N.B.K.R. INSTITUTE OF SCIENCE & TECHNOLOGY

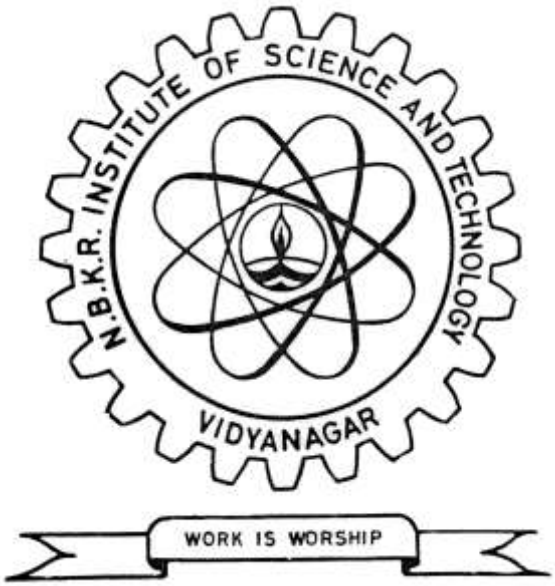
(AUTONOMOUS)

COLLEGE WITH POTENTIAL FOR EXCELLENCE (CPE)

Affiliated to JNTUA, Anantapuramu

Re-Accredited by NAAC with 'A' Grade

B.Tech. Courses Accredited by NBA under TIER-I



SYLLABUS

B.TECH. DEGREE COURSE

I B.Tech.

I & II Semesters

ELECTRONICS AND COMMUNICATION ENGINEERING

(With effect from the batch admitted in the academic year 2019-2020)

VIDYANAGAR - 524413

SPSR Nellore-Dist. Andhra Pradesh

www.nbkrist.org

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:

1. To provide a learner-centered environment that challenges individuals to actively participate in the education process.

2. To empower the faculty to excel in teaching while engaging in research, creativity and public service.

3. To develop effective learning skills enabling students pick up critical thinking thus crafting them professionally fit and ethically strong.

4. To reach out industries, schools and public agencies to partner and share human and academic resources.

VISION AND MISSION OF THE DEPARTMENT

Vision:

To develop high quality engineers with sound technical knowledge, skills, ethics and morals in order to meet the global technological and industrial requirements in the area of Electronics and Communication Engineering.

Mission:

1. To produce high quality graduates and post-graduates of Electronics and Communication Engineering with modern technical knowledge, professional skills and good attitudes in order to meet industry and society demands.
2. To develop graduates with an ability to work productively in a team with professional ethics and social responsibility.
3. To develop highly employable graduates and post graduates who can meet industrial requirements and bring innovations.
4. Moulding the students with foundation knowledge and skills to enable them to take up postgraduate programmes and research programmes at the premier institutes.

Programme Educational Objectives (PEOs):

1. To provide the students with strong fundamental and advanced knowledge in mathematics, Science and Engineering with respect to Electronics and Communication Engineering discipline with an emphasis to solve Engineering problems.

2. To prepare the students through well - designed curriculum to excel in bachelor degree programme in Electronics and Communication Engineering in order to engage in teaching or industrial or any technical profession and to pursue higher studies.

3. To train students with intensive and extensive engineering knowledge and skill so as to understand, analyze, design and create novel products and solutions in the field of Electronics and Communication Engineering.

4. To inculcate in students the professional and ethical attitude, effective communication skills, team spirit, multidisciplinary approach and ability to relate engineering issues to broader social context.

5. To provide students with an excellent academic environment to promote leadership qualities, character molding and lifelong learning as required for a successful professional career.

Program Outcomes (POs):

PO1: Ability to acquire and apply knowledge of science and engineering fundamentals in problem solving.

PO2: Acquire in-depth technical competence in a specific information technology discipline.

PO3: Ability to undertake problem identification, formulation and providing optimum solution.

PO4: Ability to utilize systems approach to design and evaluate operational performance.

PO5: Understanding of the principles of inter-disciplinary domains for sustainable development.

PO6: Understanding of professional & ethical responsibilities and commitment to them.

PO7: Ability to communicate effectively, not only with engineers but also with the community at large.

PO8: Ability to Communicate effectively on complex engineering activities with the engineering community and with society at large.

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

PO10: 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.

PO11: Understanding of the social, cultural, global and environmental responsibilities as a professional engineer.

PO12: Recognizing the need to undertake life-long learning, and possess/acquire the capacity to do so.

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR

(AUTONOMOUS)

(AFFILIATED TO JNTU ANANTAPUR: ANANTHAPURAMU)

SPSR NELLORE DIST

I YEAR OF FOUR YEAR B.TECH DEGREE COURSE – I SEMESTER

ELECTRONICS AND COMMUNICATION ENGINEERING

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the academic year 2019-2020)

(For the batch admitted in the academic year 2019-2020)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation									
							Sessional-I Marks			Sessional-II Marks			Total Sessional Marks(40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Test$^{\$}$-I	A$^{\#}$-I	Max. Marks	Test$^{\$}$-II	A$^{\#}$-II	Max. Marks		Duration In Hours	Max. Marks	100
1	19SH1101	Functional English*	2	0	-	2	34	6	40	34	6	40	0.8*Best of two+0.2* least of two	3	60	100
2	19SH1102	Applied Physics**	2	1	-	3	34	6	40	34	6	40		3	60	100
3	19SH1104	Engineering Mathematics-I*	3	1	-	4	34	6	40	34	6	40		3	60	100
4	19CS1101	Programming for Problem Solving**	3	0	-	3	34	6	40	34	6	40		3	60	100
5	19EE1102	Electrical Circuits	3	0	-	3	34	6	40	34	6	40		3	60	100
		PRACTICALS	**PRACTICALS**													
6	19SH11P1	English Lab*	-	-	2	1	-	-	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60	100
7	19SH11P2	Applied Physics Lab**	-	-	3	1.5	-	-	-	-	-	40		3	60	100
8	19CS11P1	PPS Lab**	-	-	3	1.5	-	-	-	-	-	40		3	60	100
9	19ME11P2	Engineering Workshop**	-	-	2	1	-	-	-	-	-	40	-	3	60	100
		TOTAL	13	2	10	20	-	-	-	-	-	360	-	-	540	900

***** Common to all Braches.

**Common to ECE, EEE, CSE & IT.

A for Assignment (continuous evaluation)

$ Test (Descriptive & Objective) duration = 2 Hours

19SH1101- FUNCTIONAL ENGLISH

(Common to all branches)

Course Category:	Basic Sciences	**Credits:**	2
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-0-0
Prerequisite:	Basic Level of LSRW Skills	**Sessional Evaluation:**	40
		External Exam Evaluation:	60
		Total Marks:	100

Course Objectives	Students undergoing this course are expected to understand:	
	1. To develop basic writing skills in English. 2. To learn writing paragraphs effectively with unity and coherence 3. To achieve specific linguistic and communicative competence. 4. To acquire relevant skills and use them effectively in realistic working context. 5. To learn writing simple and analytical essays. 6. To inculcate the habit of reading.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Improve syntactical knowledge and use of phrases and clauses in sentences and encourage their appropriate use in writing.
	CO2	Obtain effective writing skills in practicing different types of formal letters.
	CO3	Attain both public speaking skills and writing skills by practicing drafting of speeches
	CO4	Acquire data interpretation and summarizing skills
	CO5	Acquire effective strategies for good writing and demonstrate the same in summarizing, writing well-organized essays, record and report the useful information.
	CO6	Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials.
Course Content	**UNIT-I** **WRITING:** Paragraph Writing: Sentence Structures: use of phrases and clauses in sentences- importance of proper punctuation- The Five Parts: introducing the topic, logical order, creating coherence, unity and summarizing the main idea. **GRAMMAR:** Parts of Speech: Nouns, Pronouns, Verbs, Adjectives and Adverbs; Nouns: Countable and Uncountable, Singular and Plural; Pronoun-Agreement; Subject-Verb Agreement. **UNIT-II** **WRITING:** Letter Writing: Parts of a Letter - Formats of Letters- Types of Letters- Formal letter Writing (enquiry, complaints, seeking permission, seeking internship etc.) **GRAMMAR:** Use of Articles and Zero Article, Prepositions, basic sentence structures;	

Course Content	simple question form - wh-questions; word order in sentences **UNIT-III** **WRITING:** Drafting of Public Speech**:** Ideas / Content Generation, Structure **GRAMMAR:** Tenses- Active Voice & Passive Voice; Conditional Sentences **UNIT-IV** **WRITING:** Information transfer; comprehend, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. **GRAMMAR:** Degrees of Comparison; Question Tags, Non-finite Verbs (infinitives, gerunds & participles) **UNIT-V** **WRITING:** Essay Writing: Writing structured essays on specific topics- Introducing, analyzing and arguing an issue-creating coherence-Usage of proper punctuation-importance of conclusion **GRAMMAR:** Direct and Indirect Speech, Modifiers **UNIT-VI** **READING:** Comprehension: Different Reading Strategies- Skimming-Scanning-Inferring, Predicting and Responding to Content - Guessing from context and vocabulary extension. **GRAMMAR:** Common Errors: Identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, parallelism, subject verb agreement, pronoun agreement etc.)
Text Books and Reference Books	**REFERENCE BOOKS:** 1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014. 2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018. 3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational. 4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012. 5. Murphy, Raymond. English Grammar in Use, 4th ed, CUP

19SH1102– APPLIED PHYSICS

(Common to EEE, ECE, CSE & IT)

Course category:	Basic Science	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-1-0
Prerequisite:	Fundamental concepts of Physics	**Sessional Evaluation:**	40
		External Exam Evaluation:	60
		Total Marks:	100

Course Objectives	Students undergoing this course are expected to understand:	
	1. To understand various phenomena exhibited by light and describe the characteristics, construction & working of lasers along with applications in Science & Technology. 2. To acquire knowledge of crystal systems and their analysis using X-rays. 3. Apply principles of Quantum Mechanics to various atomic phenomena and understand the electrical behaviour of solids. 4. Explain and provide the knowledge about semiconductors and their use in electronic devices. 5. Basic properties of dielectric &magnetic materials and their uses in Science & Technology. 6. Understand the behaviour of superconductors, nano materials, quantum phenomena and the limitations of basic physical laws.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the utilization of laser technology in various disciplines.
	CO2	Understand the structure of Crystalline solids and their applications in x-ray diffraction.
	CO3	Able to understand the basic concepts of quantum physics applicable to solids.
	CO4	To know the properties of semiconductor materials by projecting the view of energy bands.
	CO5	Understand the concept of polarization& magnetization and also applications of dielectric& magnetic materials in various disciplines.
	CO6	Basic ideas about superconductors and nano materials with their uses in various fields of Science & Technology
Course Content	**UNIT-I** **WAVE OPTICS**: Introduction (Interference of light) - Interference of light by wave front splitting (Young's double slit experiment) and amplitude splitting (Newton rings) – Fraunhoffer diffraction from a single slit, double slit - Diffraction grating & its resolving power. **LASERS**: Spontaneous & stimulated emission of radiation - Population inversion - Pumping methods – Properties of lasers (monochromacity, coherence, directionality, brightness) – Types of lasers: solid state (Ruby), gas (He–Ne) – Applications of lasers in science, engineering & medicine. **UNIT-II** **CRYSTALLOGRAPHY**: Introduction – Space lattice – Unit cell – Lattice parameters – Bravais lattice – Crystal systems – Packing fractions of S.C., B.C.C., F.C.C. – Planes in crystal : Miller indices – Inter planar spacing in cubic crystals.	

Course Content	**X-RAY DIFFRACTION**: X – Ray diffraction in crystals – Bragg's law of diffraction – X- ray diffraction techniques: Laue method – Powder method (Debye – Scherrer method). **UNIT-III** **INTRODUCTION TO QUANTUM MECHANICS** : Wave nature of particles (deBroglie hypothesis) – Uncertainty principle – Schrodinger time independent wave equation - Significance of wave function (Born interpretation) – Solution of stationary state Schrodinger equation for one dimensional problems (particle in a box) **FREE ELECTRON THEORY:** Introduction (classical & quantum : postulates, success& drawbacks) – Fermi–Dirac distribution function and its temperature dependence – Fermi level – Density of states (qualitative) – Statement of Bloch's theorem for a particle in a periodic potential – Kronig–Penny model (non mathematical treatment) - Origin of energy bands. **UNIT-IV** **SEMICONDUCTOR PHYSICS**: Intrinsic Semiconductors – Intrinsic conductivity – P&N type semiconductors - Variation of Fermi level with temperature –Law of mass action – Drift & diffusion –Einstein relation – Hall effect and its applications. **SEMICONDUCTOR DEVICES:** Formation of P-N junction – V-I Characteristics of P-N junction diode (forward & reverse bias) - Diode equation – Direct & indirect bandgap semiconductors – Light emitting diodes (construction, working, materials & applications) – Photo detectors – Solar cells **UNIT-V** **DIELECTRIC PROPERTIES**: Basic definitions – Electronic, ionic (quantitative) and orientation (qualitative) polarizations – Internal fields in solid dielectrics – Clausius – Mossotti equation. **MAGNETIC PROPERTIES:** Introduction and basic definitions – Origin of magnetic moment – Classification of magnetic materials into dia, para, ferro ,anti ferro & ferri magnetics –Hysteresis – Soft & hard magnetic materials – Applications of magnetic materials . **UNIT VI** **SUPERCONDUCTORS:**Introduction – Effect of temperature and magnetic field – Meissner effect – Types of superconductors – BCS theory - Josephson effect (DC & AC) – Applications of superconductors **NANOMATERIALS:** Introduction – Significance of nanoscale – Types of nanomaterials – Properties of nanomaterials: physical, mechanical, magnetic and optical – Synthesis of nanomaterials: top-down-Ball milling, bottom up – Chemical vapour deposition – Applications of nanomaterials
Text Books and Reference Books	**TEXT BOOKS:** 1. Engineering Physics by Palanisamy, Scitech. 2. Engineering Physics by K.Thyagarajan, McGraw Hill. 3. Engineering Physics by Maninaidu, Pearson. **REFERENCE BOOKS:** 1.Solid State Physics, by Kittel, Wiley 2.Engineering Physics by Gaur and Gupta, Dhanpatrai Publications

19SH1104 – ENGINEERING MATHEMATICS – I

(Common to all branches)

Course category:	Basic Sciences	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-1-0
Prerequisite:	Intermediate Mathematics	**Sessional Evaluation:**	40
		External Evaluation:	60
		Total Marks:	100

Course Objectives	Students undergoing this course are expected to:	
	1. The concepts of Newton's law of cooling, Law of natural growth and decay. 2. Solutions of higher order linear differential equations with RHS of the different types. 3. The concepts of first shifting theorem, change of scale property, Laplace transformation of multiplied by t and division by t and transformation of derivatives and integrals. 4. The concepts of Inverse Laplace transform and their applications. 5. The solution of system of linear equations by matrices. 6. Taylor's and Maclaurin's series, Maxima and Minima of the functions of two and three variables.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Attains skills in solving first order differential equations and its applications.
	CO2	Solve the linear differential equations related to various engineering fields.
	CO3	Acquire basic knowledge in Laplace transforms and their applications.
	CO4	Develop analytical skills in solving the ordinary differential equations by using the Laplace transform technique.
	CO5	Develop the use of matrix algebra techniques that is needed by engineers for practical applications.
	CO6	Attains skills in analyzing the Taylor's and Maclaurin's series and maxima and minima of the functions of two and three variables.
Course Content	**UNIT – I** **FIRST ORDER DIFFERENTIAL EQUATIONS**: Differential equations of first order and first degree - exact, linear and Bernoulli – Applications to Newton's law of cooling – Law of natural growth and decay. **UNIT - II** **HIGHER ORDER DIFFERENTIAL EQUATIONS:** Homogeneous linear differential equations of second and higher order with constant coefficients with R.H.S. of the type e^{ax}, $\sin ax$ or $\cos ax$, x^n, e^{ax} V and $x^n v(x)$.	

Course Content	**UNIT - III** **LAPLACE TRANSFORMATION:** Laplace transformations of standard functions – Region of convergence – First shifting theorem – Change of scale property – Laplace transformation of multiple by t and division by t – Transformation of derivatives and integrals. **UNIT - IV** **INVERSE LAPLACE TRANSFORMATION:** Inverse Laplace transform – Method of partial fractions – Shifting property – Inverse Laplace transform of multiple by s and division by s – Inverse Laplace transform of derivatives and integrals – Convolution theorem – Application to solutions of ordinary differential equations. **UNIT - V** **MATRICES:** Rank of Matrix by Echelon form – System of homogenous and non-homogenous linear equations – Cayley-Hamilton theorem (without proof)-Eigen values and Eigen vectors and their properties. **UNIT - VI** **DIFFERENTIAL CALCULUS:** Taylor's and Maclaurin's series of single variable – Maxima and minima of function of two variables – Lagrangian method of multipliers with three variables only.
Text Books and Reference Books	**TEXT BOOKS:** 1. Higher Engineering Mathematics – B.S.Grewal, Khanna Publishers, New Delhi. 2. Engineering Mathematics – B.V. Ramana, Tata McGraw-Hill Education Pvt. Ltd, New Delhi. **REFERENCE BOOKS:** 1. Higher Engineering Mathematics – H.K. Dass, Er. Rajnish Verma, S.Chand Publication, New Delhi. 2. Advanced Engineering Mathematics – N.P. Bali & M. Goyal, Lakshmi Publishers, New Delhi. 3. Advanced Engineering Mathematics – Erwin Kreyszig, Wiley, India

19CS1101 - PROGRAMMING FOR PROBLEM SOLVING

(Common to all branches)

Course category:	Program Core	**Credits:**	3
Course Type:	Theory	**Lecture – Tutorial – Practical:**	3-0-0
Prerequisite:	Knowledge on computer fundamentals and basic mathematics	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to:	
	1. To learn the procedure how to develop algorithms, representations and programming development steps 2. To learn the basic building blocks of C language. 3. Usage of C constructs (arrays, structures, pointers and file management) to develop various programs 4. To create better awareness how effectively utilize the concepts of C for application development	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Learn the fundamentals of programming development, structure of C and basic data types
	CO2	Find the usage of operators in expression evaluation and construction of I/O Statements.
	CO3	Acquire knowledge on various control structures to develop simple programs
	CO4	Explore the concept of arrays, strings and its effective utilization
	CO5	Understand the concepts of Pointers and Functions for exploring the dynamic memory usage
	CO6	Explore the basics of Structures, Unions, File operations and supporting implementations
Course Content	**UNIT – I** **INTRODUCTION:** Algorithms, Flow charts, Program development steps. **FUNDAMENTALS OF C:** History, Structure of a C program, Programming rules and execution. Character set, Delimiters, C keywords, Identifiers, Constants, Variables, Rules for defining Variables, Data types, Declaration and Initialization of Variables. **UNIT – II** **OPERATORS AND EXPRESSIONS:** Introduction, Operator Precedence and Associativity, Operator Types **INPUT AND OUTPUT IN C:** Formatted and Unformatted functions, Commonly used library functions. **UNIT – III** **DECISION STATEMENTS:** Introduction, Types of If statements, switch statement, break, continue, goto.	

Course Content	**ITERATIVE STATEMENTS**: while, do-while and for loops. **UNIT – IV** **ARRAYS**: Definitions, Initialization, Characteristics of an array, Array Categories. **STRINGS:** Declaration and Initialization of strings, String handling functions. **STORAGE CLASSES**: Automatic, External, Static and Register Variables. **UNIT – V** **POINTERS:** Fundamentals, Declaration and initialization of Pointers, Arithmetic Operations, Pointers and Arrays. **FUNCTIONS:** Definition, Function Prototypes, Types of functions, Call by Value and Call by Reference, Recursion. **UNIT – VI** **STRUCTURES:** Definition, Declaration and Initialization of Structures. **UNIONS:** Definition, Declaration and Initialization of Union. **FILES:** Introduction, File Types, Basic operations on Files, File I/O, Command Line Arguments.
Text Books and Reference Books	**TEXT BOOKS:** 1. Programming with ANSI & TURBO C by Ashok N.Kamthane, Pearson Education 2007 **REFERENCE BOOKS:** 1. A Book on C by Al Kelley/Ira Pohl, Fourth Edition, Addison-Wesley.1999 2. Let Us C by Yashavant Kanetkar, BPB Publications. 1. Programming in ANSI C by Balaguruswamy 6th Edition, Tata McGraw Hill Education, 2012.
E-Resources	1. https://nptel.ac.in/courses 1. https://freevideolectures.com/university/iitm

19EE1102 - ELECTRICAL CIRCUITS

(ECE)

Course category:	Professional core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisite:	Fundamentals in engineering mathematics and concepts of Electricity in physics	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The basic concepts of R, L, C elements and network reduction techniques. 2. The concept of form factor, Crest factor and j notation. 3. The concept of power triangle, series and parallel connection of R, L & C elements with sinusoidal Excitation. 4. About the network theorems and their applications. 5. The two port network parameters for the given network. 6. The transient response of RL, RC, RLC series circuit for DC excitation.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Perform the equivalent resistance calculation of electrical circuits and also find the solution of DC circuits by Nodal and Mesh analysis.
	CO2	Compute the average, RMS, form factor &crest factor of a periodic waveform.
	CO3	Enumerates real power, reactive power, apparent power and power factor for a given circuit and also evaluate the resonant frequency, Quality factor, band width.
	CO4	Calculate the response for a given network using network theorems.
	CO5	Evaluate the two port network parameters for the given network.
	CO6	Determine the time constant and transient response of a given circuit with and without D.C excitation.
Course Content	**UNIT- I** **CONCEPT OF ELECTRIC CIRCUITS**: Introduction, Active and passive elements, V-I Characteristics of R, L and C elements, Ideal & Practical Sources, Source transformation, Network reduction techniques, Star-Delta transformation, Kirchhoff's laws - Mesh and Nodal analysis of DC circuits with independent sources. **UNIT – II** **FUNDAMENTALS OF AC CIRCUITS:** R.M.S, Average values , Form factor and Crest factor for different periodic waveforms, Sinusoidal alternating quantities - Phase and Phase difference, Complex and Polar forms of representations, j-Notation. Concept of Reactance, Impedance, Susceptance and Admittance. **UNIT – III** **SINGLE PHASE AC CIRCUITS:** Concept of Active and reactive power, power factor –power triangle -Examples -Steady state analysis of R, L and C elements (series, parallel and series-parallel combinations) with sinusoidal excitation - Phasor diagrams-Examples.	

Course Content	**RESONANCE:** Series and parallel resonance, Half power frequencies, Bandwidth and Q factor, Relation between half power frequencies, Bandwidth & Quality factor. **UNIT- IV** **NETWORK THEOREMS:** Superposition, Reciprocity, Thevenin's and Norton's theorems, Maximum power transfer theorem. Application of these theorems to DC excitation with dependent and independent sources. **UNIT – V** **TWO PORT NETWORK PARAMETERS** - Open circuit parameters – Short circuit parameters – Transmission parameters - Hybrid parameters –Inter-relationships of different parameters - Condition for reciprocity and symmetry of networks with different two port parameters. **UNIT – VI** **D.C TRANSIENT ANALYSIS:** Transient response of R-L, R-C & R-L-C circuits for DC excitations - initial conditions -Time constants -solution using Differential equation & Laplace transform methods.
Text Books and Reference Books	**TEXT BOOKS:** 1. "Engineering Circuit Analysis", by Hayt & Kemmerly, 2nd Edition,TMH publishers 2. "Network Analysis", by M.E Van Valkenburg,Third Edition,PHI learning private Limited, 2006. 3. "Fundamentals of Electric circuits", by Charles k Alexander,Mathew N O Sadiku,Tata McGraw Hill Education private Limited, 6th Edition,2017. **REFERENCE BOOKS:** 1. "Circuits & Networks", by A.Sudhakar and Shyam Mohan , 5th Edition(2015),TMH 2. "Circuit Theory", by A.Chakrabarti, Dhanpat Rai publishers 6th Edition (2014). 3. "Circuits & Systems", by Dr K.M.Soni, S.K.Kataria& sons Publication(2014).
E-Resources	1. http://nptel.ac.in/courses 2. http://iete-elan.ac.in 3. http://freevideolectures.com/university/iitm

19SH11P1-ENGLISH LANGUAGE LABORATORY

(Common to EEE, ECE, CSE & IT)

Course Category:	Basic Sciences	**Credits:**	1
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-2
Prerequisite:	Basic Level of LSRW skills	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	The students how to improve their communicative ability in English with emphasis on LSRW skills and enable them to communicate effectively in different socio- cultural and professional contexts.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	These activities practiced in the laboratory are helpful in comprehending the important language aspects which are useful for the real life situations. These are also helpful in enhancing the language competency and communicative level of students.
Course Content	**LIST OF ACTIVITIES** **1. Listening Skills** • Listening for Identifying key terms, understanding concepts • Listening for specific information • Listening for global comprehension and summarizing • Listening to short audio texts and answering a series of questions. **2. Common Everyday Conversations:** (Asking and answering general questions on familiar topics such as home, family, work, studies and interests) • Expressions in various situations • Making requests and seeking permissions • Interrupting and apologizing • Role plays / Situational dialogues **3. Communication at Work Place:** • Introducing oneself and others • Ice breaking activity and JAM Session • Greetings • Taking leave **4. Group Discussion** • Discussion in pairs/ small groups on specific topics • Short structured talks • Debates • Reporting/ summarizing	

Course Content	**5. Presentations:** • Pre-planning • Non- verbal communication • Formal oral presentations on topics from academic contexts **6. Giving directions** • Giving directions • **Asking for directions** • **Specific instructions** • Importance of Landmarks
Text Books and Reference Books	**REFERENCES:** 1. A Manual for English Language Laboratories: Dr. D. Sudha Rani, Pearson Publications 2. Techniques of Teaching English: A.L. Kohli, Dhanpat Rai Publishers, 2019 3. https://www.talkenglish.com/

19SH11P2-APPLIED PHYSICS LABORATORY

(Common to EEE, ECE, CSE & IT)

Course Category:	Basic Science	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Prerequisite:	Engineering Physics	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. To provide student to learn about some important experimental techniques in physics with knowledge in theoretical aspects so that they can excel in that particular field.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	These experiments in the laboratory are helpful in understanding important concepts of physics through involvement in the experiments by applying theoretical knowledge.
	CO2	It helps to recognize where the ideas of the students agree with those accepted by physics and where they do not.
Course Content	**LIST OF EXPERIMENTS** 1. Determination of rigidity modulus of wire material – Torsional pendulum. 2. Melde's experiment – Transverse & longitudinal modes. 3. Resonance in LCR circuit. 4. Magnetic field along the axis of a coil (Stewart – Gee's Method). 5. Study of characteristics of LED 6. Newton rings 7. Wedge method 8. Diffraction grating - Wavelength of given source. 9. Dispersive power of prism material using spectrometer. 10. P-N- junction diode characteristics. 11. Evaluation of Numerical Aperture of given optical fiber. 12. Energy gap of a P-N junction diode material. 13. Transistor characteristics. 14. Solar cell characteristics. 15. Logic gates.	

19CS11P1 - PROGRAMMING FOR PROBLEM SOLVING LABORATORY

(Common to all Branches)

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial- Practice:**	0 - 0 - 3
Prerequisite:	Basic mathematical knowledge to solve problems and computer fundamentals	**Sessional Evaluation:** **External Evaluation :** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected:	
	To learn the C programming constructs and its implementation	
Course Outcomes	Upon successful completion of the course , the students will be able:	
	CO1	To Solve problems using C programming concepts

Course Content

LIST OF EXPERIMENTS

1. To evaluate expressions.
2. To implement if constructs.
3. To implement Switch statement.
4. To implement all iterative statements.
5. To implement Arrays.
6. To implement operations on Strings without using Library functions.
7. To implement arithmetic operations using pointers.
8. Implement both recursive and non-recursive functions.
9. To implement parameter passing techniques.
10. To implement Structures.
11. To implement basic File operations.

Text Books and Reference Books

TEXT BOOK(S):

1. Programming with ANSI & TURBO C by Ashok N.Kamthane, Pearson Education 2007

REFERENCE BOOKS:

1. A Book on C by Al Kelley/Ira Pohl, Fourth Edition, Addison-Wesley.1999
2. Let Us C by Yashavant Kanetkar, BPB Publications.
3. Programming in ANSI C by Balaguruswamy 6th Edition, Tata McGraw Hill Education, 2012

19ME11P2- ENGINEERING WORKSHOP

(Common to CSE, EEE, ECE & IT)

Course Category:	Engineering Science	**Credits:**	1
Course Type:	Practical	**Lecture - Tutorial - Practical:**	0 - 0 – 2
Prerequisite:	No Prerequisite	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. To understand the usage of work shop tools and prepare the models in the trades such as carpentry, fitting, sheet metal & foundry. 2. To understand and demonstrate the usage of tools of welding, black smithy and machine tools. 3. To understand the usage of wiring tools and to execute house wiring connections.	
Course Outcomes	Upon the successful completion of the course, the students will be able to:	
	CO1	Identify, Distinguish and Choose the tools of various trades (carpentry, fitting, sheet metal, foundry, wiring, welding, black smithy and machine tools).
	CO2	Demonstrate and Describe the usage of tools of various trades (carpentry, fitting, sheet metal, foundry, wiring, welding, black smithy and machine tools).
	CO3	Documenting the procedure adopted while preparing the model.
Course Content	1. **Carpentry**: Half Lap, Mortise and Tenon and Bridle joint. 2. **Fitting:** Square, V, half round and dovetail fittings 3. **Tin-Smithy:** Tray, cylinder, hopper, cone 4. **House-wiring:** One lamp controlled by one switch, Two lamps (bulbs) controlled by two switches independently, Stair - case connection, Two lamps controlled by one switch in series, Two lamps controlled by on switch in parallel and Water pump connected with single phase starter. 5. **Foundry**: single-piece pattern and Two- piece pattern **TRADES FOR DEMONSTRATION:** 6. Machine Tools 7. Welding 8. Black Smithy	
Text Books and Reference Books	1. Engineering Work shop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd,2009 2. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers,2004 3. Engineering Practices Lab Manual, Jeyapoovan, SaravanaPandian, Vikas publishers,2007.Classical Data Structures by Samanta debasis, Prentice Hall of India, 2nd edition	

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR

(AUTONOMOUS)

(AFFILIATED TO JNTU ANANTAPUR: ANANTHAPURAMU)

SPSR NELLORE DIST

I YEAR OF FOUR YEAR B.TECH DEGREE COURSE – II SEMESTER

ELECTRONICS AND COMMUNICATION ENGINEERING

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the academic year 2019-2020)

(For the batch admitted in the academic year 2019-2020)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation									
							Sessional-I Marks			Sessional-II Marks			Total Sessional Marks(40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Test$^{\$}$-I	A$^{\#}$-I	Max. Marks	Test$^{\$}$-II	A$^{\#}$-II	Max. Marks		Duration In Hours	Max. Marks	100
1	19SH1201	Professional English*	2	0	-	2	34	6	40	34	6	40	0.8*Best of two+0.2* least of two	3	60	100
2	19SH1203	Engineering Chemistry **	3	0	-	3	34	6	40	34	6	40		3	60	100
3	19SH1204	Engineering Mathematics-II*	3	1	-	4	34	6	40	34	6	40		3	60	100
4	19EC1201	Electronic Devices	3	0	-	3	34	6	40	34	6	40		3	60	100
5	19CS1202	Data Structures**	3	0	-	3	34	6	40	34	6	40		3	60	100
		PRACTICALS	**PRACTICALS**										Day to Day Evaluation and a test (40 Marks)			
6	19SH12P3	Engineering Chemistry Lab**	-	-	3	1.5	-	-	-	-	-	40		3	60	100
7	19CS12P2	Data Structures Lab**	-	-	3	1.5	-	-	-	-	-	40		3	60	100
8	19ME12P1	Computer Aided Engineering Drawing**	-	-	6	3	-	-	-	-	-	40		3	60	100
		TOTAL	14	1	12	21	-	-	-	-	-	320	-	-	480	800

* Common to all Braches.

