-nXPx3cw4&list=PLbMVogVj5nJTG7ahmEJc4MlcGT0hCr5ik

13EC22P2 ELECTRONIC CIRCUITS LAB

Course Category	Program Core	**Credits**	2
Course Type	Practical	**Lecture-Tutorial- Practice**	0-0-3
Prerequisite	Electronic Devices and Circuits	**Sessional Evaluation:**	40
		Semester End Evaluation:	60
		Total Marks:	100

Course Objectives	1. Understand the characteristics of various Electronic Circuits like Rectifiers. 2. Demonstrates the uses and applications of Amplifiers. 3. Determine the typical values of various electronic circuits like Oscillators. 4. Plot the characteristics of feedback amplifiers in terms of Gain Vs Frequency. 5. Draw the equivalent circuits of Amplifiers.	
Course Outcomes		**Upon Successful Completion of Course, Student will be able to**
	CO1	Determine the typical values for ripple factor and % of regulation of rectifiers
	CO2	Draw the frequency response characteristics of the amplifiers.
	CO3	Find out the uses and applications of Oscillators.
	CO4	Analyze the importance of feedback amplifiers.
	CO5	Demonstrates how various parameters of the amplifiers can be found from frequency response characteristics.
Course Content	**LIST OF EXPERIMENTS** **1. Rectifiers without Filters (HWR, FWR, BR).** **2. Rectifiers with filters (C,LC,CLC).** **3. R-C Coupled Amplifier.** **4. FET Amplifier.** **5. Colpitts Oscillator.** **6. Current Series Feedback Amplifier (with & without feedback).** **7. Determination of f_T of a transistor.** **8. R-C Phase Shift Oscillator.** **9. Wien bridge Oscillator.** **10. Darlington pair Amplifier.**	

13EE21P1 – CIRCUITS AND NETWORKS LAB

Course Category:	Professional core	**Credits:**	2
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	Basic concepts of Ohm's Law, Kirchhoff's Laws. Basic knowledge of Network Theorems is required.	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	Able to understand analysis and design of electrical circuits	
Course Outcomes:	**CO1**	Students will able to analyse and design electrical circuits using circuit elements.
	CO2	Students able to understand the concept of different electrical theorems practically.
	CO3	Students will able to analyse Two port networks and to understand the concepts of resonance in R-L-C circuits.
	CO4	Students will able to analyse and calculate mutual inductance of coupled coils.
	CO5	Students will able to understand power and power factor concepts practically.

Course Content:

LIST OF EXPERIMENTS

1. Verification of Kirchhoff's Laws
2. Verification of Superposition Theorem
3. Verification of Reciprocity Theorem
4. Verification of Maximum Power Transfer Theorem
5. Determination of Two-Port Network Parameters
6. Measurement of Mutual Inductance
7. Locus Diagram of RC Series Circuit
8. Measurement of Power Using Wattmeter
9. Verification of Thevenin's Theorem
10. Resonance In RLC Series Circuit
11. Measurement of Time Constant & Rise Time in a RC Series Circuit
12. Measurement of Power Using
    (i) 3-Ammeter Method
    (ii) 3-Voltmeter Method

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY:: VIDYANAGAR (AUTONOMOUS)
(AFFILIATED TO JNTU ANANTAPUR:NELLORE)
SPSR NELLORE DIST
III YEAR OF FOUR YEAR B.TECH DEGREE COURSE – I SEMISTER
ELECTRONICS AND COMMUNICATIONS ENGINEERING
SCHEME OF INSTRUCTION AND EVALUATION
(With effect from the academic year 2015-2016)
(For the batch admitted in the academic year 2013-2014)

Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation							Max. Total Marks
						Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		
	THEORY	L	T	D/P		Duration In Hours	Max Marks	Duration in Hours	Max Marks		Duration in Hours	Max Marks	100
13EE3107	Linear Control Systems**	3	1	-	4	2	40	2	40	0.8(best test) + 0.2(other test)	3	60	100
13EC3101	Electronic Measurements & Instrumentation	3	1	-	4	2	40	2	40		3	60	100
13EC3102	Digital Communications	4	-	-	4	2	40	2	40		3	60	100
13EC3103	Analog IC Applications**	4	-	-	4	2	40	2	40		3	60	100
13EE3103	Antenna and Wave Propagation	4	-	-	4	2	40	2	40		3	60	100
13CE3107	Environmental Studies**	3	1	-	4	2	40	2	40		3	60	100
	PRACTICALS												
13EC31P1	Pulse and Digital Circuits Lab	-	-	3	2	--	-	-	-	Day to day Evaluation (30) + A test (10)	3	60	100
13SH31P1	Advanced Communication Skills Lab	-	-	3	2	--	-	-	-		3	60	100
	TOTAL	21	3	06	28	-	-	-	-	-	-	-	-

**** Common to ECE,E**

13EE3106-LINEAR CONTROL SYSTEMS

Course Category	Program Core	**Credits**	4
Course Type	Theory	**Lecture-Tutorial- Practice**	4-0-0
Prerequisite	Basics of Signals and Systems and Calculus	**Sessional Evaluation:**	40
		Semester End Evaluation:	60
		Total Marks:	100

Course Objectives	1. To teach the basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems and also deals with the different aspects of stability analysis of systems in frequency domain and time domain.. 2. To educate the students about types of system and how to control them and Can check the system to be stable, unstable or marginally stable 3. To educate the students to develop & design a system which may be useful for industry and public life. 4. To show how to use control theory to analyze and design advanced control systems for industrial problems such as trajectory tracking, disturbance rejection, and optimization	
Course Outcomes		**Upon Successful Completion of Course, Student will be able to**
	CO1	Understand various types of control systems and methods to obtain transfer function
	CO2	Develop mathematical models of physical systems
	CO3	Evaluate the stability of linear systems using different techniques
	CO4	Evaluate the response of linear systems using time domain and frequency techniques
	CO5	Design different types of compensators for linear systems
Course Content	**UNIT –I** **Introduction to classical control systems:** Open loop and closed loop control systems- Types of feedback, Feedback and its effects- Transfer functions - block diagrams and their reduction- signal flow graphs - Mason's gain formula. **UNIT-II** **Mathematical modeling of physical systems:** Mathematical modeling and transfer functions of electrical, mechanical and electro-mechanical elements.- DC servo motors- two-phase A.C. servo motors – synchros. **UNIT-III** **Time domain analysis:** Introduction, Standard test signals, Time response specifications – steady state error constants. **Stability of control systems:** Routh Hurwitz criterion- Root Locus – rules for the construction of root loci- Introduction to proportional, derivative and integral controllers. **UNIT-IV** **Frequency domain Analysis:** introduction- Frequency domain specifications- Polar plots – Bode	

	Plots- Nyquist stability criterion **UNIT-V** **Design of compensators:** Introduction - Need for compensators. Lag and lead compensators design in frequency domain.
Text Books and Reference Books	**Text books** 1. Control system Engineering I.J.Nagrath and M.Gopal, Wiley Eastern Ltd. 2. Control System Engineering – A. Nagoor kani 3. Control System Engineering – A. Anand kumar **Reference Books:** 1. Automatic Control systems- by B.C.Kuo, PHI. 2. .Discrete Time Control Systems by K.Ogata, Pearson education. . 3. Control system Engineering by NISE, Wiley, 2000.
E-Resources and Other Digital Material	1. http://www.nptel.ac.in. 2. http:/www.ebookee.com/digitalcommunicationsystems.

13EC3101-ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Course Category	Program Core	**Credits**	4
Course Type	Theory	**Lecture-Tutorial- Practice**	4-0-0
Prerequisite	Electronic Devices and Characteristics of Systems	**Sessional Evaluation:**	40
		Semester End Evaluation:	60
		Total Marks:	100

Course Objectives	1. Introduce students to the use of various standards and units of measurements, electronic instruments, their construction, applications, and principles of operation. 2. Understand the internal structure of analog and digital instruments that are used in measuring parameters and also difference between analog meters and digital meters and their performance characteristics. **3.** Provide students with opportunities to develop basic skills in the design of electronic equipment.	
Course Outcomes		Upon Successful Completion of Course, Student will be able to
	CO1	Understand various types of control systems and methods to obtain transfer function
	CO2	Develop mathematical models of physical systems
	CO3	Evaluate the stability of linear systems using different techniques
	CO4	Evaluate the response of linear systems using time domain and frequency techniques
	CO5	Design different types of compensators for linear systems
Course Content		

UNIT I

Performance characteristics of instruments : Static characteristics, Accuracy, Resolution, Precision, Expected value, Error, Sensitivity.Errors in Measurement, Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error. DC Voltmeters- DC Ammeters Multi range, Range extension, AC voltmeters- multi range, range extension, Ohmmeters - series type, shunt type, Multimeter for Voltage, Current and resistance measurements.

UNIT II

Fixed and variable signal Generators : AF oscillators, Standard and AF sine and square wave signal generators, Function Generators, Square pulse, Random noise, sweep, Arbitrary waveform. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzer.

UNIT III

Oscilloscopes : CRT features, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, triggered sweep CRO, Dual beam CRO, Measurement of amplitude and frequency, Dual trace oscilloscope, sampling oscilloscope, storage oscilloscope,

	digital readout oscilloscope, digital storage oscilloscope, Lissajous method of frequency measurement, standard specifications of CRO, Frequency counter, Time and Period measurement. **UNIT IV** **Wheat stone bridge :** AC Bridges, Measurement of inductance- Maxwell's bridge, Measurement of capacitance - Schering Bridge. Wien Bridge, Errors and precautions in using bridges. Q-meter. **UNIT V** **Transducers :** Active & Passive transducers : Resistance, Capacitance, Inductance; Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors. Measurement of physical parameters force, pressure, velocity, humidity, moisture, speed, proximity and displacement. Data acquisition systems.
Text Books and Reference Books	**Learning Resources** **Text books** 1.Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002. 2.Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004 **Reference Books:** 1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2nd Edition, 2003. 2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2nd Ed., 2004.
E-Resources and Other Digital Material	1. http://www.nptel.ac.in. 2. http:/www.ebookee.com/electronicmeasurementand instrumentation..

13EC3102-DIGITAL COMMUNICATIONS

Course Category	Program Core	**Credits**	4
Course Type	Theory	**Lecture-Tutorial- Practice**	4-0-0
Prerequisite	Basics of Probability and Analog Communication	**Sessional Evaluation:**	40
		Semester End Evaluation:	60
		Total Marks:	100

Course Objectives	1. Understand basic components of digital communication systems. 2. To prepare mathematical background for communication signal analysis. 3. Become familiar with the fundamentals of channel coding techniques. 4. Able to apply suitable pulse code modulation schemes and coding for various applications. 5. Understand transmission and detection of digital carrier modulation schemes. 6. Analyze error performance of a digital communication system in presence of noise and other interferences 7. Design of band limited signals for no Inter Symbol Interference (ISI) and controlled ISI. 8. Understand various M-array signaling schemes. 9. Learn techniques for encoding and decoding of different digital codes.	
Course Outcomes		Upon Successful Completion of Course, Student will be able to
	CO1	Select the blocks in design of digital communication system
	CO2	Acquire knowledge about, sampling and quantization.
	CO3	Identify and describe different techniques in modern digital communications
	CO4	Gain knowledge about different M-array modulation techniques
	CO5	Acquire knowledge about of inter symbol interference (ISI).
Course Content	**UNIT-I** **Digital Communication System & Information Theory:** Model Of A Digital Communication System – Unit Of Information – Entropy – Mutual Information – Channel Models And Channel Capacity – Shannon's Theorem – Shannon-Hartley Theorem –Bandwidth – S/N Trade-Off – Source Encoding Of Discrete Memory Less Source – Shannon-Fanon coding – Huffman Coding – Coding Efficiency. **UNIT-II** **Source Coding for Analog Signals:** Review of Sampling Theorem – PCM System –Quantization Noise – Companding – B.W requirements of PCM – Differential PCM –Delta Modulation – Adaptive delta Modulation – Noise in PCM & Delta Modulation. **UNIT-III** **Base Band Data Transmission:** Characterization Of Band Limited Channels – Design of band limited signals for no Inter Symbol Interference (ISI) – The Nyquist criterion –Design of band	

	limited signals with controlled ISI – Partial response signals –Transmitting & Receiving Filters for Optimum Performance– M-array signaling scheme – Binary Vs M-array – Equalization schemes – Eye diagrams. **UNIT-IV** **Digital Carrier Modulation Schemes:** ASK, FSK(coherent & Non coherent) – PSK –DPSK – Baseband signal receiver – Optimum & Matched Filters – Correlator – Comparison of Digital Modulation Schemes – Bandwidth requirement – Power requirement – Immunity to channel impairments – Equipment complexity – M-array signaling schemes – synchronization methods. **UNIT-V** **Error Control Coding :** Linear Block Codes – Matrix Description – Hamming Codes – Decoding – Binary Cyclic Codes – Algebraic Structure – Encoding Using Shift Register – Syndrome Calculation – BCH Codes, Burst & Random Error Correcting Codes – Convolution Codes – Tree Diagram –State Diagram –Trellis Diagram– Encoders and Decoding Algorithms. **TEXT BOOKS:** 1. Digital Communications – Simon Haykin 2nd Edition, Tata McGraw-Hill Publishers. 2. Analog & Digital Communication Systems –Sam Shanmugam,K, John Wiley & Sons **REFERENCE:** 3. Principles of Communication System – Taub, H & Schilling D.L, Mc Graw Hill. 4. Communication Systems, Analog & Digital –R.P. Singh & S.D.Sapre,TMH Publishers 5. Digital Communications –Proakis, J.G- Mc Graw Hill.
Text Books and Reference Books	**Learning Resources** **Text books** 1. Digital Communications – Simon Haykin 2nd Edition, Tata McGraw-Hill Publishers. 2.Analog & Digital Communication Systems –Sam Shanmugam,K, John Wiley & Sons **Reference Books:** 1. Principles of Communication System – Taub, H & Schilling D.L, Mc Graw Hill. 2.Communication Systems, Analog & Digital –R.P. Singh & S.D.Sapre,TMH Publishers 3. Digital Communications –Proakis, J.G- Mc Graw Hill.
E-Resources and Other Digital Material	1.http://www.nptel.ac.in. 2.http:/www.ebookee.com/digitalcommunicationsystems.

13 EC 3103 - ANALOG IC APPLICATIONS

Course Category	Program Core	**Credits**	4
Course Type	Theory	**Lecture-Tutorial- Practice**	4-0-0
Prerequisite	Circuit Theory	**Sessional Evaluation:**	40
		Semester End Evaluation:	60
		Total Marks:	100

Course Objectives	1. To introduce the basic building blocks of Op amp & its characteristics. 2. To teach linear and non-linear applications of operational amplifiers. 3. To introduce the theory and applications of 555 timer and PLL. 4. Design of various filters using op amp. 5. To teach theory of ADC's and DAC's.	
Course Outcomes		Upon Successful Completion of Course, Student will be able to
	CO1	Learn the various applications of the Integrated Circuits.
	CO2	Know the importance of Operational Amplifier.
	CO3	Get the knowledge of 555 timer and PLL.
	CO4	Acquiring knowledge of filters and regulators.
	CO5	Getting knowledge on interfacing ADC's and DAC's.
Course Content	**UNIT – I** **Operational Amplifier :** Introduction to ICs, Op-Amp Ideal Characteristics, Internal Circuit, Differential Amplifier and its Transfer Characteristics, Derivation of CMRR & Improvement Methods of Differential Amplifier Characteristics, DC and AC Characteristics of Op-Amp, Inverting and Non-Inverting Modes for Operation, Voltage Follower and Specifications of IC 741. **UNIT – II** **Op-Amp Applications:** Summer, Integrator, Differentiator, Analog Computation, Instrumentation Amplifier, V to I and I to V Converters, Precision Rectifiers, Sample and Hold Circuit. **Comparators and Waveform Generators :** Comparator, Regenerative Comparator, Astable and Monostable Multivibrators Using Op-Amp, Triangular Wave Generator, Sine Wave Generators Using Op-Amp (RC Phase Shift).	

