**E.G.S.PILLAY ENGINEERING COLLEGE – NAGAPATTINAM**

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

**COURSE PLAN**

**COURSE CODE** : EC6402

**COURSE TITLE** : COMMUNICATION THEORY

**SEMESTER/DEPT**  : IV/ECE

**COURSE TIME** : JANUARY – APRIL 2015

**FACULTY DETAILS**

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| **S.NO** | **NAME OF THE FACULTY** | **OFFICE** | **MAIL ID** | **Mobile Number** |
| 1 | M.NUTHAL SRINIVASAN | ECE DEPARTMENT | nuthal4u@gmail.com | 9597077499 |

**REQUIRED TEXT BOOKS:**

J.G.Proakis, M.Salehi, “Fundamentals of Communication System”, Pearson Education 2006.

S.Haykin, “Digital Communication”, John Wiley, 2005.

**WEB RESOUCES:**

www.freebookcentre.net

www.filecrop.com

www.annaunivonline.com

www.utwired.engr.utexas

www.books.google

www.nptel.com

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| EC 6402 COMMUNICATION THEORY | | | | | | | | | | | | | |
| Course designed by | Anna University, Chennai. | | | | | | | | | | | | |
| Student outcomes | a | b | c | d | e | f | g | h | i | j | k | l | m |
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| Category | Science | | | | Core | | | | Elective | | | | |
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| Course coordinator | V.Elavarasi | | | | | | | | | | | | |

**OUTCOMES:** Students who have successfully completed this course

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| **Instructional Objective** | **Instructional Outcome** |
| 1. 1. To evaluate various modulation and demodulation systems 2. 2. To analyze noise minimization of various receivers. 3. 3.To Study basic information theory with channel coding theorem | 1. Choose efficient modulation schemes. 2. Find the optimal solutions for noise minimization. 3. Explain the Random Process. 4. Illustrate the channel distortion and Noise. 5. Plan the information theory using different coding technique |

**DETAILED SESSION PLAN:**

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| **I AMPLITUDE MODULATION SYSTEMS: Generation and detection of AM – wave - spectra -**DSBSC, Hilbert Transform, Pre-envelope & Complex envelope - SSB and VSB - Comparison – Superheterodyne Receiver. | | | | | | | | | |
| **Session No.** | **Topics to be covered** | | **Text book** | **Chapter and**  **Page No** | **Content Delivery** | | **Testing method** | **Instruc**  **tional Objective** | **Instruc**  **tional Outcome** |
| **Method** | **Level** |
| 1 | Review of Spectral Characteristics of Periodic and Non-periodic signals | | Electronic Communications by Dennis Roddy& John Coolen, Fourth Edition | Chapter 8 252–253 | Chalk & Talk | Under  standing | Cycle Test | 1. 1. To evaluate various modulation and demodulation systems | 1. Choose efficient modulation schemes. |
| 2 | Classification of signal - continuous time signal, discrete time signal - Review of spectral characteristics of periodic and non-periodic signal. | | Chapter 8 253-257 | Chalk & Talk | Under  standing | Cycle Test |
| 3 | Need for modulation, amplitude modulation, degrees of modulation, power and current relation in AM | | Chapter 8 258-260 | Chalk & Talk | Under  standing | Cycle Test |
| 4 | Generation of AM – Collector modulator, square law Modulator, Balanced Modulator, Switching Modulator | | Chapter 8 267-271 | Chalk & Talk | Under  standing | Cycle Test & Assignment |
| 5 | Generation of AM – High and low level modulators Demodulation of AM – Square law, Envelope detector | | Chapter 8  272-275 | Chalk & Talk | Under  standing | Cycle Test |
| 6 | DSB-SC modulation, Generation of DSB-SC-Balanced, Ring modulator | | Chapter 8  266 | Chalk & Talk | Under  standing | Cycle Test |
| 7 | Demodulation of DSB-SC - Coherent, Envelope detector. | | Chapter 8  279 | Chalk & Talk | Under  standing | Cycle Test |
| 8 | SSB modulation and Generation of SSB-SC-Filter, phase shift, Weavers method. | | Chapter 8  297-302 | Chalk & Talk | Under  standing | Cycle Test |
| 9 | VSB modulation, Generation of VSB signals- phase discrimination method | | Chapter 3  134-136 | Chalk & Talk | Under  standing | Cycle Test |
| 10 | Demodulation of SSB-SC – coherent, Demodulation of VSB signals, Superheterodyne Receiver | | Chapter 8  279 | Chalk & Talk | Understanding | Cycle Test |
| 11 | Hilbert Transform, Pre-envelope & Complex envelope | | Chapter 8  272-275 | Chalk & Talk | Under  standing | Cycle Test |
| **2. Angle Modulation:** Phase and Frequency Modulation; Narrow Band and Wideband FM; Spectrum, FM modulation and Demodulation, FM Discriminator, PLL as FM Modulator, Transmission Bandwidth. | | | | | | | | | |
| **Session No.** | **Topics to be covered** | **Text book** | | **Chapter and**  **Page No** | **Content Delivery** | | **Testing method** | **Instructional Objective** | **Instructional Outcome** |
| **Method** | **Level** |
| 1 | Introduction, angle modulation-Frequency modulation, PM | Electronic Communications by Dennis Roddy and John Coolen, Fourth Edition | | Chapter 10  321-324 | Chalk & Talk | Understanding | Cycle Test | 1. To evaluate various modulation and demodulation systems | a. Choose efficient modulation schemes. |
| 2 | Narrow band FM- Generation | Chapter 10  325-332 | Chalk & Talk | Understanding | Cycle Test |
| 3 | Wideband FM – Generation, Spectrum | Chapter 10  333-335 | Chalk & Talk | Understanding | Cycle Test |
| 4 | Transmission bandwidth of FM | Chapter 10  336 -346 | Chalk & Talk | Understanding | Cycle Test |
| 5 | Generation of FM signal-Direct FM (reactance tube, varactor diode, VCO) | Chapter 10  347 | Chalk & Talk | Understanding | Cycle Test |
| 6 | Generation of FM signal-Indirect FM (Armstrong method) | Chapter 10  348 | Chalk & Talk | Understanding | Cycle Test |
| 7 | Demodulation of FM signals - slope detector | Chapter 10  370 | Chalk & Talk | Understanding | Cycle Test |
| 8 | Demodulation of FM signals - phase difference detector | Chapter 10  373 | Chalk & Talk | Understanding | Cycle Test |
| 9 | FM Discriminator, PLL as FM Demodulator | Chapter 10  370-373 | Chalk & Talk | Understanding | Cycle Test |