**Common to ECE, EEE, CSE & IT.

A for Assignment (continuous evaluation)

$ Test (Descriptive & Objective) duration = 2 Hours

19SH1201-PROFESSIONAL ENGLISH

(Common to all Branches)

Course Category:	Basic Sciences	**Credits:**	2
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-0-0
Prerequisite:	Basic Level of LSRW skills	**Sessional Evaluation:**	40
		External Exam Evaluation:	60
		Total Marks:	100

Course Objectives	Students undergoing this course are expected to:	
	1. To develop their basic professional writing skills in English 2. To achieve specific linguistic and verbal competence 3. To acquire relevant skills and function efficiently in a realistic professional working environment 4. To inculcate the habit of reading & writing 5. To learn writing analytical essays. 6. To acquire verbal proficiency	
Course Outcomes	After completing the course the student will be able to	
	CO1	Write effective descriptions on scientific/technical topics
	CO2	Draft effective business e-mails.
	CO3	Present perspective of an issue and analyze an argument.
	CO4	Write proposals and project reports for professional contexts
	CO5	Practice different techniques of note making and note taking.
	CO6	Write effective book reviews on technical & non-technical books. Equip themselves with verbal proficiency.
Course Content	**UNIT –I** **WRITING:** Descriptions: Descriptions on scientific/ technical in nature-writing introduction - defining – classifying - describing technical features – the structure of an automobile/gadget/product or the process - instruction or installation manuals. **VERBAL:** Verbal reasoning- Analogies, Homophones & Homonyms **UNIT-II** **WRITING:** E-mail Communication- Etiquette – Format- Writing Effective Business Email **VERBAL:** Idioms and Phrases, One-word substitutes **UNIT-III** **ANALYTICAL WRITING:** Presenting perspective of an issue- Compare & Contrast, Cause and Effect, Analyze an argument **VERBAL:** Affixes-prefix and suffix, root words, derivatives	

Course Content	**UNIT-IV** **TECHNICAL WRITING:** Writing Proposals: Significance, Structure, Style and Writing of Project Reports. **VERBAL:** Synonyms and Antonyms **UNIT-V** **WRITING:** Introduction to different kinds of materials: Technical & Non-technical- Note Taking and Note Making- Identification of important points and precise the content **VERBAL**: Words often confused **UNIT-VI** **BOOK REVIEWS**: Review of a Technical and Non-Technical - A brief written analysis including summary and appreciation **VERBAL:** Sentence Completion
Text Books and Reference Books	**REFERENCES:** 1. A Textbook of English for Engineers and Technologists (combined ed Vol. 1&2) Orient Black Swan 2010. 2. Word Power Made Easy , Norman Lewis, New Revised Edition, Goyal Publishers 3. A Communicative Grammar of English by Geoffrey Leech, Longman ,3rd ed 4. Effective Technical Communication, M. Ashraf Rizvi, Tata McGraw- Hill, 2011.

19SH1203- ENGINEERING CHEMISTRY

(Common to EEE, ECE, CSE & IT)

Course category:	Basic science	**Credits**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-1-0
Prerequisite:	Fundamental concepts of Chemistry	**Sessional Evaluation:**	40
		External Exam Evaluation:	60
		Total Marks:	100

Course Objectives	Students undergoing this course are expected:	
	1. To familiarize engineering chemistry and its applications 2. To train the students on the principles and applications of electrochemistry and polymers 3. To impart the concept of soft and hard waters, softening methods of hard water	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Illustrate the molecular orbital energy level diagram of different molecular species
	CO2	Apply Nernst equation for calculating electrode and cell potentials
	CO3	Demonstrate the corrosion prevention methods and factors affecting corrosion
	CO4	Explain the different types of polymers and their applications
	CO5	Explain the principles of reverse osmosis and electro dialysis
	CO6	Explain calorific values and refining of petroleum
Course Content	**UNIT – I** **STRUCTURE AND BONDING MODELS:** Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ^2, molecular orbital theory – bonding in homo and heteronuclear diatomic molecules – energy level diagrams of O_2 and CO. π-molecular orbitals of butadiene and benzene, calculation of bond order, crystal field theory – salient features – splitting in octahedral and tetrahedral geometry. **UNIT – II** **WATER TREATMENT:** Introduction –Hardness of water, Estimation of hardness of water by EDTA Method - Boiler troubles - scale and sludge, Priming and foaming, caustic embrittlement, Boiler corrosion, Industrial water treatment –Lime-soda, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electro dialysis. **UNIT-III** **ELECTROCHEMISTRY AND APPLICATIONS:** Electrodes – concepts, reference electrodes (Calomel electrode and glass electrode) electrochemical cell, Nernst equation, cell potential calculations, numerical problems.	

Course Content	Primary cells – Zinc-air battery, Fuel cells, hydrogen-oxygen– working of the cells. Secondary cells – lead acid and lithium ion batteries. Potentiometry – potentiometric titration (strong acid *vs* strong base). Conductometry – conductometric titrations (strong acid *vs* strong base & weak acid *vs* strong base) **UNIT-IV** **CORROSION :** Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion, prevention methods of corrosion- Metallic coatings(electroplating) and Cathodic protection. **UNIT – V** **POLYMER CHEMISTRY:** Introduction to polymers, Polymerisation and Types of polymerisation. Plastomers -Thermoplastics and Thermo-setting plastics- Preparation, properties and applications of PVC, Bakelite, Urea-Formaldehyde and Nylons. Elastomers – Preparation, properties and applications of Buna N, Thiokol and Silicone rubber **UNIT-VI** **FUEL TECHNOLOGY:** Chemical fuels – Introduction, classification, characteristics of a good fuel, calorific value, determination of calorific value (Bomb calorimeter and Boy's gas calorimeter), numerical problems based on calorific value. **Solid Fuels -** Analysis of coal. **Liquid Fuels -** Refining of petroleum, knocking and anti-knock agents, Octane and Cetane values. **Gaseous Fuels-** Flue gas analysis by Orsat's apparatus.
Text Books and Reference Books	**TEXT BOOKS:** 1. Jain and Jain, Engineering Chemistry, 16 Ed., Dhanpat Rai Publishers, 2013. 2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10 Ed., Oxford University Press, 2010. **REFERENCE BOOKS:** 1. K N Jayaveera, G V Subba Reddy and C Rama Chandraiah, Engineering Chemistry 1 Ed. Mc Graw Hill Education (India) Pvt Ltd, New Delhi 2016 2. J. D. Lee, Concise Inorganic Chemistry, 5 Ed., Oxford University Press, 2008. 3. Dr. S.S. Dara and Dr S.S Umare, A Text book of Engineering Chemistry, 1 Ed., Chand & Company Ltd., 2000. 4. K Sesha Maheswaramma and Mridula Chugh, Engineering Chemistry, 1 Ed., Pearson India Education Services Pvt. Ltd, 2016.

19SH1204-ENGINEERING MATHEMATICS – II

(Common to All Branches)

Course category:	Basic Sciences	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-1-0
Prerequisite:	Intermediate Mathematics	**Sessional Evaluation:**	40
		External Evaluation:	60
		Total Marks:	100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The concepts of double integrals and its applications. 2. The basic concepts of triple integrals and its applications, Beta and Gamma functions. 3. The gradient, divergence and curl operators, Solenoidal and Irrotational vectors. 4. The basic concepts of vector integration and their applications. 5. To express a function in Fourier series in an interval. 6. The concepts of Fourier transform.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Apply double integration techniques in evaluating areas bounded by region.
	CO2	Understand effectively in analyzing the Triple integrals, Beta and Gamma functions
	CO3	Interpret the physical meaning of different operators such as Gradient, Divergence and Curl.
	CO4	Apply Green's, Stokes and Divergence theorems in evaluation of double and triple integrals.
	CO5	Develop analytical skills in solving the problems involving Fourier Series.
	CO6	Understand effectively Fourier Sine and Cosine integral, Fourier Sine and Cosine transforms.
Course Content	**UNIT - I** **DOUBLE INTEGRALS:** Double integrals – Change of order of integration – Change to polar coordinates – Area by double integration.	

Course Content	**UNIT - II** **TRIPPLE INTEGRALS AND SPECIAL FUNCTIONS:** Evaluation of triple integrals – Volume by triple integral – Beta and Gamma functions and their properties – Relation between Beta and Gamma functions. **UNIT - III** **VECTOR DIFFERENTIATION:** Scalar and vector point functions – Vector differential operator – Gradient, Divergence and Curl – Solenoidal and Irrotational vectors. **UNIT - IV** **VECTOR INTEGRATION:** Line integral-circulation-workdone – Surface integrals - flux – Volume integral – Vector integral theorems - Green's theorem, Stoke's theorem and Gauss-divergence theorem (without proof). **UNIT-V** **FOURIER SERIES:** Determination of Fourier coefficients (without proof) – Fourier series – Even and odd functions – Change of intervals. **UNIT-VI** **FOURIER TRANSFORMS:** Fourier Integral Theorem (Without proof) – Fourier Sine and Cosine integrals — Fourier Transforms – Fourier Sine and Cosine transforms.
Text Books and Reference Books	**TEXT BOOKS:** 1. Higher Engineering Mathematics - B.S.Grewal, Khanna Publishers, New Delhi. 2. Engineering Mathematics - B.V. Ramana, Tata McGraw-Hill Education Pvt. Ltd New Delhi. **REFERENCE BOOKS:** 1. Higher Engineering Mathematics - H.K. Dass, Er. Rajnish Verma, S.Chand Publication, New Delhi. 2. Advanced Engineering Mathematics - N.P. Bali & M. Goyal, Lakshmi Publishers, New Delhi. 3. Advanced Engineering Mathematics - Erwin Kreyszig, Wiley, India

19EC1201 – ELECTRONIC DEVICES

(ECE)

Course category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 – 0
Prerequisite:	To provide students with the fundamentals of Electronics.	**Sessional Evaluation :** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The concepts of Solid State Semi-Conductor Theory. 2. The operation of a PN Junction and Zener Diodes. 3. The Ideal, Practical and Electrical Characteristics of, Varactor, Tunnel diodes, LED, and LASER 4. The need for biasing of Transistor. 5. The working of FET and MOSFET. 6. The working of MOSFET and CMOS circuits.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the Semiconductor Physics for Intrinsic and Extrinsic materials and theory of operation of Solid State devices.
	CO2	Apply how the properties of semiconductor materials are used for the formation of PN and Zener diodes.
	CO3	Explain the functioning of various solid-state devices, including several types of diodes including conventional, Varactor, Tunnel diodes, LED, and LASER.
	CO4	Design the various Bi-polar Junction Transistor biasing circuits and its usage in applications of amplifiers.
	CO5	Distinguish the constructional features and operation of FET and their applications.
	CO6	Understand the operation of MOSFET and CMOS circuits.
Course Content	**UNIT-I** **SEMICONDUCTOR DIODES:** Introduction, Classification of Semiconductors, Conductivity of Semiconductor, Energy Distribution of Electrons, Carrier Concentration in Intrinsic Semiconductor, Mass-Action Law, Properties of Intrinsic Semiconductors, Variation in Semiconductor Parameters with Temperature, Drift and Diffusion currents, Carrier Life Time, Continuity Equation. **UNIT – II** **PN JUNCTION DIODE:** Introduction, Energy Band Structure of Open Circuited Diode, Quantitative Theory of Diode Currents, Diode Current Equation, Ideal vs Practical Resistance Levels, Transition Capacitance, Diffusion Capacitance, Temperature Dependence of V-I characteristics, Zener diode, break down mechanisms in semiconductor diodes, Diode as a Circuit Element, Piecewise Linear Diode Model, Applications.	

Course Content	**UNIT –III** **SPECIAL SEMICONDUCTOR DEVICES:** Introduction, Varactor Diode, Tunnel Diode, LED, LASER, Photo diode, Photovoltaic Cell, Solar Cell, UJT. **UNIT – IV** **BIPOLAR JUNCTION TRANSISTOR:** Introduction, Construction, Transistor Biasing, Operation of NPN Transistor, Operation of PNP Transistor, Types of Configuration, Introduction to h-parameters. **UNIT – V** **JUNCTION FIELD EFFECT TRANSISTOR:** Introduction, Construction & Operation of N-Channel JFET, Characteristic Parameters, Saturation Drain Current, Slope of the Transfer Characteristic at I_{DSS}, Comparison of JFET and BJT, Applications, **UNIT – VI** **MOS FIELD EFFECT TRANSISTOR:** Introduction, MOSFET, Enhancement MOSFET, Depletion MOSFET, Comparison of MOSFET and JFET.CMOS Circuits, Introduction to FINFET.
Text Books and Reference Books	**TEXT BOOKS:** 1. Electronic Devices & Circuits by Jacob Millman & Christos C. Halkias, McGraw Hill Co. 2. Mottershed, "Electronic devices and circuits", PHI. **REFERENCES:** 1. Microelectronic Circuits - Sedra & Smith - 5th edition, Oxford University Press 2. Boylestad, Louis Nashelsky "Electronic devices and circuits" 9ed.., 2008 PE. 3. Electronic Devices and Circuits-5th edition, Oxford University Press
E-Resources	1. https://nptel.ac.in/courses 2. https://iete-elan.ac.in 3. https://freevideolectures.com/university/iitm

19CS1202– DATA STRUCTURES

(Common to ECE & EEE)

Course category:	Core	**Credits:**	3
Course Type:	Theory	**Lecture – Tutorial – Practical:**	3-0-3
Prerequisite:	Basics of computer fundamentals, knowledge on programming	**Sessional Evaluation:** **Univ. Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. Understanding the basics of data structures, types and their representation 2. Creating awareness on operations of various data structures. 3. Gaining knowledge about various data structures and its practical applications. 4. Study of different searching and sorting techniques.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Learn the fundamentals of Data Structures including the basics of Stack and its applicability.
	CO2	Study various types of Queues to develop various applications.
	CO3	Acquire the basics of Linked List representation and effective utilization of Linked lists in memory allocation.
	CO4	Learn the applications of Set data structure and Trees representations.
	CO5	Study various Graph representations and its applications.
	CO6	Learn various searching and sorting techniques.
Course Content	**UNIT – I** **INTRODUCTION –** Definition and concepts, Overview of Data Structures, Implementation of Data Structures. **STACKS**: Introduction, Definition, Representation of a Stack using Arrays, Operations of Stacks, Application of queues. **UNIT – II** **Queues**: Introduction, Definition, Representation of Queues using Arrays, Various Queue Structures – Circular, Deque, Priority, Application – Round Robin Algorithm. **UNIT – III** **Linked Lists :** Definitions, Singly Linked List – representation and operations, Circular Linked List and double linked list, Operations on circular and double linked list. **UNIT – IV** **SETS**: Definitions and Terminologies, Representation and Operations of Set. **TREES:** Basic Terminologies, Definitions and Concepts, Representations of a Binary Tree and Operations on binary tree.	

Course Content	**UNIT – V** **GRAPHS**: Introduction, Graph Terminologies, Representation of Graphs, Operations – Linked List Representation, Illustration of Warshal, Dijikstra, Kruskal's Algorithms. **UNIT – VI** **SORTING:** Basic Terminologies, Sorting Techniques – Bubble sort, Insertion sort, Simple Merge Sort. **SEARCHING:** Basic Terminologies, Searching Techniques – Linear Search with array, Binary Search, Non – linear Search Techniques - Binary Search Tree Searching.
Text Books and Reference Books	**TEXT BOOK:** 1. D. Samanta,"Classic Data Structures", Prentice Hall of India, 2nd Edition 2009. **REFERENCE BOOKS:** 1. S. Lipschutz, "Data Structures using C", Tata McGraw Hill, Special Indian Edition 2012.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19SH12P3- ENGINEERING CHEMISTRY LABORATORY

(Common to EEE, ECE, CSE & IT)

Course Category:	Basic science	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-3
Prerequisite:	Fundamental concepts of Chemistry	**Sessional Evaluation:** **External Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	The main objective is to provide students to learn about experimental techniques in chemistry with knowledge in theoretical aspects so that they can excel in that particular field.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Determine the cell constant and conductance of solutions
	CO2	Prepare advanced polymer materials
Course Content	Minimum of 8 experiments to be completed out of the following: **LIST OF EXPERIMENTS** 1. Determination of total hardness of water by EDTA method 2. Determination of total alkalinity of water 3. Estimation of chlorides using potassium chromate indicator 4. Determination of cell constant and conductance of solutions 5. Conductometric titration of strong acid Vs strong base 6. Conductometric titration of weak acid Vs strong base 7. Determination of pH of unknown solution 8. Potentiometry - determination of redox potentials and emfs 9. Determination of Strength of an acid in Pb-Acid battery 10. Preparation of a polymer 11. Determination of viscosity of oils with Redwood viscometer 12. Adsorption of acetic acid by charcoal	
Text Books and Reference Books	**TEXT BOOKS:** 1. Mendham J et al, Vogel's text books of quantitative chemical analysis, 5Ed., Pearson publications, 2012. 2. KN Jayaveera, Subba reddy & Chandra sekhar , Chemistry lab manual, 1Ed., SM Enterprises, Hyderabad, 2014 3. Chatwal & Anand , Instrumental methods of chemical analysis, 2 Ed., Himalaya publications, 2006.	

19CS12P2 - DATA STRUCTURES LABORATORY

(Common to ECE & EEE)

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Practical	**Lecture – Tutorial – Practical:**	0-0-3
Prerequisite:	Basic programming knowledge and C language fundamentals	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. To learn the various data structures and their implementation.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Acquire knowledge on types of data structures and the operations that could be performed on them.
Course Content	1. Write a C program to implement Stack operations using arrays. 2. Write a C program to implement Queue operations using arrays. 3. Write a C program to implement various operations on a Singly Linked list. 4. Write a C program to implement the creation of following: a. Doubly Linked list b. Circular Linked list 5. Write a C program for a. Bubble Sort. b. Insertion Sort 6. Write a C program for a. Linear Search b. Binary Search	
Text Books and Reference Books	**TEXT BOOKS:** 1. D. Samanta, "Classic Data Structures", Prentice Hall of India, 2nd Edition 2009. 2. S. Lipschutz, "Data Structures using C", Tata McGraw Hill, Special Indian Edition 2012.	
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm	

19ME12P1-COMPUTER AIDED ENGINEERING DRAWING LABORATORY

(Common to EEE, ECE, CSE and IT)

Course Category:	Engineering Science	**Credits:**	3
Course Type:	Practical	**Lecture-Tutorial- Practice:**	0 - 0 - 6
Prerequisite:	Geometrical Construction	**Sessional Evaluation:** **External Evaluation :** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. To enable the students with various concepts like dimensioning, construction of conic sections, polygons, cycloids and involutes. 2. To impart and inculcate proper understanding of AutoCAD fundamentals. 3. To apply the knowledge of AutoCAD for the projections of points, lines and solids. 4. To know about sections and developments of solids. 5. To improve the visualization skills with isometric projections.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the conventions and methods of engineering drawings
	CO2	Sketch the solutions to the problems on projection of points, lines, planes and solids
	CO3	Demonstrate orthographic and Isometric principles
	CO4	Understand and apply the knowledge of engineering drawing in modern CAD tools.
Course Content	**INTRODUCTION TO CAD SOFTWARE:** **Introduction:** Importance of Computer Aided Drawing, software tool environment, drawing size and scale, main menu, tool bar and menus, co-ordinate system, drafting settings. **Creation and Editing:** Points, Lines, Poly lines, Polygons, Splines, circle, ellipse, text, move, copy, off-set, pan, mirror, rotate, trim, extend, break, chamfer, fillet, curves, block, layers, line representations, dimensioning and hatching. **GEOMETRICAL CONSTRUCTIONS, AND CONIC SECTIONS:** Importance of Drawing, Drawing Instruments, Sheet layout, BIS Conventions, Types of lines, Lettering, and dimensioning methods. **Geometrical Constructions:** Regular Polygons. **Conic Sections:** Introduction, Construction of Ellipse, Parabola and Hyperbola using Eccentricity method and Rectangular/ Oblong methods, Rectangular hyperbola. **SPECIAL CURVES:** Construction of Cycloidal curves – Cycloid, Epi-cycloid and Hypo- cycloid. Involutes – Involutes of circle and polygons. **PROJECTIONS OF POINTS AND LINES:** **Projections of Points:** Principles of projections, Planes of projection, Points in four quadrants. **Projections of Lines:** Line inclined to both the principal planes (first angle projection only). **PROJECTIONS OF PLANES:**	

Course Content	**Projections of Planes:** Plane (triangle, square, rectangle, pentagon, hexagon and circular) inclined to both the principal planes. **PROJECTIONS OF SOLIDS:** **Projections of Solids:** Solids such as Prisms, Pyramids, Cylinders and Cones inclined to both the principal plane. **SECTIONS OF SOLIDS.** **Sections of Solids:** Solids such as Prisms, Pyramids, Cylinders and Cones resting on their bases on HP. **DEVELOPMENT OF SURFACES.** **Development of Surfaces:** Lateral surfaces of solids such as Prisms, Pyramids, Cylinders and Cones (cut by a plane inclined to HP). **ISOMETRIC VIEWS AND PROJECTIONS:** Isometric views of planes and solids. Isometric scale, Isometric Projections of simple objects. **ORTHOGRAPHIC PROJECTIONS:** Conversion of Pictorial views into Orthographic Views.
Text Books and Reference Books	**TEXTBOOKS:** 1. Engineering Drawing, N.D. Bhat / Charotar Publishing House,. Gujarat, 53rd edition, 2014. 2. AutoCAD 2013 For Engineers and Designers, Sham Tickoo, Dream tech Press, 2013 **REFERENCE BOOKS:** 1. Engineering Drawing And Graphics + Autocad, Venugopal K, New Age International Pvt. Ltd.New Delhi, 2007. 2. Engineering Graphics with Auto CAD, D.M. Kulkarni, A.P. Rastogi and A.K. Sarkar, PHI Learning Private Limited, Revised Edition, August 2010. 3. Engineering Drawing and Graphics Using Autocad, T Jeyapoovan, Vikas Publishing House, 3rd Edition, 2010. 4. A Textbook on Engineering Drawing, P. Kannaiah, K. L. Narayana, K. Venkata Reddy, Radiant Publishing House, 2012.

N.B.K.R. INSTITUTE OF SCIENCE & TECHNOLOGY

(AUTONOMOUS)

COLLEGE WITH POTENTIAL FOR EXCELLENCE (CPE)
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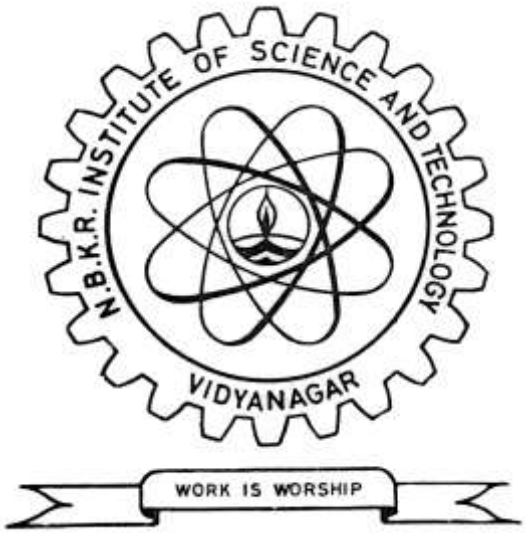
B.Tech. Courses Accredited by NBA under TIER-I



SYLLABUS

B.TECH. DEGREE COURSE

II B.TECH

I & II Semesters

ELECTRONICS AND COMMUNICATION ENGINEERING

(With effect from the batch admitted in the academic year 2019-2020)

VIDYANAGAR - 524413
SPSR Nellore-Dist. Andhra Pradesh
www.nbkrist.org

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:

1. To provide a learner-centered environment that challenges individuals to actively participate in the education process.

2. To empower the faculty to excel in teaching while engaging in research, creativity and public service.

3. To develop effective learning skills enabling students pick up critical thinking thus crafting them professionally fit and ethically strong.

4. To reach out industries, schools and public agencies to partner and share human and academic resources.

VISION AND MISSION OF THE DEPARTMENT

Vision:

To develop high quality engineers with sound technical knowledge, skills, ethics and morals in order to meet the global technological and industrial requirements in the area of Electronics and Communication Engineering.

Mission:

1. To produce high quality graduates and post-graduates of Electronics and Communication Engineering with modern technical knowledge, professional skills and good attitudes in order to meet industry and society demands.
2. To develop graduates with an ability to work productively in a team with professional ethics and social responsibility.
3. To develop highly employable graduates and post graduates who can meet industrial requirements and bring innovations.
4. Moulding the students with foundation knowledge and skills to enable them to take up postgraduate programmes and research programmes at the premier institutes.

Programme Educational Objectives (PEOs):

1. To provide the students with strong fundamental and advanced knowledge in mathematics, Science and Engineering with respect to Electronics and Communication Engineering discipline with an emphasis to solve Engineering problems.

2. To prepare the students through well - designed curriculum to excel in bachelor degree programme in Electronics and Communication Engineering in order to engage in teaching or industrial or any technical profession and to pursue higher studies.

3. To train students with intensive and extensive engineering knowledge and skill so as to understand, analyze, design and create novel products and solutions in the field of Electronics and Communication Engineering.

4. To inculcate in students the professional and ethical attitude, effective communication skills, team spirit, multidisciplinary approach and ability to relate engineering issues to broader social context.

5. To provide students with an excellent academic environment to promote leadership qualities, character molding and lifelong learning as required for a successful professional career.

Program Outcomes (POs):

PO1: Ability to acquire and apply knowledge of science and engineering fundamentals in problem solving.

PO2: Acquire in-depth technical competence in a specific information technology discipline.

PO3: Ability to undertake problem identification, formulation and providing optimum solution.

PO4: Ability to utilize systems approach to design and evaluate operational performance.

PO5: Understanding of the principles of inter-disciplinary domains for sustainable development.

PO6: Understanding of professional & ethical responsibilities and commitment to them.

PO7: Ability to communicate effectively, not only with engineers but also with the community at large.

PO8: Ability to Communicate effectively on complex engineering activities with the engineering community and with society at large.

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

PO10: 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.

PO11: Understanding of the social, cultural, global and environmental responsibilities as a professional engineer.

PO12: Recognizing the need to undertake life-long learning, and possess/acquire the capacity to do so.

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR

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II YEAR OF FOUR YEAR B.TECH DEGREE COURSE – I SEMESTER

ELECTRONICS AND COMMUNICATION ENGINEERING

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the academic year 2019-2020)

(For the batch admitted in the academic year 2019-2020)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation									
							Sessional-I Marks			Sessional-II Marks			Total Sessional Marks(40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Test$^{\$}$-I	A$^{\#}$-I	Max. Marks	Test$^{\$}$-II	A$^{\#}$-II	Max. Marks		Duration In Hours	Max. Marks	100
1	19SH2101	Engineering Mathematics-III**	2	1	-	3	34	6	40	34	6	40	0.8*Best of two+0.2* least of two	3	60	100
2	19EC2101	Electronic Circuits	3	0	-	3	34	6	40	34	6	40		3	60	100
3	19EC2102	Fundamentals of Digital Circuits	3	0	-	3	34	6	40	34	6	40		3	60	100
4	19EC2103	Signals and Systems*	3	0	-	3	34	6	40	34	6	40		3	60	100
5	19EC2104	Pulse and Analog Circuits	3	0	-	3	34	6	40	34	6	40		3	60	100
		PRACTICALS														
6	19EC21P1	Electronic Devices Lab	-	-	3	1.5	-	-	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60	100
7	19EC21P2	Analog Circuits Lab	-	-	3	1.5	-	-	-	-	-	40		3	60	100
8	19EC21P3	Electronic Circuit Design & Simulation Lab	-	-	2	1	-	-	-	-	-	40		3	60	100
		MANDATORY											0.8*Best of two+0.2* least of two			
9	19MC2101	Environmental Studies*#	2	-	-	-	34	6	40	34	6	40		3	60	100
		TOTAL	16	1	8	19	-	-	-	-	-	360	-	-	540	900

***** Common to ECE & EEE.

**Common to ECE, CE, EEE & ME.

*# Common to ECE, CE, EEE, CSE & IT.

A for Assignment (continuous evaluation),

$ Test (Descriptive & Objective) duration = 2 Hours

19SH2101 – ENGINEERING MATHEMATICS-III

(Common to ECE, MECH, EEE & CE)

Course category:	Basic Sciences	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	2 - 1 – 0
Prerequisite:	Intermediate Mathematics	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The basic concepts of numerical solutions of simultaneous linear and non-linear algebraic equations. 2. The numerical methods to solve Ordinary Differential Equations by using Taylor's series method, Picard's method, Euler's and Modified Euler's Methods and Runge-Kutta methods of 2^{nd} and 4^{th} order. 3. The concepts of Cauchy - Riemann equations, Construction of Analytic function, Line integral, Cauchy's theorem and Cauchy's integral formula. 4. The concepts of Residues. 5. The Properties of Z- Transforms, shifting properties, initial value and final value theorems and the applications of difference equations. 6. Foundation of the probability and statistical methods.	
Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Have a sound knowledge in analyzing the simultaneous linear and non-linear algebraic equations by various numerical methods.
	CO2	Understand effectively the significance numerical methods to solve Ordinary Differential Equations.
	CO3	Understand effectively the significance of differentiability for complex functions and be familiar with the Cauchy-Riemann equations and also Cauchy's integral formula.
	CO4	Compute the Taylor and Laurent expansions of simple functions, determining the nature of the singularities and calculating residues.
	CO5	Attains skills in analyzing the Z-Transforms and their applications.
	CO6	Have a well-founded knowledge of standard distributions (Binomial, Poisson and Normal distributions) which can describe real life phenomena.
	UNIT - I **SOLUTION OF SIMULTANEOUS LINEAR AND NON-LINEAR ALGEBRAIC EQUATIONS:** Iteration method, Gauss Jordon method, Gauss Elimination with Pivotal condensation method, Triangular Factorization method, Gauss-Seidal method and Newton-Raphson method	

Course Content	**UNIT - II** **NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS:** Solution by Taylor's Series, Picard's Method of Successive Approximations, Euler's Methods and Runge-Kutta Method of 2^{nd} order and 4^{th} order. **UNIT-III** **COMPLEX ANALYSIS:** Analytical functions, Cauchy - Riemann equations, Construction of Analytic function, Complex integration - Line integral, Cauchy's theorem, Cauchy's integral formula and Generalized Cauchy's integral formula. **UNIT-IV** **RESIDUES**: Taylor's theorem and Laurent's theorem (without proof), Singularities, Poles, Residues, Residue theorem and Evaluation of real definite integrals. **UNIT-V** **Z-Transforms:** 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 and Applications to difference equations. **UNIT-VI** **PROBABILITY AND STATISTICS**: Introduction, Random variables, Discrete and Continuous distributions, Binomial distribution, Poisson distribution and Normal distribution.
Text Books and Reference Books	**TEXT BOOKS:** 1. Higher Engineering Mathematics - B.S. Grewal, Khanna Publishers, New Delhi. 2. Engineering Mathematics - B.V. Ramana, Tata McGraw-Hill Education Pvt. Ltd, New Delhi 3. Advanced Engineering Mathematics - Erwin Kreyszig, Wiley, India **REFERENCES:** 1. Higher Engineering Mathematics - H.K. Dass, Er. Rajnish Verma, S. Chand Publication, New Delhi. 2. Engineering Mathematics -III - Dr.T.K.V. Iyengar, Dr.B. Krishna Gandhi, S. Ranganatham, Dr.M.V.S.S.N. Prasad, S. Chand Publication, New Delhi 3. Special functions and complex variables (Engineering Mathematics-III) – Shahnaz Bathul, PHI, New Delhi.
E-Resources	1. https://nptel.ac.in/courses 2. https://iete-elan.ac.in

19EC2101 – ELECTRONIC CIRCUITS

Course Category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 – 0
Prerequisite:	Knowledge in electronic devices and its operations with various applications.	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The concept of rectifiers and other Diode applications 2. The Hybrid model, Small signal analysis of single stage BJT amplifiers 3. The FET biasing schemes, high frequency response. 4. The types of coupling, Darlington and Bootstrap circuits. 5. The hybrid π model at high frequency. 6. Different types of feedback circuits as well as Sinusoidal oscillators	
Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the concept of rectifiers and other applications of diodes.
	CO2	Analyze the stability and biasing concepts of BJT and to design Single Stage amplifiers.
	CO3	Design a FET amplifier and compare with BJT
	CO4	Know different methods of coupling and able to design multistage amplifiers
	CO5	Represent the Hybrid π model at high frequency.
	CO6	Design feedback amplifiers and able to understand oscillators.
Course Content	**UNIT I** **RECTIFIERS:** Half Wave, Full Wave & Bridge Rectifiers, Analysis of FWR with filters (L, C, LC) & regulation. **UNIT II** **TRANSISTOR BIASING AND STABILITY:** Operating Point, Bias Stability against variation in I_{CO}, V_{BE} & β, fixed bias, Collector to Base Bias, Self-Bias, Thermal runaway, Compensation Methods. **UNIT III** **SINGLE STAGE AMPLIFIERS:** BJT Amplifier, h-parameter model, analysis of common emitter, common collector and common base amplifier using exact model & Approximate model, Millers Theorem and its Dual. **FET AMPLIFIERS:** FET Equivalent model, Analysis of Common Source, Common Drain Amplifiers.	