	UNIT – III **IC Timers:** 555 Timer, Astable and Monostable Modes. **Phase Locked Loop**s: Basic Principles, Lock and Capture Range, Voltage Control Oscillator (IC-566), PLL (IC 565) and PLL Applications. **UNIT – IV** **Active Filters:** Low Pass, High Pass and Band Pass Filters, State Variable Filters. **Voltage Regulators:** Series Op-Amp Regulator, IC Voltage Regulators, IC 723 Regulator, Switching Regulators. **UNIT – V** **Electronic Data Converters:** Introduction, DACs-Weighted Resistor, R-2R and Inverted R-2R. **Type of ADCs:** Parallel Comparator Type, Counter Type, Successive Approximation and Dual Slope ADCs, Specifications of DAC and ADC.
Text Books and Reference Books	**Learning Resources** **Text books** 1. D. Roy Choudary, Shail B.Jain, "Linear Integrated Circuits", New Age international Publishers, 2003. 2. Design of Analog Integrated Circuits by Sergio Franco. **Reference Books:** 1. J. Michel Jacob, "Applications and Design with Analog Integrated Circuits", PHI, EEE, 1997. 2. Ramkant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", LPE, 4th Edition, Pearson Education.
E-Resources and Other Digital Material	1.http://www.nptel.ac.in 2. http:/www.ebookee.com/linearintegratedcircuits.

13EC3104-ANTENNAS AND WAVE PROPAGATION

Course Category	Program Core	**Credits**	4
Course Type	Theory	**Lecture-Tutorial- Practice**	4-0-0
Prerequisite	Vector Calculus and Basics of Electromagnetic Waves and Wave Propagation	**Sessional Evaluation:**	40
		Semester End Evaluation:	60
		Total Marks:	100

Course Objectives	1. Study propagation of signals, calculate various line parameters, and impedance matching Techniques. 2. Learn antenna basics, antenna parameters and calculation of radiation resistances of various antennas. 3. Study antenna arrays and draw its 3-D patterns. 4. Understand the basic working principle of VHF and UHF antennas.. 5. Understand different kinds of Wave Propagation.	
Course Outcomes		Upon Successful Completion of Course, Student will be able to
	CO1	Understand the fundamentals of Transmission Line Theory and Impedance Matching in High Frequency Lines.
	CO2	Learn antenna basics, Antenna Parameters and calculation of Radiation Resistances.
	CO3	Describe various Antennas, Arrays And Draw Radiation Patterns .
	CO4	Explain the types of Antennas to be employed in VHF and UHF.
	CO5	Classify Radio Wave Propagation in the Atmosphere.
Course Content	**UNIT I** **Transmission Lines:** Primary and Secondary Constants of the Line, Transmission Line Equations, Propagation Constant, Characteristic Impedance, Distortion less Line, Input Impedance of Open and Short Circuited Lines, Standing Waves, Reflection Coefficient, Smith Chart, Impedance Matching Using Smith Chart(Single Stub Only). **UNIT II** **Radiation Fundamentals:** Definition of antenna, Retarded Potentials, Relation between Potential and Time Varying Fields, Far Field Approximation, Radiation from a current Element, Half Wave Dipole and Monopole Antennas. **Antenna Parameters:** Radiation Pattern, Radiation Intensity, Directivity, Gain, HPBW,	

	Effective Aperture, Relation between Directivity and Maximum Effective Aperture. **UNIT III** **Linear Wire Antennas:** Current Distribution on Thin Linear Wire Antennas, Array of Two Point Sources, Principle of Pattern Multiplication, Uniform Linear Arrays: Broad Side and Endfire Array and Binomial Arrays. **Travelling Wave Antennas:** Long Wire and Rhombic Antennas, Yagi-Uda Antenna, Folded Dipole Antennas (Without Analysis) **UNIT IV** **Surface and Space Wave Propagation:** Friis's Transmission Formulae, Salient Features of Somerfield Theory, Ground Wave Field Strength Calculation, Antennas located over Flat Earth, Effect of Curvature of Earth, Refraction of Radio Waves in Troposphere, Effective Radius of Earth, Radio Horizon and Maximum Radio Range. **UNIT V** **Sky Wave Propagation:** Structure of Ionosphere, Mechanism of Wave Refraction in Ionosphere, Critical Frequency, MUF, Virtual Height, Skip Distance, Effect of Earth's Magnetic Field, Faraday Rotation.
Text Books and Reference Books	**Learning Resources** **Text books** 1. Antennas by John D Krauss – ISE. 2. Antennas and Wave Propagation by K.D.Prasad -Khanna Publication. **Reference Books:** 1.Tansmission Lines and Networks by Umesh Sinha-Sathya Prakash Publication. 2.Electromagnetic Waves and Radiating Systems by Jordan AND Balmain-PHI.
E-Resources and Other Digital Material	1.http://www.nptel.ac.in. 2.http:/www.ebookee.com/antennaandwavepropagation.

13CE3107 – ENVIRONMENTAL STUDIES
(Common to All branches)

Course Category:	Humanities	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	4-0-0
Pre-requisite:	Engineering Physics and Engineering Chemistry	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	1. To give an idea of scope and importance of environmental studies and environmental components. 2. To describe and discuss the basic aspects associated with the structure and function of ecosystems and bio-diversity. 3. To understand the various natural resources environmental acts. 4. To analyze causes, effects and control of environmental pollution. 5. To apply apply the knowledge of environmental studies for certain case studies in India.	
Course Outcomes:	**CO1**	Able to understand the features of ecosystem and bio-diversity.
	CO2	Understand the management of major natural resources.
	CO3	Understand the causes, effects and remedial measures of environmental pollution.
	CO4	Able to understand effectives of elements on environment and disaster management
	CO5	Able to familiar with environmental acts and must be able to apply the knowledge of environmental studies to certain case studies.

Course Content:

UNIT-I

Introduction: Definition, Scope and Importance of Environmental studies, Environmental Components.

Ecosystem: Introduction, types, characteristics and functions of Ecosystems Bio-diversity and its conservation- Value of bio-diversity consumptive and productive use, social, ethical, aesthetic and option values. Threats to biodiversity-conservation of biodiversity.

UNIT-II

Environmental and natural resources management:

a) Land resources and its importance, Land degradation, Soil erosion and desertification, Effects of modern agriculture, fertilizer and pesticide problems.
b) Forest Resources: Use and over-exploitation-Mining and dams-their effects on forest and tribal people.
c) Water Resources: Use and over-utilization of surface and ground water, Floods and droughts, Water logging and salinity, Conflicts over water sharing, Rain water harvesting, clouds seeding and watershed management.
d) Energy resources Energy needs: Renewable and non-renewable energy needs use of alternate energy sources, Impact of energy use of environment.

UNIT-III

Environmental Pollution: Local and global issues, Causes, Effects and control measures of Air pollution, Water Pollution, Soil pollution, Marine Pollution, Noise pollution. Solid waste management: Composting, Vermiculture- Urban and industrial wastes, recycling and reuse, Nature of Thermal pollution and nuclear hazards, Global warming, Acid rain, Ozone depletion.

UNIT-IV

Environmental Problems in India: Drinking water, Sanitation and public health. Effects of urbanization, Transportation, Industrialization on the quality of environment, Green revolution.

Economy and Environment: The economy and environment interaction, Sustainability, Environment Impact Assessment, Social Issues.

UNIT-V

Environmental Acts: Water (Prevention and control of pollution) Act-Air (Prevention and control of pollution) Act – Environment protection Act, Wildlife protection Act, Forest conservation Act, Coastal Zone Regulations.

Case Studies: Silent valley project, Madhura Refinery and Taj Mahal, Tehri Dam, Kolleru Lake Aquaculture, Fluorosis in Andhra Pradesh.

Field Work: Visit to Local Area having river/Forest/grass land/hill/mountain to

	document and environmental assets. Study of local environment-common plants, insects, birds. Study of simple ecosystemspond,visit to industries, water treatment plants, effluent treatment plants.
Text Books & Reference Books:	**Text Books:** 1. "Environmental science" by Anubha Kaushik and C.P.Kaushik. 2."Environmental science and Engineering" by P.Anandan and R.K.Kumaravelan. **Reference Books:** 1. "Introduction to Environmental science" by Y.Anjaneyulu. 2. "Environmental studies" by Dr B.S.Chauhan. 3. "Environmental science" by M.Chandra sekhar
E-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

13EC31P1 PULSE AND DIGITAL CIRCUITS LABORATORY

Course Category	Program Core	**Credits**	2
Course Type	Practical	**Lecture-Tutorial- Practice**	0-0-3
Prerequisite	Electronic Devices and Characteristics of Systems	**Sessional Evaluation:**	40
		Semester End Evaluation:	60
		Total Marks:	100

Course Objectives	This course aims to equip the student with a basic understanding of concepts of electrical machines and capable of operating them to determine the various characteristics and test data.	
Course Outcomes		Upon Successful Completion of Course, Student will be able to
	CO1	Understand Function of Logic gates and can Implement Logic Circuits using gates.
	CO2	Implement combinational logic circuits.
	CO3	Elucidate differences between Synchronous and Asynchronous Circuits.
	CO4	Demonstrate linear and non-linear wave Shopping.
	CO5	Design Multivibrators.
Course Content	**LIST OF EXPERIMENTS** 1. **(a) Logic Circuits and Logic Gates.** **(b) Realization of Logic Gates using Nand and Nor Gates.** 2. **Full Adder and Full Subtractor.** 3. **Decoder** 4. **Divide by N-Ripple Counter.** 5. **Multiplexer** 6. **Divide by N-Synchronous Counter.** 7. **RC Differentiator and RC Integrator** 8. **Diode Clippers and Clampers.** 9. **Astable Multivibrator.** 10. **Schmitt Trigger.**	
	Text Books: 1.Pulse and Digital Circuits by Taub and Schelling,Mc-Grahill Publications. 2.Switching Theory and Logic Design by Anand Kumar,PHI Publications	

13SH31P1 – ADVANCED COMMUNICATION SKILLS LABORATORY

Course Category:	Humanities	**Credits:**	2
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	1.Knowledge of issues around the world 2.Ability to use language in professional contexts 3.Understand the importance of maintenance of good relationships	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	1. To understand the strategies of the interviews to facilitate better responses during the placements 2. To develop inter personal skills and be an effective goal oriented team player with idealistic, practical and moral values 3. Understand what constitutes proper etiquette in a professional environment. 4. To equip with a wide range of vocabulary technically and perform better in tests like GRE, TOEFL etc 5. To sharpen communication skills towards writing a persuasive resume and effective job application letters	
Course Outcomes:	**CO1**	To understand the strategies of the interviews to facilitate better responses during the 'Placement'.
	CO2	To develop inter personal skills and be an effective goal oriented team player with idealistic, practical and moral values.
	CO3	Understand what constitutes proper etiquette in a professional environment.
	CO4	To equip with a wide range of vocabulary technically and perform better in tests like GRE, TOEFL etc.
	CO5	To sharpen communication skills towards writing a persuasive resume and effective job application letters.
Course Content:	**LIST OF EXPERIMENTS** 1. **Vocabulary Building** – Synonyms and Antonyms, Word roots, One-word Substitutes, Prefixes and Suffixes, Study of word origin, Analogy, Idioms and Phrases. 2. **Group Discussion** – Dynamics of Group Discussion, Intervention, Summarizing, Modulation of voice, Body Language, Relevance, Fluency and Coherence. 3. **Intrapersonal & Interpersonal Relationship Skills** - Intrapersonal & Interpersonal Relationship Skills - To be an Effective Team Player 4. **Resume' Writing** – Structure and Presentation, Planning, Defining the career Objective, Projecting ones strengths and Skill-Sets, Summary, Formats and Styles, Letter-Writing. 5. **Interview Skills** – Concept and Process, Pre-Interview Planning, Opening Strategies, Answering Strategies, Interview through Tele and Video-Conferencing. 6. **Corporate Etiquettes**- Dressing Etiquettes- Dining Etiquettes- Nonverbal Communication- Proximity of Place.	

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY:: VIDYANAGAR (AUTONOMOUS)
(AFFILIATED TO JNTU ANANTAPUR:NELLORE)
SPSR NELLORE DIST
III YEAR OF FOUR YEAR B.TECH DEGREE COURSE – II SEMISTER
ELECTRONICS AND COMMUNICATIONS ENGINEERING
SCHEME OF INSTRUCTION AND EVALUATION
(With effect from the academic year 2015-2016)
(For the batch admitted in the academic year 2013-2014)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation							
							Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Duration In Hours	Max. Marks	Duration In Hours	Max. Marks		Duration In Hours	Max. Marks	100
1	13EC3201	MicroProcessors and Interfacing*#	3	1	-	4	2	40	2	40	0.8*Best of two+0.2*least of two	3	60	100
2	13EC3202	MicroWave Techniques	4	-	-	4	2	40	2	40		3	60	100
3	13EC3203	Optical Communications	4	-	-	4	2	40	2	40		3	60	100
4	13EC3204	Digital Design	3	1	-	4	2	40	2	40		3	60	100
5	13EC3205	Computer Organization**	3	1	-	4	2	40	2	40		3	60	100
6		Elective - I	4	-	-	4	2	40	2	40		3	60	100
		PRACTICALS												
7	13EC32P1	Analog & Digital Communications Lab	-	-	3	2	--	-	-	-	Day to Day Evaluation and a test (40 Marks)	3	60	100
8	13EE32P2	IC Applications Lab	-	-	3	2	--	-	-	-		3	60	100
		TOTAL	21	03	06	28	-	-	-	-		-	480	800

**** Common to ECE,EEE, *# Common to ECE,EEE & CSE**

13EC3201 – MICROPROCESSOR AND INTERFACING
(Common to EEE, ECE and CSE)

Course Category:	Professional core	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	4-0-0
Pre-requisite:	Logic circuit design ,A/D & D/A converters, fundamental programming skills	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	1. Understand the history and need of different types of microprocessor. 2. Learn and understand the internal architecture details, pin configuration, and their timing diagrams of 8085µp. 3. Develop various projects and to know complete architectural, programming, and interfacing details of 8085 microprocessor. 4. Understand the internal architecture details, pin configuration, and their timing diagrams of 8086µp. 5. Understand various Interrupts and their uses using 8086 Microprocessor. 6. Develop Programs in assembly level language of the 8086 family of microprocessors. 7. Learn techniques of interfacing between the processors and peripheral devices so that they themselves can design and develop a complete microprocessor based system. 8. Learn to interface 8257/8253/8259/8251 peripheral chips and I/O devices with 8086. 9. Design different real-time projects and they will know use of timers, interrupts and serial communication techniques. 10. Develop programs to control different hardware's using 8086µp.	
Course Outcomes:	**CO1**	Understand the evaluation of different types of microprocessors.
	CO2	Write efficient programs in Assembly level language of the 8085 family of µp's with the help of instruction set easily.
	CO3	Gain the knowledge on internal architecture of 8086µp (Execution unit, Bus interfacing unit, queue, and 8086 memory address).Programming structure and able to write programs in assembly language of the 8086 family of microprocessors.
	CO4	Know the techniques of interfacing between the processors and peripheral devices so that they themselves can design and develop a complete microprocessor based systems real time projects.
	CO5	Understand the inter connections of different co-processors, hardware knowledge of programmable devices like 8257/8253/8259/8251/8255 with 8086µp and developing hardware applications involving microprocessors.
Course Content:	**UNIT-I** **INTRODUCTION TO MICROPROCESSORS**:Evaluation of Microprocessors, Types of microprocessors, Architecture of 8085 microprocessor, pin configuration, Instruction Cycle, Timing Diagrams, Stack and Subroutines. **UNIT-II** **INSTRUCTION SET OF 8085 MICROPROCESSOR**:Addressing modes, Assembly Language Programs(8085) for addition, subtraction, multiplication, division etc., Interrupts of 8085, Memory and I/O interfacing of 8085 microprocessor. **UNIT-III** **Architecture of 8086 microprocessor:** Instruction set, Addressing modes, Interrupt system. Minimum mode and Maximum mode operations of 8086 and	

	its timing diagrams, Assembler directives, Assembly language programs (8086), Stages of software development. **UNIT- IV** **Data transfer schemes:**-synchronous, Asynchronous, Interrupt driven and DMA type schemes, Programmable interrupt controller (8259) and its interfacing, Programmable DMA controller (8257) and its interfacing, Programmable Interval Timer (8253) and its interfacing, Programmable communication Interface(8251 USART) and its interfacing. **UNIT-V** **Memory interfacing to 8086:**-Interfacing various types of RAM and ROM chips, PPI (8255) and its interfacing, ADC and DAC Interfacing, Waveform generation, Traffic light controller, Stepper motor control, temperature measurement and control.
Text Books & Reference Books:	**Text Books** 1.Ram . B," Fundamentals of Microprocessors and Micro controllers" ,DhanpatRai publications. 2.Douglas V. Hall, " Microprocessors and interfacing: Programming and hard ware", TMH, 2nd edition. **Reference Books:** 1.A.K. Ray and K.M. Bhurchandi, " Advanced Microprocessors and Peripherals", TMH. 2."Microprocessor Architecture, Programming, and Applications with the 8085" by Ramesh S. Gaonkar",Prentice Hall PTR.
E-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