Course Content	**UNIT IV** **MULTISTAGE AMPLIFIERS:** Methods of Coupling, Analysis of Two Stage RC Coupled Amplifier, High Input Impedance Circuits: Boot strap & Darlington amplifier. **UNIT V** **HIGH FREQUENCY ANALYSIS:** Transistor at High Frequency, Hybrid π CE Model, Determination of High Frequency Parameters, CE Short circuit Current Gain, Current Gain with Resistive Loads, Cut-off Frequencies, Frequency Response, parameters f_T and f_{β}. Analysis of CS amplifier at High Frequency. **UNIT VI** **FEEDBACK AMPLIFIER:** Feedback Concept, Types of Feedback, Feedback Topology, Characteristics, Analysis of Feedback Amplifiers.
Text Books and Reference Books	**TEXT BOOKS:** 1. Allen Mottershead, "Electronic Devices and Circuits-An Introduction", PHI, 18th Reprint, 2006. 2. Millman and Halkias, "Integrated Electronics", McGraw- Hill Co 2nd Ed, 2017. **REFERENCES:** 1. Boylestad, Louis Nashelsky "Electronic devices and circuits" 11th ed., 2012 PH. 2. David. A. Bell. "Electronic Devices and circuits", Oxford, 5th Ed., 2008.
E-Resources	1. https://nptel.ac.in/courses 2. https://iete-elan.ac.in 3. https://freevideolectures.com/university/iit

19EC2102 – FUNDAMENTALS OF DIGITAL CIRCUITS

Course category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0– 0
Prerequisite:	Number systems ,Semiconductor device operations, basic Arithmetic operations	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. Introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions. 2. Introduce the methods for simplifying Boolean expressions. 3. Outline the formal procedures for the analysis and design of combinational circuits 4. Illustrate the concept of synchronous and asynchronous sequential circuits 5. Introduce the concept of various counters and Registers 6. Introduce the concept of memories and Memory expansion	
Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the fundamental concepts and techniques used in digital electronics and examine the structure of various number systems and its application in digital design
	CO2	Identify basic requirements for a design application and propose a cost effective solution
	CO3	Understand, analyze and design various combinational circuits
	CO4	Understand, analyze and design various sequential circuits.
	CO5	Identify and prevent various hazards and timing problems in a digital design.
	CO6	Understand the memories
Course Content	**UNIT – I** **NUMBER SYSTEMS AND CODES:** Number systems, Signed binary numbers, Base conversions, Binary arithmetic, Complements, Binary codes–(BCD, Excess-3, Grey, ASCII). **BOOLEAN ALGEBRA AND LOGIC GATES**: Theorems of Boolean algebra, De-Morgan's theorem, Realization of logic gates using Universal gates. **UNIT – II** **MINIMIZATION OF DIGITAL CIRCUITS:** Standard forms of logical functions, Min-term and max-term specifications, Simplification by K-maps, incompletely specified functions, Realization of logic functions using gates. **UNIT -III** **COMBINATIONAL LOGIC CIRCUITS:** Design procedure, Binary adder, Sub-tractor, Decimal adder, Magnitude comparator, Decoders, Encoders, Multiplexers and De-multiplexers.	

Course Content	**UNIT – IV** **SEQUENTIAL CIRCUITS:** Sequential circuits, Storage Elements: (Latches & Flip-flops), Master-Slave Flip-flop, Race around condition, Flip-flop conversions, Timing and triggering considerations, State diagrams, state tables, reduction of state tables and state assignment, design procedures. **UNIT – V** **REGISTERS AND COUNTERS:** Registers, Shift registers, Ripple counters, Synchronous counters, Ring and Johnson counters. **UNIT-VI** **MEMORY AND PROGRAMMABLE DEVICES:** Random-Access Memory, Memory Decoding, Read-only Memory, Programmable Logic Array, Programmable Array Logic, Sequential programmable devices.
Text Books and Reference Books	**TEXT BOOKS:** 1. Digital design by Morris Mano, Pearson Education Asia, 5th Ed., 2012 2. Fundamentals of logic design by Roth & Charles, 6th Edition, West Publishing Company, 2009. **REFERENCES:** 1. Fundamentals of logic circuits by A. Anand Kumar, PHI Learing, 2016 2. Jon M, Yarbrough, "Digital logic — applications and design", Thomson-Brooks India edition 3. Fundamental of Digital Design By M. Senthil Sivakumar, S.Chand publications, 2014.
E-Resources	1. http://nptel.ac.in/cources 2. https:// iete-elan.ac.in 3. https://freevideolectures.com/university/iitm

19EC2103 – SIGNALS AND SYSTEMS

(Common to ECE and EEE)

Course category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3- 0 – 0
Prerequisite:	Knowledge of vectors Trigonometry, Differentiation & Integration	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. Various analysis and operations on signals. 2. The Fourier series for periodic signals. 3. The Fourier Transform of various signals. 4. The different type of sampling technique. 5. The response of systems. 6. The discrete time signals and systems.	
Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Define a signal and perform various operation on signals.
	CO2	Find the Fourier series of various Periodic signals.
	CO3	Analyse a signal in frequency domain by applying FT and its properties
	CO4	Establish the need for sampling and gaining various sampling technique.
	CO5	Perform distortion less transmission through a system.
	CO6	Apply signal analysis using DTFT.
Course Content	**UNIT-I** **SIGNAL ANALYSIS**: Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Classification of Signals, Concepts of Impulse function, Unit Step function, Signum function. Operations on signals. **UNIT-II** **FOURIER SERIES**: Representation of Fourier series, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum. **UNIT III** **FOURIER TRANSFORMS**: Deriving Fourier Transform from Fourier Series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform.	

Course Content	**UNIT-IV** **SAMPLING**: Sampling theorem – Graphical and analytical proof for Band Limited Signals, Types of Sampling – Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass sampling. **UNIT-V** **SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS**: Linear System, Convolution, Impulse response, Response of a Linear System, Linear Time Invariant (LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI system, Filter characteristics of Linear Systems, Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and Rise time. **UNIT-VI** **DISCRETE TIME SIGNALS AND SYSTEMS**: Linear Shift Invariant(LSI) system – Stability – Causality – Convolution and Correlation –Linear constant coefficient difference equation – Impulse response -Definition of Discrete Time Fourier Transform – Properties – Transfer function – System analysis using DTFT.
Text Books and Reference Books	**TEXT BOOKS:** 1. Signals and Systems – A.V. Oppenheim, A.S. Willsky and S.H. Nawab, 2nd Ed., Pearson New international Edition-2014 2. Principles of Linear Systems and Signals, 2nd Ed, B. P. Lathi, 2009, Oxford. 3. Signals and Systems , 4th Edition, Ramesh Babu, Scitech Publications (India), 2010 **REFERENCES:** 1. Signals & Systems – Simon Haykin and Van Veen, Wiley, 2 Ed.-2018 2. Signals and Systems – A.Rama Krishna Rao – 2008, TMH, 2014 3. Fundamentals of Signals and Systems – Michel J. Robert, 2017, MGH International Edition.
E-Resources	1. https://nptel.ac.in/courses 2. https://iete-elan.ac.in 3. https://freevideolectures.com/university/iit

19EC2104 – PULSE AND ANALOG CIRCUITS

(Common to ECE and EEE)

Course category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 - 0
Prerequisite:	Knowledge in active & passive components and mathematical representation of different waves.	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. Design of wave shaping circuits. 2. Functioning of Switching Circuits. 3. Concept of multi-vibrators. 4. Principle and operation of time base generators. 5. various Power Amplifiers and their operation 6. LC tuned amplifiers.	
Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Design RC circuits for triggering
	CO2	Understand Switching circuits (BJT Inverter, NMOS, PMOS and CMOS switching circuits)
	CO3	Design a Multi-vibrator and Schmitt trigger
	CO4	Analyse Voltage/ Current Sweep Circuits
	CO5	Categorize Power Amplifiers and understand the essence
	CO6	Understand principle and operation of a Tuned amplifiers
Course Content	**UNIT-I** **LINEAR WAVE SHAPING**: Types of waveforms, RC low pass and high pass circuits, rise time, tilt. **UNIT-II** **NON LINEAR WAVE SHAPING**: Diode as a switch, BJT as a switch and switching times, Diode clippers and clampers. **UNIT-III** **MULTIVIBRATORS:** Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using transistors, triggering methods. **UNIT-IV** **TIME BASE GENERATORS:** RC sweep circuits, constant current Miller and Bootstrap time base generators using BJT's and UJT relaxation oscillator.	

Course Content	**UNIT-V** **TUNED AMPLIFIERS:** Introduction, Q-factor, small signal tuned amplifiers, effect of cascading single tuned amplifier on bandwidth and stagger-tuned amplifiers. **OSCILLATORS:** Oscillator Principles, Barkhausan Criteria, RC Phase shift and Wien Bridge Oscillator, Hartley and Colpitts Oscillators, Crystal Oscillator. **UNIT-VI** **POWER AMPLIFIERS:** Classification of Power Amplifiers, Class-A, Transformer coupled Class-A, cross over distortion, Class-B push-pull amplifier, Distortions in amplifiers.
Text Books and Reference Books	**TEXT BOOKS:** 1. "Pulse & Digital switching waveforms" by J. Milliman & H. Taub Mc Graw-Hill, 2nd edition 2008. 2. Millman and Halkias,"Integrated Electronics", McGraw-Hill Co 2nd Ed, 2017. **REFERENCE:** 1. Solid State Pulse Circuits, by David A. Bell, PHI.4th edition 2008. 2. Boylestad, Louis Nashelsky "Electronic devices and circuits" 11th ed., 2012 PH.
E-Resources	1. http://nptel.ac.in/cources 2. https:// iete-elan.ac.in 3. https://freevideolectures.com/university/iit

19MC2101 – ENVIRONMENTAL STUDIES

(Common to CE, EEE, ECE, CSE & IT)

Course Category:	Mandatory course	**Credits:**	0
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-0-0
Pre-requisite:	Basic idea on environment, Environmental pollution causes, effects and control measures.	**Sessional Evaluation:** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to:	
	1. To know the importance of Environmental Sciences and understand the various components of environment. 2. To know the value of natural resources and need to protect them. 3. To know the value of biodiversity and it`s conservation methods. 4. To describe advanced methods to solve problems related to environmental pollution. 5. To understand the social issues and provide plans to minimize the problems. 6. To articulate various environmental acts in order to protect the environment.	
Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Know the importance of Environmental sciences and understand the various components of environment.
	CO2	Understand the value of natural resources
	CO3	Summarize the function of ecosystem, values of biodiversity and conservation.
	CO4	Identify how the environment is polluted and suggest the mitigation measures.
	CO5	Understand the environmental problems in India and way to minimize the effects.
	CO6	Categorize the environmental protection laws in our country and role of information technology in environment protection.
Course Content	**UNIT-I** **MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL SCIENCES:** Introduction, Definition, Scope and Importance of environmental sciences - Various components of environment – Atmosphere, lithosphere, hydrosphere and biosphere – Multidisciplinary nature of environmental sciences. **UNIT-II** **NATURAL RESOURCES:** **LAND RESOURCES:** Importance, Land degradation, Soil erosion and desertification, Effects of modern agriculture (fertilizer and pesticide problems). **FOREST RESOURCES**: Use and over-exploitation-Mining and Dams-their effects on forest and tribal people. **WATER RESOURCES:** Use and over-utilization of surface and ground water - Floods and droughts. **ENERGY RESOURCES:** Renewable and non-renewable energy, need to use of alternate energy sources, Impact of energy use on environment. **UNIT-III** **ECOSYSTEM**: Definition, types, structure (biotic and abiotic components) and functions of an Ecosystem – Energy flow, Food chain, food web, ecological pyramids and Ecological succession.	

Course Content	**BIO-DIVERSITY AND ITS CONSERVATION:** Definition - genetic, species and ecosystem diversity- value of biodiversity - hotspots of biodiversity in India - threats to biodiversity – in situ and ex situ conservation of biodiversity. **UNIT-IV** **ENVIRONMENTAL POLLUTION:** Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards. **SOLID WASTE MANAGEMENT**: causes, effects and control measures of urban and industrial waste. **DISASTER MANAGEMENT:** Floods, earthquake and cyclones. **UNIT-V** **SOCIAL ISSUES AND ENVIRONMENT:** From unsustainable to sustainable development, urban problems related to energy, water conservation, rainwater harvesting and water shed management. **CASE STUDIES:** Silent valley project, Madhura Refinery and TajMahal, Tehri Dam, Kolleru Lake Aquaculture and Fluorosis in Andhra Pradesh. **CLIMATE CHANGE**- Global warming, Acid rain and Ozone depletion. **UNIT-VI** **HUMAN POPULATION AND ENVIRONMENT:** Population growth, variation among nations and population explosion- Role of information technology in environment and human health. **ENVIRONMENTAL ACTS:** Water (Prevention and control of pollution) Act-Air (Prevention and control of pollution) Act – Wildlife protection Act and Forest conservation Act. **FIELD WORK:** Visit to Local Area having river/Forest/grass land/hill/mountain to document environmental assets.
Text Books and Reference Books	**TEXT BOOKS:** 1. "Environmental science and Engineering" by Anubha Kaushik and C.P.Kaushik, New Age International publishers. Sixth Edition 2018. 2. "Environmental science and Engineering" by N. Arumugam,V Kumaresan, Saras Publication; 2 edition (2014) **REFERENCE BOOKS:** 1. "Introduction to Environmental science" by Y.Anjaneyulu, B.S Publications.2004. 2. Perspectives in Environmental Studies, Anubha Kaushik and C.P.Kaushik, New Age International publishers, Third Edition 2019. 3. "Environmental science" by M. Chandrasekhar, Hi-Tech Publications. 2009.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

19EC21P1 – ELECTRONIC DEVICES LAB

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial- Practice:**	0 - 0 - 3
Prerequisite:	Basic Electrical Sciences and Electronic Devices	**Sessional Evaluation:** **External Evaluation :** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. The behaviour of various semiconductor devices. 2. The V-I characteristics of various semiconductor devices.	
Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Analyse the electronic circuits experimentally.
	CO2	Verify the V-I characteristics of various semiconductor devices experimentally.
	CO3	Analyse& Calculate the cut-in voltage and forward resistance of P-N Junction diode practically.
	CO4	Examine the performance of JFET and UJT.
	CO5	Understand the performance LED and DIAC
	CO6	Inspect the input and output characteristics of BJT.
Course Content	Minimum of **TEN** experiments to be completed out of the following: **LIST OF EXPERIMENTS** 1. P-N Junction Diode Characteristics(Si Diode) 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 Dependent Resistor Characteristics 7. Photo Transistor Characteristics 8. Thermistor Characteristics 9. LED Characteristics 10. DIAC Characteristics 11. SCR Characteristics 12. Solar Cell Characteristics	

19EC21P2 – ANALOG CIRCUITS LAB

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial- Practice:**	0 - 0 - 3
Prerequisite:	Electronic Devices & Circuits and Analysis of Electronic Circuits	**Sessional Evaluation:** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. The design and analysis of various electronic circuits. 2. The behaviour of various rectifiers and amplifiers.	
Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Analyse the electronic circuits experimentally.
	CO2	Design & Analyse the rectifiers (With & Without filters).
	CO3	Calculate the frequency response of the RC coupled amplifier practically.
	CO4	Analyse the Transistor Voltage Regulator (Series and Shunt).
	CO5	Understand the performance of feedback amplifiers practically
	CO6	Design & Analyse the various oscillators.
Course Content	Minimum of **TEN** experiments to be completed out of the following: **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. C88olpitts 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. 11. Transistor Voltage Regulator (Series and Shunt) 12. Voltage Series Feedback Amplifier (With & Without feedback).	

19EC21P3 – ELECTRONIC CIRCUIT DESIGN AND SIMULATION LAB

Course Category:	Program Core	**Credits:**	1
Course Type:	Practical	**Lecture-Tutorial- Practice:**	0 - 0 - 2
Prerequisite:	Electronic Devices, Signals and Systems	**Sessional Evaluation:** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. The design and analysis of various electronic circuits. 2. The behaviour of various rectifiers and amplifiers.	
Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Simulate and Verification the Class-A Power Amplifier.
	CO2	Design & simulate the Rectifiers.
	CO3	Analyse& Calculate the frequency response CE and CS Amplifier.
	CO4	Analyse the Transistor Voltage Regulator.
	CO5	Design and Verification the Pre-emphasis and De-emphasis circuits.
	CO6	Simulation and Verification of Logic Gates.
Course Content	Minimum of **TEN** experiments to be completed out of the following: **LIST OF EXPERIMENTS** 1. Verification of Half–Wave and Full-Wave Rectifier 2. Frequency Response of CE Amplifier 3. Frequency Response of CS Amplifier 4. Half adder / Full adder circuits using gates 5. Design and Verification of Pre-emphasis and De-emphasis circuits 6. Verification of Clippers 7. Verification of Clampers 8. Design and Verification of RC coupled amplifier 9. Design and Verification of Voltage Regulator 10. Design and Verification of Logic Gates 11. Characteristics of the UJT 12. Astable multivibrator	

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(AFFILIATED TO JNTU ANANTAPUR: ANANTHAPURAMU)

SPSR NELLORE DIST

II YEAR OF FOUR-YEAR B.TECH DEGREE COURSE – II SEMESTER

ELECTRONICS AND COMMUNICATION ENGINEERING

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the academic year 2019-2020)

(For the batch admitted in the academic year 2019-2020)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation									
							Sessional-I Marks			Sessional-II Marks			Total Sessional Marks(40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Test$^{\$}$-I	A$^{\#}$-I	Max. Marks	Test$^{\$}$-II	A$^{\#}$-II	Max. Marks		Duration In Hours	Max. Marks	100
1	19EC2201	Probability Theory and Stochastic Processes	3	0	-	3	34	6	40	34	6	40	0.8*Best of two+0.2* least of two	3	60	100
2	19EC2202	Analog IC Applications	2	1	-	3	34	6	40	34	6	40		3	60	100
3	19EC2203	Electromagnetic Fields & Waves	3	0	-	3	34	6	40	34	6	40		3	60	100
4	19EC2204	Analog Communication	3	0	-	3	34	6	40	34	6	40		3	60	100
5	19EC2205	Digital IC Applications	3	0	-	3	34	6	40	34	6	40		3	60	100
		PRACTICALS											Day to Day Evaluation and a test (40 Marks)			
6	19EC22P1	Pulse and Digital Circuits Lab	-	-	3	1.5	-	-	-	-	-	40		3	60	100
7	19EC22P2	Analog IC Applications Lab	-	-	3	1.5	-	-	-	-	-	40		3	60	100
8	19EC22P3	Digital System Design Lab Using VHDL	-	-	2	1	-	-	-	-	-	40		3	60	100
		MANDATORY														
9	19MC2201	Economics & Accountancy*	-	-	-	-	-	-	-	-	-	-		-	-	-
		TOTAL	14	1	8	19	-	-	-	-	-	320	-	-	480	800

***** Common to ECE & EEE.

**Common to ECE, CE, EEE & ME.

*# Common to ECE, CE, EEE, CSE & IT.

A for Assignment (continuous evaluation),

$ Test (Descriptive & Objective) duration = 2 Hours

19EC2201 – PROBABILITY THEORY AND STOCHASTIC PROCESSES

Course category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0- 0
Prerequisite:	Knowledge of Signals and systems, integrations and differential equations.	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to: 1. Provide mathematical background and probability theory. 2. Understand the random variable concepts with distribution and density functions. 3. Know basic concepts of multiple random variables, Conditional probability and conditional expectation, joint distribution and independence. 4. Make the difference between time averages and statistical averages. 5. Analysis of random process and application to the signal processing in the communication system. 6. Demonstrate the students how to model a noise source and design of filters for white and coloured noises and maximize S/N ratio.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand fundamentals of probability theory
	CO2	Learn the fundamentals of random variables.
	CO3	Illustrate the concepts of vector random variables and related problems.
	CO4	Remember the characterization of random processes and their properties
	CO5	Evaluate response of a system to random signal and noise
	CO6	Know the noise and how these noises are effecting the communication system
Course Content	**UNIT-I** **PROBABILITY**: Introduction, Set theory and Venn diagrams -Axioms- Joint and conditional probability - Bayes' theorem - Bernoulli trials. **UNIT –II** **RANDOM VARIABLE**: Concept — Distribution function — Density functions — Conditional density functions — Expectation — Conditional expected value — Moments — Chebyshev, Markov's and Chernoff's inequalities — Characteristics and moment generating functions - Transformation of continuous and discrete random variables. **UNIT –III** **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.	

Course Content	**UNIT – IV** **RANDOM PROCESSES:** Concept — Stationarity — Independence — Time averages — Ergodicity — Correlation function and its Properties. Gaussian process— 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-V** **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-VI** **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, 4th edition, 2001. 2. A.Papoulis and S.Unnikrishna Pillai, "Probability Random Variables and Stochastic Processes", PHI, 4th edition, 2008 3. J.LAunon and V.Chandrasekhar, "Introduction to Probability and Random Processes", McGraw-Hill 2nd edition , 1997. **REFERENCE:** 1. D.G. Childer, "Probability and Random Processes", McGraw Hill, 2nd edition 1997. 2. GR.Babu and K. Pushpa, "Probability Theory and Stochastic Processes", Premier Publishing House, 3rd edition 2010.
E-Resources	1. http://nptel.ac.in/cources 2. https:// iete-elan.ac.in 3. https://freevideolectures.com/university/iit

19EC2202 – ANALOG IC APPLICATIONS

(Common to ECE and EEE)

Course category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	2 - 1 - 0
Prerequisite:	Circuit & Networks, Electronics Devices & Circuits and Pulse & Analog Circuits	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to:	
	1. Learn the basic building blocks of Op-amp & its characteristics. 2. Study linear and non-linear applications of operational amplifiers. 3. Design Multivibrators. 4. Understand the theory and applications of 555 timer and P.L.L. 5. Design of various filters using op amp. 6. Learn theory of A.D.C.s and D.A.C.s.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Gain the basics of op-amp characteristics and its applications.
	CO2	Study and analyse each building blocks of op-amp and its applications.
	CO3	Analyse and design of Multivibrators, Oscillators and comparators using op-amp.
	CO4	Illustrate and design of Multi-vibrators using 555 timer, understand of PLL and its applications.
	CO5	Analyze and design of Active filters and regulators.
	CO6	Apply and Analyze A/D and D/A converters and their applications.
Course Content	**UNIT – I** **OPERATIONAL AMPLIFIER :** Introduction to I.C.s, Op-Amp Ideal Characteristics, DC & AC Characteristics, Internal Circuit, Inverting and Non-Inverting Modes of Operation, Differential Amplifier and its Transfer Characteristics, Derivation of C.M.R.R. & Improvement Methods of Differential Amplifier Characteristics **UNIT – II** **OPERATIONAL AMPLIFIER APPLICATIONS:** Summer, Integrator, Differentiator, Voltage Follower, Instrumentation Amplifier, V-I and I-V Converters, Precision Rectifiers, Analog multiplier (AD 534 IC) **UNIT – III** **COMPARATORS AND WAVEFORM GENERATORS:** Comparator, Regenerative Comparator, Astable and Mono stable Multi-vibrators using Op-Amp, Sine Wave Generators using Op-Amp (R.C. Phase Shift oscillator).	

Course Content	**UNIT – IV** **IC TIMERS:** 555 Timer, Astable and Monostable Modes (without applications). **PHASE LOCKED LOOPS:** Basic Principle, First and Second order PLL concepts. **UNIT – V** **ACTIVE FILTERS:** Low Pass, High Pass and Band Pass Filters, State Variable Filters. **VOLTAGE REGULATORS:** Series Op-Amp Regulator, I.C. Voltage Regulators 78XX, I.C.-723 Regulator, Switching Regulators, Step up and step down regulators (buck & boost). **UNIT – VI** **ELECTRONIC DATA CONVERTERS:** Introduction, **D.A.C.s**-Weighted Resistor, R-2R. **A.D.C.s**-Parallel Comparator Type, Successive Approximation and Dual Slope.
Text Books and Reference Books	**TEXT BOOKS:** 1. D. Roy Choudary, Shail B. Jain, "Linear Integrated Circuits", New Age International Publishers, 5th edition 2018. 2. Sergio Franco's "Design With Operational Amplifiers and Analog Integrated Circuits", 4th edition, 2016. **REFERENCE BOOKS:** 1. J. Michael Jacob, "Applications and Design with Analog Integrated Circuits", PHI, EEE, 2nd edition, 1996. 2. Ramkant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", LPE, Pearson Education, 4th Edition, 2015
E-Resources	1. http://www.nptel.ac.in 2. http:/www.ebookee.com/linearintegratedcircuits.

19EC2203 – ELECTROMAGNETIC FIELDS & WAVES

Course category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 - 0
Prerequisite:	Basic concepts of coordinate system & fundamentals of electricity & magnetism	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. Co-ordinate systems, Vector calculus. 2. Electrostatics, Coulomb's law, Mathematical analysis of Gauss's law. 3. Behaviour of conductors with regard to Current, Current Density, Resistance. Understand the significance of Ohm's law for EM fields. 4. Magnetic Static Fields and various laws applicable to magnetic fields. 5. Dipole Moment of materials, Boundary conditions governing Magnetic interfaces and study about energy stored in Magnetic Fields. 6. Maxwell's equations in different forms and their applications to EM fields, Uniform plane wave propagation.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Know the conversions of one co-ordinate system to other forms.
	CO2	Remember Gauss Law, Coulomb's law to find fields and potentials for a various situations.
	CO3	Derive the Continuity equation and give the importance of current density.
	CO4	Understand Biot-Savart's Law and Ampere's Circuital law and apply to solve problems on these.
	CO5	Acquire the knowledge of Dipole moment, Boundary conditions of Magnetic Fields
	CO6	Know the Maxwell's equation in differential and integral forms, Faraday's law, Uniform plane wave propagation
Course Content	**UNIT-I** **REVIEW OF COORDINATE SYSTEMS:** Introduction to coordinate systems, Cartesian, Cylindrical and Spherical coordinate systems, Vector transformations, Vector calculus. **UNIT-II** **ELECTROSTATIC FIELDS:** Coulomb's Law, Electric Field Intensity, Electric Flux Density –Gauss's Law, Gauss's law in point form, Electric Potential, Potential Gradient and Energy Stored in Electric Field. **UNIT-III** **CONDUCTORS AND DIELECTRICS:** Current and Current Density- Continuity Equation-Conductors-Ohms Law, Resistance, power dissipation and Joules law. Dielectrics: Dipole Moment-Polarization-bound Charge Densities-Boundary Conditions, Capacitance.	

Course Content	**UNIT-IV** **MAGNETOSTATIC FIELDS:** Ampere's force law, Biot-Savart's Law, Lorentz force law, Ampere's circuital law in point form, Magnetic Vector Potential. **UNIT-V** **MAGNETIC FIELD IN MATERIALS:** Dipole Moment, Magnetization and bound current densities, Boundary Conditions, Inductance, Energy Stored in Magnetic Field. **UNIT-VI** **MAXWELL'S EQUATIONS:** Faraday's law, Motional and transformer induced EMFs, Faraday's law in point form, Displacement current, Maxwell's equations in differential and integral forms, Poynting theorem, Wave Equation – Uniform Plane Waves in Lossless Media and in Lossy Media.
Text Books and Reference Books	**TEXT BOOKS:** 1. Matthew N.O.Sadiku: "Elements of Engineering Electromagnetics" Oxford University Press, 4th edition, 2007. 2. E.C. Jordan & K.G. Balmain "Electromagnetic Waves and Radiating Systems." Pearson Education/PHI 4th edition 2006. **REFERENCES:** 1. NarayanaRao, 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-Resources	1. https://nptel.ac.in/courses 2. https://iete-elan.ac.in 3. https://freevideolectures.com/university/iit

19EC2204 – ANALOG COMMUNICATION

Course category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 - 0
Prerequisite:	Knowledge in Fourier series and Fourier transforms.	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The Generation and Detection of A.M waves. 2. DSB & SSB modulation and demodulation. 3. The difference between SSB-SC, DSB-SC and VSB modulation schemes. 4. The discriminate between Frequency Modulation and Phase Modulation generation and detection methods. 5. The effect of noise on different modulation schemes and to design some circuits like pre - emphasis and de - emphasis networks. 6. The concepts to realize or implement the circuits required for modulation and demodulation of AM and FM Schemes such as Transmitters and receivers.	
Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the need for modulation, Generation and detection of AM waves.
	CO2	Know the SSB-SC modulation and demodulation techniques
	CO3	Demonstrate FM signal generation and detection.
	CO4	Get familiarized with the different types of noises present in the Analog Communication.
	CO5	State and prove Sampling theorem.
	CO6	Analyze the Characteristics of AM and F.M radio Transmitter and receiver.

Course Content

UNIT –I

AMPLITUDE MODULATION: Introduction to communication system, need for modulation and its types.

Amplitude Modulation: Definition, Time domain and frequency domain description, Single tone and multi tone modulations, Power relations in AM waves. Generation of AM waves: Square law Modulator, Switching Modulator. Detection of AM Waves: Square Law Detector, Envelop Detector.

UNIT –II

DSB MODULATION AND DEMODULATION: Introduction to Double Side Band Suppressed Carrier modulation, Generation of DSB-SC Modulated waves: COSTAS Loop, Frequency discrimination.

SSB MODULATION AND DEMODULATION: Introduction to SSB-SC, Frequency discrimination, Phase discrimination methods for generating SSB-SC, Demodulation of SSB Waves, VSB generation, detection and its applications. Comparison of AM schemes, Applications of different AM Systems.

Course Content	**UNIT –III** **ANGLE MODULATION:** Frequency Modulation, Phase modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Transmission bandwidth of FM Wave, Generation of FM Waves, Direct and Indirect methods of FM, Detection of FM Waves: Discriminators and its types, Phase Locked Loop. **UNIT –IV** **NOISE IN ANALOG COMMUNICATION:** Noise in AM, DSB-SC and SSB-SC Systems, Noise in Angle Modulation Systems, Threshold Effect. Pre-Emphasis and De-Emphasis. **UNIT –V** **SAMPLING THEOREM**: Definition, Nyquist rate, Types of Sampling, Aliasing Effect, Sampling of Band Pass Signals. **PULSE ANALOG MODULATION:** Types of Pulse Analog Modulations, Generation and Detection methods of PAM, PWM, PPM, Comparison of Pulse Analog Modulation schemes. **UNIT-VI** **RADIO TRANSMITERS:** Block diagram of AM transmitter, Frequency Scintillation, Radio Broadcast Transmitter, Armstrong FM Transmitter, Simple FM Transmitter using Reactance Modulator. **RADIO RECEIVERS:** TRF Receiver, Super Heterodyne Receiver, Intermediate Frequency, Image Frequency, AGC, AFC.
Text Books and Reference Books	**TEXT BOOKS:** 1. "Communication Systems" Simon Haykin, Wiley, 2nd Ed., 2007 2. "Electronic Communication Systems" John Kennedy, TMH, 5th Ed., 2011. 3. "Analog Communication Systems" Sanjay Sharma, Katson Books, 2013. **REFERENCE BOOKS:** 1. "Communication Systems Engineering" John Proakis, MasoudSaleb, Pearson, 2nd Ed, 2002. 2. "Principles of Communication Systems" Taub and Schilling, McGraw-Hill ISE, 4th Ed, 2017. 3. "Analog Communication Systems" P. Chakrabarthi, Dhanapat Rai & Sons, 2018.
E-Resources	1. http://nptel.ac.in/cources 2. https:// iete-elan.ac.in 3. https://freevideolectures.com/university/iit

19EC2205 – DIGITAL IC APPLICATIONS

Course category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0– 0
Prerequisite:	Electronic Devices, Digital System Design & Programming Skills,	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. Implementing logic gates and Boolean expressions using different logic families. 2. 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. 3. Create minimal realizations of single and multiple output Boolean functions. 4. Design and analyze combinational circuits using V.H.D.L. language. 5. Design and analyze sequential circuits using V.H.D.L. language. 6. To have a profound understanding of the design of complex digital VLSI circuits and synthesis tool for hardware design.	
Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Understand the process of integration and characteristics of different logic families
	CO2	Demonstrate knowledge of V.H.D.L. History & Language fundamentals
	CO3	Demonstrate knowledge of Objects in V.H.D.L
	CO4	Design and analyze combinational circuits for various practical problems using basic gates
	CO5	Design and analyze sequential circuits for various practical problems using flip flops
	CO6	Understand the synthesis tool for hardware design
Course Content	**UNIT – I** **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 – II** **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	

Course Content	**UNIT – III** **OBJECTS IN VHDL:** Signals, Variable, constants, files-attributes of objects – VHDL package, package body and configurations – Entity declarations and statements, Logic gates using VHDL **UNIT – IV** **COMBINATIONAL CIRCUIT BUILDING BLOCKS:** Multiplexers, 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, FSM: Meelay and Moore-Machines and their implementation using VHDL. **UNIT – VI** **VHDL SYNTHESIS:** VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout, Design capture tools, Design Verification Tools.
Text Books and Reference Books	**TEXT BOOKS:** 1. B.S .sonde, "Introduction to system design using ICs", Wiley Eastern,2nd Ed, 1980 2. J Bhasker, "VHDL primer", PEARSON Education, 3rd Ed, 2015. 3. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 4th Ed. 2007 4. Pucknell Douglas A ," Basic VLSI Design", Prentice-Hall of India Pvt.Ltd , 3rd Ed., 2009. **REFERENCE BOOKS:** 1. Stephen Brown and zvonkovranesic, 'Fundamentals of digital design with VHDL, TMH 3rd Ed., 2017. 2. A.P.Godse & Bakshi Digital IC Application-Technical Publications, 2014. 3. S.S. Limaye, 'VHDL – A design oriented Approach, 'TMH edition (2009).
E-Resources	1. http://nptel.ac.in/cources 2. https:// iete-elan.ac.in 3. https://freevideolectures.com/university/iit

19MC2201- ECONOMICS & ACCOUNTANCY

(Common to ECE and EEE)

Course Category:	Humanities	**Credits**	0
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-0-0
Pre-requisite:	Nil	**Sessional Evaluation:**	40
		External Evaluation:	60
		Total Marks:	100

Course Objectives	Students undergoing this course are expected to understand:	
	1. Causes of economic problems. 2. Behaviour of a Consumer while purchasing and consuming various commodities and services 3. Various production and cost concepts used in managerial decision making process 4. Formation of different types of business organizations in India. 5. Application of the basic accounting concepts	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Demonstrate an ability to define, analyze and identify the appropriate solution to a business problem using sound economic and accounting principles.
	CO2	Know the role of various cost concepts in managerial decisions and the managerial uses of production function.
	CO3	Understand to take price and output decisions under various market structures.
	CO4	Know in brief formalities to be fulfilled to start a business organization.
	CO5	Analyse the firm's financial position with the techniques of economic aspects as well as financial analysis.
	CO6	Evaluate and select profitable investment proposals
Course Content	**UNIT – I** **INTRODUCTION TO ECONOMICS**: Definition of Economics and basic concepts of Micro and Macro-economics. The concept of Demand-Law of demand – Elasticity of Demand: Types and measurement-Demand Forecasting-Methods of Demand Forecasting. **UNIT – II** **THEORY OF PRODUCTION AND COST**: Production function – Cobb – Douglas production function and its properties – Law of variable proportions – Law of Returns to Scale. Cost concepts – Cost- Out put relations in short run long run- Revenue curves – Break-Even Analysis. **UNIT – III** **THEORY OF PRICING**: Classification of markets – Pricing under perfect Competition – Pricing under Monopoly – Price discrimination – Monopolistic Competition.	

Course Content	**UNIT – IV** **TYPES OF BUSINESS ORGANIZATIONS:** Sole proprietorship, partnership and Joint Stock Company – Shares and debentures. **BANKING SYSTEM**: Central bank, Commercial banks and their functions. Impact of technology in banking sector. **UNIT – V** **FINANCIAL ACCOUNTING**: Concepts and principles, Journal and Ledger, Trial Balance, Final Accounts: Trading account, Profit and Loss account and Balance sheet (Simple Final account problems without adjustments). **UNIT-VI** **FUNDAMENTAL CONCEPTS OF CAPITAL AND CAPITAL BUDGETING:** Factors and Sources of Capital -Meaning, process and Methods Capital budgeting (Payback period, NPV, ARR & IRR- simple problems).
Text Books and Reference Books	**TEXT BOOKS:** 1. Varshney & Maheswari: Managerial Economics, S. Chand Publishers 2. Business Organisations: C.B.Gupta , S.Chand Publishers 3. Managerial Economics and Financial Accounting: A.R.Arya Sri, Tata Mcgraw Hills publishers. **REFERENCE BOOKS:** 1. Economic Analysis: S.Sankaran, Margham Publications. 2. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas Publishers. 3. S. A. Siddiqui & A. S. Siddiqui, Managerial Economics & Financial Analysis, New age International Space Publications. 4. M. Sugunatha Reddy: Managerial Economics and Financial Analysis, Research India Publication, New Delhi. .

19EC22P1 – PULSE AND DIGITAL CIRCUITS LAB

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial- Practice:**	0 - 0 - 3
Prerequisite:	Electronic Devices and Circuits, Pulse and Analog Circuits, Switching Theory and Logic design.	**Sessional Evaluation:** **External Evaluation :** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. The behaviour of various semiconductor devices. 2. The V-I characteristics of various semiconductor devices.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand function of logic gates and can implement logic circuits using gates.
	CO2	Implement the combinational logic circuits.
	CO3	Elucidate differences between synchronous and asynchronous circuits.
	CO4	Demonstrate linear and non-linear wave Shaping.
	CO5	Design Multivibrators.
	CO6	Design Schmitt Trigger
Course Content	Minimum of **TEN** experiments to be completed out of the following: **LIST OF EXPERIMENTS** 1. (a). Logic Gates (b). Realization of logic gates using NAND and NOR Gates 2. Full Adder 3. Decoder 4. Divide by N-Ripple Counter 5. Multiplexer 6. Divide by N-Synchronous Counter 7. RC Differentiator and Integrator 8. Diode Clippers & Clampers 9. Astable Multivibrator using BJT 10. Bistable Multivibrator using BJT 11. Schmitt Trigger using BJT 12. Bootstrap sweep circuit.	

19EC22P2 – IC APPLICATIONS LAB

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial- Practice:**	0 - 0 - 3
Prerequisite:	Analog Integrated Circuit Applications	**Sessional Evaluation:** **External Evaluation :** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. The basic applications of Op-Amp 2. The R-2R ladder network used as an A/D converter in interfacing between Analog and digital. 3. 555 Timer applications –in various timer circuits and Delay circuits.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Design Rectifiers without and with Filters (HWR, FWR, BR).
	CO2	Design various amplifier circuits using op-amp
	CO3	Design various oscillator circuits using op-amp
	CO4	Design regulator circuit using op-amp
	CO5	Design various feedback amplifier circuits using op-amp
	CO6	Determine the f_T of a given Transistor.
Course Content	Minimum of **TEN** experiments to be completed out of the following: **LIST OF EXPERIMENTS** 1. Voltage Follower, Inverting Amplifier 2. Summing Amplifier & Difference Amplifier 3. Astable Multivibrator using Op-Amp. 4. Astable Multivibrator using 555 Timer. 5. Comparator using Op-Amp. 6. Zero crossing Detector using Op-Amp. 7. Ramp Generator using 555 Timer. 8. Op-Amp Frequency Response. 9. Narrow band pass filter using IC 747. 10. Full Wave Rectifier using Op-Amp. 11. R-2R Ladder Network. 12. Schmitt Trigger using Op-Amp.	

19EC22P3 – DIGITAL SYSTEM DESIGN LAB USING VHDL

Course Category:	Program Core	**Credits:**	2
Course Type:	Practical	**Lecture-Tutorial- Practice:**	0 - 0 - 3
Prerequisite:	Switching theory & logic design, Digital design and digital IC's	**Sessional Evaluation:** **External Evaluation :** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. How to write VHDL programs of different digital circuits. 2. How to simulate the VHDL programs of different digital circuits.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Write and simulate the various logic gates by using VHDL.
	CO2	Write and simulate the adders and subtractors by using VHDL.
	CO3	Verify the truth table of various digital circuits and IC's.
	CO4	Design the various digital circuits.
	CO5	Write and simulate the various counters by using VHDL.
	CO6	Write and simulate the various registers by using VHDL.
Course Content	Minimum of **TEN** experiments to be completed out of the following: **LIST OF EXPERIMENTS** 1. Logic Gates 2. Full Adder & Full Subtractor 3. 3 to 8 Decoder 4. 8 to 3 Encoder 5. 4 bit Comparator 6. 8x1 Multiplexer 7. 1x4 Demultiplexer 8. D Flip-Flop 9. Decade Counter 10. Shift Register 11. BCD to 7-segment display code converter 12. 3 bit up/down Ripple counter 13. 2 bit synchronous counter 14. Bi-directional shift register	

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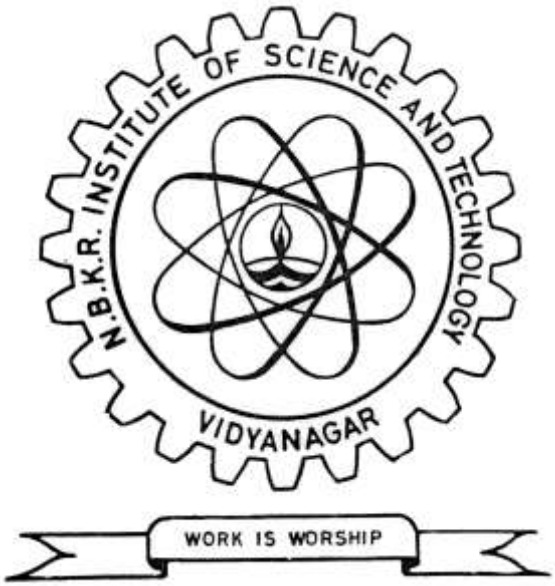

SYLLABUS

B.TECH. DEGREE COURSE

III B.Tech.

I & II Semesters

ELECTRONICS AND COMMUNICATION ENGINEERING

(With effect from the batch admitted in the academic year 2019-2020)

VIDYANAGAR - 524413

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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.

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2. To empower the faculty to excel in teaching while engaging in research, creativity and public service.

3. To develop effective learning skills enabling students pick up critical thinking thus crafting them professionally fit and ethically strong.

4. To reach out industries, schools and public agencies to partner and share human and academic resources.

VISION AND MISSION OF THE DEPARTMENT

Vision:

To develop high quality engineers with sound technical knowledge, skills, ethics and morals in order to meet the global technological and industrial requirements in the area of Electronics and Communication Engineering.

Mission:

1. To produce high quality graduates and post-graduates of Electronics and Communication Engineering with modern technical knowledge, professional skills and good attitudes in order to meet industry and society demands.
2. To develop graduates with an ability to work productively in a team with professional ethics and social responsibility.
3. To develop highly employable graduates and post graduates who can meet industrial requirements and bring innovations.
4. Moulding the students with foundation knowledge and skills to enable them to take up postgraduate programmes and research programmes at the premier institutes.

Programme Educational Objectives (PEOs):

1. To provide the students with strong fundamental and advanced knowledge in mathematics, Science and Engineering with respect to Electronics and Communication Engineering discipline with an emphasis to solve Engineering problems.

2. To prepare the students through well - designed curriculum to excel in bachelor degree programme in Electronics and Communication Engineering in order to engage in teaching or industrial or any technical profession and to pursue higher studies.

3. To train students with intensive and extensive engineering knowledge and skill so as to understand, analyze, design and create novel products and solutions in the field of Electronics and Communication Engineering.

4. To inculcate in students the professional and ethical attitude, effective communication skills, team spirit, multidisciplinary approach and ability to relate engineering issues to broader social context.

5. To provide students with an excellent academic environment to promote leadership qualities, character molding and lifelong learning as required for a successful professional career.

Program Outcomes (POs):

PO1: Ability to acquire and apply knowledge of science and engineering fundamentals in problem solving.

PO2: Acquire in-depth technical competence in a specific information technology discipline.

PO3: Ability to undertake problem identification, formulation and providing optimum solution.

PO4: Ability to utilize systems approach to design and evaluate operational performance.

PO5: Understanding of the principles of inter-disciplinary domains for sustainable development.

PO6: Understanding of professional & ethical responsibilities and commitment to them.

PO7: Ability to communicate effectively, not only with engineers but also with the community at large.

PO8: Ability to Communicate effectively on complex engineering activities with the engineering community and with society at large.

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

PO10: 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.

PO11: Understanding of the social, cultural, global and environmental responsibilities as a professional engineer.

PO12: Recognizing the need to undertake life-long learning, and possess/acquire the capacity to do so.

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR

(AUTONOMOUS)

(AFFILIATED TO JNTU ANANTAPUR: ANANTHAPURAMU)

SPSR NELLORE DIST

III YEAR OF FOUR YEAR B.TECH DEGREE COURSE – I SEMESTER

ELECTRONICS AND COMMUNICATION ENGINEERING

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the academic year 2019-2020)

(For the batch admitted in the academic year 2021-2022)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation									
							Sessional-I Marks			Sessional-II Marks			Total Sessional Marks(40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Test$^{\$}$-I	A$^{\#}$-I	Max. Marks	Test$^{\$}$-II	A$^{\#}$-II	Max. Marks		Duration In Hours	Max. Marks	100
1	19EC3101	Microprocessors and Microcontrollers*	3	0	-	3	34	6	40	34	6	40	0.8*Best of two+0.2* least of two	3	60	100
2	19EC3102	Digital Signal Processing*	2	1	-	3	34	6	40	34	6	40		3	60	100
3	19EC3103	Digital Communication	2	1	-	3	34	6	40	34	6	40		3	60	100
4	19EC3104	Antennas & Wave Propagation	3	0	-	3	34	6	40	34	6	40		3	60	100
5	19EE3103	Linear Control Systems	3	0	-	3	34	6	40	34	6	40		3	60	100
6	19EC31EX	Program Elective-I	3	0	-	3	34	6	40	34	6	40		3	60	100
		PRACTICALS														
7	19EC31P1	MP & MC Lab	-	-	3	1.5	-	-	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60	100
8	19EC31P2	Analog Communication Lab	-	-	3	1.5	-	-	-	-	-	40		3	60	100
		MANDATORY														
9	19AC3101	Audit Course	3	-	-	-	-	-	-	-	-	40		3	60	100
		TOTAL	19	2	6	21	-	-	-	-	-	360	-	-	540	900

***** Common to ECE & EEE.

PE-Program Elective, **OE**-Open Elective

A for Assignment (continuous evaluation)

$ Test (Descriptive & Objective) duration = 2 Hours

19EC3101-MICROPROCESSORS AND MICROCONTROLLERS

(Common to ECE & EEE)

Course Category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 – 0
Prerequisite:	Computer architecture and Basic programming.	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The history and need of different types of microprocessors and learn the internal architecture details, pin configuration, and their timing diagrams of 8085µp. 2. And develop various projects, by learning programming, and interfacing details of 8085 microprocessor. 3. The internal architecture details, pin configuration, Interrupts and their timing diagrams of 8086µp, and develop assemble language programs. 4. The internal architecture details, pin configuration, and their timing diagrams of 8051µp. 5. The programming and interfacing details of 8051 microcontroller and memory interfacing too. 6. The internal architecture details, pipelining, addressing modes, and C.P.U. Registers of P.I.C. µc.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the evaluation of different types of microprocessors and features of 8085 µp along with memory interfacing.
	CO2	Assess and solve basic binary math operations using the microprocessor and explain the microprocessor 8085 internal architecture and its operation within the area of manufacturing and performance.
	CO3	Gain the knowledge on internal architecture of 8086µp and its modes of operations along with timing diagrams.
	CO4	Design electrical circuitry to the Microcontroller I/O ports in order to interface the processor to external devices.
	CO5	Illustrate how the different peripherals are interfaced with 8086 µc and develop hardware projects using DAC, ADC, & 7-Segment Display.
	CO6	Gain the knowledge on internal architecture of 8051µp and its modes of operations along with timing diagrams by which improving programming skills on microcontroller.
Course Content	**UNIT-I** **INTRODUCTION TO MICROPROCESSORS:** Types of microprocessors, Features of 8085 microprocessor, Architecture of 8085 microprocessor, pin configuration, Register set, Instruction Cycle, Timing Diagrams, Stack and Subroutines. **UNIT-II** **INSTRUCTION SET OF 8085 MICROPROCESSORS:** Addressing modes, Assembly Language Programs (8085) for addition, subtraction, multiplication, division etc., Interrupts of 8085, Memory interfacing of 8085 microprocessor. **UNIT-III** **ARCHITECTURE OF 8086 MICROPROCESSOR:** Architecture, pin description, Instruction set, Addressing modes, Interrupt system. Minimum mode and Maximum mode operations of 8086 and its timing diagrams, Assembler directives, Assembly language programs (8086).	

Course Content	**UNIT- IV** **DATA TRANSFER SCHEMES:** Programmable Communication Interface 8251, Programmable Interrupt Controller (8259) and its interfacing, Programmable DMA controller (8257) and its interfacing, Programmable Interval Timer (8253) 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. **UNIT-VI** **8051 MICROCONTROLLERS:** Architecture, pin description, Register set, Instruction set. Interrupt structure, timer & serial port operations, Simple Assembly language programs on general arithmetic and logical operations.
Text Books and Reference Books	**TEXT BOOKS:** 1. Ram. B, "Fundamentals of Microprocessors and Micro controllers", Dhanpat Rai publications. 2. Douglas V. Hall, "Microprocessors and interfacing: Programming and hard ware", TMH, 2nd edition. 3. The 8051 Micro-Controllers, Kenneth J. Ayala, 3rd Edition, Thomson Publications. 4. Design with PIC Micro-Controllers by John B. Peatman, Pearson Educations. **REFERENCES 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 of India. 3. Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Prentium Proprocessor, Pentium II, III, IV by Barry B.Brey.
E-Resources	1. http://w3.ualg.pt/~jmcardo/ensino/ihs2004/Benner93.pdf 2. http://engreric.com/wpcontent/uploads/2014/06/Syllabus_CECS346_Fall15.pdf

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	3	2	-	-	-	-	-	-	3
CO2	2	2	2	3	2	-	-	-	-	-	-	3
CO3	2	2	2	3	2	-	-	-	-	-	-	3
CO4	2	2	2	3	2	-	-	-	-	-	-	3
CO5	2	2	2	3	2	-	-	-	-	-	-	2
CO6	2	2	2	3	2	-	-	-	-	-	-	3

19EC3102– DIGITAL SIGNAL PROCESSING

(Common to ECE and EEE)

Course category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	2 - 1 - 0
Prerequisite:	Signal & System, Fourier transform, Laplace Transform & Z transform	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The basic concepts and analytical methods of Z-transform. 2. The various DFT & FFT algorithms. 3. The techniques and tools for digital filter structures. 4. The design of FIR filters. 5. The various IIR filters. 6. The truncation and Rounding errors, Quantization noise	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Explain the concept of Z-transform, its properties and understand the concept of discrete and fast Fourier trans forms.
	CO2	Understand the concept of IDFT and IZT
	CO3	Apply the Concept of FIR ,IIR Structures and frequency domain filter models
	CO4	Design Parallel and cascade structure and Butterworth, Chebyshev filters.
	CO5	Design FIR filter using Fourier series method and understand the concept of fixed point and floating-point representation.
	CO6	Understand limit cycle oscillations concept and windowing technique.

Course Content

UNIT – I

REVIEW OF Z-Transforms: Z-transform and Inverse Z-Transform, Theorems and Properties, system function, Fourier representation of finite duration sequences.

UNIT – II

DISCRETE & FAST FOURIER TRANSFORM: DFT, properties of DFT, FFT, FFT algorithms, Use of DFT for fast computation of convolution, IDFT.

UNIT – III

DIGITAL FILTER STRUCTURES: Basic FIR structures, IIR structures: Direct form-I, Direct form-II, Parallel form, Cascade form.

UNIT – IV

DESIGN OF IIR FILTERS: Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Impulse Invariant and Bilinear Transformation Method.

UNIT – V

DESIGN OF FIR FILTERS: Introduction to FIR filter, Methods of FIR filters: Fourier series method, Windowing, Sampling.

UNIT-VI

FINITE WORDLENGTH EFFECTS: Fixed point and floating point number representations – Truncation and Rounding errors – Quantization noise – coefficient quantization error – Product quantization error – Overflow error – Round off noise power – limit cycle oscillations due to product round off and overflow errors.

Text Books and Reference Books	**TEXTBOOKS:** 1. Digital Signal Processing A.V Oppenheim and R.W. Schafer, Prentice – Hall of India. 2. Digital Signal Processing, S. Salivahanam – TMH. 3. Digital Signal Processing Computer Base Approach, S.K. Mitra – Tata McGraw-Hill (III) **REFERENCES BOOKS :** 1. Digital Signal Processing, P. Ramesh Babu, Scitech Publications. 2. Digital Signal Processing, John G Proakis and monolokis – Wiley Eastern Economy edition.
E-Resources	1. http://nptel.ac.in/courses 2. https://dspace.mit.edu/handle/1721.1/57007 3. http://dl.acm.org/citation.cfm?id=562622

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	2	-	-	-	-	-	-	3
CO2	3	2	2	3	2	-	-	-	-	-	-	3
CO3	3	2	2	3	2	-	-	-	-	-	-	3
CO4	3	2	2	3	2	-	-	-	-	-	-	3
CO5	3	2	1	3	2	-	-	-	-	-	-	3
CO6	3	2	1	3	2	-	-	-	-	-	-	2

19EC3103-DIGITAL COMMUNICATION

Course Category:	Program Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-1-0
Prerequisite:	Random Signals and Stochastic Processes- Analog Communication	**Sessional Evaluation:** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The basic components of digital communication system. 2. The pulse code modulation schemes for various applications. 3. The Inter-Symbol Interference (ISI) and Nyquist criterion for distortion less baseband binary transmission 4. The transmission and detection of digital passband modulation schemes. 5. The mathematical background for different communication receivers. 6. The architecture, interfaces, channels and applications of GSM.	
Course Outcomes	After completing the course the student will be able to	
	CO1	Illustrate the digital transmission with the help of block diagram.
	CO2	Describe each block in PCM with help of digital communication system.
	CO3	Analyze the need for Nyquist criterion for no-ISI transmission.
	CO4	Discuss the generation and detection of ASK and FSK, BPSK and QPSK schemes.
	CO5	Derive expressions for error probabilities of ASK and FSK, BPSK and QPSK.
	CO6	Demonstrate the architecture of GSM system.

Course Content

UNIT – I

ELEMENTS OF DIGITAL COMMUNICATION SYSTEMS: Block diagram of Digital Communication System, Merits and Demerits of Digital Transmission, Line Coding.

MULTIPLEXING TECHNIQUES: FDM, TDM, CDM, Comparison of FDM, TDM and CDM, Digital Multiplexers.

UNIT – II

PULSE CODE MODULATIONS: Introduction to PCM, Transmitter and Receiver, Uniform Quantization, Non-uniform Quantization, Companding, DPCM Transmitter and Receiver, Delta Modulation Transmitter and Receiver, Adaptive Delta Modulation Transmitter and Receiver, Noise in PCM and DM systems. Comparison of Pulse Code Modulation Schemes.

UNIT – III

BASEBAND TRANSMISSION: Introduction, Inter-Symbol Interference (ISI), Nyquist Criterion for Distortion Less Baseband Binary Transmission, Ideal Nyquist Channel, Raised Cosine Filter & its Spectrum, Correlative Coding – Duo Binary & Modified Duo Binary Signaling Schemes, Baseband M-array PAM Transmission, Equalization Schemes, Eye Patterns.

UNIT – IV

PASSBAND DATA TRANSMISSION: Introduction, Passband Transmission Model, Generation and Detection of Coherent Amplitude Shift Keying, Frequency Shift Keying, Binary Phase Shift Keying and Quadrature Phase Shift keying, Generation and Detection of non-coherent FSK and DPSK, Generation and Detection of QAM, Comparison of ASK, FSK, BPSK, DPSK and QPSK Schemes.

UNIT – V

Matched Filter: Integrator and dump filter, Optimum filter, Matched filter, Properties of Matched filter, Matched filter for rectangular pulse, Bit Error Rate due to Noise.

Error probabilities- ASK, FSK, BPSK and QPSK.

Course Content	**UNIT – VI** **Introduction to Mobile Communication**: Evolution of Mobile Communications, **Global System for Mobile (GSM):** Architecture, Interfaces, Channels and Applications.
Text Books and Reference Books	**TEXT BOOKS:** 1. Communication Systems - Simon Haykin - Wiley India Edition, 4th Edition, 2011. 2. Digital and Analog Communicator Systems - Sam Shanmugam- John Wiley- 2005. 3. Lee. W. C. Y – "Mobile Cellular Telecommunication – Analog and Digital Systems", Mc Graw Hill, 2015. **REFERENCE BOOKS:** 4. Principles of communication systems - Herbert Taub. Donald L Schiling- Goutam Sana- 3rd Edition-McGraw-Hill- 2008. 5. Communication Systems- Analog & Digital –R. P. Singh & S.D. Sapre- T.M.H. Publications. 2nd Edition, 2008. 6. Digital Communications - John G. Proakis. Masoud salehi – 5th Edition- McGraw-Hill- 2008.
E-Resources	1. http://www.nptel.ac.in. 2. http:/www.ebookee.com/digitalcommunicationsystems.

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	-	-	-	-	-	-	1	-	-
CO2	3	3	2	-	-	-	-	1	-	1	-	-
CO3	3	3	2	1	1	-	-	1	-	2	-	1
CO4	3	3	1	1	1	-	-	2	-	2	-	1
CO5	3	3	1	1	1	-	-	2	-	1	1	1
CO6	3	3	1	1	1	-	-	2	-	1	1	1

19EC3104 –ANTENNAS AND WAVE PROPAGATION

Course category:	Program Core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	2 - 1 – 0
Prerequisite:	Vector Calculus, Basics of Electromagnetic Fields and Waves	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to:	
	1. Study the propagation of signals; calculate various line parameters. 2. Study the concept of polarization and its significance in wireless communications. 3. Learn antenna basics, antenna parameters and calculation of radiation resistances of various antennas. 4. Study antenna arrays and to draw their radiation 3-D patterns. 5. Understand the basic working principle of VHF and UHF antennas. 6. Understand different kinds of Wave Propagation.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the fundamentals of Transmission Line Theory.
	CO2	Explain polarization and its significance in wireless communications.
	CO3	Learn antenna basics, Antenna Parameters and calculation of Radiation Resistances.
	CO4	Describe various Antennas, Arrays And Draw Radiation Patterns.
	CO5	Learn different types of Antennas to be employed in V.H.F. and U.H.F.
	CO6	Classify Radio Wave Propagation in the Atmosphere.

Course Content

UNIT I

POLARIZATION, REFLECTION AND REFRACTION: Polarization- Linear, Circular and Elliptical polarizations, Normal incidence on plane boundaries, Reflection and Transmission coefficients, Oblique incidence on plane boundaries- Parallel and perpendicular polarizations.

UNIT-II

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.

UNIT III

RADIATION FUNDAMENTALS: Definition of antenna, Retarded Potentials, Far Field Approximation, Radiation from a current Element, Half Wave Dipole and Monopole Antennas.

ANTENNA PARAMETERS: Radiation Pattern, Radiation Intensity, Directivity, Gain, H.P.B.W., Effective Aperture, Relation between Directivity and Maximum Effective Aperture.

UNIT IV

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 End fire Array and Binomial Arrays.

TRAVELLING WAVE ANTENNAS: Long Wire and Rhombic Antennas, Yagi-Uda Antenna, Folded Dipole Antennas (Without Analysis)

Course Content	**UNIT V** **SURFACE AND SPACE WAVE PROPAGATION:** Friis Transmission Equation, 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 VI** **SKY WAVE PROPAGATION:** Structure of Ionosphere, Mechanism of Wave Refraction in Ionosphere, Critical Frequency, M.U.F., Virtual Height, Skip Distance, Effect of Earth's Magnetic Field, Faraday's rotation.
Text Books and Reference Books	**TEXT BOOKS:** 1. Antennas by John D Krauss – ISE. 2. Antenna and Wave Propagation by K.D. Prasad - Khanna Publication. **REFERENCE BOOKS:** 1. Transmission Lines and Networks by Umesh Sinha –S athya Prakashan. 2. Electromagnetic Waves and Radiating Systems by Jordan E.C. and Balmain H. G.-P.H.I.
E-Resources	1. http://www.nptel.ac.in. 2. http:/www.ebookee.com/antennaandwavepropagation.