13EC3202-MICROWAVE TECHNIQUES

Course Category	Program Core	credits	4
Course Type	Theory	Lecture-Tutorial-Practice	4-0-0
Prerequisites	EM Wave Propagation Characteristics & Fundamental of Transmission Lines & Antennas	Sessional Evaluation	40
		Semester End Evaluation	60
		Total Marks	100

Objectives	1. To understand the operation of Klystron amplifier, Reflex Klystron oscillator, Travelling Wave Tube amplifier and Magnetron oscillators. 2. To study the operation of different microwave semiconductor devices like Tunnel diode, Gunn diode, IMPATT diode, Schottkey Barrier diode, PIN diode and varactor diodes. 3. To understand different microwave components like Resonators, attenuators, TEEs, Directional couplers, Isolators and S-parameters of networks. 4. To study the measurement of frequency, VSWR, impedance, S-parameter and 'Q' of a cavity. 5. To study Hybrid MICs, strip lines, micro strip lines, parabolic reflector antenna, Horn and Lens antennas.	
Course outcomes		Upon Successful completion of course, student will be able to
	Co1	Demonstrate the use of different Klystrons, magnetron devices.
	Co2	Describe the use of active and passive microwave devices
	Co3	Analyze different UHF components with the help of scattering parameter and analyze the different power distribution Tees
	Co4	Describe the microwave bench,different blocks and their features and methods to measure the microwave power,attenuation, frequency, VSWR and cavity Q, Impedance
	Co5	Study types of strip lines and MICs fabrication and operation of antennas at Microwave frequency

Course Content	**UNIT I** **MICRO WAVE TUBES:** Klystron Amplifier, Reflex Klystron Oscillator, Travelling Wave Tube Amplifier and Magnetron Oscillator. . **UNIT II** **MICROWAVE SEMOCONDUCTOR DEVICES:** Tunnel Diode, Gunn Diode, IMPATT Diode, PIN Diode, SchottKey Barrier Diode, Varactor Diode and Parametric Amplifier, MASER. **UNIT III** **MICROWAVE COMPONENTS:** Waveguides, Cavity Resonators, Attenuators, TEEs, Bends, Corners, Windows, Phase Shifters, Directional Couplers, Matching elements, Isolators, Circulators, S-Parameters of Networks. **UNIT IV** **MICROWAVE MEASUREMENTS:** Measurement of Frequency, Power, VSWR, Impedance, Reflection Coefficient, Attenuation Constant and Dielectric Constant, S-parameters, 'Q'- of a Cavity. **UNIT V** **MICs AND ANTENNAS:** Advantages of MICs, Hybrid MICs, Strip Lines, and Microstrip Lines, Monolithic MICs, Parabolic Reflector Antenna, Passive Reflector Antenna, Horn and Lens Antennas.

Text Books & References	**TEXT BOOKS** 1. Samuel Y Liao, **"Microwave Devices and Circuits"**, Prentice Hall,1999. 2. M. Kulkarni, **"Microwave and Radar Engineering"**, Umesh Publications,1998. 3. Annapurna Das and Sisir K Das, **"Microwave Engineering"**, TMH, 2000. **REFERENCE BOOKS** 1. D C Dube, **"Microwave Devices and Applications"**, Narosa Publications, 2011. 2. David M Pozar, **"Microwave Engineering"**, IE,1997. 3. Robert E Collin, **"Foundations for Microwave Engineering"**, John Wiley and Sons,2007
E-Resources & other digital material	1. http://nptel.ac.in/syllabus/117105029/ 2. https://www.youtube.com/user/nptelhrd

13EC3203 - OPTICAL COMMUNICATIONS

Course Category	Program Core	**credits**	4
Course Type	Theory	**Lecture-Tutorial-Practice**	4-0-0
Prerequisites	EM wave and Propagation Characteristics, Basics of Electronic Devices	**Sessional Evaluation**	40
		Semester End Evaluation	60
		Total Marks	100

Objectives	1. To provide an overview of the optical materials, dispersion, diffraction, absorption, scattering, fibre losses, fibre modes and configurations, fibre types and rays and fibre materials. 2. To Provide an overview on LED, lasers and their excitations and noises of light sources and coupling to single mode fibres, splicing and connectors. 3. To understand the operating principles of optical detectors and Receivers. 4. To analyse the behaviour of the optical amplifiers, semiconductor and doped optical amplifiers, and optical networks. 5. To provide an overview of telephony telemetry, video distribution, military applications, Passive and active sensing.	
Course outcomes		Upon Successful completion of course, student will be able to
	Co1	Acquire knowledge about optical materials, fibre characteristics, classification
	Co2	Understand the fibre modes and configurations and fibre materials
	Co3	Acquire knowledge of LED, laser excitations, fibre noises, coupling of fibres
	Co4	Analyse optical detectors and receivers' performance and calculation
	Co5	Understand the optical amplifiers and basic noise networks

Course Content	**UNIT-I** **INTRODUCTION AND OPTICAL MATERIALS :** Introduction, Fiber characteristics and classification, Dispersion, Diffraction, Absorption and scattering, Fiber losses, Optical fiber modes and configurations, Fiber types and rays, and modes and fiber materials. **UNIT-II** **OPTICAL SOURCES AND COMPONENTS :** Electro luminescence, LED's, Laser's and their excitation light source linearity, Model partition and reflection, fiber noise- to-fiber joints. LED coupling to single -mode fibers. Fiber splicing and fiber connectors. **UNIT-III** **OPTICAL DETECTORS AND RECEIVERS :** Types of photo detectors, Photo diodes and its noise, PIN photo diodes, Photo transistors, Photo Darlington receiver transistor operation, receiver performance and calculation. **UNIT-IV** **OPTICAL AMPLIFIERS AND NETWORKS :** Types of optical amplifiers semi conductor optical amplifiers, fiber amplifiers and basic noise networks, Broadcast-and-select WDM networks. **UNIT-V** **OPTICAL COMMUNICATIONS APPLICATIONS :** components of optical communication systems, transmitter, transmission channel receiver, Telephony Telemetry, video distribution military applications, passive and active sensing.

Text Books & Reference Books	**Learning Resources Text Books** 1. Optical communications_Gred keiser 3rd edition, Mc Graw-Hill-2000. 2. Optical fiber communication-John M Senior **Reference Books** 1 Electronic communications systems-Williams Schweber, 3rd edition, prentice hall, 1999. 2 Optical fiber communication systems- C.P Saud bance, john Wiley 1980. 3 Modern electronic communication-G.M.Miller 6th edition prentice hall 1999.
E-Resources & other digital material	1. http://nptel.ac.in/courses/117103063/1 2. https://www.youtube.com/user/nptelhrd

13EC3204-DIGITAL DESIGN

Course Category	Program Core	**credits**	4
Course Type	Theory	**Lecture-Tutorial-Practice**	4-0-0
Prerequisites	Electronic Devices, Fundamentals of Switching Theory & Programming Knowledge	**Sessional Evaluation**	40
		Semester End Evaluation	60
		Total Marks	100

Objectives	1. Explain the differential and current mirror MOS circuits. 2. Implementing logic gates and Boolean expressions using different logic families. 3. Explain how digital circuit of large complexity can be built in a methodological way, starting from Boolean logic and applying a set of rigorous techniques. 4. Create minimal realizations of single and multiple output Boolean functions. 5. Design and analyze combinational and sequential circuits using VHDL language.	
Course outcomes		Upon Successful completion of course, students will be able to
	Co1	Design and explain the various MOS amplifiers
	Co2	Understand the process of integration and characteristics of different logic families
	Co3	Demonstrate knowledge of VHDL language
	Co4	Design and analyze combinational and sequential circuits for various practical problems using basic gates and flip flops
	Co5	Write a VHDL code for digital circuits
	UNIT – I **MOS AMPLIFIERS:** Common source amplifier with resistive load, Common Drain amplifier. Differential amplifier, transfer characteristics and derivation of CMRR. **Current Mirrors:** Basic Current Mirrors, cascode current mirror and active current mirrors without signal analysis.	

Course Content	**UNIT – II** **DIGITAL INTEGRATED CIRCUITS:** Evaluation of ICs, Advantages and classification of ICs. Digital IC characteristics, Digital IC families- DTL, HTL, ECL, MOS, CMOS, TTL-Totem-pole, Open collector and Tristate outputs and IC packaging's. **UNIT – III** **VHDL INTRODUCTION AND LANGUAGE FUNDAMENTALS:** **VHDL History – Design methodology:** - Description Style, Direction Of Design, Design Flow, Step In Digital System Design. **Hardware modeling issue:** Concurrency, Delays, Delta Time And Back Annotation – Organization Of A VHDL Design File – Libraries. **Language Fundamentals :** Basic Sequential Statements – Date Types – Assignment Statements And Operators – Objects In VHDL : Signals, Variable, Constants, Files- Attributes Of Objects – VHDL Package, Package Body And Configurations – Entity Declarations And Statements – Examples Of Simple Circuits. **UNIT – IV** **COMBINATIONAL CIRCUIT BUILDING BLOCKS :** Multiplexes, Decoders, Encoders – Code converters and their implémentation using VHDL . **UNIT – V** **SEQUENTIAL LOGIC DESIGN :** Latches and flip-flops, registers, counters (Asynchronous and synchronous) BCD, Ring and Johnson counter and their implementation using VHDL .

Text Books & Reference Books	**Learning Resources Text Books** 1. **"Design of analog CMOS Integrated circuits"** by Behzad Razhavi. 2. Ronald J.Tocci, Neal S.Widmer, **"Digital systems — Principles and applications"**. 8th edition, Pearson Education Asia, 2001. 3. B.S .sonde, **"Introduction to system design using ICs"** Wiley Eastern. 4. S.S. Limaye, '**VHDL – A design oriented Approach**, 'TMH edition (2008). 5. John Wakerley **"Digital Design Principles".** **Reference Books** 1. Stephen Brown and zvonkovranesic, **'Fundamentals of digital design with VHDL"**, TMH edition (2007). 2.APGodse&Bakshi, **"Digital IC Application"**-Technical Publications.
E-Resources & other digital material	1. http://nptel.ac.in/courses/117106086/1 2. http://nptel.ac.in/courses/117106086/31 3. https://www.youtube.com/user/nptelhrd

13CS3207-COMPUTER ORGANIZATION

Course Category	Program Core	**credits**	4
Course Type	Theory	**Lecture-Tutorial-Practice**	4-0-0
Prerequisites	Switching Theory & Logic Design, basics of Digital Design	**Sessional Evaluation**	40
		Semester End Evaluation	60
		Total Marks	100

Objectives	1. It enhance knowledge regarding Register Transfer, Micro Operations, Instructions and Interrupts 2. It tells about Machine language, Assembly language and Micro Programmed Control 3. It specifies about General Register, Stack Organization, Program Control, Pipeline and vector Processing. 4. It provides detailed information about I/O devices and their Interface, Data transfer and its modes, Priority Interrupt and DMA. 5. It tells about types and Organization of memory; Multiprocessor characteristics and Inter Processor communication	
Course outcomes		Upon Successful completion of course, student will be able to
	Co1	Understand the architecture of modern computer
	Co2	Analyze the performance of a computer using performance equation
	Co3	Understand different instruction types
	Co4	Calculate the effective address of an operand by addressing modes
	Co5	Understand how cache mapping occurs in a computer and solve various problems

Course Content	**UNIT I** **REGISTER TRANSFER AND MICRO OPERATIONS :** register transfer. Bus and Memory transfers, Arithmetic micro operations. Logic micro operations, Shift micro operations. Arithmetic logic shift units. **BASIC COMPUTER ORGANIZATION AND DESIGN :** Instruction codes, Computer Registers and Instructions , Timing and Control, Instruction cycles, Memory reference Instructions, Input-Output and interrupt. **UNIT II** **PROGRAMMING THE BASIC CONTROL :** Machine language, Assembly language, The Assembler, Programming Arithmetic and logic operations, Subroutines. **MICRO PROGRAMMED CONTROLb:** Control memory, Address sequencing , Micro program example, Design of control unit. **UNIT III** **CENTRAL PROCESSING UNIT :** General register organization, Stack organization, Instruction formats, Addressing modes, Program control, RISC, Parallel processing, Pipelining, Arithmetic pipe-line, Instruction pipe-line. **UNIT IV** **INPUT – OUTPUT ORGANIZATION :** Peripheral devices, Input-Output Interface, Asynchronous Data Transfer. Modes of transfer, Priority interrupt, DMA, Input – Output Processor, Serial Communication. **UNIT V**

	MEMORY ORGANIZATION : Memory hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory, Characteristics of multi processors, Interprocessor arbitration, Inter processor communication and Synchronization and Cache coherence.
Text Books & Reference Books	**Learning Resources Text Books** 1. **"Computer System Architechture"** 3/e M.Moris Mano PHI-I. 2. **"Computer Organization"** – V.C. Hemacher, Z.G.Vranesic and others Mc-Graw-Hill. **Reference Books** 1. **"Computer architechutre and organization"** –Hays& Briggs –PHI. 2. **"Computer Organization"** Willium stallings PHI.
E-Resources & other digital material	1. http://nptel.ac.in/courses/106105085/4 2. http://nptel.ac.in/courses/106108052/1

13EC32P1 ANALOG AND DIGITAL COMMUNICATION LAB

Course Category	Program Core	**Credits**	2
Course Type	Practical	**Lecture-Tutorial- Practice**	0-0-3
Prerequisite	Electronic Devices and Characteristics of Systems	**Sessional Evaluation:**	40
		Semester End Evaluation:	60
		Total Marks:	100

Course Objectives	1. To understand basic modulation & demodulation schemes. 2. By using Pre-emphasis & De-emphasis the student understands how modulation signal can be improved. 3. Prototypes filters are different types of LC-filters used in communication systems 4. Studies the transmission line characteristics and applying and practical utility.	
Course Outcomes		Upon Successful Completion of Course, Student will be able to
	CO1	Understand Function of Logic gates and can Implement Logic Circuits using gates.
	CO2	Implement combinational logic circuits.
	CO3	Elucidate differences between Synchronous and Asynchronous Circuits.
	CO4	Demonstrate linear and non-linear wave Shopping.
	CO5	Design Multivibrators.
Course Content	**LIST OF EXPERIMENTS** **1. (a) Logic Circuits and Logic Gates.** **(b) Realization of Logic Gates using Nand and Nor Gates.** **2. Full Adder and Full Subtractor.** **3. Decoder** **4. Divide by N-Ripple Counter.** **5. Multiplexer**	