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	1	-	-	-	-	-	-	2
CO2	3	2	2	3	1	-	-	-	-	-	-	2
CO3	3	2	2	3	1	-	-	-	-	-	-	2
CO4	3	2	2	3	1	-	-	-	-	-	-	3
CO5	3	2	2	3	2	-	-	-	-	-	-	3
CO6	3	2	2	3	2	-	-	-	-	-	-	2

19EE3103-LINEAR CONTROL SYSTEMS

<table>
<tr><td>Course category:</td><td>Program core</td><td>Credits:</td><td>3</td></tr>
<tr><td>Course Type:</td><td>Theory</td><td>Lecture - Tutorial - Practical:</td><td>3 - 0- 0</td></tr>
<tr><td>Prerequisite:</td><td>Basic knowledge of differentiation, integration and Laplace transform techniques.</td><td>Sessional Evaluation :
External Evaluation:
Total Marks:</td><td>40
60
100</td></tr>
<tr><td>Course Objectives</td><td colspan="3">Students undergoing this course are expected to understand:
1. The various types of control systems and methods to obtain transfer function.
2. The mathematical models of physical systems.
3. The time domain responses of first and second-order systems for different input signals.
4. The stability of a control system using different techniques.
5. The frequency domain techniques to assess the system performance.
6. The different types of compensators for linear systems.</td></tr>
<tr><td rowspan="7">Course Outcomes</td><td colspan="3">Upon successful completion of the course , the students will be able to:</td></tr>
<tr><td>CO1</td><td colspan="2">Understand the various types of control systems and methods to obtain transfer function.</td></tr>
<tr><td>CO2</td><td colspan="2">Develop mathematical models of physical systems.</td></tr>
<tr><td>CO3</td><td colspan="2">Determine the time domain responses of first and second-order systems for different input signals.</td></tr>
<tr><td>CO4</td><td colspan="2">Evaluate the stability of a control system using different techniques.</td></tr>
<tr><td>CO5</td><td colspan="2">Apply frequency domain techniques to assess the system performance.</td></tr>
<tr><td>CO6</td><td colspan="2">Design the different types of compensators for linear systems.</td></tr>
<tr><td>Course Content</td><td colspan="3">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 AC servo motors - synchros.

UNIT-III
TIME DOMAIN ANALYSIS: Introduction, standard test signals- time response specifications-steady state error constants.

UNIT-IV
STABILITY OF CONTROL SYSTEMS: Routh-Hurwitz criterion- root locus- rules for the construction of root loci- introduction to proportional- derivative and integral controllers.
UNIT-V
FREQUENCY DOMAIN ANALYSIS: Introduction- frequency domain specifications- polar plots- bode plots- Nyquist stability criterion.</td></tr>
</table>

Course Content	**UNIT-VI** **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", by I.J.Nagrath and M.Gopal, 6th Edition, New age International (P) Ltd. 2. "Control systems", by A.Nagoorkani, 2nd Edition, RBA publishers. 3. "Control systems", by A.Anandkumar, 2nd Edition, PHI publishers. **Reference books:** 1. "Automatic control systems", by B.C.Kuo, 7thEdition, PHI publishers. 2. "Discrete time control systems", by K.Ogata, PHI Publishers. 3. "Control systems engineering", by Norman S Nise, Wiley, 2000.
E-Resources	http://nptel.ac.in/courses http://iete-elan.ac.in http://freevideolectures.com/university/iitm

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	2	-	-	-	-	-	-	3
CO2	3	3	2	3	2	-	-	-	-	-	-	3
CO3	3	3	2	3	2	-	-	-	-	-	-	3
CO4	3	3	2	3	2	-	-	-	-	-	-	3
CO5	3	3	2	3	2	-	-	-	-	-	-	3
CO6	3	3	2	3	2	-	-	-	-	-	-	2

19EC31P1 – MP & MC LAB

(Common to ECE, EEE)

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial- Practice:**	0 - 0 - 3
Prerequisite:	Basic knowledge in programming C, knowledge in microprocessors and programming	**Sessional Evaluation:** **External Evaluation :** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The features of the software tool – T.A.S.A.M. simulator. 2. The arithmetic and data transfer instructions of 8086. 3. The various hardware modules to be interfaced with µp and µc. 4. The interfacing knowledge with Microprocessor kit 5. How to develop the ALP for simple logical and arithmetic operations. 6. Develop assembly language programs for various applications using 8051µc.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Set up programming strategies and select proper mnemonics and run their program on the training boards.
	CO2	Acquire interfacing knowledge with microprocessor kit.
	CO3	Design the high speed communication circuits using serial bus connection
	CO4	Use a commercial C.P.U.(s) as realistic vehicles to demonstrate these concepts by introducing students to C.P.U. instructions and internal register structures
	CO5	Understand the full internal workings of a typical simple C.P.U. including the utilization of the various hardware resources during the execution of instructions.
	CO6	Develop testing and experimental procedures on Microprocessor and Microcontroller analyse their operation under different cases.

Course Content

LIST OF EXPERIMENTS

1. Summation & Block Transfer of Data
   a) Write and execute 8086 to add the given series of B.C.D. numbers and show the result.
   b) Write and execute 8086 A.L.P. to transfer a Block of data from one memory area to another memory area.
   c) Write and execute 8086 A.L.P. to perform the following multiplications.
      1) Repeated addition
      2) Using SHIFT and ADD instruction
   d) Write and execute 8086 A.L.P. to perform the following.
      1)Binary division
      2)B.C.D. division
2. Searching & Sorting Data
   a) Write and execute 8086 A.L.P. to find the minimum and maximum number from a given data array
   b) Write and execute 8086 A.L.P. to arrange the given data array in ascending order and descending order
3. Logic Controller Module
   Write and execute 8086 A.L.P. to design the logical expression using Logic controller interface module

Course Content	4. Stepper Motor Module Write and execute 8086 A.L.P. to rotate a stepper motor either in clockwise direction or in anticlockwise direction and to control the speed of rotation 5. Serial Input Display Unit Module(S.I.D.U.) Write and execute 8086 A.L.P. to display the desired word in a display of serial input display unit interface module 6. Parallel Input Display Unit Module (P.I.D.U.) Write and execute 8086 A.L.P. to design an up and down counter using P.I.D.U. Interface module 7. Digital to Analog Converter Interface Module Write and execute 8086 A.L.P. to generate given waveform through C.R.O. using D.A.C. 8. ARITHEMATIC OPERATIONS USING 8051 a) Write an assembly language program to perform the addition, subtraction, multiplication & Division of two numbers. b) Write an assembly language program to find the square of a given number N. 9. SEARCHING OPERATIONS USING 8051 a) To find smallest, largest number from given array of numbers b) To sort given array of numbers in ascending & descending order 10. LOGICAL AND BIT MANIPULATION OPERATIONS USING 8051 a) Write an assembly language program to count number of ones and zeros in a eight bit number. b) Write an assembly language program to find whether given eight-bit number is odd or even. If odd store 00h in accumulator. If even store FFh in accumulator. c) Write an assembly language program to perform logical operations AND, OR, XOR on two eight-bit numbers stored in internal RAM locations 21h, 22h.
Reference Books	1. A K Ray and K M Bhurchandi, “Advanced Microprocessors & Peripherals”, 2nd ed., TMH, 2006. 2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, “The 8051 microcontroller and embedded systems”, Pearson education, 2004.

19EC31P2 – ANALOG COMMUNICATION LAB

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial- Practice:**	0 - 0 - 3
Prerequisite:	Electronic Devices and Circuits, Signals and Systems	**Sessional Evaluation:** **External Evaluation :** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. The design and analysis of various communication circuits. 2. To study and verify the various modulation techniques.	
Course Outcomes	Upon successful completion of the course, the students will be able to:	
	CO1	Analyse the electronic circuits experimentally.
	CO2	Design & Analyse the Amplitude Modulation and De-Modulation system.
	CO3	Study and verify the Mixer Characteristics.
	CO4	examine the PAM and PPM practically
	CO5	Understand the performance of transmission lines.
	CO6	Design & Analyse the Frequency Modulation and De-Modulation system.

Course Content

Minimum of 10 experiments to be completed out of the following:

LIST OF EXPERIMENTS

1. Amplitude Modulation.
2. Amplitude De-Modulation.
3. Frequency Modulation.
4. Pulse Amplitude Modulation.
5. Pulse Position Modulation.
6. Pulse Width Modulation.
7. Proto Type Filters.
8. Pre-Emphasis and De-Emphasis.
9. Transmission Lines.
10. FM using Variable Reactance Method.
11. Frequency De-Modulation.
12. Mixer Characteristics.

S.No	COURSE CODE	ELECTIVES-I
1.	19EC31E1	ELECTRONIC MEASUREMENTS & INSTRUMENTATION
2.	19EC31E2	COGNITIVE RADIO
3.	19EC31E3	OPTOELECTRONICS
4.	19EC31E4	RELIABILITY ENGINEERING

19EC31E1 – ELECTRONIC MEASUREMENTS & INSTRUMENTATION

Course category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3-0 - 0
Prerequisite:	Electronic Devices and Circuits, Pulse and Analog Circuits, Signals & Systems	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives

Students undergoing this course are expected to understand:

1. The various standards and units of measurements, electronic instruments, their construction, applications, and principles of operation.
2. 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. The importance of different waveforms and their generation.
4. The functioning of CRO including digital oscilloscope and its operation.
5. The measurement using bridges for resistances, inductance and capacitances.
6. Different type of sensors and transducers and their application.

Course Outcomes

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

CO1	Explain various performance characteristics of instruments like accuracy, sensitivity, resolution and speed of response and their importance in meters.
CO2	Design basic meters with good performance characteristics.
CO3	Generate various signals using signal generators and harmonic distortion analyzer with the help of oscilloscope.
CO4	Analyse the waveforms and signals with the help of digital oscilloscope.
CO5	Understand precision measurement techniques to measure resistance, capacitance using different transducers.
CO6	Identify the transducers for various applications like to measurement of force, voltage, and speed with the help of bridges.

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, Problems in error calculation.

UNIT-II

METERS: D.C. Voltmeters- D.C. Ammeters Multi range, Range extension, A.C. voltmeters- multi range, range extension, Ohmmeters - series type, shunt type, Multimeter for Voltage, Current and resistance measurements.

UNIT-III

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-IV

OSCILLOSCOPES: C.R.T. features, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, triggered sweep C.R.O., Dual beam C.R.O., Measurement of Amplitude and Frequency, Dual Trace Oscilloscope, Sampling Oscilloscope, Digital Readout Oscilloscope, Digital Storage Oscilloscope, Lissajous method of frequency measurement.

Course Content	**UNIT-V** **BRIDGE MEASUREMENT:** Wheatstone bridge, Kelvin Bridge, Measurement of Resistance, A.C. Bridges, Measurement of inductance- Maxwell's bridge, and Measurement of capacitance - Schering Bridge. Errors and precautions in using bridges, Q-meter. **UNIT-VI** **TRANSDUCERS:** Active & Passive transducers : Resistance, Capacitance, Inductance; Strain gauges, L.V.D.T., Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors. Measurement of physical parameters force, Pressure, Velocity, Humidity, Moisture, Speed, Proximity and Displacement, Industrial Applications, Data acquisition systems.
Text Books and Reference Books	**TEXT BOOKS:** 1. Modern Electronic Instrumentation and Measurement Techniques – A. D. Helfrick and W. D. Cooper, P.H.I., 5th Edition, 2002. 2. Electronic instrumentation, second edition - H. S. Kalsi, Tata McGraw Hill, 2004 **REFERENCE BOOKS:** 1. Electronic Instrumentation & Measurements - David A. Bell, P.H.I., 2nd Edition, 2003. 2. Principles of Industrial Instrumentation-Patranabis D.McGraw Hill US, 3rd Edition.
E-Resources	1. http://www.nptel.ac.in. 2. http:/www.ebookee.com/electronicmeasurementand instrumentation.

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	-	-	-	-	-	-	1
CO2	2	2	1	1	-	-	-	-	-	-	-	1
CO3	3	3	1	2	-	-	-	-	-	-	-	1
CO4	2	2	1	1	-	-	-	-	-	-	-	1
CO5	3	2	2	3	-	-	-	-	-	-	-	1
CO6	3	2	2	3	-	-	-	-	-	-	-	2

19EC31E2 – COGNITIVE RADIO

Course category:	Program Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 – 0
Prerequisite:	Computer networks, basic concepts of embedded systems.	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The spectrum scarcity problem and how cognitive radio deals with this problem. 2. The contribution of cognitive radio systems in wireless networks and its architectures that enable the development of the cognitive radio network (both Centralized and distributed). 3. The technologies to allow an efficient use of TVWS for radio communications Discussion about various cognitive radio standards. 4. The various research challenges for deployment of cognitive radio network. 5. The knowledge in issues in next generation wireless networks 6. The current research scenario in this field	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Identify fundamental issues regarding dynamic spectrum access and radio-resource management.
	CO2	Understand Essential functions of the software radio, architecture of SDR
	CO3	Demonstrate energy issues in cognitive radio.
	CO4	Understand principle of cognitive techniques and AI techniques
	CO5	Illustrate functions and design rules of cognitive radio
	CO6	Identify layer issues and design cross layer
Course Content	**UNIT I** **INTRODUCTION TO SOFTWARE DEFINED RADIO**: Definitions and Potential Benefits, Software defined Radio, Architecture, Evolution, Technology Tradeoffs and Architecture Implications. **UNIT II** **SDR ARCHITECTURE**: Essential Functions of The Software defined Radio, Basic SDR, Hardware Architecture, Computational Processing Resources, Software Architecture, Top Level Component Interfaces, Interface Topologies Among Plug And Play Modules. **UNIT III** **INTRODUCTION TO COGNITIVE RADIOS**: Marking Radio Self-Aware, Cognitive Techniques – Position Awareness, Environment Awareness in Cognitive Radios, Optimization of Radio Resources, Artificial Intelligence Techniques. **UNIT IV** **COGNITIVE RADIO ARCHITECTURE:** Cognitive Radio – Functions, Components And Design Rules, Cognition Cycle – Orient, Plan, Decide and act Phases, Inference Hierarchy, Architecture Maps, Building the Cognitive Radio Architecture On Software Defined Radio Architecture. **UNIT V** **NEXT GENERATION WIRELESS NETWORKS**: The XG Network Architecture, Spectrum Sensing, Spectrum Management, Spectrum Mobility, Spectrum Sharing, Upper Layer Issues, Cross – Layer Design.	

Course Content	**UNIT VI** **COGNITIVE TECHNIQUES: PHYSICAL AND LINK LAYERS:** Introduction, Optimizing physical and Link Layers for Multiple-Objectives, Under Current Channel Conditions, Defining the Cognitive Radio, developing Radio Controls (Knobs) and Performance Measures (Meters), multi object decision making Theory and Its Application to Cognitive Radio , The Multi-objective genetic algorithm for Cognitive Radios, Advanced GA Techniques ,Need for a Higher-Layer Intelligence.
Text Books and Reference Books	**TEXT BOOKS:** 1. Joseph Mitola III,"Software Radio Architecture: Object-Oriented Approaches To Wireless System Engineering", John Wiley & Sons Ltd. 2000. 2. Thomas W.Rondeau, Charles W. Bostain, "Artificial Intelligence in Wireless Communication", ARTECH HOUSE .2009. 3. Bruce A. Fette, "Cognitive Radio Technology", Elsevier, 2009. 4. Ian F. Akyildiz, Won – Yeol Lee, Mehmet C. Vuran, Shantidev Mohanty, "Next Generation / Dynamic Spectrum Access / Cognitive Radio Wireless Networks: A Survey" Elsevier Computer Networks, May 2006. **REFERENCES BOOKS:** 1. Simon Haykin, "Cognitive Radio: Brain –Empowered Wireless Communications", IEEE Journal on Selected Areas in Communications, Feb 2005. 2. Hasari Celebi, Huseyin Arslan, "Enabling Location And Environment Awareness In Cognitive Radios", Elsevier Computer Communications, Jan 2008. 3. Markus Dillinger, Kambiz Madani, Nancy Alonistioti, "Software Defined Radio", John Wiley, 2003.
E-Resources	1. http://www.nptel.ac.in. 2. http:/www.ebookee.com/ Cognitive Radio Communication and Networks.

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	-	-	-	-	-	-	2
CO2	3	2	2	2	2	-	-	-	-	-	-	2
CO3	3	2	2	2	2	-	-	-	-	-	-	2
CO4	3	2	2	2	2	-	-	-	-	-	-	2
CO5	3	2	1	2	1	-	-	-	-	-	-	1
CO6	3	2	1	2	1	-	-	-	-	-	-	1

19EC31E3 – OPTOELETRONICS

Course category:	Program Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 – 0
Prerequisite:	Engineering physics	**Sessional Evaluation :**	40
		External Evaluation:	60
		Total Marks:	100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The operation of semiconductor optoelectronic devices. 2. The Hetero junctions and quantum wells and their application to Optoelectronic devices. 3. The design, analysis and modelling of semiconductor lasers (D.C. & Modulation Properties). 4. The design and small-signal circuit modelling of various types of Photo Detectors. 5. The Fourier optics, nonlinear optical signal processing. 6. The Holography, pattern recognition.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Acquire knowledge about optical radiation, black body radiation and material interactions.
	CO2	Analyse radioactive processes, laser excitations and Gaussian characteristics of laser beam.
	CO3	Analyse Q-switching and mode locking.
	CO4	Analyse specific lasers, Helium, Neon, Argon ion, carbon dioxide, neodymium and Semiconductor free electron.
	CO5	Understand modulation of light, electro optic modulation, Acousto-optic modulation and magneto optic devices.
	CO6	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.

UNIT-III

SPECIFIC LASERS – Helium – Neon Laser, Argon ion Laser, Carbon dioxide Laser, Neodymium Laser, Semiconductor Laser, Free electron Laser

UNIT-IV

MODULATION OF LIGHT: Polarization, Light propagation in crystals, Electro-optic modulation, Acousto-optic modulation, Magneto-optic devices, Image Binarization using photographic process

UNIT-V

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-VI

ELECTRO-OPTIC SYSTEMS: Holography, phase contrast microscopy, Pattern recognition, Optical computing systems.

Text Books and Reference Books	**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	1. http://nptel.ac.in/courses/117103063/26 2. https://www.youtube.com/user/nptelhrd

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	1	-	-	-	-	-	-	2
CO2	2	2	2	1	1	-	-	-	-	-	-	2
CO3	2	2	2	1	1	-	-	-	-	-	-	2
CO4	3	2	2	1	1	-	-	-	-	-	-	2
CO5	3	2	1	1	1	-	-	-	-	-	-	1
CO6	3	2	1	1	1	-	-	-	-	-	-	1

19EC31E4 – RELIABILITY ENGINEERING

Course category:	Program Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 – 0
Prerequisite:	Basics of Analog and Digital communications Signals and Systems	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to:	
	1. To acquire Knowledge about Quality and reliability and Probability concepts and failure time of Electronic system. 2. To become familiar with system reliability and failure rates. 3. To cater the knowledge Device Reliability and faults. 4. To understand & analyze various Reliability Techniques of electronic systems. 5. Understanding the need of Reliability improvement methods of systems. 6. To analyze various Reliability Life Testing Methods	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Gain adequate knowledge about Quality and reliability and Probability concepts and failure time of Electronic system.
	CO2	Understand the system reliability and failure rates.
	CO3	Know about different faults and Device Reliability
	CO4	Able understand & analyze various Reliability Techniques of electronic systems.
	CO5	Analyse Reliability improvement methods of systems.
	CO6	Know about various Reliability Life Testing Methods
Course Content	**UNIT-I** **INTRODUCTION:** Quality and reliability, importance of reliability, reliability parameters, Methods of achieving reliability, Reliability fundamentals and bath tub curve, Reliability measures and parameters, Electronic system reliability, Hazard rate model, Probability concepts and failure time distribution. **UNIT-II** **SYSTEM RELIABILITY:** System reliability modeling, v-out of 'n' system, Analysis of complex reliability structures, System reliability estimation. Measure of central tendency and dispersion system reliability with constant and variable failure rates. **UNIT-III** **DEVICE RELIABILITY:** Accelerated life testing, Early life reliability, Long-term device reliability, Electrostatic discharge, Electrical stress, Steady state hazard rate. **UNIT-IV** **RELIABILITY TECHNIQUES:** Reliability prediction, Cut set, Tie set, FME set, PTA, Markov, Monte Carlo Simulation, Application to electronic systems. VLSI reliability: reliability screening and modeling, electrostatic discharge damage, Metal Electro-migration phenomena, dielectric breakdown, instabilities in ICs. **UNIT-V** **MAINTAINABILITY AND AVAILABILITY CONCEPTS:** Guidelines for design for maintainability, MITR, BIT / BITE facility, Spares provisioning, Electronics system, packaging and interconnections. Serial and parallel reliability maintainability and availability failure mechanisms, reliability data and analysis, Reliability improvement	

Course Content	methods. **UNIT-VI** **RELIABILITY LIFE TESTING METHODS:** Reliability Life Testing - Test time calculations, Burn-in testing, Acceptance testing, accelerated life testing and Experimental Design - Reliability Growth Testing - Growth process, Idealized growth curve and other growth modals.
Text Books and Reference Books	**TEXT BOOKS:** 1. David J. Klinger, Yoshinao Nakada and Maria A. Menendez, " AT & T Reliability Manual ", Von Nostrand Reinhold, New York, 5th Edition, 1998. 2. Gregg K. Hobbs, " Accelerated Reliability Engineering - HALT and HASS ", John Wiley & Sons, New York, 2000. 3. Lewis, " Introduction to Reliability Engineering ", 2nd Edition, Wiley International, 1996. **REFERENCE BOOKS:** 1. O' Connor, P.D.T., " Practical Reliability Engineering ", Hayden Book Company, New Jersey, 1981. 2. S. K. Sinha, Reliability and Life Testing, Wiley Eastern Ltd., 1986.
E-Resources	1. http://www.nptel.ac.in. 2. https://outofprint.cc/downloads/introduction-to-reliability-engineering-lewis.pdf

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	-	-	-	-	-	-	-	2
CO2	2	2	2	1	-	-	-	-	-	-	-	2
CO3	3	1	2	1	-	-	-	-	-	-	-	3
CO4	2	1	2	1	-	-	-	-	-	-	-	2
CO5	3	2	1	1	-	-	-	-	-	-	-	3
CO6	2	2	1	1	-	-	-	-	-	-	-	2

19AC3101 – AUDIT COURSE

HUMAN RESOURCE MANAGEMENT AND ORGANISATIONAL BEHAVIOUR

(Common to EEE & ECE)

Course category:	Humanities	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 – 0
Prerequisite:	-NIL-	**Sessional Evaluation :**	40
		External Evaluation:	60
		Total Marks:	100

Course Objectives	Students undergoing this course are expected to:	
	1. Familiarize the students about different aspects of managing people in the organizations from the stage of acquisition to development and retention. 2. Familiarize the students with the components of individual and group behavior in organizational setting and to help them learn behavioral skills in managing people at work	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	To understand HRM concepts and the role of HRM has to play in different aspects of HRM
	CO2	To understand the role of recruitment and selection in relation to the organizations.
	CO3	To understand job-based compensation scheme and performance management system and appraisals.
	CO4	To understand the development of organizational behavior and its importance in managing people at the workplace.
	CO5	To understand human behavior as an individual.
	CO6	To learn the foundation of group dynamics and management of different types of conflict at the workplace.
Course Content	**UNIT – I** Human Resource Management - Definition - Objectives - Functions - Scope - Importance - Computer Applications in Human Resource Management – characteristics of a good Human Resource Manager - Human Resource Planning - Job design. **UNIT – II** Recruitment and Selection - Sources of Recruitment - Selection Process - Test Types in selection-Interview Types - Placement and Induction- Training - Methods of Training. **UNIT-III** Performance Appraisal - Methods of Performance Appraisal - Transfers - Promotion - Wage & Salary Administration - Wage Incentive - Fringe Benefits . **UNIT-IV** .Definition, need and importance of organizational behaviour – Nature and scope – Frame work – Organizational behaviour models. Personality – types – Factors influencing personality – Theories – Learning – Types of learners – The learning process – Learning theories **UNIT-V** Attitudes – Characteristics – Components – Formation – Measurement- Values.	

Course Content	Perceptions – Importance – Factors influencing perception – Interpersonal perception- Impression Management. **UNIT-VI** Group dynamics- cohesiveness and productivity- Group decision making- Groups versus teams- Managing organizational conflict: sources, levels and types of conflict- Conflict resolution.
Text Books and Reference Books	**TEXT BOOKS:** 1. Human Resource Management - Dr. C.B. Gupta - Sultan and Sons. 2. Personnel & Human Resource Management - P. SubbaRao - Himalaya Publishing House. 3. Organisational Behaviour- L. M Prasad, S. Chand Publishers, New Delhi. 4. Organisational Behavior- Stephen P. Robins- PHI Learning / Pearson Education. **REFERENCE BOOKS:** 1. Human Resource and Personnel Management - K. Aswathappa - Tata McGraw Hill Publishing Co. Ltd. 2. Organizational Behaviour - Fred Luthans McGrawhill ,NewYork

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	2	2	2	2	2	3
CO2	-	-	-	-	-	2	2	2	2	2	2	3
CO3	-	-	-	-	-	2	1	1	1	2	2	3
CO4	-	-	-	-	-	2	1	1	1	2	2	3
CO5	-	-	-	-	-	2	1	1	1	2	1	3
CO6	-	-	-	-	-	2	2	2	2	2	1	2

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR

(AUTONOMOUS)

(AFFILIATED TO JNTU ANANTAPUR: ANANTHAPURAMU)

SPSR NELLORE DIST

III YEAR OF FOUR-YEAR B.TECH DEGREE COURSE – II SEMESTER

ELECTRONICS AND COMMUNICATION ENGINEERING

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the academic year 2019-2020)

(For the batch admitted in the academic year 2021-2022)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation									
							Sessional-I Marks			Sessional-II Marks			Total Sessional Marks(40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Test$^{\$}$-I	A$^{\#}$-I	Max. Marks	Test$^{\$}$-II	A$^{\#}$-II	Max. Marks		Duration In Hours	Max. Marks	100
1	19EC3201	Information Theory and Coding	3	0	-	3	34	6	40	34	6	40	0.8*Best of two+0.2* least of two	3	60	100
2	19EC3202	VLSI Design	2	1	-	3	34	6	40	34	6	40		3	60	100
3	19EC3203	Computer Networks	3	0	-	3	34	6	40	34	6	40		3	60	100
4	19EC3204	Fiber Optical Communication	3	0	-	3	34	6	40	34	6	40		3	60	100
5	19EC32EX	Program Elective-II	3	0	-	3	34	6	40	34	6	40		3	60	100
		PRACTICALS														
6	19EC32P1	Digital Communication Lab	-	-	3	1.5	-	-	-	-	-	40	Day to Day Evaluation and a test (40 Marks)	3	60	100
7	19EC32P2	Digital Signal Processing Lab	-	-	3	1.5	-	-	-	-	-	40		3	60	100
8	19EC32MP	Mini Project	-	-	4	2	-	-	-	-	-	40		3	60	100
9	19EC32IS	Internship	-	-	-	2	-	-	-	-	-	-		-	-	-
		TOTAL	14	1	10	22	-	-	-	-	-	320	-	-	480	800

***** Common to ECE & EEE.

**Common to, ECE, EEE, CE & ME,

PE-Program Elective, **OE**-Open Elective

A for Assignment (continuous evaluation), $ Test (Descriptive & Objective) duration = 2 Hours,

19EC3201 – INFORMATION THEORY AND CODING

Course category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0- 0
Prerequisite:	Data types, Communication theory, basics of computer networks	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The Mutual information, information rate, channel capacity, redundancy and efficiency of channels. 2. The discrete and continuous channels. 3. The Construction of basic source codes – Shannon-Fano algorithm, Huffman coding, Arithmetic coding, ZIP coding. 4. The Standard array and Syndrome decoding, Hamming codes, Encoding and decoding of systematic and unsystematic codes. 5. The Decoding of cyclic codes, BCH codes, RS codes, Burst error correction. 6. The Sequential decoding, Stack algorithm, Block and convolutional interleaving.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the fundamentals of information Theory.
	CO2	Explain different type of discrete channels and continuous channels
	CO3	Learn various coding techniques and algorithms.
	CO4	Know the different types of Codes for Error Detection and Correction
	CO5	Understand the Syndrome computation and error detection, Decoding of cyclic codes
	CO6	Know the Tree and Trellis diagrams, Maximum likelihood decoding of convolutional codes

Course Content

UNIT I

INFORMATION THEORY – Concept of amount of information -units, Entropy - Marginal, Conditional and Joint entropies -Relation among entropies, Mutual information, information rate, channel capacity, redundancy and efficiency of channels.

UNIT II

DISCRETE CHANNELS – Symmetric channels, Binary Symmetric Channel, Binary Erasure Channel, Cascaded channels, repetition of symbols, Binary unsymmetric channel, Shannon theorem.

CONTINUOUS CHANNELS – Capacity of band limited Gaussian channels, Shannon-Hartley theorem, Trade off between Bandwidth and signal to noise ratio, Capacity of a channel with infinite band width, Optimum modulation system.

UNIT III

SOURCE CODING – Encoding techniques, Purpose of encoding, Instantaneous codes, Construction of instantaneous codes, Kraft's inequality, Coding efficiency and redundancy, Noiseless coding theorem. Construction of basic source codes – Shannon-Fano algorithm, Huffman coding, Arithmetic coding, ZIP coding.

UNIT IV

CODES FOR ERROR DETECTION AND CORRECTION – Parity check coding, Linear block codes, Error detecting and correcting capabilities, Generator and Parity check matrices, Standard array and Syndrome decoding, Hamming codes, Encoding and decoding of systematic and unsystematic codes.

Course Content	**UNIT V** **CYCLIC CODES –** Generator polynomial, Generator and Parity check matrices, Encoding of cyclic codes, Syndrome computation and error detection, Decoding of cyclic codes, BCH codes, RS codes, Burst error correction. **UNIT VI** **CONVOLUTIONAL CODES** – Encoding- State, Tree and Trellis diagrams, Maximum likelihood decoding of convolutional codes -Viterby algorithm, Sequential decoding - Stack algorithm. Block and convolutional interleaving, CIRC encoding and decoding.
Text Books and Reference Books	**TEXT BOOKS:** 1. Communication Systems Simon Haykin, John Wiley & Sons. Pvt. Ltd. 2. Principles of Communication Systems Taub & Schilling, Tata McGraw-Hill 3. Principles of Digital Communication Das, Mullick & Chatterjee, Wiley Eastern Ltd. **REFERENCE BOOKS:** 1. Error Control Coding Fundamentals and Applications Shu Lin & Daniel J. Costello Jr., Prentice Hall Inc. 2. Digital Communications Fundamentals and Applications Bernard Sklar, Person Education Asia
E-Resources	1. https://nptel.ac.in/courses/106105082

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	2	-
CO2	3	2	2	-	-	-	-	1	-	-	2	-
CO3	3	3	2	1	1	-	1	1	-	-	2	1
CO4	3	3	1	1	1	-	1	1	-	-	2	1
CO5	3	3	1	1	1	-	1	2	1	1	1	1
CO6	3	3	1	1	1	-	1	2	1	1	1	1

19EC3202 – VLSI DESIGN

Course category:	Program Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0- 0
Prerequisite:	Electronic Devices & Circuits, Linear & Digital ICs and Basics of IC Fabrication	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected:	
	1. To introduce the fundamental structures of VLSI Systems at the lowest levels of System abstraction. 2. To know the basic electrical properties of MOS & BI-CMOS circuits 3. To understand the Basic Circuit Concepts and design process of VLSI circuits and also to introduce the fundamental principles of VLSI circuit design. 4. To know the Gate level design and physical design by considering partioning, floor Planning, Placement and Routing. 5. To bring both Circuits and System views on design together by considering circuit Subsystems and VLSI Design styles. 6. To have a profound understanding of the design of complex digital VLSI circuits, computer aided simulation and synthesis tool for hardware design	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Know the trends in semiconductor technology, and how it impacts scaling and performance.
	CO2	analyze the basic electrical characterstics of MOS & BI-CMOS circuits
	CO3	Learn Layout, Stick diagrams, Fabrication steps, Static and Switching characteristics of inverters
	CO4	Estimate delay in circuits and knows routing techniques for clock and power
	CO5	Understand design styles in VLSI like full-custom, FPGA etc.
	CO6	Discriminate various faults in circuits and to develop fault-modeling synthesis.
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. **UNIT-II** **BASIC ELECTRICAL PROPERTIES OF MOS & Bi-CMOS CIRCUITS:** I_{ds}-V_{ds} relationships, MOSFET threshold voltage, g_m, g_{ds}, ω_o, Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design Bi-CMOS inverters. **UNIT-III** **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 Diagrams for NMOS and CMOS Inverters and gates , Scaling of MOS circuits, Limitation of Scaling. **UNIT-IV** **GATE LEVEL DESIGN:** Logic gates and other Complex gates, Switch Logic, Alternate Gate circuits.	