	6. **Divide by N-Synchronous Counter.** 7. **RC Differentiator and RC Integrator** 8. **Diode Clippers and Clampers.** 9. **Astable Multivibrator.** 10. **Schmitt Trigger.**
	Text Books: 1.Pulse and Digital Circuits by Taub and Schelling,Mc-Grahill Publications. 2.Switching Theory and Logic Design by Anand Kumar,PHI Publications

13EC32P2 IC APPLICATIONS LAB

Course Category		**Credits**	2
Course Type	Practical	**Lecture-Tutorial- Practice**	0-0-3
Prerequisite	Linear Integrated Circuits	**Sessional Evaluation:**	40
		Semester End Evaluation:	60
		Total Marks:	100

Course Objectives	1. Study the basic applications of op-Amp 2. The student first studies the frequency response of op-Amp. So that student will have the ability to distinguish its wider band width. 3. Comparative circuit is the fundamental block in electronic circuits to compare voltages. 4. R-2R ladder network is used as a A/D converter in interfacing between Analog and digital. 5. Op-Amp filter is one of the important block in Audio Amplifiers. 6. 555 timer applications –in various timer circuits and Delay circuits. 7. PLL IC is the heart of any communication system. 8. It also gives exposure to various IC- function Generators.	
Course Outcomes		**Upon Successful Completion of Course, Student will be able to**
	CO1	It gives the basic idea of applying op-Amp in various applications for ex: Amp,filter,OSC etc.,
	CO2	Basic understanding of up-Amp characteristics
	CO3	555 timers are used Extensively in delay circuits
	CO4	PLL is one of the important block in Rf communication system so it gives an idea of it
	CO5	It gives good knowledge of op-Amp in applying open-loop & closed loop configurations
Course Content	**LIST OF EXPERIMENTS** 1. **Function Generator Using 8038 and 566 ICs.** 2. **Astable Multivibrator using Op-Amp & 555 Timers.**	

	3. Comparator Using Op-Amp. **4. Ramp Generator Using Op-555 Timers.** **5. Op-Amp Frequency Response.** **6. Narrowband Pass Filter.** **7. Full Wave Rectifier Using Op-Amp.** **8. R-2R Ladder Network.** **9. Window Detector.** **10. Schmitt Trigger Using Op-Amp.**
TextBooks & References	1. D. Roy Choudary, Shail B.Jain, "Linear Integrated Circuits", New Age international Publishers, 2003. 2. Design of Analog Integrated Circuits by Sergio Franco.

ELECTIVES-I	
1	**NUERAL NETWORKS AND FUZZY LOGIC**
2	**DATABASE MANAGEMENT SYSTEMS**
3	**OPTO-ELECTRONICS**
4	**TELEVISION ENGINEERING**

13EC32E1-NEURAL NETWORKS AND FUZZY LOGIC

Course Category	Program Core	**credits**	4
Course Type	Theory	**Lecture-Tutorial-Practice**	4-0-0
Prerequisites	Set Theory and Functions, Basics of Control Systems	**Sessional Evaluation**	40
		Semester End Evaluation	60
		Total Marks	100

Course Objectives	1. To acquire Knowledge about principles and techniques of Artificial Neural Networks 2. To become familiar with the fundamentals of Supervised Learning process. 3. To understand & analyze various Unsupervised Learning techniques. 4. To provide mathematical background and sufficient experience so that the student can read, write, and understand various problems involved in Fuzzy Logic And Fuzzy Sets 5. To cater the knowledge of Fuzzy Logic Control and use these for controlling real time systems	
Course outcomes		Upon Successful completion of course, student will be able to
	Co1	Design the neural network to meet the needs of control systems and pattern classification issues
	Co2	Explain about the concept of fuzziness involved in various systems
	Co3	Gain adequate knowledge about fuzzy set theory and gain comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control
	Co4	Get adequate knowledge of application of fuzzy logic control to real time systems
	Co5	Designing knowledge on the process of de-fuzzification using various methods

Course Content	**UNIT –I** **ARTIFICIAL NEURAL NETWORKS:** Introduction to Neural Networks-Biological neurons-artificial neurons-Mc Culloch-pitts model-neuron modeling for artificial neural systems-feed forward network-Feedback network-perception- Supervised and Unsupervised Learning. Learning rules Hebbian learning rule, perception learning rule, Delta learning, winner take all learning rule, Ouster learning rule. **UNIT –II** **SUPERVISED LEARNING:** Preceptors-exclusive OR problem –single layer preceptor network-Multilayer feed forward networks: linearly non-separable pattern classification-delta learning rule for multi preceptor layer-Error back propagation algorithm-training errors-ADALINE-introduction to radial basis function network (RBFN). **UNIT –III** **UNSUPERVISED LEARNING:** Hamming net- Max net-Winner take all learning-counter propagation network-feature mapping-self organizing feature maps. Application of neural algorithms-elementary aspects of applications of character recognition- Neural network control applications- process identification: Basic non dynamic learning control architecture. **UNIT –IV** **FUNDEMENTAL OF FUZZY LOGIC AND FUZZY SETS:** Definition of Fuzzy set, a-level fuzzy set Cardinality-operation of Fuzzy sets- Union, intersection, complement-Cartesian product-Algebraic Sum-definition of Fuzzy relation-properties of fuzzy relations-fuzzy composition.. **UNIT –V** **DESIGN OF FUZZY SYSTEMS:** Components of fuzzy systems- Functions of fuzzification-Rule base patterns-Inference mechanisms-method of de-fuzzification: Centre of Gravity method. Mean of maxima method, weighted average method, Height method. Design of fuzzy systems for temperature setting of storage water heater-fuzzy system for control of air conditioner.

Text Books & Reference Books	**Learning Resources Text Books** 1. Jacek M Zurada, Introduction to Artificial Neural Systems, Jaico Publications. 2. H.J. Zimmermann, Fuzzy set theory and its applications Kluwer Academic publishers **Reference Books** 1. Timothy J. Ross, "Fuzzy logic with Engineering Applications" (Wiley) 2. Nikola K.Kasabov, "Foundations of Neural Networks, Fuzzy Systems and Knowledge Egineering"(The MIT Press)
E-Resources & other digital material	1. http://nptel.ac.in/courses/108104049/13 2. https://www.youtube.com/user/nptelhrd

13CS3208-DATABASE MANAGEMENT SYSTEMS

Course Category	Program Core	**credits**	4
Course Type	Theory	**Lecture-Tutorial-Practice**	4-0-0
Prerequisites	Basics of UNIX, data mining & set theory	**Sessional Evaluation**	40
		Semester End Evaluation	60
		Total Marks	100

Course Objectives	1. Describe DBMS architecture and models 2. Describes Database constraints, database languages 3. Specify normal forms with examples 4. Gives the concept of a transaction and management, concurrency control techniques 5. Introduces file indexing and tree structure management	
Course outcomes		Upon Successful completion of course, student will be able to
	Co1	Describe DBMS architecture and models
	Co2	Describes Database constraints, database languages
	Co3	Specify normal forms with examples
	Co4	Gives the concept of a transaction and management, concurrency control techniques
	Co5	Introduces file indexing and tree structure management
Course Content	**UNIT-I** **DATABASE SYSTEM & APPLICATIONS:** data base System VS file System – View of Data – Data Abstraction – Instances and Schemas – data models – the ER Model – Relational model – Other Models – Data base Languages – DDL – DML – data base access for applications programs – data base Users and Administrator – Transaction Management – data base systems structure – Storage Manager – the query processor – History of Data base Systems.Data base design and ER diagrams –Beyond ER Design Entitles, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER model – Concept Design with the ER model – Conceptual Design for Large enterprises.. **UNIT-II** **RELATIONAL MODEL:** Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing integrity constraints – Querying relational data – Logical data base Design – Introduction to view – destroying / altering Tables and Views. **RELATIONAL ALGEBRA AND CALCULUS:** Relational Algebra – Selection and	

projection set operations – renaming joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus –Expressive power of algebra and calculus. Form of basic SQL Query – Examples of SQL Queries – Introduction to Nested Queries - Correlated Nested Queries set – Comparison Operators – Aggregative operators NULL values – Comparison using NULL values – Logical connectivity's – AND,OR and NOTR – Impact on SQL Constructs – Outer joins –Disallowing NULL values – Complex integrity Constraints in SQL 0 Triggers and Active Data bases

UNIT-III

SCHEMA REFINEMENT: Problems caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS-FIRST, SECOND, THIRD Normal forms – BCNG – Lossless join Decompositions – Dependency preserving Decomposition – Schema refinement in data base design – Multi valued dependencies – Forth Normal form.Overview of Transaction Management: ACID Properties – Transactions and Schedules – Concurrent Execution of transaction – Lock Based concurrency control – Performance locking – Transaction support in SQL – Introduction to Crash recovery.

UNIT-IV

CONCURRENCY CONTROL: Serializability and recoverability – introduction to Lock Management – Lock Conversions – Dealing with Dead locks – Specialized Locking Techniques – Concurrency with outlocking.

CRASH RECOVERY: Introduction to ARIES – the Log – Other Recovery related structures – The Write Ahead Log protocol – Check pointing – recovering from a system Crash – Media recovery –Other approaches and interaction with Concurrency control.

UNIT-V

OVER VIEW OF STORAGE AND INDEXING: Data on External storage – File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data structures – Hash Based Indexing – Tree base Indexing – Comparison of file organizations – Indexes and performance Tuning.

STORAGE DATA: Disks and Files: The memory Hierarchy – Redundant Arrays of Independent – Disks –Disk Space Management – Buffer Manager – Files of records –Page formats – record formats.

Tree Structured Indexing- Intuitions for free Indexes – Indexed sequential Access Methods (ISAM)-B+

TREES: A Dynamic Index Structure

HASH BASED INDEXING: Static Hashing – Extendable hashing – Linear Hashing – Extendable vs Linear Hashing

Text Books & Reference Books	**Learning Resources Text Books** 1. Database Management system, Raghurama Krishna, Johannes Gehrke, TATA McGraw Hill, 3rd edition. 2. Database Systems Design, Implementation, and management, Rob & Coronel 5th Edition, Thomson. **Reference Books** 1. Introduction to Database Systems, C.J.Data Pearson Education. 2. Database Systems Design, Implementation, and management, Rob & Coronel 5th Edition, Thomson. 3. Database Management System, Elmasri Navrate Pearson Education. 4. Database Management System Mathew Leon, Leon Vikas.
E-Resources & other digital material	1 http://nptel.ac.in/courses/106108052/1 2. http://nptel.ac.in/courses/106108052/42

13EC32E2 OPTO - ELECTRONICS

Course Category	Program Core	**credits**	4
Course Type	Theory	**Lecture-Tutorial-Practice**	4-0-0
Prerequisites	Characteristics of light, basics of physics	**Sessional Evaluation**	40
		Semester End Evaluation	60
		Total Marks	100

Course Objectives	1. Acquire knowledge about optical radiation, black body radiation, material interactions 2. Analyse radioactive processes, laser excitations, Gaussian characteristics of laser beam 3. Analyse specific lasers, Helium, Neon, Argon ion, carbon dioxide, neodymium, semiconductor free electron 4. Understand modulation of light, electro optic modulation, Acousto-optic modulation, magneto optic devices 5. Understand image binarization using photographic process	
Course outcomes		Upon Successful completion of course, student will be able to
	Co1	Acquire knowledge about optical radiation, black body radiation, material interactions
	Co2	Analyse radioactive processes, laser excitations, Gaussian characteristics of laser beam
	Co3	Analyse specific lasers, Helium, Neon, Argon ion, carbon dioxide, neodymium, semiconductor free electron
	Co4	Understand modulation of light, electro optic modulation, Acousto-optic modulation, magneto optic devices
	Co5	Understand image binarization using photographic process

Course Content	**UNIT-I** **OPTICAL RADIATION:** Radiometric and photortietric definitions. Blackbody radiation, Material interactions, Temperature. **UNIT-II** **LASERS:** Radioactive Processes, Laser excitations, Gaussian characteristics of the laser beam, optical feedback, Q-switching and mode locking. Specific Lasers – Helium – Neon Laser, Argon ion Laser, Carbondioxiode Laser, Neodymium Laser, Semiconductor Laser, Free electron Laser **UNIT-III** **MODULATION OF LIGHT:** Polarization, Light propagation in crystals, Electro-optic modulation. Acousto-optic modulation. Magneto-optic devices. Image binarization using photographic process **UNIT-IV** **FOURIER OPTICS:** Scalar theory of diffraction. Fourier transform properties of Lenses. Optical information processing systems, special filtering using binary filters. Nonlinear optical signal processing using contact screens, Apodization. .**UNIT-V** **ELECTRO-OPTIC SYSTEMS:** Holography, phase contrast microscopy. Pattern recognition. Optical computing systems.
Text Books & Reference Books	**Learning Resources Text Books** 1. Electro-Optical Devices and systems by M.A.Karim PWS-KENT publishing company 2. Optical Electronics by A.K.Ghatak and K.Thygarajan, Cambridge University press. **Reference Books** 1. Optoelectronics-Emmanual Rosencher & Borge Vinter by Cambridge University 2. Laser Principals and Applications by J.Wilson, J.F.B.Hawkes, PHI Publications.

E-Resources & other digital material	1. http://nptel.ac.in/courses/117103063/26 2. https://www.youtube.com/user/nptelhrd

13EC41E3-TELEVISION ENGINEERING

Course Category	Program Core	**credits**	4
Course Type	Theory	**Lecture-Tutorial-Practice**	4-0-0
Prerequisites	Communication systems and various modulation techniques	**Sessional Evaluation**	40
		Semester End Evaluation	60
		Total Marks	100

Course Objectives	1. Understand TV transmitter and Receiver 2. Analyze different types camera tubes 3. Understand different types of beam deflections 4. Analyze picture tube characteristics, specifications and colour picture tube 5. Understand composite video signal, TV broadcasting channels and antennas	
Course outcomes		Upon Successful completion of course, student will be able to
	Co1	Understand TV transmitter and Receiver
	Co2	Analyze different types camera tubes
	Co3	Understand different types of beam deflections
	Co4	Analyze picture tube characteristics, specifications and colour picture tube
	Co5	Understand composite video signal, TV broadcasting channels and antennas
Course Content	**UNIT-I** **INTRODUCTION TO TV:** TV Transmitter and receivers, synchronization. Television Pictures**:** Geometric form and aspect ratio, image continuity, interlaced scanning, picture resolution. TV cameras**:** Camera tube, Videocon, Silicon Diode Arry Vidicon, camera optics, monochrome TV camera, color cameras. Picture tube**:** Monochromatic picture tube, Electrostatic focusing, Beam deflection, Picture Tubes: Monochromatic picture tube, Electrostatic focusing Beam deflection, picture tube characteristics and specifications, color picture tubes. **UNIT-II**	

COMPOSITE VIDEO SIGNAL: Horizontal and vertical sync details, scanning sequence details, colour signal generation and Encoding: Perception of brightness and colours, additive colour mixing, video signals for colours, luminance signal, colour difference signals, encoding of colour difference signals, formation of chrominance signal, PAL encoder. TV signal transmission, VSB transmission, sound signal transmission, standard channel BW, TV transmitter TV signal propagation, interface, TV broadcast channels, TV transmitting Antennas.

TV STANDARDS: American 525 line B&W TV system, NTSC colour system, 625 – line monochrome system, PAL colour system, TV standards

UNIT-III

MONOCHROME TV RECEIVER: RF tuner, IF subsystem, video amplifier, sound section, syncseparation and processing, deflection circuits, scanning circuits.