Course Content	**PHYSICAL DESIGN:** Floor- Planning, Placement, routing, Power delay estimation, Clock and Power routing **UNIT-V** **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-VI** **VHDL Synthesis:** VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout, Design capture tools, Design Verification Tools. **TEST AND TESTABILITY:** Fault-modelling and simulation, test generation, design for testability, Built-in self-test.
Text Books and Reference Books	**TEXT BOOKS:** 1. Essentials of VLSI circuits and Systems – Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, PHI, 2005 Edition. 2. Principles of CMOS VLSI Design- Weste and Eshraghian, Pearson Education,1999 3. ASIC Design Flow by Smith. **REFERENCE BOOKS:** 1. D. Roy Chowdhury. Linear Integrated circuits, New Age International Edition(2003) 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	1. http://nptel.ac.in/courses 2. http://tocs.ulb.tu-darmstadt.de/35621702.pdf 3. http://www.ulb.tu-darmstadt.de/tocs/23570458.pdf 4. http://www.academia.edu/download/30922844/L1-print.pdf

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	-	3	-	2	2	-	-	-	3
CO2	3	3	3	1	2	-	-	2	-	-	-	2
CO3	3	2	3	1	1	-	-	-	-	-	-	3
CO4	3	2	2	1	2	-	-	-	-	-	-	2
CO5	3	2	2	1	1	-	-	2	-	-	-	3
CO6	3	2	3	-	3	-	-	2	-	-	-	3

19EC3203 – COMPUTER NETWORKS

Course category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0- 0
Prerequisite:	Data types, Communication theory, basics of computer networks	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to:	
	1.Become familiar with the fundamentals of parallel and serial data transmission 2. Acquire the Knowledge about various Local Area Networks & Routing algorithms 3. Acquire knowledge about principles and techniques of different network layer design issues 4. Understand the Data compression techniques & Cryptography 5. Understand the presentation layer. 6. Become familiar with the World wide web, web browsers & web servers	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the basics of communication, and different models of data transmission
	CO2	Studies different types of networks, and various protocols for data transmission
	CO3	Understand the Local Area Networks.
	CO4	Studies design issues of Link layers.
	CO5	Understand the error detection and correction schemes
	CO6	Create tables using external media and tries to Design webpage

Course Content

UNIT-I

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.

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.

UNIT-III

DATA LINK LAYER: Design issues Error detection and correction, sliding window protocols. Wide area network standards, SDLC, HDLC, X 25 protocols.

UNIT-IV

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-V

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.

Course Content	**UNIT-VI** **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.
Text Books and Reference Books	**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
E-Resources	https://nptel.ac.in/courses/106105082

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	-	2	2	-	-	-	-	-	2
CO2	3	3	2	-	2	-	-	-	-	-	-	2
CO3	2	3	2	1	-	-	-	-	-	-	-	2
CO4	3	3	2	1	-	-	-	-	-	-	-	2
CO5	2	3	1	1	-	-	-	-	-	-	-	2
CO6	3	3	1	1	-	-	2	-	-	-	-	2

19EC3204 – FIBER OPTICAL COMMUNICATION

Course category:	Program Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 – 0
Prerequisite:	Electro Magnetic Fields and waves, Antenna and Wave Propagation, Electronic Devices and Circuits.	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	7. An overview of the Ray theory. 8. Optical materials, dispersion, diffraction, absorption, scattering, fiber losses, fiber modes and configurations, fiber types and rays and fiber materials. 9. L.E.D., Lasers and their excitations and noises of light sources and coupling to single mode fibers, splicing and connectors. 10. The operating principles of optical Detectors and Receivers. 11. The behavior of the optical amplifiers, semiconductor and doped optical amplifiers, and optical networks. 12. The knowledge of measurement of optical parameters and applications of optical fibers in different fields.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Acquire knowledge about optical materials, fiber characteristics, classification with different losses.
	CO2	Understand the fibre modes, configurations and fibre materials for proper optical propagation.
	CO3	Acquire knowledge of L.E.D., Laser excitations, fiber noises, coupling of fibers and its receivers.
	CO4	Analyse optical sources and detectors and receivers' performance and calculation
	CO5	Understand the optical amplifiers and basic noise networks in optical fiber applications.
	CO6	Understand the measurements of optical parameters and applications of optical fibers in different fields.
Course Content	**UNIT-I** **INTRODUCTION TO OPTICAL FIBERS**: Introduction- Ray theory transmission- Total internal reflection-Acceptance angle –Numerical aperture – Skew rays – Electromagnetic mode theory of optical propagation –EM waves modes in planar Guide – phase and group velocity – cylindrical fibers – SM fibers. **UNIT –II** **TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS:** Attenuation – Material absorption losses in silica glass fibers – Linear and Nonlinear Scattering losses - Fiber Bend losses – Midband and Farband infrared Transmission – Intra and inter Modal Dispersion – Over all Fiber Dispersion – Polarization- nonlinear Phenomena. Optical fiber connectors, Fiber alignment and Joint Losses – Fiber Splices – Fiber connectors –Expanded Beam Connectors – Fiber Couplers. **UNIT –III** **FIBER OPTICAL SOURCES**: Light Emitting Diodes, LED structures, Surface and edge emitters, mono and hetero structures - internal - quantum efficiency, injection	

Course Content	laser diode structures - comparison of LED and ILD **UNIT –IV** **FIBER OPTICAL DETECTORS AND RECEIVERS:** **OPTICAL DETECTORS**: PIN Photo detectors, Avalanche photo diodes, construction, characteristics and properties, Comparison of performance, Photo detector noise -Noise sources, Signal to Noise ratio, Detector response time. **OPTICAL RECEIVERS**: Fundamental receiver operation, Pre amplifiers, Error sources – Receiver Configuration-Probability of Error – Quantum limit. **UNIT- V** **FIBER OPTICAL AMPLIFIERS AND NETWORKS**: Semiconductor Optical amplifiers – EDFA- Raman amplifier. **WDM SYSTEM**: Principles of WDM networks. Nonlinear effects in fiber optic links. Concept of self-phase modulation, group velocity dispersion and solution based communication. **UNIT- VI** **FIBER OPTICAL MEASUREMENTS**: Fiber Attenuation measurements-Dispersion measurements –Fiber Refractive index profile measurements – Fiber cut-off Wavelength Measurements –Fiber Numerical Aperture Measurements – Fiber diameter measurements. **OPTICAL FIBER APPLICATIONS**: Telephony Telemetry- video distribution and military applications.
Text Books and Reference Books	**TEXT BOOKS:** 1. "Optical Communications", C. Gerd Keiser 3rd Edition, Mc Graw-Hill-2000. 2. "Optical Fiber Communication", John M Senior, Pearson publications. **REFERENCE BOOKS:** 1. Electronic Communications Systems-Williams Schweber, 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	1. http://nptel.ac.in/courses/117103063/1 2. https://www.youtube.com/user/nptelhrd

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	2
CO2	3	2	2	-	-	-	-	-	-	-	-	2
CO3	3	3	2	1	-	-	-	-	-	-	-	3
CO4	3	3	1	1	-	-	-	-	-	-	-	3
CO5	3	3	1	1	-	-	-	-	-	-	-	3
CO6	3	3	1	1	-	-	-	-	-	-	-	3

19EC32P1-DIGITAL COMMUNICATION LAB

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Practical	**Lecture-Tutorial- Practice:**	0 - 0 - 3
Prerequisite:	Analog Communication, Digital Communication and Information Theory & Coding.	**Sessional Evaluation:** **External Evaluation :** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand: 1. Analog signal sampling and re-construction. 2. Different modulation and demodulation schemes. 3. The encoder and decoders of Linear Block Codes. 4. The Binary Cyclic Code encoder and decoder.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Modulate and demodulate a message Signal with a high frequency carrier using DM.
	CO2	Modulate and demodulate a message Signal with a high frequency carrier using PCM
	CO3	Understand signal sampling and re-construction
	CO4	Understand time division multiplexing & de-multiplexing
	CO5	Know the different shift keying methods.
	CO6	Understand the encoder and decoders of Linear Block Codes.
Course Content	**LIST OF EXPERIMENTS** 1. Verifying Sampling Theorem. 2. Time Division Multiplexing and De-multiplexing. 3. Pulse Code Modulation and Demodulation. 4. Differential Pulse Code Modulation and Demodulation. 5. Delta Modulation and Demodulation. 6. Amplitude Shift Keying Modulation and Demodulation. 7. Frequency Shift Keying Modulation and Demodulation. 8. Binary Phase Shift Keying Modulation and Demodulation. 9. Differential Phase Shift Keying Modulation and Demodulation. 10. Linear Block Code-Encoder and Decoder. 11. Binary Cyclic Code- Encoder and Decoder. 12. Companding.	

19EC32P2 – DIGITAL SIGNAL PROCESSING LAB

<table>
<tr><td>Course Category:</td><td>Program Core</td><td>Credits:</td><td>1.5</td></tr>
<tr><td>Course Type:</td><td>Practical</td><td>Lecture-Tutorial- Practice:</td><td>0 - 0 - 3</td></tr>
<tr><td>Prerequisite:</td><td>Signals and system, digital signal processing and digital image processing.</td><td>Sessional Evaluation:
External Evaluation :
Total Marks:</td><td>40
60
100</td></tr>
<tr><td>Course Objectives</td><td colspan="3">Students undergoing this course are expected to understand:
1. Basic operations varies filters and images.
2. Verification of various systems.</td></tr>
<tr><td>Course Outcomes</td><td colspan="3">Upon successful completion of the course , the students will be able to:
CO1 Generate various filters using MAT lab.
CO2 Find the Inverse z-transform using residue method.
CO3 Perform linear convolution and cross correlation of two sequences.
CO4 Compute the DFT and IDFT of a given sequence.
CO5 Perform linear convolution using DFT
CO6 Design digital band pass and band stop filters.</td></tr>
<tr><td>Course Content</td><td colspan="3">LIST OF SIGNAL PROCESSING EXPRIMENTS
1. Generation of discrete time signals like sine, cosine, exponential, square and sawtooth
2. Perform linear convolution and cross correlation of two sequences.
3. Constant co-efficient difference equation.
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 Chebyshew 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.</td></tr>
</table>

S.No	COURSE CODE	ELECTIVE-II
1.	19EC32E1	MACHINE LEARNING
2.	19EC32E2	PRINCIPLES OF MODERN RADAR SYSTEMS
3.	19EC32E3	ADAPTIVE SIGNAL PROCESSING
4.	19EC32E4	TELECOMMUNICATION & SWITCHING NETWORKS

19EC32E1 – MACHINE LEARNING

Course category:	Program Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0- 0
Prerequisite:	Probability Theory and Linear Algebra.	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected:	
	1. To introduce fundamental concepts in machine learning and popular machine learning algorithms. 2. To become familiar with the fundamentals of Supervised Learning techniques 3. To understand & analyze various Unsupervised Learning techniques. 4. To acquire knowledge on principles and techniques of Artificial Neural Networks. 5. To understand different types of Perceptron. 6. To have a profound understanding of Computational Learning Theory.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the fundamental principles, techniques and applications of Machine Learning.
	CO2	Design and implement machine-learning solutions to classification, regression and clustering problems.
	CO3	Evaluate and interpret the results of the Unsupervised Learning techniques.
	CO4	Design the neural network to meet the needs of control systems and pattern classification issues.
	CO5	Recognize and Implement various ways of selecting suitable model parameters for different Machine Learning techniques.
	CO6	Gain the knowledge of Computational Learning Theory.
Course Content	**UNIT – I** **MACHINE LEARNING**: Introduction, Review of Probability Theory and Linear Algebra, Basic definitions of machine learning, types and applications of machine learning, hypothesis space and inductive bias, evaluation, cross-validation. **UNIT - II** **SUPERVISED LEARNING:** Introduction, Linear methods for classification, Linear methods for regression, Support Vector Machine, SVM- the dual formulation, SVM- the maximum margin with noise, Decision trees, over fitting. **UNIT – III** **UNSUPERVISED LEARNING:** Introduction, Instance based learning: K- Nearest neighbour, Feature selection, Feature Extraction, Collaborative filtering based recommendation, Bayesian learning, Naïve Bayes, Bayesian network, Kernel functions, Non-linear SVM with kernel function. **UNIT – IV** **NEURAL NETWORKS:** Introduction, Biological neurons, Artificial neurons, Mc.Culloch-Pitts model, Neuron Modelling for artificial neural systems, Feed forward network, Feedback network, Types of neural networks.	

Course Content	**UNIT – V** **PERCEPTRON:** Introduction, Exclusive OR problem, Single layer perceptron network, Multilayer feed forward networks, Pattern classification, Delta learning rule for multilayer perceptron, Error back propagation algorithm. **UNIT - VI** **COMPUTATIONAL LEARNING THEORY:** Introduction, PAC learning model, Sample complexity, VC Dimension, Ensemble learning, Introduction to Clustering, k-means clustering, adaptive hierarchical clustering.
Text Books and Reference Books	**TEXT BOOKS:** 1. Mitchell Tom, Machine Learning, McGraw Hill, 1997. 2. Christopher Bishop, Pattern Recognition and Machine Learning, Springer 2006. 3. Jacek M. Zurada, Introduction to Artificial Neural Systems, Jaico Publications. **REFERENCE BOOKS:** 1. Richard O. Duda, Peter E. Hart, David G. Stork. Pattern classification (2nd edition). Wiley, New York, 2001. 2. Nikola K.Kasabov, Foundations of Neural Networks, Fuzzy Systems and Knowled Engineering (The MIT Press)
E-Resources	1. https://onlinecourses.nptel.ac.in/noc18_cs40 2. http://nptel.ac.in/courses/108104049/13

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	1	-	-	-	2
CO2	3	3	3	2	-	-	-	1	-	-	-	2
CO3	3	3	3	1	-	-	-	1	-	-	-	2
CO4	3	2	3	2	-	-	-	1	-	-	-	2
CO5	3	2	3	2	-	-	-	2	-	-	-	3
CO6	3	3	3	2	-	-	-	2	-	-	-	3

17EC32E2 – PRINCIPLES OF MODERN RADAR SYSTEMS

Course category:	Program Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0- 0
Prerequisite:	Analog and digital communication systems, Microwave techniques and Radiating systems.	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to:	
	1. Analyze the fundamentals of radar block diagram and range equation. 2. Understand different components of radar system. 3. Know types of radar systems. 4. Illustrate Radar detection techniques. 5. Learn special radars. 6. Understand fundamentals ECM and ECCM.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the components of a radar system and their relationship to overall system and measure of performance.
	CO2	Analyze the performance of radar components.
	CO3	Familiarized in different radar systems.
	CO4	Develop skills in designing Radar systems in different noise environments.
	CO5	Demonstrate knowledge in special radars.
	CO6	Describe the fundamentals ECM and ECCM.
Course Content	**UNIT-I** **THE NATURE OF RADAR**: The simple form of the Radar equation, Radar block diagram and operation, Radar frequencies and Applications of Radar. Minimum Detectable signal, Receiver noise, Probability Density 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 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- IV** **RADAR DETECTION TECHNIQUES:** Coherent & Non-Coherent Detection – Matched Filters-Different methods of Integration of Pulse Trains – Detection of Fluctuating Targets – Fluctuation laws – Diversity gain – Binary Integration of Fluctuation Targets – Cumulative Integration of Fluctuating Targets – Sequential	

Course Content	Detection with Rapid Confirmation – Constant False Alarm Rate Detection – Cell Averaging – Two Parameter Averaging & Non-Parametric Averaging. **UNIT-V** **SPECIAL RADARS:** Bi-Static Radar – Synthetic Aperture Radar – HF Over The Horizon Radar –Air Surveillance Radar– Height Finder & 3D radar. **UNIT-VI** **RADAR ELECTRONIC COUNTER MEASURES (ECM) AND ELECTRONIC COUNTER-COUNTER MEASURES (ECCM):** Noise Jamming of Surveillance Radar – Detection Range in Noise Jamming – ECCM Provisions for Surveillance Radar – Objective of ECM.
Text Books and Reference Books	**TEXT BOOKS:** 1. David. K. Barton-"Modern Radar Systems"- Artech House INC 1988. 2. Introduction to Radar Systems-Merrill. I. Skolnik, TMH, 2nd Edition, 2007. 3. Radar: Principles, Technology and Applications-Byron Edde, Pearson Education, 2004. **REFERENCE BOOKS:** 1. Microwave and Radar Engineering- M. Kulakarni, Umesh Publications, 4th Edition, 2012. 2. Hamish. D. Meikle- "Modern Radar Systems" - Artech House INC 1988. David. K. Barton-"Radar system Analysis & Modeling" - Artech House INC 2003.
E-Resources	1. https://www.ll.mit.edu/outreach/introduction-radar-systems 2. http://lej4learning.com.pk/videos-introduction-to-radar-systems-mit/

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	-	-	2
CO2	3	2	2	2	-	-	-	-	-	-	-	3
CO3	3	3	2	2	-	-	-	-	-	-	-	2
CO4	3	3	2	1	-	-	-	-	-	-	-	2
CO5	3	3	2	2	-	-	-	-	-	-	-	2
CO6	3	3	2	1	-	-	-	-	-	-	-	3

19EC32E3- ADAPTIVE SIGNAL PROCESSING

Course Category:	Program Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practical:**	3-0-0
Prerequisite:	Signals & Systems Digital Signal Processing	**Sessional Evaluation:** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The Definitions, Characteristics, Applications of adaptive systems 2. The Methods & Ideas of Gradient Search methods, Gradient Searching Algorithm & its Solution 3. The steepest descent algorithms, eigen values and vectors 4. The LMS Adaptation algorithms, Stability & Performance analysis of LMS Algorithms 5. The Application of RLS algorithm on Adaptive Equalization. 6. The Variants of Kalman filtering, Extend Kalman filtering	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the concept of adaptive filter theory and develop a filter for any real time application.
	CO2	Know how to get desired response from a filter and various searching methods.
	CO3	Design a filter using Steepest Descent algorithm and LMS algorithm.
	CO4	Compare Eigen filters with LMS algorithm in any real time application.
	CO5	Apply RLS algorithm design an adaptive filter equalization and Kalman filtering.
	CO6	Develop an adaptive filter for target tracking using only DOA.

Course Content

UNIT I

INTRODUCTION TO ADAPTIVE SYSTEMS: Definitions, Characteristics, Applications, Example of an Adaptive System. The Adaptive Linear Combiner - Description, Weight Vectors, Desired Response Performance function, Gradient & Mean Square Error.

UNIT II

DEVELOPMENT OF ADAPTIVE FILTER THEORY AND SEARCHING METHODS: Introduction to Filtering, Smoothing and Prediction, Linear Optimum Filtering, Problem statement, Principle of Orthogonality - Minimum Mean Square Error, Wiener- Hopf equations, Error Performance - Minimum Mean Square Error. Methods & Ideas of Gradient Search methods, Gradient Searching Algorithm & its Solution, Stability & Rate of convergence - Learning Curves.

UNIT III

STEEPEST DESCENT ALGORITHMS, EIGEN VALUES AND VECTORS: Gradient Search by Newton's Method, Method of Steepest Descent, Comparison of Learning Curves. Eigen Value Problem, Properties of Eigen values and Eigen vectors, Eigen Filters, Eigen Value computations.

UNIT IV

LMS ALGORITHM & APPLICATIONS: Overview - LMS Adaptation algorithms, Stability & Performance analysis of LMS Algorithms - LMS Gradient & Stochastic

Course Content	algorithms, Convergence of LMS algorithm, Noise cancellation, Cancellation of Echoes in long distance telephone circuits. **UNIT-V** **RLS ALGORITHM** : Matrix Inversion lemma, Exponentially weighted recursive least square algorithm, update recursion for the sum of weighted error squares, convergence analysis of RLS Algorithm, Application of RLS algorithm on Adaptive Equalization. **UNIT-VI** **KALMAN FILTERING:** Statement of Kalman filtering problem, Filtering, Initial conditions, Variants of Kalman filtering, Extend Kalman filtering, Introduction to Recursive Mean Square Estimation Random variables, Target tracking using only DOA.
Text Books and Reference Books	**TEXT BOOKS:** 1. Adaptive signal processing- Bernard Widrow, Samuel D.Strearns, 2005, PE. 2. Adaptive Filter Theory - Simon Haykin-, 4th ed., 2002, PE Asia **REFERENCE BOOKS:** 1. Optimum signal processing: An introduction - Sophocles. J. Orfamadis, 2 ed., 1988, McGraw-Hill, New York 2. Adaptive signal processing-Theory and Applications, S.Thomas Alexander, 1986, Springer-Verilog.
E-Resources	https://nptel.ac.in/courses/117105075/

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	-	-	-	-	-	-	-	2
CO2	3	2	2	2	-	-	-	-	-	-	-	2
CO3	3	3	3	2	-	-	-	-	-	-	-	3
CO4	3	3	3	1	-	-	-	-	-	-	-	3
CO5	3	3	3	1	1	1	-	-	-	-	-	3
CO6	3	3	3	1	1	1	-	-	-	-	-	3

19EC32E4 – TELECOMMUNICATION & SWITCHING NETWORKS

Course category:	Program Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0- 0
Prerequisite:	Basics of Analog and Digital communication signals and Systems	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected:	
	1. To teach the basic concepts of analog and digital communication principles. 2. To educate the students about the concepts and principles of optical fiber communications 3. To get the knowledge and principles learnt to analyze, design, install and manage typical wired and wireless communication systems and networks 4. To educate the students satellite communication systems, public switched telephone networks, digital transmission system standards. 5. To get the knowledge about network planning and principle of digital Switching systems. 6. To educate the students about tele traffic theory	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand various multiplexers techniques like TDM, FDM, BPSK in different communication networks.
	CO2	Memorize SONET optical standards and describes frequency justification and utilization with different techniques.
	CO3	Describe network planning and principle of digital switching systems for proper network management.
	CO4	Understand the principles of network synchronization control and management with switching techniques.
	CO5	Gain the knowledge and principles digital subscriber access, ISDN and Network Blocking.
	CO6	Understand the Public switched telephone networks, tele traffic theory, digital transmission system standards and Digital Subscriber Loops.
Course Content	**UNIT-I** **MULTIPLEXING:** Introduction, Transmission Systems, FDM Multiplexing And Modulation, Time Division Multiplexing, Digital Transmission and Multiplexing, Pulse Transmission and line coding, Binary n-zero substitution, Digital bi phase, differential encoding, Time Division Multiplex loops and rings. **UNIT-II** SONET Multiplexing Overview, SONET Frame Formats, SONET operations, Administration and maintenance, Payload framing and frequency justification ,Virtual tributaries, ds3 Payload mapping, E4Payload mapping, SONET optical standards, networks, SONET rings: unidirectional, path switched bidirectional line switched rings **UNIT-III** **DIGITAL SWITCHING:** Switching Functions, Space division Switching, Time Division Switching, Two dimensional Switching: STS Switching, TST Switching, No.4 ESS Toll Switch, Digital Cross Connect Systems, Digital Switching In Analog Environment, Elements of SS7signaling.	

Course Content	**UNIT-IV** **NETWORK SYNCHRONIZATION CONTROL AND MANAGEMENT:** Timing, timing recovery, Phase locked loop, Clock instability, jitter measurements, Systematic jitter, Timing inaccuracies: slips, Asynchronous Multiplexing, Network synchronization, U.S. Network synchronization, Network Control, Network Management **UNIT-V** **DIGITAL SUBSCRIBER ACCESS, ISDN:** ISDN Basic Rate Access Architecture, ISDN U interface, ISDN D channel protocol, High Data Rate Digital Subscriber Loops, Asymmetric Digital Subscriber Line, VDSL, Digital Loop Carrier Systems, Universal Digital Loop Carrier Systems, Integrated Digital Loop Carrier Systems, Next generation Digital Loop Carrier , Fiber in the loop, Hybrid fiber coax systems, Voice band modems: pcm modems, Local microwave distribution service, Digital satellite services **UNIT-VI** **TRAFFIC ANALYSIS:** Traffic Characterization, Arrival Distribution, Holding Time Distribution, Loss Systems, Network Blocking Probabilities, End To End Blocking Probabilities, Overflow Traffic, Delay Systems, Exponential Service Times, Constant Service Time, Finite Queues
Text Books and Reference Books	**TEXT BOOKS:** 1. JE FLOOD, "Telecommunication Switching, Traffic and Networks" 2. Telecommunication Switching systems and networks by Viswanathan. **REFERENCE:** 1. J.Bellamy,"digital telephony", john wiley, 2003, 3rd edition 2. Fundamentals of Telecommunication Networks by T.N.Saawivi
E-Resources	1. http://www.nptel.ac.in. 2. http:/www.ebookee.com/Telecommunication switching networks

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	1	-	-	-	-	-	-	2
CO2	3	2	2	2	2	-	-	-	-	-	-	2
CO3	3	3	2	3	2	-	-	-	-	-	-	1
CO4	3	3	1	3	1	-	-	-	-	-	-	2
CO5	3	3	1	3	1	-	-	-	-	-	-	3
CO6	3	3	1	3	1	-	-	-	-	-	-	3

19EC32MP – MINI PROJECT

Course Category:	Program core	**Credits:**	2
Course Type:	Practical	**Lecture - Tutorial - Practical:**	0 - 0- 4
Prerequisite:	Basic idea of Electronics and communication	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

19EC32IS – INTERNSHIP

Course Category:	Program core	**Credits:**	2
Course Type:	Practical	**Lecture - Tutorial - Practical:**	0 - 0- 0
Prerequisite:	Basic idea of Electronics and communication	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	- - -

N.B.K.R. INSTITUTE OF SCIENCE & TECHNOLOGY

(AUTONOMOUS)

COLLEGE WITH POTENTIAL FOR EXCELLENCE (CPE)

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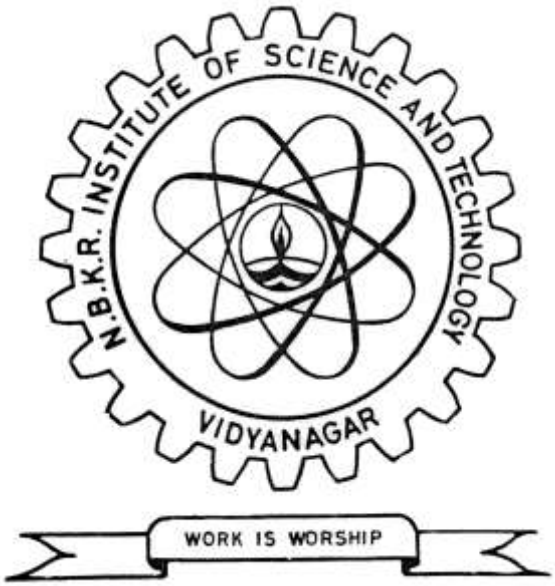

SYLLABUS

B.TECH. DEGREE COURSE

IV B.TECH

I & II Semesters

ELECTRONICS AND COMMUNICATION ENGINEERING

(With effect from the batch admitted in the academic year 2019-2020)

VIDYANAGAR - 524413

SPSR Nellore-Dist. Andhra Pradesh

www.nbkrist.org

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:

1. To provide a learner-centered environment that challenges individuals to actively participate in the education process.

2. To empower the faculty to excel in teaching while engaging in research, creativity and public service.

3. To develop effective learning skills enabling students pick up critical thinking thus crafting them professionally fit and ethically strong.

4. To reach out industries, schools and public agencies to partner and share human and academic resources.

VISION AND MISSION OF THE DEPARTMENT

Vision:

To develop high quality engineers with sound technical knowledge, skills, ethics and morals in order to meet the global technological and industrial requirements in the area of Electronics and Communication Engineering.

Mission:

1. To produce high quality graduates and post-graduates of Electronics and Communication Engineering with modern technical knowledge, professional skills and good attitudes in order to meet industry and society demands.
2. To develop graduates with an ability to work productively in a team with professional ethics and social responsibility.
3. To develop highly employable graduates and post graduates who can meet industrial requirements and bring innovations.
4. Moulding the students with foundation knowledge and skills to enable them to take up postgraduate programmes and research programmes at the premier institutes.

Programme Educational Objectives (PEOs):

1. To provide the students with strong fundamental and advanced knowledge in mathematics, Science and Engineering with respect to Electronics and Communication Engineering discipline with an emphasis to solve Engineering problems.

2. To prepare the students through well - designed curriculum to excel in bachelor degree programme in Electronics and Communication Engineering in order to engage in teaching or industrial or any technical profession and to pursue higher studies.

3. To train students with intensive and extensive engineering knowledge and skill so as to understand, analyze, design and create novel products and solutions in the field of Electronics and Communication Engineering.

4. To inculcate in students the professional and ethical attitude, effective communication skills, team spirit, multidisciplinary approach and ability to relate engineering issues to broader social context.

5. To provide students with an excellent academic environment to promote leadership qualities, character molding and lifelong learning as required for a successful professional career.

Program Outcomes (POs):

PO1: Ability to acquire and apply knowledge of science and engineering fundamentals in problem solving.

PO2: Acquire in-depth technical competence in a specific information technology discipline.

PO3: Ability to undertake problem identification, formulation and providing optimum solution.

PO4: Ability to utilize systems approach to design and evaluate operational performance.

PO5: Understanding of the principles of inter-disciplinary domains for sustainable development.

PO6: Understanding of professional & ethical responsibilities and commitment to them.

PO7: Ability to communicate effectively, not only with engineers but also with the community at large.

PO8: Ability to Communicate effectively on complex engineering activities with the engineering community and with society at large.

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

PO10: 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.

PO11: Understanding of the social, cultural, global and environmental responsibilities as a professional engineer.

PO12: Recognizing the need to undertake life-long learning, and possess/acquire the capacity to do so.