PAL-D COLOUR RECEIVER: Electron tuners IF subsystem, Chroma decoder, separation of U & V colour phasors, synchronous demodulators, subcarrier generation, raster circuits.

TV RECEIVER TUNERS: Tuner operation, VHF and UHF tuners, digital tuning techniques, remote control of receiver functions.

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UNIT-IV

IF SUBSYSTEM: AGC, noise cancellation, video and intercarrier sound signal detection, vision IF subsystem of Black and White receivers, colour receiver, IF subsystem. Receiver sound system: FM detection, FM sound detectors, typical applications. Colour signal system: PAL-D decoder, Chroma signal amplifiers, separation of U and V signals, Color burst separation, Burst phase discriminator, ACC amplifier, Reference oscillator, color killer circuit, RO phase shift and 180^0 PAL – SWITCH circuitry, U&V demodulators, colour signal mixing.

UNIT-V

SYNC SEPARATION, AFC & DEFLECTION OSCILLATORS: Synchronous separation, noise in syncpulses, separation of frame and line sync pulses, AFC, single ended AFC circuit.

Deflection Oscillators, deflection drive IC's, Receiver Antennas.

Digital TV: Digital Satellite TV, Direct to Home Satellite TV, Digital TV Receiver, Digital Terrestrial TV.

Text Books & Reference Books	**Learning Resources Text Books** 1. Modern Television practice – Principles, Technology and Servicing – by R.R.Gulati, New age International Publication – 2002. 2. Monochrome and Colour TV – by R.R.Gulati, New Age International Publication - 2002. 3. Basic Telivision:Transmission& Reception &Colour Telivision Maini Anil.K **Reference Books** 1. TV engineering by A.M.Dhake, TMH 2. Monochrome & color TV by R.R.Gulati, New Age International
E-Resources & other digital material	1. http://nptel.ac.in/syllabus/117105029/ 2. https://www.youtube.com/user/nptelhrd

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY:: VIDYANAGAR (AUTONOMOUS)
(AFFILIATED TO JNTU ANANTAPUR:NELLORE)
SPSR NELLORE DIST
IV YEAR OF FOUR YEAR B.TECH DEGREE COURSE – I SEMISTER
ELECTRONICS AND COMMUNICATIONS ENGINEERING
SCHEME OF INSTRUCTION AND EVALUATION
(With effect from the academic year 2016-2017)
(For the batch admitted in the academic year 2013-2014)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation							
							Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Duration In Hours	Max. Marks	Duration In Hours	Max. Marks		Duration In Hours	Max. Marks	100
1	13EC4101	Digital Signal Processing**	3	1	-	4	2	40	2	40	0.8*Best of mid+0.2*other mid	3	60	100
2	13EC4102	Radar Engineering	4	-	-	4	2	40	2	40		3	60	100
3	13EC4103	VLSI Design	3	1	-	4	2	40	2	40		3	60	100
4	13SH4102	Management Science**	3	1	-	4	2	40	2	40		3	60	100
5	13EC4104	Micro Controllers and Embedded systems	4	-	-	4	2	40	2	40		3	60	100
6		Elective – II	4	-	-	4	2	40	2	40		3	60	100
		PRACTICALS												
7	13EC41P1	MicroProcessor & Applications Lab	-	-	3	2	--	-	-	-	Day to Day Evaluation and a test (40 Marks)	3	60	100
8	13EC41P2	MicroWave and Optical Communications Lab	-	-	3	2	--	-	-	-		3	60	100
		TOTAL	21	3	06	28	-	-	-	-		-	480	800

**** Common to ECE,EEE**

13EC41101 DIGITAL SIGNAL PROCESSING

<table>
<tr><td>Course Category</td><td colspan="2">Program Core</td><td>Credits:</td><td>4</td></tr>
<tr><td>Course Type</td><td colspan="2">Theory</td><td>Lecture –tutorial
Practice :</td><td>4</td></tr>
<tr><td>Prerequisites</td><td colspan="2">Signal & System, Fourier transform, Laplace Transform & Z transform</td><td>Continuous evaluation:
Semester End evaluation:
Total marks:</td><td>40
60
100</td></tr>
<tr><td>Objectives</td><td colspan="4">1. Introduce students to the basic concepts and analytical methods of Z-transform.
2. To provide mathematical background and sufficient experience so that the student can read, write and understand various DFT & FFT algorithms.
3. Introduce techniques and tools for digital filter structures.
4. To teach students how to design FIR filters.
5. To understand various IIR filters.</td></tr>
<tr><td rowspan="6">Course Outcomes</td><td></td><td colspan="3">Upon Successful completion of the course student is able to :</td></tr>
<tr><td>Co1</td><td colspan="3">1. Explain the concept of Z-transform and its properties.</td></tr>
<tr><td>Co2</td><td colspan="3">2. Describe the use of DFT in linear filtering</td></tr>
<tr><td>Co3</td><td colspan="3">3. Apply the fast Fourier Transform algorithm in different applications</td></tr>
<tr><td>Co4</td><td colspan="3">4. Design the IIR filters and FIR filters for given specification</td></tr>
<tr><td>Co5</td><td colspan="3">5. Design the IIR filters from analog filters for given specification. And To design the discrete–time systems .</td></tr>
<tr><td>Course Content</td><td colspan="4"><u>UNIT – I</u>

Review of Discrete signals & systems: Z-transform and Inverse Z-transform, Theorems and Properties, system function, Sampling the Z-Transform, Fourier representation of finite duration sequences.

<u>UNIT – II</u>

Discrete & Fast Fourier Transform: DFT, properties of DFT, FFT, FFT algorithms, Use of DFT for fast computation of convolution, IDFT – Correlation.</td></tr>
</table>

	UNIT – III **Digital filter structures:-** Basic FIR structures, IIR structures: Direct form-I, Direct form-II, Parallel form ,Cascade form Lattice Structure, Lattice-ladder structures, State space structures, **UNIT – IV** **Design of IIR filters:** Properties of analog filters – Frequency domain filter models – Butter- worth, Chebyshev and other approximations – Filter design data – Low pass to high, Band pass and Band stop transformation – Filter response curves. **UNIT – V** **Design of FIR filters**- Fourier series method, Windowing, Sampling, Applications of Digital signal processing.
TextBooks & References	**1.** Digital Signal Processing A.V Oppenheim and R.W. Schafer, Prentice – Hall of India **2.** Digital Signal Processing, Salivahanam – TMH **3.** Digital Signal Processing Computer Base Approach, S.K.Mitra – Tata Mc Graw-Hill (III) **References** **1.** Digital Signal Processing, P.Ramesh Babu, Scitech Publications. **2.** Digital Signal Processing, John G Proakis and monolokis – Wiley Eastern Economy edition.
E-Resources & other Digital Materials	

13EC4102 - RADAR ENGINEERING

<table>
<tr><td>Course Category</td><td>Program Core</td><td>Credits:</td><td>4</td></tr>
<tr><td>Course Type</td><td>Theory</td><td>Lecture –tutorial
Practice :</td><td>4</td></tr>
<tr><td>Prerequisites</td><td>Electromagnetic spectrum, Antenna Basics, and Propagation Mechanisms</td><td>Continuous evaluation:
Semester End evaluation:
Total marks:</td><td>40
60
100</td></tr>
<tr><td>Objectives</td><td colspan="3">1. Understanding the principles of operation of pulsed radar systems. Derive the of radar range equation in terms of signal to noise ratio.
2. Know about the components radar.
3. To refresh principles of antennas and propagation as related to radars, also study of
4. Parabolic reflector and phased array antennas.
5. To apply Doppler principle to radars and hence detect moving targets, also to understand racking radars.
6. Ability to work using detection of signals in radar clutters.</td></tr>
<tr><td rowspan="6">Course Outcomes</td><td></td><td colspan="2">Upon Successful completion of the course student is able to</td></tr>
<tr><td>Co 1</td><td colspan="2">Ability to identify, formulate and solve engineering problems related to radar equation.</td></tr>
<tr><td>Co 2</td><td colspan="2">Ability to know about working of different components in a radar system</td></tr>
<tr><td>Co 3</td><td colspan="2">Acquired knowledge about antenna parameters for parabolic and phased array antennas</td></tr>
<tr><td>Co 4</td><td colspan="2">Gained knowledge about the working principal of CW and MTI Radars</td></tr>
<tr><td>Co 5</td><td colspan="2">Foster ability to work using detection of signals in radar clutters</td></tr>
<tr><td>Course Content</td><td colspan="3"><u>UNIT-I</u>

THE NATURE OF RADAR : The simple form of the Radar equation, Radar blocks diagram and operation, Radar frequencies and Applications of Radar.

Minimum Detectable signal, Receiver noise, Probability Density</td></tr>
</table>

	Functions, Signal to Noise Ratio, Integration of Radar pulses, Radar Cross Section of Targets, Cross section fluctuations, Pulse Repetition Frequency and Range Ambiguities. **UNIT-II** **RADAR COMPONENTS :** Klystron Power Amplifier, Travelling Wave Tube, Magnetron Oscillator, Cross Field Amplifier, Modulators, Mixers: Conversion Loss, Noise Figure, Balanced mixer, Image recovery mixer, Duplexers: Branch type, Balanced type and Solid State Duplexers, limiters, Displays: CRT Display, A,B,C,D Scopes, PPI and RHI. **UNIT-III** **RADAR ANTENNAS :** Antenna Parameters, Radiation Pattern and Aperture distribution. Parabolic Reflector Antenna, Phased arrays, Beam steering, Advantages and Limitations of Phased arrays, Phased array Architectures, Constrained Feed, Space Feed, Passive and Active Aperture Arrays, Digital Beam Forming. **UNIT-IV** **RADAR SYSTEMS :** Doppler Effect, Simple CW Radar, FM-CW Radar, MTI Radar: Delay line Cancellers, Blind speeds, Range Gated Doppler Filters, Limitations and types of MTI radars. Tracking Radar: Sequential Lobbing, Conical Scanning and Monopulse Tracking, Tracking in Range. **UNIT-V** **RADAR CLUTTER :** Introduction to Radar Clutter, Surface Clutter and Radar equation, Sea Clutter, Land Clutter, Detection of Targets in Sea and Land Clutter and Angel Echoes
TextBooks & References	**TextBooks :** 1) Introduction to Radar Systems – Merrill.I.Skolnik, TMH, 2nd Edition, 2007 2) Radar : Principles, Technology and Applications, Byron Edde, Pearson Education, 2004 **References :** 1) Introduction to Radar Systems – Merrill.I.Skolnik, TMH, 2nd Edition, 2011. 2) MicroWave and Radar Engineering – M.Kulakarni, Umesh Publications, 4th Edition, 2012.
E-Resources & other Digital Services	

13EC4103 - VLSI DESIGN

<table>
<tr><td>Course Category</td><td>Program Core</td><td>Credits:</td><td>4</td></tr>
<tr><td>Course Type</td><td>Theory</td><td>Lecture –tutorial
Practice :</td><td>4</td></tr>
<tr><td>Prerequisites</td><td>Electronic Devices & Circuits, Linear & Digital Ic’s andBasics of Ic Fabrication</td><td>Continuous evaluation:
Semester End evaluation:
Total marks:</td><td>40
60
100</td></tr>
<tr><td>Objectives</td><td colspan="3">1. To introduce the fundamental structures of VLSI Systems at the lowest levels of system abstraction, namely those associated with the direct application of VLSI devices to particular problems of interest by knowing the physical and electrical properties of MOS semiconductor materials.

2. To understand the Basic Circuit Concepts and design process of VLSI circuits and also to introduce the fundamental principles of VLSI circuit design and to examine the basic building blocks of large-scale digital integrated circuits

3. To know the Gate level design and physical design by considering partioning, floorplanning, Placement and Routing.

4. To bring both Circuits and System views on design together by considering circuit subsystems and VLSI Design styles .

5. To have a profound understanding of the design of complex digital VLSI circuits, computer aided simulation and synthesis tool for hardware design</td></tr>
<tr><td rowspan="6">Course Outcomes</td><td></td><td>Upon Successful completion of the course student is able to :</td></tr>
<tr><td>Co 1</td><td>To be aware about the trends in semiconductor technology, and how it impacts scaling and performance.</td></tr>
<tr><td>Co 2</td><td>Able to learn Layout, Stick diagrams, Fabrication steps, Static and Switching characteristics of inverters</td></tr>
<tr><td>Co 3</td><td>Compute terminal voltage and current characteristics for MOS transistors under a variety of conditions</td></tr>
<tr><td>Co 4</td><td>To understand MOS transistor as a switch and its capacitance</td></tr>
<tr><td>Co 5</td><td>Able to design digital systems using MOS circuits. Synthesis of digital VLSI systems from register-transfer or higher level descriptions in hardware design languages.</td></tr>
</table>

Course Content	**UNIT-I** **INTRODUCTION:** IC fabrication - MOS, PMOS, NMOS, CMOS &Bi-CMOS Technologies -Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation, Probe testing, Integrated Resistors and capacitors. **BASIC ELECTRICAL PROPERTIES OF MOS & BiCMOS CIRCUITS:** I_{ds}-V_{ds} relationships, MOSFET threshold voltage, g_m, g_{ds}, W_o,Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design Bi-CMOS inverters. **UNIT-II** **BASIC CIRCUIT CONCEPTS:** Sheet Resistance $R_s$and its concepts to MOS, Area Capacitance calculations, Inverter Delays, Driving large capacitive Loads, Wiring Capacitances, Fan-In and Fan-Out. **VLSI CIRCUIT DESIGN PROCESSES:** VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2µm CMOS Design rules for wires, Contacts and Transistors, Layout Diagram's for NMOS and CMOS Inverters and gates , Scaling of MOS circuits, Limitation of Scaling. **UNIT-III** **GATE LEVEL DESIGN:** Logic gates and other complex gates, switch logic, Alternate gate circuits. **PHYSICAL DESIGN:** Floor- Planning, Placement, routing, Power delay estimation, Clock and Power routing **UNIT-IV** **SUBSYSTEM DESIGN:** Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Counters, High density Memory Elements. **VLSI DESIGN STYLES:** Full-custom, Standard Cells, Gate-arrays, FPGAs and CPLDs and Design approach for Full Custom and Semi-Custom devices. **UNIT-V** **VHDL Synthesis:** VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout, Design capture tools, Design Verification Tools. **TEST AND TESTABILITY:** Fault-modeling and simulation, test generation, design for testability, Built-in self-test.