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR

(AUTONOMOUS)

(AFFILIATED TO JNTU ANANTAPUR: ANANTHAPURAMU)

SPSR NELLORE DIST

IV YEAR OF FOUR YEAR B.TECH DEGREE COURSE – I SEMESTER

ELECTRONICS AND COMMUNICATION ENGINEERING

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the academic year 2019-2020)

(For the batch admitted in the academic year 2019-2020)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation									
							Sessional-I Marks			Sessional-II Marks			Total Sessional Marks(40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Test$^{\$}$-I	A$^{\#}$-I	Max. Marks	Test$^{\$}$-II	A$^{\#}$-II	Max. Marks		Duration In Hours	Max. Marks	100
1	19SH4101	Management Science**	3	0	-	3	34	6	40	34	6	40	0.8*Best of two+0.2* least of two	3	60	100
2	19EC4101	Microwave Techniques	2	2	-	3	34	6	40	34	6	40		3	60	100
3	19EC4102	Embedded Systems & IOT	2	2	-	3	34	6	40	34	6	40		3	60	100
4	19EC41EX	Program Elective-III	3	0	-	3	34	6	40	34	6	40		3	60	100
5	19XX41OX	Open Elective-I	3	0	-	3	34	6	40	34	6	40		3	60	100
		PRACTICALS	**PRACTICALS**										Day to Day Evaluation and a test (40 Marks)			
6	19EC41P1	Microwave & Optical Communication Lab	-	-	3	1.5	-	-	-	-	-	40		3	60	100
7	19EC41P2	IOT Lab	-	-	3	1.5	-	-	-	-	-	40		3	60	100
		TOTAL	13	4	06	18	-	-	-	-	-	360	-	-	540	900

**Common to ECE, EEE, CSE, IT

***** Common to ECE, EEE

A for Assignment (continuous evaluation)

$ Test (Descriptive & Objective) duration = 2 Hours

19SH4101 – MANAGEMENT SCIENCE
(Common to ECE, EEE and CSE)

Course Category:	Humanities	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Pre-requisite:	Economics and accountancy	**Sessional Evaluation:** **Univ.Exam Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected:	
	1. To understand the disciplines of management science and manager's role in business and other decision-making 2. To gain an overview of the process of developing and using quantitative techniques in decision making and planning. 3. To aware of the ethical dilemmas faced by managers and the social responsibilities of business. 4. To know the significance of strategic management in competitive and dynamic global economy	
Course Outcomes	After completing the course the student will be able to :	
	CO1	Explain the concepts of management, ethical and social responsibilities and principles of Organization
	CO2	Evolution of Management Thought and hierarchy of layouts of plants.
	CO3	Apply work-study techniques for increased productivity in Corporate world.
	CO4	Manage human resources efficiently and effectively with best HR practices with marketing management plans.
	CO5	Develop marketing strategies based on product, price, place and promotion objectives with Project Cost Analysis.
	CO6	Determine activities' times (early start, early finish, late start, late finish, total float, and free float) and schedule the project using the CPM and PERT.
Course Content	**UNIT – I** **INTRODUCTION TO MANAGEMENT**: Concept of Management — Functions of Management, Evolution of Management Thought: Taylor's Scientific Management Theory, Fayal's Principles of Management- Maslow's theory of Hierarchy of Human Needs- Douglas McGregor's Theory X and Theory Y - Hertzberg Two Factor Theory of Motivation - Leadership Styles. **UNIT – II** **DESIGN OF ORGANIZATION:** principles of Organization –Organisation process- Types of organisation: line, line and staff organization, function, committee, matrix, virtual, cellular, team organization. Boundary less organization, inverted pyramid structure, lean and flat organization. Managerial objectives and social responsibilities. **UNIT-III** **STRATEGIC MANAGEMENT**: Corporate planning – Mission, Objectives, programmers, SWOT analysis – Strategy formulation and implementation. **MARKETING MANAGEMENT**: Functions of Marketing, Marketing Mix, and Marketing Strategies based on Product Life Cycle, Channels of distribution.	

Course Content	**UNIT-IV** **HUMAN RESOURCES MANAGEMENT**- Manpower planning – Personnel management – Basic functions of personnel management, Job Evaluation and Merit Rating – Incentive plans. **UNIT-V** **PRODUCTION AND OPERATIONS MANAGEMENT**: Plant Location and Plant Layout concepts- methods of production (Job, Batch & Mass)-Production Planning and control. Work study- Basic procedure involved in Method Study -Work Measurement. **UNIT-VI** **PROJECT MANAGEMENT (PERT/ CPM):** Network Analysis- Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), identifying critical path, probability of completing the project within given time, Project Cost Analysis, Project Crashing (simple problems).
Text Books & Reference Books	**TEXT BOOKS:** 1. Dr. T.P. Singh Er. Arvind Kumar "Applied management Science and Operations Research" 2. A.R.Aryasri "Management Science" 3. O.P.Kanna "Industrial Engineering and Management" **REFERENCE BOOKS:** 1. C.B.Gupta "Business organisations and management" 2. T.R.Banga,S.C.Sharma "Industrial Engineering and Management (Including Production Management)"
E-Resources	1. http://nptel.ac.in/courses 2. http://iete-elan.ac.in 3. http://freevideolectures.com/university/iitm

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

19EC4101 – MICROWAVE TECHNIQUES

Course category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	2 - 2 - 0
Prerequisite:	Electro Magnetic Fields & Waves, Antenna & wave Propagation.	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected:	
	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 parabolic reflector antenna, Horn and Lens antennas. 6. To study Hybrid MICs, strip lines, micro strip lines	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Demonstrate the Magnetron and tunnel diode as oscillator.
	CO2	Derive the power efficiency in parametric amplifier and klystron amplifier.
	CO3	Understand the measurement of impedance using Microwave TEEs.
	CO4	Measure various parameters like power, VSWR at microwave frequencies with the help of various microwave components.
	CO5	Design Parabolic antenna and explain MIC.
	CO6	Understand the fabrication technique of MICs and radiation pattern of Horn Antenna.
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.	

Course Content	**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** **MICROWAVE ANTENNAS:** Parabolic Reflector Antenna, Passive Reflector Antenna, Helical antenna, Horn and Lens Antennas **UNIT-VI** **MICs:** Fabrication of MICs, Advantages of MICs, Hybrid MICs, Strip Lines, and Microstrip Lines, Monolithic MICs
Text Books and Reference Books	**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	1. http://nptel.ac.in/syllabus/117105029/ 2. https://www.youtube.com/user/nptelhrd

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

19EC4102 – EMBEDDED SYSTEMS & IOT

Course category:	Program Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 – 0
Prerequisite:	Microcontrollers and Microprocessors, C-Programming.	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The basic idea regarding the nature of embedded systems. 2. The advantages of using Aurdino and MSP430 microcontrollers in Embedded and IoT applications. 3. The Basics of MSP430 controller. 4. The skill in simple program writing for MSP430 and applications. 5. The basics of IoT concepts. 6. The different Wireless services to access/control IoT devices.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the selection procedure of Processors in the Embedded domain.
	CO2	Develop Embedded Systems on Arduino and MSP430.
	CO3	Know the internal architecture and organization of MSP430.
	CO4	Understand the interfacing techniques to MSP 430 and can design and implement programs on MSP430 controller.
	CO5	Know the application areas of IoT.
	CO6	Develop Wireless Technologies to access/control IoT devices.
Course Content	**UNIT-I** **INTRODUCTION TO EMBEDDED SYSTEMS**: Introduction, Hardware and Software requirements, Processor selection, categories of embedded system, applications of embedded systems. Development Process: Development process of embedded systems, linkers and locators **UNIT – II** **INTRODUCTION TO AURDINO AND MSP430:** **ARDUINO**: AVR Family with Arduino ATMega 328- Interfaces - Arduino IDE – Programming – Interfacing LED- Interfacing LED and Switch with Arduino. **MSP430:** Introduction, Features of MSP430, Architecture of MSP430, Exceptions, Addressing Modes of MSP430, Instruction Set, Interrupts, Timers. **UNIT – III** **MSP430 I/O REGISTERS AND MODES:** I/O ports pull up/down registers concepts, Interrupts and interrupt programming. Watchdog timer. System clocks. Low Power aspects of MSP430: low power modes, Active vs Standby current consumption, FRAM vs Flash for low power & reliability. **UNIT – IV** **MSP430 INTERFACING:** Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and	

Course Content	Comparator in MSP430, data transfer using DMA. **UNIT – V** **INTRODUCTION TO IOT:** Definition & Characteristics of IoT, Physical design, Logical design, IoT Enabling Technologies, IoT Levels and Deployment Templates, IoT vs M2M. **UNIT-VI** **WIRELESS TECHNOLOGIES FOR IOT (LAYER 1 & 2):**WiFi (IEEE 802.11), Bluetooth/Bluetooth Smart, ZigBee/ZigBeeSmart , UWB (IEEE 802.15.4).
Text Books and Reference Books	**TEXT BOOKS :** 1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hil. 2. Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014. 3. MSP430 microcontroller basics. John H. Davies, Newnes Publication, I st Edition. 4. Vijay Madisetti, ArshdeepBagha,"Internet of Things A Hands-On-Approach",2014, ISBN:978-1-118-43062-0 **REFERENCE BOOKS :** 1. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers. 2. Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014. 3. Daniel Kellmereit, "The Silent Intelligence: The Internet of Things". 4. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 Editors OvidiuVermesan Peter Friess,'Internet of Things – From Research and Innovation to Market
E-Resources	1. http://processors.wiki.ti.com/index.php/MSP430_LaunchPad_Low_Power_Mode 2. http://processors.wiki.ti.com/index.php/MSP430_16-Bit_UltraLow_Power_MCU_Training 1. nptel.ac.in/courses

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

19EC41P1-MICROWAVE & OPTICAL COMMUNICATION LAB

Course Category:	Program Core	**Credits:**	2
Course Type:	Practical	**Lecture-Tutorial- Practice:**	0 - 0 - 3
Prerequisite:	Microwave techniques	**Sessional Evaluation:** **External Evaluation :** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The reflex klystron, it is used as amplifier and oscillator in radar stations and radio stations etc. 2. The wave-guide characteristics 3. The antenna parameters 4. The unknown load impedance measurement using VSWR method. 5. The working of directional couplers.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Study reflex klystron characteristics and understands how it can be used as an amplifier, oscillator in microwave applications
	CO2	Calculate the power in the parts of direction couplers
	CO3	Know the cut off, free space and guided wavelength of waveguide.
	CO4	Know how to power can be mixed and split up phase reversal etc. using magic tee
	CO5	Measure Antenna Parameters like Gain , Aperture Area and the directivity
	CO6	Know how to measure numerical aperture and bending losses of OFC
Course Content	**LIST OF EXPERIMENTS** 1. Reflex klystron characteristics –I 2. Reflex klystron characteristics –II 3. Direction couplers 4. Wave guide parameters 5. Characteristics of GUNN diode 6. Characteristics of MAGIC TEE 7. Antenna measurements 8. Measurement of V.S.W.R. 9. Measurement of impedance 10. Measurement of numerical aperture	

19EC41P2- IOT LAB

Course Category:	Program Core	**Credits:**	2
Course Type:	Practical	**Lecture-Tutorial- Practice:**	0 - 0 - 3
Prerequisite:	Micro controllers and embedded systems	**Sessional Evaluation:** **External Evaluation :** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. Use Embedded C language to develop embedded applications. 2. Apply, Construct and demonstrate various in-build interfaces/modules of Aurdino and MSP430 for specific applications. 3. Apply Embedded C code for utilizing Low power modes of MSP430.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Design the home appliances and toys using Microcontroller chips.
	CO2	Design Logic controller module and SIDU module.
	CO3	Design the high speed communication circuits using serial bus connection
	CO4	Interfacing and programming GPIO ports in c using MSP430
	CO5	Understand the PWM generation using timer on MSP430 GPIO
	CO6	Know how to connect and communicate to cloud
Course Content	**LIST OF EXPERIMENTS** 1. BASIC LED PROGRAMMING IN C USING AURDINO 1.1 Study and Install IDE of Arduino and different types of Arduino 1.2 Write program using Arduino IDE for Blink LED 1.3 Write Program for RGB LED using Arduino 2. INTERFACING AND PROGRAMMING GPIO PORTS IN C USING MSP430 2.1: Blink LED 2.2: Fade RGB LED (PWM) 2.3:Push Button (Input) 3. INTERFACING AND PROGRAMMING GPIO PORTS IN C USING MSP430 3.1: Multiple LED (Many Outputs) 3.2:Shift Register (Integrated Circuit) 3.3: Photoresistor (Light Sensor) 4. INTERFACING AND PROGRAMMING GPIO PORTS IN C USING MSP430 4.1: Spin the Motor 4.2: Seven-Segment Display (Digital Display) 5. A BASIC WI-FI APPLICATION – COMMUNICATION BETWEEN TWO SENSOR NODES	

Course Content	6. INTERFACING POTENTIOMETER WITH MSP430 6.1: Alter the threshold to 75% of Vcc for the LED to turn on. 6.2: Modify the code to change the Reference Voltage from Vcc to 2.5V. 7. CONNECT AND COMMUNICATE TO CLOUD 7.1: Creating a simple HTML web server using MSP430 Launch Pad& CC3100 Wi-Fi Booster Pack 7.2: Create a Wi-Fi-connected IoT sensor that calls you when sensor values exceed a threshold 8. CONNECT AND COMMUNICATE TO CLOUD 8.1: Playing Music – (Buzzer) 8.2: Potentiometer – (Rotary Angle Sensor) 9. PWM GENERATION USING TIMER ON MSP430 GPIO 9.1: Observe the PWM waveform on a particular pin using CRO. 9.2: What is the maximum resolution of PWM circuitry in MSP430G2 Launch Pad? 9.3: Change the above code to create a PWM signal of 75% duty cycle on particular PWM pin. 10. PWM BASED SPEED CONTROL OF MOTOR CONTROLLED BY POTENTIOMETER CONNECTED TO MSP430 GPIO 10.1: Interface a Stepper motor with MSP-EXP430G2 Launch Pad to run it in a Predetermined uniform speed. 10.2: Describe the applications of PWM in a digital power supply control. 10.3: Create Switch case code from the example code to run the DC Motor in 3 set of Speeds. 11. A BASIC WI-FI APPLICATION 11.1: In the terminal output window, we have received a debug message "Pinging…!" Search in the code and change the message to "Pinging the Website". Repeat the experiment to observe this change in the Serial Window. 12. INTERRUPT PROGRAMMING EXAMPLES THROUGH GPIOS 12.1: Write the code to enable a Timer interrupt for the pin P1.1. 12.2: Write the code to turn on interrupts globally.

S.No	COURSE CODE	COURSE
		ELECTIVE-III
1.	19EC41E1	CELLULAR MOBILE COMMUNICATION
2.	19EC41E2	VLSI DIGITAL SIGNAL PROCESSING
3.	19EC41E3	IC FABRICATION TECHNOLOGY
4.	19EC41E4	RADAR SIGNAL PROCESSING

19EC41E1-CELLULAR MOBILE COMMUNICATION

Course Category:	Program Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practical:**	2-2-0
Prerequisite:	Antenna and Wave Propagation, Radar Engineering	**Sessional Evaluation:**	40
		External Evaluation:	60
		Total Marks:	100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The basic Cellular system 2. The elements of cellular radio system design. 3. The various Prediction models for cell coverage in terms of signal and traffic. 4. The interference problem and its reduction by designing proper antenna system. 5. Frequency spectrum utilization techniques channel & traffic management and evaluation of dropped call rate. 6. The need for digital mobile telephony and studying various mobile systems like GSM & CDMA.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand cellular communication system with cell splitting, consideration of cellular system, cell-site antennas like elements.
	CO2	Design elements for Analog and Digital cellular systems.
	CO3	Acquire knowledge about propagation mechanisms, Multipath fading, and channel modeling and co-channel interference.
	CO4	Know about different types of channel interferences with cell-site antenna heights and signals coverage cells
	CO5	Gain knowledge about Frequency management and Channel assignment and multiple access schemes
	CO6	Acquire knowledge about the evolution of GSM, TDMA & CDMA technologies for proper Frequency spectrum utilization.
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. **UNIT-II** **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-III** **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.	

Course Content	**UNIT-IV** **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-V** **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-VI** **DIGITAL CELLULAR SYSTEM:** Why digital, digital mobile telephony, practical multiple access schemes, Global System for Mobile (GSM), TDMA & CDMA, miscellaneous mobile systems.
Text Books and Reference Books	**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 **REFERENCE BOOKS:** 1. Principles of communication systems Taub & shilling TMH 2. Celullar mobile communications –Willium stallings –PHI
E-Resources	1. www.iitg.ernet.in/scifac/qip/public_html/cd_cell/EC632.pdf 2. www.morse.colorado.edu/~tlen5510/text/

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

19EC41E2– VLSI DIGITAL SIGNAL PROCESSING

Course Category:	Program core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	2 - 2 – 0
Prerequisite:	VLSI Design, Digital Signal Processing algorithms, graph-theoretic concepts, and combinatorial algorithms.	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. fundamentals of graph theory in VLSI signal processing 2. transformations for high speed using pipelining, retiming, and parallel processing techniques 3. area reduction using folding techniques 4. mapping of algorithms on array structures, DSP systems, and FPGAs 5. low Power Design Techniques 6. VLSI systems for some typical signal processing applications	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand VLSI design methodology for signal processing systems in different signal processing application.
	CO2	Apply the concepts with VLSI algorithms for computing digital signal processing applications**.**
	CO3	Be familiar with architectures for DSP and its Properties.
	CO4	Design Families of Architectures for specified algorithm complexity and speed constraints for Systolic Array Design
	CO5	Design low power constrained systems with Power estimation approach.
	CO6	Describe signal processing computation and its relevance to some specific applications with proper power management.
Course Content	**UNIT-I** **INTRODUCTION FOR DSP ALGORITHMS:** VLSI Design flow, Mapping algorithms into Architectures: Graphical representation of DSP algorithms – signal flow graph (SFG), data flow graph (DFG), critical path, dependence graph (DG). Data path synthesis, control structures, Optimization at Logic Level and architectural Design, Loop bound and iteration bound, Algorithms for computing iteration bound, Iteration bound of Multi-rate data-flow graphs. **UNIT-II** **PARALLEL AND PIPELINE OF SIGNAL PROCESSING APPLICATION:** Architecture for real time systems, latency and throughput related issues, clocking strategy, power conscious structures, array architectures; Pipelining processing of Digital filter, Parallel processing, Parallel and pipelining for Low power design, Optimization with regard to speed, area and power, asynchronous and low power system design, ASIC and ASISP design. **UNIT-III** **SYSTOLIC ARRAY ARCHITECTURE:** Methodology of systolic array architecture, FIR based Systolic Array, Selection of Scheduling Vector, Matrix Multiplication and 2D Systolic Array Design, Systolic Design for Space Representations Containing Delays.	

Course Content	**UNIT-IV** **ARCHITECTURE OF DIFFERENT SIGNAL PROCESSING MODULES:** Convolution technique, Folding /Unfolding Transformation, CORDIC architecture, Retiming: Introduction, Definition and Properties, Solving System of Inequalities, Retiming Techniques. **UNIT-V** **LOW POWER DESIGN:** Theoretical background, Scaling v/s power consumption, power analysis, Power reduction techniques, Power estimation approach. **UNIT-VI** **APPLICATION IN COMMUNICATION AND SIGNAL PROCESSING SYSTEM:** Transformation architectures, source and channel coding structures, Motion Estimation and motion compensation for video, Speech processing algorithm.
Text Books and Reference Books	**TEXT BOOKS:** 1. VLSI Digital Signal Processing Systems: Design and Implementation By K.K. Parhi, John Wiley & Sons, 1999 2. Richard J, Higgins, Digital Signal Processing in VLSI, Prentice Hall **REFERENCES BOOKS :** 1. M.A. Bayoumi, VLSI Design Methodology for DSP Architectures, Kluwer, 1994 2. U. Meyer – Baese, Digital Signal Processing with FPGAs, Springer, 2004
E-Resources	1. http://people.ece.umn.edu/users/parhi/SLIDES/

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

19EC41E3 – IC FABRICATION TECHNOLOGY

Course category:	Program Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 – 0
Prerequisite:	Electronic Devices & Circuits, Switching Theory & Logic Design, Analog IC Applications, Digital Design, VLSI Design.	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The fundamental process involved in IC fabrication and able to describe the CMOS and Bi-CMOS IC Fabrication Process 2. The modelling of resistor and capacitor in IC fabrication considering the parasitic effects and design rules 3. The gate structures, Network layout design and sequential machines 4. The gain adequate knowledge on subsystems and physical design 5. The floor planning, touting, distribution 6. The automatic test pattern generator and BIST.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the fundamental process involved in IC fabrication process and Model resistor and capacitor in IC fabrication and understand transistor parasitic, stick diagrams
	CO2	Describe the CMOS and BiCMOS IC Fabrication Process and SCMOS design rules.
	CO3	Understand the gate structures and sub systems
	CO4	Design sequential machines and 4-bit arithmetic processor.
	CO5	Gain adequate knowledge on floor planning and Testing and Testability
	CO6	Design channel distribution and BIST and ATPG
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. Bi-CMOS 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 vias, 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, parasitic, Wires and delay. Network layout design- Single row layout, Standard cell layout. Network delay- Fan-out, Path delay, Transistor sizing. Sequential machines-	

Course Content	Latches and Flip-flops. **UNIT-IV** **SUBSYSTEMS:** Subsystems- Pipelining, Data paths, 4-bit arithmetic processor as example of subsystem design. **UNIT-V** **FLOOR PLANNING:** Floor planning methods – Block placement and channel distribution, Global routing, power distribution, Clock distribution. Off-chip connections- Packages, I/O Architecture, Pad design. **UNIT-VI** **TESTING AND TESTABILITY:** System partitioning, Design for testability, Fault models. ATPG, Testing combinational logic, Testing sequential logic, Scan design techniques BIST.
Text Books and Reference Books	**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	1. www.iue.tuwien.ac.at/phd/ceric/node8.html 2. www.eecs.berkeley.edu/~hu/ChenmingHu_ch3.pdfwww.nptel.ac.in/courses/111310602/Lec22.pdf

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

19EC41E4 – RADAR SIGNAL PROCESSING

Course category:	Program Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 – 0
Prerequisite:	Analog and digital communication systems, DSP, Basic Radar engineering.	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected:	
	1. To learn the fundamentals of radar block diagram and range equation. 2. To understand the matched filter receiver. 3. To understand detection criteria of radar signals in noise environment. 4. To learn the Radar waveform design requirements. 5. To learn the Pulse compression techniques. 6. To understand fundamentals different phase coding techniques.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the components of a radar system and their relationship to overall system and measure of performance with and without noise.
	CO2	Analyze the radar performance and Frequency Response Characteristic of matched filter receiver with noise.
	CO3	Develop skills in designing Radar systems in different noise environments by choosing proper Waveform Design Requirements.
	CO4	Familiarized Detection Criteria of radar and ambiguity function and basic radar signals.
	CO5	Demonstrate knowledge in radar pulse compression techniques with coding techniques.
	CO6	Describe the different phase coding techniques in Decoding the received Waveforms.
Course Content	**UNIT-I** **RADA RRANGE EQUATION**: Introduction– Radar Frequencies, Radar Block Diagram, Radar Equation, Information Available from Radar Echo. Review of Radar Range Performance– General Radar Range Equation, Radar Detection with Noise Jamming, Beacon and Repeater Equations, Bistatic Radar. **UNIT – II** **MATCHED FILTER RECEIVER**: Impulse Response, Frequency Response Characteristic and its Derivation, Matched Filter and Correlation Function, Correlation Detection and Cross-Correlation Receiver, Efficiency of Non-Matched Filters, Matched Filter for Non-White Noise. **UNIT – III** **DETECTION OF RADAR SIGNALS IN NOISE**: Detection Criteria – Neyman-Pearson Observer, Likelihood-Ratio Receiver, Inverse Probability Receiver, Sequential Observer, Detectors –Envelope Detector, Logarithmic Detector, I/Q Detector. Automatic Detection – CFAR Receiver, Cell Averaging CFAR Receiver, CFAR Loss, CFAR Uses in Radar. Radar Signal Management –Schematics, Component Parts, Resources and Constraints. **UNIT – IV** **WAVEFORM SELECTION**: Radar Ambiguity Function and Ambiguity Diagram –	

Course Content	Principles and Properties; Specific Cases – Ideal Case, Single Pulse of Sine Wave, Periodic Pulse Train, Single Linear FM Pulse, Noise like Waveforms. Waveform Design Requirements. Radar clutter- Introduction, surface clutter, Land clutter, Detection of targets in Clutter. **UNIT – V** **PULSE COMPRESSION IN RADAR SIGNALS**: Introduction, Significance, Types. Linear FM Pulse Compression – Block Diagram, Characteristics, Reduction of Time Side lobes, Stretch Techniques, Generation and Decoding of FM Waveforms – Block Schematic and Characteristics of Passive System, Digital Compression, SAW Pulse Compression. **UNIT-VI** **PHASE CODING TECHNIQUES:** **Phase Coding Techniques**: Principles, Binary Phase Coding, Barker Codes, Maximal Length Sequences (MLS/LRS/PN), Block Diagram of a Phase Coded CW Radar. **Poly Phase Codes :** Frank Codes, Costas Codes, Non-Linear FM Pulse Compression, Doppler Tolerant PC Waveforms – Short Pulse, Linear Period Modulation (LPM/HFM), Side lobe Reduction for Phase Coded PC Signals, Complementary codes, Huffman codes, Limiting in Pulse Compression, Cross Correlation Properties, compatibility.
Text Books and Reference Books	**TEXT BOOKS :** 1. M.I. Skolnik, *"*Introduction to Radar Systems*",* TMH, 3rd Edition, 2001. " 2. Fred E. Nathanson, *"*Radar Design Principles – Signal Processing and The Environment", McGraw Hill, Inc, 2nd Edition,1991. 3. M.I. Skolnik, *Radar Handbook,* McGraw Hill, 2nd Edition, 1991. **REFERENCE BOOKS :** 1. Peyton Z. Peebles Jr., Radar Principles, Wiley India Pvt. Ltd., 1998. 2. R. Nit berg, Radar Signal Processing and Adaptive Systems, Artech House, 1999. 3. F.E. Nathanson, Radar Design Principles, *1st* Edition, McGraw Hill, 1969
E-Resources	2. https://www.ll.mit.edu/outreach/introduction-radar-systems 3. https://ocw.mit.edu/resources/res-ll-001-introduction-to-radar-systems-spring-2007/ 4. http://lej4learning.com.pk/videos-introduction-to-radar-systems-mit/

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

S.No	COURSE CODE	OPEN ELECTIVES-I
1.	19CS41O1	PYTHON PROGRAMMING
2.	19EE41O1	SMART GRID TECHNOLOGY
3.	19SH41O1	NANO TECHNOLOGY
4.	19CS41O2	DATA BASE MANAGEMENT SYSTEM

19CS41O1 –PYTHON PROGRAMMING

Course Category:	Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practical:**	3-0-0
Prerequisite:	Require the fundamental concepts of computers and any programming basics	**Sessional Evaluation:** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected:	
	1. To introduce Object Oriented Programming using an easy to use language 2. To use iterators and generators. 3. To test objects and handle changing requirements. 4. To be exposed to programming over the web to develop various applications.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the concepts of object oriented programming in python.
	CO2	Study to compose a group of characters and utilization of strings into various applications
	CO3	Use generators and iterators to develop different applications
	CO4	Develop test cases and handle refactoring to identify its advantages.
	CO5	Use serializing objects to program over the web.
	CO6	Lean how to create and utilize the advantages of packages
Course Content	**UNIT-I** **INTRODUCTION:** Function Declaration - Import - Objects - Indenting as Requirement - Exceptions – Unbound Variables - Case Sensitive - Scripts - Native Data Types - Booleans - Numbers - Lists -Tuples - Sets - Dictionaries - Comprehensions - List Comprehensions – Dictionary Comprehensions - Set Comprehensions. **UNIT-II** **STRINGS**: Strings - Unicode - Formatting - String Methods - Bytes - Encoding - Regular Expressions Verbose - Case Studies **UNIT-III** **CLASSES**: Closures - List of Functions - List of Patterns - File of Patterns - Generators – Defining Classes - Instantiating Classes - Instance Variables - Iterators – Iterators - Assert –Generator Expressions **UNIT-IV** **FILES**: Reading and Writing Text Files - Binary Files - Stream Objects - Standard Input, Output and Error. **UNIT-V** **XML and SERILIZATION**: XML - Atom Feed - Parsing HTML - Searching for Nodes - html - Generation – Serializing Objects - Pickle Files - Versions - Debugging - Serializing to JSON **UNIT-VI** **PACKAGING PYTHON LIBRARIES**: Directory Structure, Writing Your Setup Script - Classifying Your Package - Examples of Good Package Classifiers - Checking Your Setup Script for Errors - Creating a Source Distribution - Creating a Graphical Installer - Building Installable Packages for Other Operating Systems - Adding Your Software to the Python Package Index - The Many Possible Futures of Python Packaging.	