TextBooks & References	**TEXT BOOKS:** 1. Essentials of VLSI circuits and Systems – Kamran Eshraghian, Eshraghian Douglas and A Pucknell, PHI, 2005 Edition. 2. D. Roy Chowdhury. Linear Integrated circuits, New Age International Edition(2003) 3. ASIC Design Flow by Smith. **REFERENCE BOOKS:** 1. Pronciples of CMOS VLSI Design- Weste and Eshraghian, Pearson Education, 1999. 2. Modern VLSI Design-Wayne Wolf, Pearson Education, 3rd Edition 1997. 3. Introduction to VLSI Circuits and Systems – John. P. Uyemura. John Wiley, 2003. 4. Digital Integrated Circuits – John M.Rabaey, PHI.
E-Resources & other Digital Materials	

13SH4102– MANAGEMENT SCIENCE
(Common to EEE and ECE)

Course Category:	Humanities	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	4-0-0
Pre-requisite:	Economics and accountancy	**Sessional Evaluation:**	40
		Univ.Exam Evaluation:	60
		Total Marks:	100

Course Objectives:	1. To analyze the characteristics and contributions of enterprising people 2. To develop an understanding of the general role of Small Business Enterprises 3. Have an introductory understanding of global entrepreneurship concepts 4. Identify the general characteristics of entrepreneurs; know the differences between entrepreneurial and managerial type jobs 5. Understand the role of entrepreneurship in economic development.	
Course Outcomes:	**CO1**	Understanding the concept of Management and its objectives
	CO2	Able to understand Corporate Planning mission and objectives
	CO3	Exploring on Human resource management such as man powering, personal management.
	CO4	Getting more functionality about personal management
	CO5	Understanding about mass production and Batch production and exploring on PERT and CPM
Course Content:	**UNIT-I** Concept of Management – Administration, organization – Functions of Management, evolution of management thought – Organization, principles of organization – Types – Organization charts – Managerial objectives and social responsibilities. **UNIT – II** Corporate planning – Mission, Objectives, and programmes, SWOT analysis – Strategy formulation and implementation – plant location and plant layout concepts- Production control. **UNIT –III** Human resources management- Manpower planning – Personnel management – Basic functions of personnel management, job evaluation and merit rating – Incentive plans – Marketing, Functions of marketing. **UNIT-IV** Productivity – Batch and mass production – Work study- Basic procedure involved in method study- work measurement –Elements of cost- method of calculation of overhead charges – Depreciation. **UNIT- V** Network Analysis to project management - PERT/CPM- Application of network techniques to engineering problems. – Cost Analysis- Project crashing.	
Text Books & Reference Books:	**Text Books:** 1. Principles of management by Koontz and O.Donnel. 2.Industrial Engineering and Management by O.P.Khanna. 3.Industrial organisation and management by T.R.Banga & S.C.Sharma **Reference Books:** 1. Marketing by Philip Kotler 2. PERT/CPM by L.S. Srinath. 3. Business policy by Gluek (TMH).	

E-Resources:	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

13 EC4104 - MICRO CONTROLLERS & EMBEDDED SYSTEMS

<table>
<tr><td>Course Category</td><td>Program Core</td><td>Credits:</td><td>4</td></tr>
<tr><td>Course Type</td><td>Theory</td><td>Lecture –tutorial
Practice :</td><td>4</td></tr>
<tr><td>Prerequisites</td><td>Computer architecture and
Basic programming.</td><td>Continuous evaluation:
Semester End evaluation:
Total marks:</td><td>40

60
100</td></tr>
<tr><td>Objectives</td><td colspan="3">1. To understand the internal architecture details, pin configuration, their timing diagrams of 8051µc, and to know complete architectural, programming, and interfacing details of 8051 microcontroller.
2. To understand the internal architecture details, pipelining, addressing modes, and cpu registers of PIC µc.
3. To study the classification, processors, hardware units and software units of an embedded system.
4. To understand the hardware and software requirements, Co-design issues of an Embedded System, and also to learn how embedded software development tools are developed.
5. To understand the internal architecture of Kernel, Interrupt Service Routine, Timers, and Memory Management of Real time Operating Systems.</td></tr>
<tr><td rowspan="6">Course Outcomes</td><td></td><td colspan="2">Upon Successful completion of the course student is able to :</td></tr>
<tr><td>Co 1</td><td colspan="2">Understand the evaluation of different types of microcontrollers</td></tr>
<tr><td>Co 2</td><td colspan="2">Write efficient programs in Assembly level language of the 8051 µc with the help of instruction set easily</td></tr>
<tr><td>Co 3</td><td colspan="2">Gain the knowledge on internal architecture of 8051µc (Register Set, Interrupt Structure and Timers).</td></tr>
<tr><td>Co 4</td><td colspan="2">Programming structure and able to write programs in assembly language of the 8051 & PIC Microcontrollers</td></tr>
<tr><td>Co 5</td><td colspan="2">Develop software systems for embedded devices using assembler code. Design, test and critically evaluate embedded solutions to real world situations using (embedded) computer systems interfaced to digital hardware.</td></tr>
<tr><td>Course Content</td><td colspan="3"><u>UNIT-I</u>

8051 MICROCONTROLLER: Architecture, pin description, Register set, Instruction set. Interrupt structure, timer and serial port operations, Memory and I/O interfacing Simple Assembly language programs.

<u>UNIT-II</u></td></tr>
</table>

	INTRODUCTION TO PIC MICROCONTROLLERS : Architecture and pipelining, program memory considerations, Addressing modes, CPU registers, Instruction set, simple operations. **UNIT-III** **INTRODUCTION TO EMBEDDED SYSTEMS :** classification, processors, hardware units, software embedded into systems, applications and products of embedded systems. **UNIT-IV** **EMBEDDED SYSTEM DESIGN :** Processor Selection, Hardware and Software Requirements, Hardware/Software Partitioning, co-design issues Embedded Software Development Tools: Host and Target Machines, Linkers/Locators for embedded software. **UNIT-V** **REAL TIME OPERATING SYSTEMS :** Architecture of kernel, tasks and task scheduler, Interrupt Service Routine, Semaphores, Mutex, Mail boxes, Message queues, event registers, pipes, signals, timers, memory management, priority inversion problem
TextBooks & References	**TextBooks :** **1.** The 8051 Micro-Controllers, Kenneth J Ayala, 3rd Edition, Thomson Publications. **2.** Design with PIC Micro-Controllers by John B Peatman, Pearson Educations. **3.** Embedded Systems – Architecture, Programming and Design, Raj Kamal, 2nd Edition, TMH, 2008 **4.** Embedded Systems, by KVKK Prasad (Black Book). **References :** **1.** An Embedded Software Primer, Simon D E, Pearson Education, 1999 **2.** Specifications and Design of Embedded Systems, David D Gajski, Frank Vahid, S.Narayan, J Garg.
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13EC41P1 – MICROPROCESSORS & EMBEDDED SYSTEMS LAB

Course Category:	Computing	**Credits:**	2
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Pre-requisite:	Basic knowledge in programming C , knowledge In microprocessors and programming	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives:	1. Expose the features of the software tool – TASAM simulator. 2. Demonstrate the arithmetic and data transfer instructions of 8086. 3. To Write the assembly language programs for counters and code conversions. 4. Demonstrate the application of DOS interrupts. 5. Develop the assembly language programs for simple logical and arithmetic operations. 6. Demonstrate the interfacing knowledge with Microprocessor kit	
Course Outcomes:	**CO1**	Able to design the home appliances and toys using Microcontroller chips.
	CO2	Able to design computers like desktops , laptops using various processors
	CO3	Able to design the high speed communication ckts using serial bus connection
	CO4	Able to use a commercial CPU(s) as realistic vehicles to demonstrate these concepts by introducing students to CPU instructions and internal register structures
	CO5	Able to understand the full internal workings of a typical simple CPU including the utilization of the various hardware resources during the execution of instructions.

Course Content:

LIST OF EXPERIMENTS

1. **SUMMATION & BLOCK TRANSFER OF DATA**
   a) Write and execute 8086 to add the given series of BCD numbers and show the result.
   b) Write and execute 8086 ALP to transfer a Block of data from one memory area to another memory area.
2. **MULTIPLICATION & DIVISION**
   a) Write and execute 8086 ALP to perform the following multiplications.
      1) Repeated addition
      2) Using SHIFT and ADD instruction
   b) Write and execute 8086 ALP to perform the following.
      1) Binary division
      2) BCD division
3. **SEARCHING & SORTING DATA**
   a) Write and execute 8086 ALP to find the minimum and maximum number from a given data array
   b) Write and execute 8086 ALP to arrange the given data array in ascending order or descending order
4. **EVALUATION OF MATHEMATICAL EXPRESSION**
   Mathematical Expressions
   a) a*b- c/d + e
   b) $\sum_{i=1}^{n} xi\ yi$

	c) Write and execute 8086 Alp to compute the following : Evaluation of Multiplication of Series **5. CODE CONVERSION** a) Write and execute 8086 ALP to convert HEX to BCD number b) Write and execute 8086 ALP to convert BCD to HEX number c) Write and execute 8086 ALP to convert HEX to ASCII number d) Write and execute 8086 ALP to convert ASCII to HEX number **6. LOGIC CONTROLLER MODULE** Write and execute 8086 ALP to design the logical expression using Logic controller interface module **7. STEPPER MOTOR MODULE** Write and execute 8086 ALP to rotate a stepper motor either in clockwise direction or in anticlockwise direction and to control the speed of rotation **8. SERIAL INPUT DISPLAY UNIT MODULE(SIDU)** Write and execute 8086 ALP to display the desired word in a display of serial input display unit interface module **9. PARALLEL INPUT DISPLAY UNIT MODULE (PIDU)** Write and execute 8086 Alp to design an up and down counter using PIDU Interface module **10. DIGITAL TO ANALOG CONVERTER INTERFACE MODULE** Write and execute 8086 Alp to generate given waveform through CRO using DAC

13EC41P2 MICROWAVE AND OPTICAL COMMUNICATIONS LAB

Course Category		**Credits**	2
Course Type	Practical	**Lecture-Tutorial- Practice**	0-0-3
Prerequisite	MicroWave techniques	**Sessional Evaluation:**	40
		Semester End Evaluation:	60
		Total Marks:	100

Course Objectives	1. To Study the reflex klystron which is used as amplifier and oscillator in radar stations and radio stations etc. 2. Student understands well wave guide charcterstics so that he will know what frequency of operation guide can be use. 3. By measuring antenna parameters student have an idea how wavelength and gain affects the directivity of an antenna and also the same can be applied for studying other types of antennas. 4. To measure unknown load impedance using VSWR method. 5. To measure howmuch power is connected to load (using directional couplers) for ex : antenna	
Course Outcomes		
	CO1	By studying reflex klystron characteristics student understands how it can be used as a amp,osc in microwave applications
	CO2	By studying direction couplers student understands well how to calculate the power deliver to any load
	CO3	Student have an idea what frequency range wave guide can be operated
	CO4	Using magic tee student knows well how power can be mixed and split phase reversal etc
	CO5	Measuring antenna parameters gain , aperture area and wave length affects the directivity
Course Content	**LIST OF EXPERIMENTS** 1. **Reflex klystron charcteristics –I** 2. **Reflex klystron charcteristics –II**	

	3. Direction couplers **4. Wave guide parameters** **5. Characteristics of GUNN diode** **6. Characteristics of MAGIC TEE** **7. Antenna measurements** **8. Measurement of VSWR** **9. Measurement of impedance** **10. Measurement of numerical aperture**
TextBooks & References	1. Samuel Y Liao, **"Microwave Devices and Circuits"**, Prentice Hall,1999. 2. M. Kulkarni, **"Microwave and Radar Engineering"**, Umesh Publications,1998. 3. Annapurna Das and Sisir K Das, **"Microwave Engineering"**, TMH, 2000

ELECTIVES-II	
1	**BIO – MEDICAL INSTRUMENTATIONS**
2	**COMPUTER NETWORKS**
3	**DATA & COMPUTER COMMUNICATIONS**
4	**OPERATING SYSTEMS**

13EC41E1 – BIO-MEDICAL INSTRUMENTATIONS

Course Category	Program Core	Credits:	4
Course Type	Theory	Lecture –tutorial Practice :	4
Prerequisites		Continuous evaluation: Semester End evaluation: Total marks:	40 60 100

Objectives	1. **Biomedical Signals and Instrumentation Sensors:** Learn several signals that can be measured from the human body. Specific examples include temperature, electrical, and pressure signals. Understand how noise from the environment, instruments and other physiologic systems can create artifacts in instrumentation. Understand the theory of how several sensors operate and use these sensors in laboratory sessions. Specific examples include thermistors and electrodes. 2. **Instrumentation Design:** Understand theory and design on Wheatstone bridge; inverting, non-inverting, differential and instrumentation amplifiers. Design filters necessary to condition and isolate a signal. Understand how signals are digitized and stored in a computer or presented on an output display. 3. **Instrumentation Application:** Review the cardiac, respiratory and neural physiological systems. Study the designs of several instruments used to acquire signals from living systems. Examples of instruments studied include ECG, blood pressure monitors, spirometers, EEG, MRI, and ultrasound. Integrate information learned about biomedical signals, sensors and instrumentation design to create a design of your own. 4. **Work in Multi-disciplinary Teams:** Learn written and oral communication skills necessary to present information learned from laboratory sessions. Learn how to work in a group to attain a common goal.	
Course Outcomes		**Upon Successful completion of the course student is able to :**
	Co 1	Demonstrate a basic understanding of disease, medical conditions or physiological conditions.
	Co 2	Understand the functional components of various instruments.
	Co 3	Suggest a range of methods which are used to diagnose, monitor or manage conditions.

	Co 4	Demonstrate a critical appreciation of various biomedical instruments.
	Co 5	Explore new developments for better management or assessment of conditions.
Course Content	**UNIT – I** **Electro – Physiology**: Review of physiology and anatomy resting potential, action potential Propagation of action potential, bio electric potential, cardiovascular dynamics, electrode theory Bipolar and unipolar electrodes, surface electrodes, physiology transducers, system approach to biological system. **UNIT – II** **Bio-electric potential and cardio vascular measurements**: EMG – Evoked potential response, EEG – fetal monitor ECG – Phonocardiography, vactor cardiography B.P. – Blood flow – ardiac output, plethysmography, impedance cardiology, cardiac arrhythmias, pacemakers defibrillators **UNIT – III** **Respiratory and pulmonary measurements and rehabilitation**: Physiology of respiratory system rate measurements, oximeter, hearing aids, functional neuromuscular simulation, physiotherapy, diatheropy, nerve simulator. **UNIT – IV** **Patient Monitoring Systems:** Intensive cardiac care unit, bedside and central monitoring systems Patient monitoring through bio-telemetry, implanted transmitters, Telemetering multiple information, sources of electrical hazards and safety techniques. **UNIT – V** **Recent Trends:** Medical imaging Laser applications, Ultrasound scanner Echo cardiograph, CT scan, MR/NMR. Cine angiograms, Colour Doppler systems, Holter monitoring. Endoscopy.	
TextBooks & References	**TEXT BOOKS:** **1.** Seslie Cromwell, Red J. Weibell and esich A. Plefitter – Bio medical Instrumentation and Measurements. **2.** R.S. Kandpur, Hand Book of Bio-medical Instrumentation, Tata Mc. Graw Hill, 1987. **3.** M.Arumugam, Bio –medical Instrumentation, Anuradha Agencies Publisher, Vidayal Karuppu – 612 606, Kumbakansm R.M.S., 1992.	

	REFERENCE BOOKS: 1. L.A. Geddes and L.E. Baker – Principles of Applied Bio medical Instrumentation, John Wiley, 1989. 2. Reichard Aston, Principles of Bio-medical Instrumentation and Measurements, Mervill Publishing Company, 1990.
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13EC41E2 - COMPUTER NETWORKS

<table>
<tr><td>Course Category</td><td colspan="2">Program Core</td><td>Credits:</td><td>4</td></tr>
<tr><td>Course Type</td><td colspan="2">Theory</td><td>Lecture –tutorial
Practice :</td><td>4</td></tr>
<tr><td>Prerequisites</td><td colspan="2"></td><td>Continuous evaluation:
Semester End evaluation:
Total marks:</td><td>40
60
100</td></tr>
<tr><td>Objectives</td><td colspan="4">1. To become familiar with the fundamentals of parallel and serial data transmission
2. Knowledge about various Local Area Networks & Routing algorithms
3. To acquire knowledge about principles and techniques of different network layer design issues
4. To understand the Data compression techniques & Cryptography
5. To become familiar with the World wide web, web browsers & web servers</td></tr>
<tr><td rowspan="6">Course Outcomes</td><td></td><td colspan="3">Upon Successful completion of the course student is able to :</td></tr>
<tr><td>Co 1</td><td colspan="3">Understands the basics of communication, and different models of data transmission</td></tr>
<tr><td>Co 2</td><td colspan="3">Studies different types of networks, and various protocols for data transmission</td></tr>
<tr><td>Co 3</td><td colspan="3">Studies design issues of Link layers, and network layer.</td></tr>
<tr><td>Co 4</td><td colspan="3">Understands error detection and correction schemes</td></tr>
<tr><td>Co 5</td><td colspan="3">Creates tables using external media and tries to Design webpage</td></tr>
<tr><td>Course Content</td><td colspan="4"><u>UNIT-I</u>

INTRODUCTION : Theoretical basis for communication, Maximum data rate of channel, communications media, Networks goals, Application of networks, protocol hierarchies, OSI reference model, Design issues for the layers in the model, Modulation and keying alternatives, multiplexing, modems, parallel and serial data transmission, handshake procedures. Rs 232C, V.14/V.28, Rs449 interfaces, X.21, IEEE protocols, Link switching techniques.</td></tr>
</table>

	UNIT-II **LOCAL AREA NETWORKS :** Local communication alternatives, static and dynamic channel allocation in LANs, the ALOHA protocols, LAN protocols, IEEE logical link control, Ethernet, Token bus and Token ring protocols. **DATA LINK LAYER :** Design issues Error detection and correction, sliding window protocols. Wide area network standards, SDLC, HDLC, X 25 protocols. **UNIT-III** **NETWORK LAYER :** Design issues, Routing algorithms, congestion control algorithms, Internetworking, Transport layer design issues, connection management, Transport protocol X 25, session layer design issues, Remote procedure cell. **UNIT-IV** **PRESENTATION LAYER :** Abstract syntax notation, Data compression techniques, Cryptography Application such as file transfer, Electronic mail and virtual terminals, X 400 protocol for electrical messaging overview of ARPANET, MAP, TOP, Novell Netware, PC/NOS, Unix support for networking. **UNIT-V** **APPLICATION LAYER :** World wide web, web browsers, web servers, uniform resource locator, Home pages, Basics of HTML, creating links, Anatomy of URL and kinds of URLs, HTML assignments, Editors and converters, New features of HTML, creating tables, Using images, Using external media, writing and designing web pages, Introduction to CGI scripts.
TextBooks & References	**TEXT BOOKS:** 1. Computer Networks – Andrew S Tanenbaum, 4th edition. Pearson Education/PHI 2. Data Communications and Networking – Behrouz A.Forouzan, Third edition, TMH. **REFERENCES:** 1. An Engineering Approach to Computer Networks – S.Keshav,2nd

	edition, Pearson Education 2. Understanding communications and Networks,3rd edition,W.A.Shay,Thomson
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13EC41E3-DATA AND COMPUTER COMMUNICATION

<table>
<tr><td>Course Category</td><td colspan="2">Program Core</td><td>Credits:</td><td>4</td></tr>
<tr><td>Course Type</td><td colspan="2">Theory</td><td>Lecture –tutorial
Practice :</td><td>4</td></tr>
<tr><td>Prerequisites</td><td colspan="2">Basics of communication</td><td>Continuous evaluation:
Semester End evaluation:
Total marks:</td><td>40
60
100</td></tr>
<tr><td>Objectives</td><td colspan="4">1. To acquire Knowledge about principles and techniques of different Data communication circuits
2. To become familiar with the fundamentals of data communication protocols
3. To understand & analyze various digital multiplexing schemes
4. Knowledge about the design of various multiple access algorithms for different engineering mode
5. Learn techniques for spread spectrum access</td></tr>
<tr><td rowspan="6">Course Outcomes</td><td></td><td colspan="3">Upon Successful completion of the course student is able to</td></tr>
<tr><td>Co1</td><td colspan="3">Understands basics of data communications and error control mechanisms</td></tr>
<tr><td>Co 2</td><td colspan="3">Studies different types of networks and protocol hierarchy</td></tr>
<tr><td>Co 3</td><td colspan="3">Understands different digital multiplexing techniques</td></tr>
<tr><td>Co 4</td><td colspan="3">Recognizes the importance of multiple access schemes</td></tr>
<tr><td>Co 5</td><td colspan="3">Understands the applications of Spread spectrum techniques</td></tr>
<tr><td>Course Content</td><td colspan="4"><u>UNIT-I</u>

DATA COMMUNICATION : Introduction – History of data communications – Data communication circuits – Data communication codes – Error control- Synchronization – Data communications hardware – serial interfaces – Transmission media and data modem.

<u>UNIT-II</u>

DATA COMMUNICATION PROTOCOLS : Introduction – public data network – ISO protocol hierarchy – CCITT X.25 user to network interface PROTOCOL – Local area networks – Metropolitan area networks – wide area networks.</td></tr>
</table>

	UNIT-III **DIGITAL MULTIPLEXING :** Time-Division multiplexing – TI digital carrier system – CCITT Time-division Multiplexed carrier system – codecs – T- carriers – frame synchronization – Bit interleaving versus word interleaving. Frequency division multiplexing. AT & T's FDM hierarchy– Composite base band signal – L carriers – Hybrid data. **UNIT-IV** **MULTIPLE ACCESS :** TDMA – FDMA – CDMA – CSMA/CD – Multiple access information flow – Demand – assignment multiple access algorithms – ALOHA, polling techniques, slotted ALOHA. **UNIT-V** **SPREAD – SPECTRUM TECHNIQUES :** The beneficial attributes of spread – spectrum systems, model for spread – spectrum interference rejection – Pseudonoise sequences. Direct – sequence spread – spectrum systems – example of direct sequencing – processing gain and performance. Frequency hopping systems- frequency hopping example – fast hopping versus slow hopping. Synchronization – Acquisition, tracking.
TextBooks & References	**TEXT BOOKS:** 1. Wayne Temasi, 'Advance Electronic Communications systems', Pearson Education(I,II and III). 2. Bernard Sklar, Digital communications – Fundamentals and Applications, 2nd Edition , Pearson Education (IV and V). **REFERENCE BOOKS:** 1 Stallings – Data and Computer Communication, 6th Edition, Pearson Education. 2 Taub&Shelling, Principles of Communication system, McGraw Hill.
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13EC41E4-OPERATING SYSTEMS

<table>
<tr><td>Course Category</td><td colspan="2">Program Core</td><td>Credits:</td><td>4</td></tr>
<tr><td>Course Type</td><td colspan="2">Theory</td><td>Lecture –tutorial
Practice :</td><td>4</td></tr>
<tr><td>Prerequisites</td><td colspan="2">Basics of computers and its architechture</td><td>Continuous evaluation:
Semester End evaluation:
Total marks:</td><td>40

60
100</td></tr>
<tr><td>Objectives</td><td colspan="4">1. Studies the evolution of operating systems and understands the Objectives of Operating System
2. Understands Process control strategies
3. Recognizes the importance of memory management
4. Analyzes disk scheduling process.
5. Understands file management , and security threats</td></tr>
<tr><td rowspan="6">Course Outcomes</td><td></td><td colspan="3">Upon Successful completion of the course student is able to</td></tr>
<tr><td>Co1</td><td colspan="3">Studies the evolution of operating systems and understands the Objectives of Operating System</td></tr>
<tr><td>Co 2</td><td colspan="3">Understands Process control strategies</td></tr>
<tr><td>Co 3</td><td colspan="3">Recognizes the importance of memory management</td></tr>
<tr><td>Co 4</td><td colspan="3">Analyzes disk scheduling process.</td></tr>
<tr><td>Co 5</td><td colspan="3">Understands file management , and security threats</td></tr>
<tr><td>Course Content</td><td colspan="4"><u>UNIT-I</u>

COMPUTER SYSTEM & OPERATING SYSTEM OVERVIEW : Overview of Computer System hardware- instruction execution- I/O function- Interrupts – Memory hierarchy- I/O Communication Techniques. Operating System Objectives and functions, Evaluation of operating systems- Example systems.

<u>UNIT-II</u>

PROCESS DESCRIPTION : Process Control- Process states- Process and Threads- Examples of process description and control.

CONCURRENCY : Principles of Concurrency- Mutual Exclusion – Software and hardware approaches- semaphores- Monitors- Message Passing- Readers Writers problem.</td></tr>
</table>

	UNIT-III **PRINCIPLES OF DEADLOCK :** Deadlock prevention, detection and avoidance dining philosophers problem- Example Systems. **MEMORY MANAGEMENT :** Memory Management requirements- loading programs into main memory – virtual memory- hardware and Control structures- OS software- Examples of Memory Management. **UNIT-IV** **UNI-PROCESSOR SCHEDULING :** Types of Scheduling- Scheduling algorithms- I/O Management and Disc Scheduling- I/O devices- Organization- of I/O function- OS design issues- I/O buffering- Disk I/O – disk scheduling policies- examples System. **UNIT-V** **FILE MANAGEMENT AND SECURITY :** Overview of file management- file organization and access- File Directories- File sharing- Record blocking- secondary storage Management- Example system. **Security:** Security threats- Protection- Intruders- Viruses- trusted Systems
Text Books & References:	**TEXT BOOKS:** 1. Operating. System`- Internal and Design Principles, Fifth Edition- 2005, Pearson Education. / PHI 2. Operating System Principles- Abraham Silberchatz, Peter B.Galvin, Greg Gagne, 7th Edition John Wiley. **REFERENCES:** 1. Operating Systems A design approach- Crowley, TMH. 2. Modern Operating Systems, Andrew S Tanenbaum, 2nd Edition, PHI/PEARSON.
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SPSR NELLORE DIST
IV YEAR OF FOUR YEAR B.TECH DEGREE COURSE – II SEMISTER
ELECTRONICS AND COMMUNICATIONS ENGINEERING
SCHEME OF INSTRUCTION AND EVALUATION
(With effect from the academic year 2016-2017)
(For the batch admitted in the academic year 2013-2014)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation							
							Sessional Test-I		Sessional Test-II		Total Sessional Marks (Max. 40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Duration In Hours	Max. Marks	Duration In Hours	Max. Marks		Duration In Hours	Max. Marks	100
1	13EC4201	Digital Image Processing	4	-	-	4	2	40	2	40	0.8*Best of two+0.2*least of two	3	60	100
2	13EC4202	Satellite Communication	3	1	-	4	2	40	2	40		3	60	100
3		Elective - III	4	-	-	4	2	40	2	40		3	60	100
		PRACTICALS												
4	13EC42P1	Digital Signal Processing Lab	-	-	3	2	--	-	-	-	Day to Day Evaluation and a test (40 Marks)	3	60	100
5	13EC42PR	Project Work	-	-	3	6	--	-	-	-	Continuous Assesment and Seminar (80 Marks)	3	120	200
		TOTAL	11	01	06	20	-	-	-	-		-	360	600

13EC4201-DIGITAL IMAGE PROCESSING

Course Category:	Programme Core	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practice:	4-0-0
Prerequisites:	Engineering Mathematics(13SH1002, 13SH1002, 13SH2101) Signals and Systems (13EC2101) Digital Signal Processing (13EC4101)	Continuous Evaluation: Semester end evaluation: Total Marks:	40 60 100

Objectives	1. To learn the fundamentals of digital image processing and relationship between pixels. 2. To understand transformations used in digital image processing algorithms. 3. To understand the spatial and frequency domain image processing and fundamentals of color image processing. 4. To learn the restoration techniques used in image enhancement. 5. To learn how to code and compress the images.	
Course Outcomes		**Upon successful completion of this course, the student will be able to**
	CO1	Describe how digital images are represented and how they are sampled and quantized and Define image processing system and basic relations among pixels.
	CO2	Analyze the need for image transforms, types and their properties.
	CO3	Study different techniques employed for the enhancement of images both in spatial and frequency domain and Describe techniques of color image processing.
	CO4	Explore causes for image degradation and various restoration techniques.
	CO5	Understand the techniques for image segmentation and Define different image coding techniques and compression models.

Course Content	**UNIT-I** **DIGITAL IMAGE FUNDAMENTALS :** Digital Image Representation – Digital Image Processing System – Visual Perception – Sampling and quantization – Basic Relationship between pixels – Imaging geometry. **UNIT – II** **IMAGE TRANSFORMS :** Discrete Fourier Transform – Properties of 2-D Fourier transform – 2-D Fast Fourier Transform – Walsh Transform – Hadamard Transform – DCT – Haar Transform – Slant Transform – Hotelling Transform. **UNIT – III** **IMAGE ENHANCEMENT :** Back ground enhancement by point processing – Histogram Processing – Spatial Filtering – Enhancement in frequency Domain – Image Smoothing – Image Sharpening. **COLOUR IMAGES :** Colour Image Processing – Pseudo colour image processing – Full colour image processing. **UNIT – IV** **IMAGE RESTORATION :** Degradation model – Algebraic approach to restoration – Inverse filtering – Least Mean Square filters – Constrained Least Mean Square restoration – Inverse Restoration. **IMAGE SEGMENTATION :** Detection of Discontinuities – Edge Linking – Boundary detection and Boundary Description – Thresholding – Region Oriented Segmentation. **UNIT – V** **IMAGE CODING & COMPRESSION :** Fidelity Criteria – Encoding Process – Transform Encoding – Redundancies and their removal methods – Image compression models and methods – Source coder and decoder – Error free compression – Lossy compression.
Text Books & References:	**Text Books :** 1. **"Digital Image Processing"** – Rafael C. Gonzalez, Richard E. Woods, 3rd Ed, Pearson. 2. **"Fundamentals of Image Processing"** – A. K. Jain, Prentice Hall India. **Reference Books :** 1. **"Digital Image Processing"** – William K. Pratt, John Wiley Publications 2. **"Digital Image Processing"** – K. R. Castleman, Pearson Publications 3. **"Fundamentals of Electronic Image Processing"** – Weeks Jr, SRIC/IEEE series, PHI.
E-resources & other Digital	**1.** nptel.ac.in/courses/117105079/ **2.** www.ee.columbia.edu/~xlx/courses/ee4830-sp08/notes/lect1-parta.pdf

services	

13EC4202-SATELLITE COMMUNICATION

Course Category:	Programme Core	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practice:	3-1-0
Prerequisites:	Antenna and Wave Propagation (13EC3104) RADAR Engineering (13EC4102)	Continuous Evaluation: Semester end evaluation: Total Marks:	40 60 100

Objectives	1. Understand the origin, brief history, current state and future trends of Satellite Communications. 2. Understand the principles, concepts and operation of satellite communication systems. 3. Able to calculate and interpret key geometric and timing parameters for a variety of common satellite orbits. 4. Able to apply suitable pulse code modulation schemes and coding for various applications. 5. Understand different types of satellite subsystems. 6. Describe the concepts of signal propagation affects, link design, rain fading and link availability and perform interference calculations. 7. Design multiple-access satellite communications networks and understand the various trade-offs involved. 8. Understand the earth station architecture, hardware, testing and design considerations.	
Course Outcomes		**Upon successful completion of this course, the student will be able to**
	CO1	To identify, formulate and solve engineering problems related to orbital aspects of satellite communication.
	CO2	To know about working of different subsystems in the satellite.
	CO3	Design satellite link budgets to account for channel losses, noise, and interference in satellite communications systems for specific communications requirements.
	CO4	Gain knowledge about different multiple access techniques.
	CO5	Acquire knowledge about of Earth Station
Course Content	**UNIT-I** **INTRODUCTION :** The Origin of Satellite Communications, A brief history of Satellite Communications, Frequency allocations for Satellite Services, Applications, Current State of Satellite Communications and Future trends of Satellite Communications. **ORBITAL ASPECTS OF SATELLITE COMMUNICATION :** Orbital Mechanics, Lock Angle determination, Orbital perturbations, Orbit determination, Launches and Launch Vehicles, Orbital effects in Communication Systems Performance.	