Text Books and Reference Books	**TEXT BOOKS:** 1. Mark Pilgrim, "Dive into Python 3", Apress, 2009. 2. Allen Downey, Jeffrey Elkner, Chris Meyers, "How to Think Like a Computer Scientist - Learning with Python", Green Tea Press, 2002. **REFERENCE BOOKS:** 1. John V. Guttag, "Introduction to Computation and Programming using Python", Prentice Hall of India, 2014 2. Mark Lutz, "Learning Python: Powerful Object-Oriented Programming", Fifth Edition, O'Reilly, Shroff Publishers and Distributors, 2013
E-Resources	1. https://nptel.ac.in/courses 2.https://freevideolectures.com/university/iitm

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

19EE41O1-SMART GRID TECHNOLOGY

Course Category:	Program Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practical:**	3-0-0
Prerequisite:	Nil	**Sessional Evaluation:** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to:	
	1. Learn introduction to Smart Grid 2. Learn necessity of smart grid 3. Learn operation and construction of measuring the smart grid signals 4. Learn automation technologies of smart grid 5. Learn Island, protection and applications of smart grid 6. Learn Distributed Energy Resources	
Course Outcomes	After completing the course the student will be able to	
	CO1	Gain the knowledge on introduction to Smart Grid
	CO2	Gain the knowledge on necessity of smart grid
	CO3	Know the operation and construction of measuring the smart grid signals.
	CO4	Understand the automation technologies of smart grid
	CO5	Gain knowledge on Island, protection and applications of smart grid
	CO6	Understand the concepts on Distributed Energy Resources
Course Content	**UNIT-I** **INTRODUCTION TO SMART GRID:** Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self-Healing Grid, Present development & International policies in Smart Grid. Case study of Smart Grid ,CDM opportunities in Smart Grid. **UNIT-II** **NECESSITY OF SMART GRID:** The Smart Grid Enables the ElectriNetSM, Local Energy Networks, Electric Transportation, Low-Carbon Central Generation, the Attributes of the Smart Grid- Need of a Smart Grid- Is the Smart Grid a "Green Grid"- Smart Grid Initiative for Power Distribution Utility in India. **UNIT –III** **SENSING AND MEASUREMENT:** Smart metering and demand-side integration, Introduction, Smart metering, Evolution of electricity metering, Key Components of smart metering, Smart meters: An overview of the hardware used Signal acquisition, Signal conditioning, Analogue to digital conversion, Computation, Input/output, Communication, Communications infrastructure and protocols for smart metering, **UNIT –IV** **CONTROL AND AUTOMATION TECHNOLOGIES :**Home-area network, neighbourhood area network, Data concentrator, Meter data management system, Protocols for communications, Demand-side integration, Services provided by DSI, Implementations of DSI, Hardware support to DSI implementations, Flexibility delivered by prosumers from the demand side, System support from DSI. Smart Appliances, Automatic Meter Reading (AMR), Outage**.** Management System (OMS), Plug in Hybrid Electric Vehicles (PHEV), Vehicle to Grid, Grid to Vehicle, Coordination of PHEV charging and discharging cycle, Smart Sensors, Home & Building Automation, Phase	

Course Content	Shifting Transformers. **UNIT –V** **CONCEPT OF MICRO GRIDS:** Concept of micro grid, need & applications of micro grid, formation of micro grid, issues of interconnection, protection & control of micro grid. Islanding, need and benefits, different methods of islanding detection. **UINT-VI** **DISTRIBUTED ENERGY RESOURCES:** Distributed Energy Resources: Small scale distributed generation, Distributed Generation Technology, Internal Combustion Engines, Gas Turbines, Combined Cycle Gas Turbines, Micro turbines, Fuel Cells, Solar Photovoltaic, Solar thermal, Wind power, Geothermal, - all sources as a DG. Advantages and disadvantages of DG.
Text Books and Reference Books	**TEXT BOOKS:** 1. "Integration of Green and Renewable Energy in Electric Power Systems", by Ali K., M.N. Marwali, Min Dai, -Wiley. 2. "The Smart Grid: Enabling Energy Efficiency and Demand Response", by Clark W. Gellings, - CRC Press. 1. "Smart Grid: Technology and Applications", by Janaka Ekanayake, N. Jenkins, K. Liyanage, J. Wu, Akihiko Yokoyama - Wiley. **REFERENCE BOOKS:** 1. "Smart Grids" by Jean Claude Sabonnadiere, Nouredine Hadjsaid - Wiley Blackwell. 2. "Securing the Smart Grid" by Tony Flick and Justin Morehouse- Elsevier Inc. 3. "Smart Power: Climate Change, the Smart Grid, and the Future of Electric Utilities"by Peter S. Fox-Penner - Island Press. 4. "SMART GRID Fundamentals of Design and Analysis "by James Momoh - IEEE press, A John Wiley & Sons, Inc., Publication.
E-Resources	1. http://nptel.ac.in/courses 2. http://iete-elan.ac.in 3. http://freevideolectures.com/university/iitm

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

19SH41O1-NANO TECHNOLOGY

Course Category:	Program Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practical:**	3-0-0
Prerequisite:	Basics of semiconductors	**Sessional Evaluation:**	40
		External Evaluation:	60
		Total Marks:	100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The basic concepts of semiconductor nano devices. 2. Types of photonic and molecular materials 3. Design of thermal and gas sensors 4. Bio sensors and DNA based bio sensors 5. Criteria for the choice of materials 6. Protein based biosensors	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand various types of nano devices and nano mechanics
	CO2	Develop nano technology based LED,LASER…etc
	CO3	Develop the Electroluminescent Organic materials
	CO4	Develop the different thermal sensors
	CO5	Evaluate the response various materials
	CO6	Design different types of bio sensors
Course Content	**UNIT –I** **SEMICONDUCTOR NANODEVICES -I:** Single-Electron Devices; Nano scale MOSFET – Resonant Tunnelling Transistor - Single-Electron Transistors; Single-Electron Dynamics; Nanorobotics and Nano manipulation **UNIT-II** **SEMICONDUCTOR NANODEVICES -II:** Mechanical Molecular Nano devices; Nano computers: Theoretical Models; Optical Fibers for Nano devices; Photochemical Molecular Devices; DNA-Based Nano devices; Gas-Based Nano devices; Micro and Nano mechanics. **UNIT-III** **ELECTRONIC AND PHOTONIC MOLECULAR MATERIALS:** Preparation – Electroluminescent Organic materials - Laser Diodes - Quantum well lasers:-Quantum cascade lasers- Cascade surface-emitting photonic crystal laser- Quantum dotlasers- Quantum wire lasers:- White LEDs - LEDs based on nanowires - LEDs based on nanotubes- LEDs based on nanorods High Efficiency Materials for OLEDs- High Efficiency Materials for OLEDs - Quantum well infrared photo detectors. **UNIT-IV** **THERMAL SENSORS:** Thermal energy sensors -temperature sensors, heat sensors- Electromagnetic sensors electrical resistance sensors, electrical current sensors, electrical voltage sensors, electrical power sensors, magnetism sensors - Mechanical sensors - pressure sensors, gas and liquid flow sensors, position sensors - Chemical sensors -	

Course Content	Optical and radiation sensors. **UNIT-V** **GAS SENSOR MATERIALS:** Criteria for the choice of materials, Experimental aspects – materials, properties, measurement of gas sensing property, sensitivity; Discussion of sensors for various gases, Gas sensors based on semiconductor devices. **UNIT-VI** **BIOSENSORS:** Principles- DNA based biosensors – Protein based biosensors – materials for biosensor applications- fabrication of biosensors—future potential.
Text Books and Reference Books	**TEXT BOOKS:** 1. W. Ranier, ―Nano Electronics and Information Technology‖, Wiley, (2003). 2. K.E. Drexler, ―Nano systems‖, Wiley, (1992). **REFERENCE BOOKS:** 1. M.C. Petty, ―Introduction to Molecular Electronics‖1995.

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

17CS41O2– DATA BASE MANAGEMENT SYSTEM

Course category:	Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 – 0
Prerequisite:	Basic foundations in mathematics and preliminary fundamentals of data and information	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. Understand the areas of databases and composition of queries using Structured Query Language 2. To study various database design models for building applications 3. Evaluate a business situation while designing a database system	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Master the basic concepts and their applicability
	CO2	Understand Relational Model and the Relational Algebraic operations.
	CO3	Learn ER model and its usage in applications.
	CO4	Familiar with SQL to create simple databases
	CO5	Identify the basic issues of normalization and exposure on relational database design.
	CO6	Acquire knowledge in Transaction Management and Recovery.
Course Content	**UNIT – I** **INTRODUCTION** : Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Data Storage and Querying, Transaction Management, Database Architecture, Database Users and Administrators. **UNIT – II** **RELATIONAL MODEL**: Structure of Relational Databases, Fundamental Relational-Algebra Operations, Additional Relational-Algebra Operations, Extended Relational-Algebra Operations, Null Values, Modification of the Database. **UNIT – III** **DATABASE DESIGN AND THE E-R MODEL**: Overview of the Design Process, The Entity-Relationship Model, Constraints, Entity- Relationship Diagrams, Entity-Relationship Design Issues, Weak Entity Sets, Extended E-R Features, Reduction to Relational Schemas, Other Aspects of Database Design. **UNIT – IV** **SQL:** Data Definition, SQL Data Types and Schemas, Integrity Constraints, Basic Structure of SQL Queries, Set Operations, Aggregate Functions, Null Values, Nested Sub queries, Complex Queries, Views, Modification of the Database, Joined Relations. **UNIT – V** **RELATIONAL DATABASE DESIGN:** Features of Good Relational Design, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional Dependency Theory, Algorithms for Functional Dependencies, Decomposition Using Multivalued Dependencies ,More Normal Form, Database-Design Process .	

Course Content	**UNIT – VI** **TRANSACTION MANAGEMENT AND RECOVERY**: Lock Based and timestamp based Protocols, Multiple Granularity, Multiversion Schemes, Deadlock Handling, Weak Levels of Consistency, Recovery and Atomicity, recovery algorithm, Buffer Management, Remote Backup Systems.
Text Books and Reference Books	**TEXT BOOKS:** 1. Silberschatz, Korth, Sudarshan, "Database System Concepts", McGrawHill, 6th Edition , 2011. **REFERENCE BOOKS:** 2. Ramez Elmasri and Shamkant Navathe, Durvasula V L N Somayajulu, Shyam K Gupta, "Fundamentals of Database Systems", Pearson Education, 2006. 3. Thomas Connolly, Carolyn Begg, "Database Systems – A Practical Approach to Design, Implementation and Management", Pearson Education, 3rd Edition, 2002. 4. Raghu ramakrishnan ,"Database Management Systems", Publisher: McGraw Hill, Third edition.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

NBKR INSTITUTE OF SCIENCE & TECHNOLOGY: VIDYANAGAR

(AUTONOMOUS)

(AFFILIATED TO JNTU ANANTAPUR: ANANTHAPURAMU)

SPSR NELLORE DIST

IV YEAR OF FOUR YEAR B.TECH DEGREE COURSE – II SEMESTER

ELECTRONICS AND COMMUNICATION ENGINEERING

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the academic year 2019-2020)

(For the batch admitted in the academic year 2019-2020)

S.No	Course Code	Course Title	Instruction Hours/Week			Credits	Evaluation									
							Sessional-I Marks			Sessional-II Marks			Total Sessional Marks(40)	End Semester Examination		Maximum Total Marks
		THEORY	L	T	D/P		Test$^{\$}$-I	A$^{\#}$-I	Max. Marks	Test$^{\$}$-II	A$^{\#}$-II	Max. Marks	0.8*Best of two+0.2* least of two	Duration In Hours	Max. Marks	100
1	19EC42EX	Program Elective-III	3	0	-	3	34	6	40	34	6	40		3	60	100
2	19XX42OX	Open Elective-II	3	0	-	3	34	6	40	34	6	40		3	60	100
		PRACTICALS											Continuous Assessment and Seminar (80 Marks)			
3	19EC42PR	PROJECT WORK	-	-	-	11	-	-	-	-	-	80		3	120	200
4	19EC42MO	MOOCs	-	-	-	3	-	-	-	-	-	-		-	-	-
		TOTAL	6	0	-	20	-	-	-	-	-	160	-	-	240	400

A for Assignment (continuous evaluation)

$ Test (Descriptive & Objective) duration = 2 Hours

S.No	COURSE CODE	COURSE
		ELECTIVE- VI
1.	19EC42E1	DIGITAL IMAGE PROCESSING
2.	19EC42E2	SATELLITE COMMUNICATION
3.	19EC42E3	ERROR CONTROL CODING
4.	19EC42E4	DIGITAL CONTROL SYSTEMS

19EC42E1-DIGITAL IMAGE PROCESSING

Course Category:	Program Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	2-2-0
Prerequisite:	Engineering Mathematics ,Signals and Systems , Digital Signal Processing	**Sessional Evaluation:** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected:	
	1. To learn the fundamentals of digital image processing and the relationship between pixels. 2. To understand transformations used in digital image processing algorithms. 3. To understand the spatial and frequency domain image processing 4. To learn the restoration techniques used in image enhancement. 5. To learn how to code and compress the images. 6. To understand fundamentals of color image processing.	
Course Outcomes	After completing the course the student will be able to :	
	CO1	Describe how digital images are represented and how they are sampled and quantized and Define the 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 in both spatial and frequency domain.
	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.
	CO6	Describe the techniques of colour image processing.
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 – D.C.T. – 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. **UNIT – IV** **IMAGE RESTORATION:** Degradation model – Algebraic approach to restoration – Inverse filtering – Least Mean Square filters – Constrained Least Mean Square restoration – Inverse Restoration.	

Course Content	**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. **UNIT-VI** **COLOUR IMAGE PROCESSING:** Colour Image Processing – Colour Model, Pseudo colour image processing – Full colour image processing, Colour Image Filtering, Colour Image Segmentation
Text Books and Reference Books	**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	3. nptel.ac.in/courses/117105079/ 4. www.ee.columbia.edu/~xlx/courses/ee4830-sp08/notes/lect1-parta.pdf

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

19EC42E2 – SATELLITE COMMUNICATION

Course category:	Program Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 – 0
Prerequisite:	Antenna and Wave Propagation, Radar Engineering	**Sessional Evaluation :**	40
		External Evaluation:	60
		Total Marks:	100

Course Objectives	Students undergoing this course are expected to:	
	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. Calculate and interpret key geometric and timing parameters for a variety of common satellite orbits. 4. Understand different types of satellite subsystems. 5. Describe the concepts of signal propagation affects, link design, rain fading, link availability and perform interference calculations. 6. Understand different components of satellite Earth Stations.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand history, current state and future trends of Satellite Communications.
	CO2	Identify, formulate and solve engineering problems related to orbital aspects of satellite communication.
	CO3	Know about working of different subsystems in the satellite.
	CO4	Design satellite link budgets to account for channel losses, noise, and interference in satellite communications systems for specific communications requirements.
	CO5	Gain knowledge about different multiple access techniques.
	CO6	Acquire knowledge about of Earth Station components.
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. **UNIT-II** **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-III** **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-IV** **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.	

Course Content	**UNIT-V** **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-VI** **EARTH STATION:** Types of Earth Station, Earth Station Architecture, Earth Station Design Considerations, Earth Station Testing, Earth Station Hardware and Satellite Tracking.
Text Books and Reference Books	**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. **REFERENCE BOOKS :** 1. "Satellite Communication"- D.C Agarwal, Khanna Publications,5th edition 2. "Satellite Communications"- Dennis Roddy, McGraw Hill, 4th Edition, 2009.
E-Resources	1. http://ocw.mit.edu/courses/aeronautics-and-astronautics/16-851-satellite-engineering-fall-2003/lecture-notes/

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

19EC42E3- ERROR CONTROL CODING

Course Category:	Program Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practical:**	3-0-0
Prerequisite:	Knowledge of Probability, Matrices, Modulation.	**Sessional Evaluation:** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. Know some aspects of mutual information, channels, coding, in particular to source coding, linear block codes, cyclic codes, convolutional coding and error control in data storage systems.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Acquire knowledge about various information sources, Fixed Length and Variable Length Coding.
	CO2	Develop skills in obtaining the Entropy and finding the Efficiency of source codes.
	CO3	Attain skills in creating various Hamming Codes, Syndrome decoding and parity check matrices
	CO4	Acquire knowledge in Error correction using syndrome vector and Cyclic Redundancy Check (CRC).
	CO5	Apply appropriate coding methods such as Golay Codes- BCH code and Error control for computer main processor.
	CO6	Develop skills for the Error control in IBM 3850 main storage system and able to compare the performance of Convolutional codes and Block codes.
Course Content	**UNIT – I** **INFORMATION AND CODING**: Definition of Information- sources-types - mathematical models-information content of discrete memory less source- information content of a symbol-Entropy-Information Rate-Discrete Memory less Channels-Types of channels-Mutual information-over view of error control coding techniques-classification of codes. **UNIT – II** **SOURCE CODING**: Fixed Length and Variable Length Coding, properties of Prefix codes, Shannon-Fanon Coding, Huffman code, Huffman code applied for pair of Symbols, Efficiency Calculations, Lempel-Ziv Codes **UNIT – III** **LINEAR BLOCK CODES**: Structure of linear block code- Hamming Codes-Error detection and correction capabilities of Hamming code-Encoder of (7, 4) Hamming code-Syndrome decoding-Error correction using syndrome vector. **UNIT – IV** **CYCLIC CODES:** Definition- Generator polynomial for cyclic code-systematic and	

Course Content	Non-systematic code words-Generator and parity check matrices of cyclic codes-Encoder for (n, k) cyclic code. Syndrome decoding –Cyclic Redundancy Check (CRC). **UNIT – V** **CONVOLUTIONAL CODES**: Golay Codes-Bose Chaudhri Hocquenghem (BCH) codes-Encoder for Convolutional code-Graphical representation for Convolutional encoding-Decoding methods- Viterbi algorithm-performance comparison of Convolutional codes and Block codes. Application of Viterbi and Sequential Decoding. **UNIT – VI** **ERROR CONTROL IN DATA STORAGE SYSTEMS**: Error control for computer main processor- Error control for magnetic tapes-syndrome computation- Error control in IBM 3850 main storage system.
Text Books and Reference Books	**TEXT BOOKS:** 1. Communication Systems – Dr.Sanjay Sharma-S.K. Kataria &sons-New Delhi. 2. Shu lin and Daniel J. Costello, Jr. "Error Control Coding – Fundamentals and Applications", Prentice Hall Inc. **REFERENCE BOOKS:** 1. Digital Communications-John G.Proakis, Masoud Salehi-Mc Graw Hill-5e 2. Bernard Sklar,"Digital Communications Fundamental and Application", Pearson Education, Asia. 3. B.P.Lathi,Zhi Ding-Modern Digitl and Analog communication systems-4/e - Oxford university press-2016 4. Simon Haykin- Communication systems-4/e,Wiley India,2011

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

19EC42E4-DIGITAL CONTROL SYSTEMS

Course Category:	Program Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practical:**	3-0-0
Prerequisite:	Signals and Systems, Linear Control Systems, Digital Design	**Sessional Evaluation:** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The Principles and techniques of A/D and D/A conversions and basics of Z-Transform. 2. The Stability analysis of digital control systems. 3. The design of digital control systems for different engineering model. 4. The state variable analysis, Routh criterion 5. The transient & steady state analysis 6. The design of feedback controller	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Obtain dynamic responses of linear systems and determine their stability, construct root-locus and bode plots, and apply Nyquist criterion in the context of controller 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.
	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
	CO6	Obtain dynamic responses of linear systems and determine their stability, construct root-locus and bode plots, and apply Nyquist criterion in the context of controller design.

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.

UNIT-III

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 – IV

STATE VARIABLE ANALYSIS: Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability,

Course Content	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 stability test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion. **UNIT – V** **DESIGN OF DIGITAL CONTROLLER:** Transient & steady – State response Analysis – Design based on the frequency response method – Bilinear Transformation & Design procedure in the w-plane, Lead, Lag & Lead Lag compensators & digital PID controllers. **UNIT – VI** **POLE PLACEMENT DESIGN 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 and Reference Books	**TEXT BOOKS:** 1. Discrete-Time Control systems - K. Ogata, Pearson Education/PHI, 2nd Edition. 2. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003. **REFERENCES BOOKS:** 1. Digital Control and State Variable Methods by M. Gopal, TMH
E-Resources	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/

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

S.No	COURSE CODE	COURSE
		OPEN ELECTIVE- III
1.	19CS42O1	JAVA PROGRAMMING
2.	19CE42O1	DISASTER MANAGEMENT AND MITIGATION
3.	19ME42O1	INTRODUCTION TO ROBOTICS
4.	19EE42O1	GREEN ENERGY SOURCES

19CS42O1 –JAVA PROGRAMMING

Course Category:	Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practical:**	3-0-0
Prerequisite:	Require the fundamental concepts of any programming and basic analytical capabilities	**Sessional Evaluation:** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected:	
	1. To learn the fundamentals of building blocks and supporting exposure. 2. To study the development of programs using procedural programmingmethodologies 3. To identify various software development techniques that imposes ahierarchical structure on the design of the programs. 4. To learn the principles of object-oriented programming (OOP) techniques based on classes and objects. 5. To explore the environments of Integrated DevelopmentEnvironment (IDE), Eclipse and other tools to debug the programs	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understandthe basics of Java including package concepts.
	CO2	Learn various I/O classes and supporting interfaces to develop simple programs
	CO3	Study the concept of exceptions and database connectivity to explore the quality improvement in various applications
	CO4	Identify various thread classes including applet class and implement the same on design and development
	CO5	Examine the role of event handling mechanisms and its applicability
	CO6	Study variousAWT controls and buttons which are used to develop smart user interfaces
Course Content	**UNIT-I** **OVERVIEW OF JAVA:** Object Oriented Programming Byte Code Concept, Java Buzzwords, A First Simple Program, Data Types, Variables And Arrays, primitive wrapper classes, Operators, Control Statements, Classes And Methods, Inheritance. **PACKAGES AND INTERFACE :** Packages, Access Protection, Importing Packages **UNIT-II** **INPUT/OUTPUT:** The Java I/O Classes And Interface, File, Standard Streams – System. In, System. Out, System. Err - Their Purpose And Usage, The Byte Streams - Input Stream, Output Stream, File Input Stream, File Output Stream, Print Stream, The Character Streams – Reader, Writer, File Reader, File Writer, Buffered Reader, Buffered Writer, Print writer, Serialization – Use Of Object Input Stream And Object Output Stream. . **UNIT-III** **EXCEPTION HANDLING:** Exception Handling Fundamentals, Exception Types, Using Try And Catch, Multiple Catch Clauses, Nested Try Statements, Throw, Throws, Finally Creating Own Exception Subclass. **DATA BASES:** Data Bases Introduced, Jdbc: The Java Database Connectivity, Jdbc Explored.	

	UNIT-IV **MULTITHREADED PROGRAMMING:** The Java Thread Model, Creating Thread, Creating Multiple Threads, Synchronization, Interthread Communication. **THE APPLET CLASS:** Applet Fundamentals, Applet Basics, Applet Architecture, An Applet Skeleton, Simple Applet Display Methods, Requesting Repainting, Passing Parameters To Applets. **UNIT-V** **EVENT HANDLING:** Two Event Handling Mechanisms, The Event Delegation Modes, Event Classes (ActionEvent, AdjustmentEvent, MouseEvent, WindowEvent, KeyEvent, TextEvent) Sources Of Events, Event Listener Interface (ActionListener, AdjustmentListener, MouseListener, ouseMotionListener, Keylisten, WindowListener, TextListener), Adapter Classes, Inner Classes. **UNIT-VI** **INTRODUCTION TO AWT:** Working With Windows , Controls , Layout Managers, Awt Classes, Window Fundamentals, Working With Frame Windows, Creating a Frame window From Applet, Controls, Labels, Using Buttons, Understanding Layout Managers, Menu Bars And Menus, Dialog Boxes, File Dialog;
Text Books and Reference Books	**TEXT BOOKS:** 1. Java 7 the Complete Reference, 7th Edition Herbert Schildt. **REFERENCE BOOKS:** 1. Steven Holzner, "Java 2 Programming Black Book", DreamTech, New Delhi, reprint: 2005. 2. Pratik Patel &KarlMoss, "Java database programming with JDBC" DreamTech, New Delhi, second edition, 2000.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

19CE42O1-DISASTER MANAGEMENT AND MITIGATION

Course category:	Program Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 - 0
Prerequisite:	Environmental science	**Sessional Evaluation :**	40
		External Evaluation:	60
		Total Marks:	100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The basic knowledge of Environmental Hazards and disasters. 2. The basics of Endogenous and Exogenous hazards and gives a suitable picture on the different types of hazard and disaster mitigation methods and some case studies related to disasters 3. The cumulative atmosphere hazards, cyclones. 4. The soil erosion, sedimentation, population explosion 5. The approaches of pre-disaster, post disaster preparation 6. The various case studies.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand Hazards and disasters and different approaches to disaster and their mitigation
	CO2	Explore the types of disasters, exogenous disasters and their effects
	CO3	Explore the Endogenous disasters and their effects
	CO4	Know the man induced disasters and their effects
	CO5	Understand the Disaster management through engineering applications
	CO6	Understand the disasters in national and international level.
Course Content	**UNIT-I** **ENVIRONMENTAL HAZARDS & DISASTERS**: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches. **UNIT-II** **TYPES OF ENVIRONMENTAL HAZARDS & DISASTERS:** Natural hazards and Disasters - Man induced hazards & Disasters Natural Hazards- Planetary Hazards/ Disasters - Extra Planetary Hazards/ disasters Planetary Hazards- Endogenous Hazards - Exogenous Hazards Endogenous Hazards - Volcanic Eruption, Earthquakes, Landslides; Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes - Environmental impacts of volcanic eruptions Earthquake Hazards/ disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of earthquakes - Human adjustment, perception & mitigation of earthquake. **UNIT –III** Exogenous hazards/ disasters - Infrequent events- Cumulative atmospheric hazards/ disasters Infrequent events; Cyclones – Lightning – Hailstorms Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms - causes , distribution human adjustment, perception & mitigation)Cumulative atmospheric hazards/ disasters; Floods- Droughts- Cold waves- Heat waves. Floods:- Causes of floods- Flood control	

Course Content	measures (Human adjustment, perception & mitigation); Droughts:- Impacts of droughts- Drought control measures; Extra Planetary Hazards/ Disasters **UNIT –IV** Soil Erosion- Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion- Conservation measures of Soil Erosion. Chemical hazards/ disasters - Release of toxic chemicals, nuclear explosion- Sedimentation processes. Sedimentation processes: - Global Sedimentation problems- Regional Sedimentation problems- Sedimentation & Environmental problems- Corrective measures of Erosion & Sedimentation. Biological hazards/ disasters: - Population Explosion. **UNIT –V** Emerging approaches in Disaster Management- Three Stages 1. Pre- disaster stage (preparedness) 2. Emergency Stage 3. Post Disaster stage-Rehabilitation **UNIT – VI** Case study of - Bhuj earthquake, Gujarat 2001 Indian Ocean earthquake and Tsunami, 2004 Chernobyl disaster, Ukraine 1986 Bhopal Gas tragedy, 1984 Kerala Floods, 2018.
Text Books and Reference Books	**TEXT BOOKS:** 1. Disaster Management by Rajib Shah, Universities Press, India, 2003 2. Disaster Science and Management by Tushar Bhattacharya, TMH Publications. 3. Disaster Mitigation: Experiences And Reflections by PardeepSahni 4. Natural Hazards & Disasters by Donald Hyndman & David Hyndman – Cengage Learning **REFERENCES:** 1. The Environment as Hazards by Kates, B.I & White, G.F, Oxford Publishers, New York, 1978 2. Disaster Management by R.B. Singh (Ed), Rawat Publication, New Delhi, 2000 3. Disaster Management by H.K. Gupta (Ed), Universiters Press, India, 2003 4. Space Technologyfor Disaster Mitigation in India (INCED) by R.B. Singh,, University of Tokyo,1994.
E-Resources	1.nptel.ac.in/courses/117105079/

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

19ME42O1-INTRODUCTION TO ROBOTICS

Course category:	Program Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 – 0
Prerequisite:	Physics, Differential Equations, Matrices and basic Geometry. Computer Simulation skills using MATLAB	**Sessional Evaluation :** **External Evaluation:** **Total Marks:**	40 60 100

Course Objectives	Students undergoing this course are expected to understand:	
	1. Classification of robotic manipulators and related technologies. 2. Skills associated with robot control 3. Skills associated with sensors and machine vision systems to robot control 4. Kinematics analysis of robot systems 5. Robot programming. 6. Interactive applications of industrial robots	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand robotics in today and future and robot configuration and subsystems
	CO2	Gain knowledge about Control systems for motion control
	CO3	Understand about sensors and machine vision.
	CO4	Relate kinematics for robot motion
	CO5	Design and implement programming for robot systems by using programming.
	CO6	Gain knowledge about Industrial robots applications.

Course Content

UNIT –I

INTRODUCTION: Need, Anatomy of robot, types of joints, types of constructions- degree of freedom, coordinate system workspace/work volume. Robot. Specification.

END-EFFECTORS: Types - mechanical, magnetic, pneumatic

UNIT –II

ACTUATORS: Introduction, actuators – Characteristics, Types, comparison – Hydraulic, pneumatic, Electric- DC, AC, Servo, stepper.

MOTION CONTROL SYSTEMS: Introduction, basic components and terminology, transfer function, open loop, feed-forward and closed-loop. Microprocessor control of electric motor.

UNIT-III

SENSORS: Introduction, characteristics. Types - Position, velocity, acceleration, force and pressure, torque, proximity, micro switches, touch and tactile, range finders.

MACHINE VISION: Introduction to Machine Vision, the sensing and digitizing function in machine vision, Image processing and analysis- training the vision system. Robotic applications

UNIT-IV

KINEMATICS OF ROBOTS: Introduction, reference frames. Robots as mechanisms - Matrix representation, transformations, forward and inverse kinematics of 2R and 3R robots. DH representation. degeneracy and dexterity

Course Content	**UNIT-V** **ROBOT PROGRAMMING**: Methods of robot programming- A robot program as a path in space Motion interpolation wait signal and delay commands branching **ROBOT LANGUAGES:** Introduction-Generation of Robot Programming Languages- robot language Structure –operating systems –Robot language elements and functions **UNIT-VI** **ROBOT APPLICATIONS**: manufacturing-material transfer and machine loading and unloading .Processing operations-welding-other processing operations, assembly and Inspection-robotic assembly, parts presentation methods. Inspection Automation
Text Books and Reference Books	**TEXT BOOKS:** 1. Industrial Robotics 2e by MP Groover McGraw-Hill Education (SIE) 2. Introduction To Robotics: Analysis,Control,Applications,2nd Edition Saeed B Niku Wiley **REFERENCE BOOKS:** 1. Introduction to Robotics by Subir Kumar Saha Tata McGraw-Hill Education. 2. Robotics: Fundamental Concepts And Analysis by Ashitava Ghosal oxford university press 3. Craig John J, Introduction to Robotics: Mechanics and Control, 3rd Edition, Prentice-Hall, 2005 4. P. Corke. Robotics, Vision and Control. Springer Verlag, 2011.
E-Resources	2. http://nptel.ac.in/courses 3. http://freevideolectures.com/university/iitm

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	2
CO2	3	3	2	-	-	-	-	-	-	-	-	2
CO3	3	3	3	-	-	-	-	-	-	-	-	2
CO4	3	3	2	-	-	-	-	-	-	-	-	2
CO5	3	3	2	-	-	-	-	-	-	-	-	2
CO6	3	3	2	-	-	-	-	-	-	-	-	2

19EE42O1-GREEN ENERGY SOURCES

Course category:	Open Elective	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practical:**	3 - 0 – 0
Prerequisite:	Nil	**Sessional Evaluation :**	40
		External Evaluation:	60
		Total Marks:	100

Course Objectives	Students undergoing this course are expected to understand:	
	1. The basic concepts of the energy scenario. 2. The operation, construction and design of various components of hydro power plant. 3. The working principle of PV cell and applications of solar energy. 4. The concepts of wind power generation. 5. The concepts of Biomass energy. 6. The concepts of Fuel cell and Geothermal systems.	
Course Outcomes	Upon successful completion of the course , the students will be able to:	
	CO1	Understand the basic concepts of the energy scenario.
	CO2	Gain the knowledge of operation, construction and design of various components of hydro power plant.
	CO3	Understand the working principle of PV cell and applications of solar energy.
	CO4	Gain the knowledge on wind power generation.
	CO5	Gain the knowledge on Biomass energy.
	CO6	Gain the knowledge on Fuel cell and Geothermal systems.
Course Content	**UNIT-I** **GLOBAL AND NATIONAL ENERGY SCENARIO**: Over view of conventional & renewable energy sources, need & development of renewable energy sources, types of renewable energy systems, Future of Energy use, Global and Indian Energy scenario, Renewable and Non renewable Energy sources, Energy for sustainable development, Potential of renewable energy sources, renewable electricity and key elements, Global climate change, CO2 reduction potential of renewable energy- concept of Hybrid systems. **UNIT-II** **HYDRO-ELECTRIC POWER PLANTS:** Introduction, Selection of site for Hydro – electric Power plants, classification of Hydro – electric plants, Layout of Hydro Electric Power plant, working principle, Description of main components, water power equation, types of turbines - Pelton, Fransis & Kaplan turbines, Pumped storage plant, Advantages and disadvantages of hydro power plant - Hydro power plants in India. **UNIT –III** **SOLAR ENERGY:** Introduction, solar radiation, solar energy collectors, Flat plate collectors, concentrating collectors, solar thermal power plant, working principle of photo voltaic cell, solar energy storage, solar applications. **UNIT –IV** **WIND ENERGY:** Introduction, power in the wind mills, site selection considerations for installing wind mill, Construction details of the wind mill (Wind Turbine Gear	

Course Content	System), working principle of wind mill, variation of power output with wind speed, Betz criterion, Applications. **UNIT –V** **BIOMASS**: Biomass Energy: Fuel classification – Pyrolysis – Direct combustion of heat – Different digesters and sizing. **UNIT –VI** **FUEL CELL**: Classification – Efficiency – V-I characteristics. **GEOTHERMAL**: Classification – Dry rock and acquifer – Energy analysis.
Text Books and Reference Books	**TEXT BOOKS:** 1. "Acourse in power systems", by J.B.Guptha, S.K.Kataria&sons, Eleventh edition, Reprint-2014. 2. "Generation of Electrical Energy"- by B.R Gupta-S.Chand Publications,6th Edition, Reprint-2014. 3. Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis - second edition, 2013. **REFERENCE BOOKS:** 1. Renewable Energy- Edited by Godfrey Boyle-oxford University, press, 3rd edition, 2013. 2. Renewable Energy Technologies /Ramesh & Kumar /Narosa. 3. Renewable energy technologies – A practical guide for beginners – Chetong Singh Solanki, PHI. 4. Non-conventional energy source –B.H. Khan- TMH-2nd edition.
E-Resources	1. http://nptel.ac.in/courses 2. http://iete-elan.ac.in 3. http://freevideolectures.com/university/iitm

Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												