	UNIT-II **SATELLITE SUBSYSTEMS :** Introduction, Attitude and Orbit Control System (AOCS), Telemetry, Tracking, Command and Monitoring (TTC&M), Power Systems, Communication Subsystems, Satellite Antennas, Equipment reliability and Space Qualification.
	UNIT-III **SATELLITE LINK DESIGN :** Basic Transmission Theory, System Noise Temperature and G/T ratio, Design of Down Link, Up Link design, Design of Satellite links for specified C/N, System Design examples.
	UNIT-IV **MULTIPLE ACCESS :** Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Frame Structure and Code Division Multiple Access (CDMA), Spread Spectrum Transmission and Reception.
	UNIT-V **EARTH STATION :** Types of Earth Station, Earth Station Architecture, Earth Station Design Considerations, Earth Station Testing, Earth Station Hardware and Satellite Tracking.
Text Books & References:	**Text Books :** 1. **"Satellite Communication"** - Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003. 2. **"Satellite Communications"** - Anil K.Maini and Varsha Agarwal, Wiley India Pvt Ltd, 2011. 3. **Reference Books :** 1. **"Satellite Communication"**- D.C Agarwal, Khanna Publications,5th edition 2. **"Satellite Communications"**- Dennis Roddy, McGraw Hill, 4th Edition, 2009. 3.
E-resources and other Digital material	1. http://ocw.mit.edu/courses/aeronautics-and-astronautics/16-851-satellite-engineering-fall-2003/lecture-notes/

13EC42P1- DIGITAL SIGNAL PROCESSING LAB

Course Category:	Programme core	Credits:	2
Course Type:	Practical	Lecture-Tutorial-Practice:	0-0-3
Prerequisites:	Engineering Mathematics ((13SH1002, 13SH1002, 13SH2101) Signals and Systems (13EC2101) Digital Signal Processing (13EC4101)	Continuous Evaluation: Semester end evaluation: Total Marks:	40 60 100

Objectives	To Understand the DSP using MATLAB programming	
Course Outcomes		**Upon successful completion of this course, the student will be able to**
	CO1	Calculate the output of any Linear Time Invariant system using Convolution for all test signals and generate various discrete time signals using MATLAB.
	CO2	Understand the concept of DFT and FFT and derive the spectrum of the various signals
	CO3	Calculate the output of any system using Z-Transform
	CO4	Design a digital filters using Butterworth and Chebyshev approximations
	CO5	Design a FIR digital filters
Course Content	**LIST OF EXPRIMENTS** 1. Generation of discrete time signals like sine, cosine, exponential, square and saw tooth 2. Perform linear convolution and cross correlation of two sequences 3. Solutions of Constant co-efficient difference equations 4. Computation of the DTFT of a given sequence x(n) 5. Computation of the DFT and IDFT of a given sequence 6. Computation of the efficiency of FFT algorithm with the DFT algorithm 7. Linear convolution using DFT 8. Inverse Z-Transform using residue method 9. Design Chebyshev digital low pass filter using Bilinear transformation 10. Design a Butterworth digital low pass filter 11. Design FIR digital low pass filter 12. Design digital band pass filter 13. Design digital band stop filter	
Text Books &	**Text Books:** 1. "Digital Signal Processing" by Salivahanan Mc-graw hill Publications. 2. Digital Signal Processing A.V. Oppenheim and R.W. Schafer, Prentice – Hall of India,	

References:	New Delhi, 1988. 3. Digital signal Processing Salivahanan-TMH 4. Digital signal Processing Computer based approach, S.K.Mitra – Tata Mc Graw – **5.** Hill (III) (p-339-400). **Reference Books:** 1 "Digital Signal Processing" P.Ramesh Babu Scitech Publishers 2 "Digital Signal Processing", John G Proakis and monolokis –Whiley eastern economy edition
E-resources and other Digital material	

ELECTIVES-III	
1	**CONSUMER & ENTERTAINMENT ELECTRONICS**
2	**IC FABRICATION TECHNOLOGY**
3	**CELLULAR MOBILE COMMUNICATIONS**
4	**DIGITAL CONTROL SYSTEMS**

13EC42E1 CONSUMER AND ENTERTAINMENT ELECTRONICS ENGINEERING

Course Category:	Programme Elective	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practice:	4-0-0
Prerequisites:	Electronic Devices & Circuits (13EC2102), Pulse and Analog Circuits (13EC2204) Electronic Measurements & Instrumentation (13EC3101) Microprocessor & Interfacing (13EC3201)	Continuous Evaluation: Semester end evaluation: Total Marks:	40 60 100

Course Objectives		
Course Outcomes		**Upon successful completion of this course, the student will be able to**
	CO1	Design industrial product as per the customer needs and specifications
	CO2	Understand the operation of home entertainment devices with advances in technology
	CO3	Understand the usage of set top boxes, internet and networking in embedded devices.
	CO4	Understand the operation of handheld, wearable computers and mobile computing
	CO5	Understand the principle of human computer interface and test quality & reliability of a device.

Course Content	**UNIT I** **INTRODUCTION** :Review of Electronics circuits, Microprocessor/microcontrollers and interfacing, Digital signal Processing, Embedded systems, PC interfacing Product Design fundamentals- Identifying Customer needs –Product specification – Product architecture- Industrial design- Managing projects. **UNIT II** **HOME ENTERTAINMENT:** Home Gateway, DTV, DVB, Home Theatre, Games systems, Advanced DVD and CD, HDTV and Flat panel, 3D TV Technologies, Set top Box, Internet TV, Home Networking in Embedded Devices. **UNIT III** **MOBILE COMPUTING AND COMMUNICATION:** Handheld and wearable computers, AV streaming to handheld devices, Smart Antennas. **UNIT IV** **AUTOMOTIVE ENTERTAINMENT AND INFORMATION:** Navigation, Driver assistance, sensors and control. **UNIT V** **ENABLING TECHNOLOGIES:** Power and batteries, Human computer Interface, compliance testing - EMC/RFI, Environmental, Special needs and assistive technologies, Standards, Quality, Reliability prediction and Engineering.
Text Books & References:	**Text Books:** 1. Consumer Electronics for Engineers by Philip Hoff ,Cambridge University Press. **Reference Books:** 2. Product Design and development Karl T Ulrich Steven D Eppinger Tata-McGraw Hill ISBN. 3. Hardware Bible by Winn Rosch Techmedia publications ISBN 81 87105 23 2
E-resources and other Digital material	www.icce.org

13EC42E2-IC FABRICATION TECHNOLGY

Course Category:	Programme Elective	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practice:	4-0-0
Prerequisites:	Electronic Devices & Circuits (13EC2102), Switching Theory & Logic Design (13EC2201), Analog IC Applications (13EC3103) Digital Design (13EC3204) VLSI Design (13EC4103)	Continuous Evaluation: Semester end evaluation: Total Marks:	40 60 100

Course Objectives	1. Explain the fundamental process involved in IC fabrication process and describe the CMOS and BiCMOS IC Fabrication Process 2. Modelling of resistor and capacitor in IC fabrication considering the parasitic effects and design rules 3. Design Gate structures, Network layout and sequential machines 4. Gain adequate knowledge on subsystems and physical design 5. Design for Testing and Testability	
Course Outcomes		**Upon successful completion of this course, the student will be able to**
	CO1	Explain the fundamental process involved in IC fabrication process and describe the CMOS and BiCMOS IC Fabrication Process
	CO2	Modelling of resistor and capacitor in IC fabrication considering the parasitic effects and design rules
	CO3	Design Gate structures, Network layout and sequential machines
	CO4	Gain adequate knowledge on subsystems and physical design
	CO5	Design for Testing and Testability
Course Content	**UNIT-I** **FUNDAMENTALS OF IC FABRICATION PROCESS :** Preparation of EGS, Crystal growing, Wafer preparation, Epitaxy, Oxidation, Photolithography, Diffusion, Metallization, CMOS fabrication-p-well process, n-well process, twin-tub process. BiCMOS fabrication. IC design techniques-Hierarchical design and design abstraction.	
	UNIT-II **DEVICES AND LAYOUT :** Sheet resistance. Area capacitance. Delay unit τ. MOS Transistors - Structure of the transistor, Simple transistor model, Transistor parasitics,	

	Wires and via s, Tub ties and latch up, Wire parasitics, Advanced characteristics. Design rules- Fabrication errors, Scalable design rules, SCMOS design rules, Layout design and tools- Layouts for circuits, Stick diagrams, Hierarchical stick diagrams.
	UNIT-III **GATES, NETWORK, AND SEQUENTIAL MACHINES :** Static complementary gates- Gate structures, Basic gate layouts, delay, Power consumption, Speed- power product, parasitics, Wires and delay. Network layout design- Single row layout, Standard cell layout. Network delay- Fan-out, Path delay, Transistor sizing. Sequential machines- Latches and Flip-flops.
	UNIT-IV **SUBSYSTEMS AND FLOOR PLANNING :** Subsystems- Pipelining, Data paths, 4-bit arithmetic processor as example of subsystem design. Floor planning methods – Block placement and channel distribution, Global routing, power distribution, Clock distribution. Off-chip connections- Packages, I/O Architecture, Pad design.
	UNIT-V **TESTING AND TESTABILITY :** System partitioning. Design for testability. Fault models. ATPG. Testing combinational logic. Testing sequential logic. Scan design techniques. BIST.
Text Books & References:	**Text Books:** 1. S.M.Sze, **"VLSI Technology"**, Mc Graw-Hill Int. Edn. 2. Wayne Wolf, **"Modern VLSI design"**, Pearson Education Asia. **Reference Books** 1 Douglas A.Pucknell and Kamran Eshraghian, **"Basic VLSI design"**, Prentice-Hall of India Pvt. Ltd. 2 **"Introduction to VLSI Circuits and Systems"** – John. P. Uyemura. John wiley, 2003. 3 **"Digital Integrated Circuits"** – John M.Rabaey, PHI,
E-resources and other Digital material	www.iue.tuwien.ac.at/phd/ceric/node8.html www.eecs.berkeley.edu/~hu/Chenming-Hu_ch3.pdf www.nptel.ac.in/courses/113106062/Lec22.pdf

13EC42E3-CELLULAR MOBILE COMMUNICATION

Course Category:	Programme Elective	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practice:	4-0-0
Prerequisites:	Engineering Mathematics ((13SH1002, 13SH1002, 13SH2101) Antenna and Wave Propagation (13EC3104) RADAR Engineering (13EC4102)	Continuous Evaluation: Semester end evaluation: Total Marks:	40 60 100

Objectives	1. Understanding the basic Cellular system and elements of cellular radio system design. 2. Study of various Prediction models for cell coverage in terms of signal and traffic. 3. Understanding the interference problem and its reduction by designing proper antenna system. 4. Understanding frequency spectrum utilization techniques, channel and traffic management and evaluation of dropped call rate. 5. Understanding the need for digital mobile telephony and studying various mobile systems like GSM & CDMA.	
Course Outcomes		**Upon successful completion of this course, the student will be able to**
	CO1	Understand cellular communication system and elements of cellular radio system design.
	CO2	Acquire knowledge about propagation mechanisms, Multipath fading, and channel modelling.
	CO3	Know about different types of co-channel interferences.
	CO4	Gain knowledge about Frequency management & Channel assignment.
	CO5	Acquire knowledge about the evolution of GSM, TDMA and CDMA technologies.

Course Content	**UNIT-I** **INTRODUCTION TO CELLULAR MOBILE SYSTEM :** A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, Analog and Digital cellular systems. **ELEMENTS OF CELLULAR RADIO SYSTEM DESIGN :** General description of the problem, concept of frequency reuse channels, channel interferences reduction factors, desired C/I from a normal case in an omni-directional antenna system, cell splitting, consideration of cellular system, cell-site antennas & mobile antennas characteristics, antennas at cell-site, mobile antennas.
	UNIT-II **CELL COVERAGE FOR SIGNAL & TRAFFIC :** General introduction, obtaining the mobile point-to-point model, propagation over water or flat open area, foiling loss, propagation in near distance, long distance propagation, point-to-point prediction model characteristics, cell-site antenna heights and signals coverage cells, mobile propagation.
	UNIT-III **INTERFERENCE :** Introduction to co-channel interference, real – time co-channel interference measurement, design of antenna system, diversity receiver, types of non-co-channel interference, interference between systems.
	UNIT-IV **FREQUENCY MANAGEMENT & CHANNEL ASSIGNMENT :** Frequency spectrum utilization, setup channels, management & traffic channel assignment, Handoff & their characteristics, dropped call rates and their evaluations. real-time co-channel interference measurement
	UNIT-V **Digital cellular system:** Why digital, digital mobile telephony, practical multiple access schemes, global system for mobile (GSM), TDMA & CDMA, miscellaneous mobile systems.
Text Books & References:	**TEXT BOOKS:** 1. Lee. W. C. Y – "Mobile Cellular Telecommunication – Analog and Digital Systems", Mc Graw Hill. 2. G.K behere lopamudra das" Mobile communication" SciTech publications **RÉFERENCE BOOKS:** 1. Principles of communication systems Taub & shilling TMH

	2. Celullar mobile communications –Willium stallings –PHI
E-resources and other Digital material	www.iitg.ernet.in/scifac/qip/public_html/cd_cell/EC632.pdf www.morse.colorado.edu/~tlen5510/text/

13EC42E4-DIGITAL CONTROL SYSTEMS

Course Category:	Programme Elective	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practice:	4-0-0
Prerequisites:	Engineering Mathematics ((13SH1002, 13SH1002, 13SH2101) Signals and Systems (13EC2101) Linear Control Systems (13EE3107)	Continuous Evaluation: Semester end evaluation: Total Marks:	40 60 100

Objectives	1. Knowledge about principles and techniques of A/D and D/A conversions and basics of Z-Transform. 2. Knowledge in stability analysis of digital control systems. 3. Knowledge about the design of digital control systems for different engineering model.	
Course Outcomes		**Upon successful completion of this course, the student will be able to**
	CO1	Use ordinary differential equations and Laplace transformation to model physical systems, (ii) obtain dynamic responses of linear systems and determine their stability, (iii) construct root-locus and bode plots, and apply nyquist criterion in the context of controller design, (iv) obtain and manipulate state-space representation of dynamical systems using linear algebra, and (v) become fluent in digital control systems design.
	CO2	Translate a set of performance specifications given in words to a formal description of a design problem, and then design a suitable feedback-controller using design tools, followed by simulation and verification using software tools.
	CO3	Know the techniques for relaxing the constraints or redesigning the controller for achieving closed-loop specifications either in the time-domain or in the frequency domain. They should also know how constraints in the time domain affect the frequency response of the system and vice versa and how to apply these concepts to design
	CO4	Debug their controller design
	CO5	Design digital controllers, assess their design through the constraint specifications, and decide whether their initial design is acceptable or can be improved

Course Content	**UNIT – I** **Introduction:** Examples of Data control systems – Digital to Analog conversion and Analog to Digital conversion, sample and hold operations. Introduction, Linear difference equations, pulse response, Z – transforms, Theorems of Z – Transforms, the inverse Z – transforms, Modified Z- Transforms. **UNIT-II** **Signal Processing And Digital Control:** Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane. State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and its Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations. **UNIT – III** **State Variable Analysis:** Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function. Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constant frequency loci, Constant damping ratio loci, Stability Analysis of closed loop systems in the Z-Plane. Jury stablility test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion. **UNIT – IV** **Design of Digital Controller:** Transient and steady – State response Analysis – Design based on the frequency response method – Bilinear Transformation and Design procedure in the w-plane, Lead, Lag and Lead Lag compensators and digital PID controllers. **UNIT – V** **Pole Placement Designa and State Observers:** Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman's formula. State Observers–Full order and Reduced order observers.
Text Books & References:	**TEXTBOOKS:** 1. Discrete-Time Control systems - K. Ogata, Pearson Education/PHI, 2nd Edition. 2. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003.

	REFERENCES: 1. Digital Control and State Variable Methods by M.Gopal, TMH
E-resources and other Digital material	1. nptel.ac.in/syllabus/108103008/ **2.** http://ocw.mit.edu/courses/mechanical-engineering/2-171-analysis-and-design-of-digital-control-systems-fall-2006/