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| 1. **Random Process:** Random Variables, Central limit Theorem, Random Process, Stationary processes, Mean, Correlation and Covariance functions, Power Spectral density, Ergodic processes, Gaussian Process; Transmission of a Random Process Through a LTI filter. | | | | | | | | | | | |
| **Session No.** | **Topics to be covered** | **Text book** | **Chapter and**  **Page No** | **Content Delivery** | | | | **Testing method** | | **Instructional Objective** | **Instructional Outcome** |
| **Method** | | | **Level** |
| 1 | Review of probability - mathematical definition, law of probability, conditional probability | Principles of Communications by Taub and Schilling | Chapter 2  57-65 | Chalk & Talk | | | Understanding | Cycle Test | | 1. 1. To evaluate various modulation and demodulation systems | c.Explain the Random Process. |
| 2 | Random Variables - discontinuous, discrete, distribution function, numerical characteristics and distribution laws of random variable | Chapter 2  57-65 | Chalk & Talk | | | Understanding | Cycle Test | |
| 3 | Central limit Theorem, Random process | Chapter 2  87-89 | Chalk & Talk | | | Understanding | Assignment | |
| 4 | Stationary processes | Chapter 2  57-65 | LCD Projector | | | Understanding | Assignment | |
| 5 | Mean, Correlation and Covariance functions | Chapter 2  82-86 | Chalk & Talk | | | Understanding | Cycle Test | |
| 6 | Power Spectral density | Chapter 1  14-15 | Chalk & Talk | | | Understanding | Cycle Test | |
| 7 | Ergodic processes, Gaussian Process | Chapter 4  76-81 | LCD Projector | | | Understanding | Assignment | |
| 8 | Transmission of a Random Process Through a LTI filter | Chapter 1  7-13 | Chalk & Talk | | | Understanding | Assignment | |
| 4.**Noise Characterization:** Noise Sources and Types, Noise Figure and noise temperature, Noise in cascaded systems, Narrow band noise, PSD of in-phase and quadrature noise, noise performance in AM systems, Noise performance in FM systems, pre-emphasis and de-emphasis, Capture effect, threshold effect. | | | | | | | | | | | |
| **Session No.** | **Topics to be covered** | **Text book** | **Chapter and**  **Page No** | **Content Delivery** | | | | **Testing method** | | **Instructional Objective** | **Instructional Outcome** |
| **Method** | | | **Level** |
| 1 | Noise Sources and Types | Electronic Communications by Dennis Roddy& John Coolen, Fourth Edition | Chapter 4  118-133 | Chalk & Talk | | | Understanding | Cycle Test | | 1. 2. To analyze noise minimization of various receivers. | b. Find the optimal solutions for noise minimization. |
| 2 | Noise Figure and noise temperature, Noise in cascaded systems | Chapter 4  137-145 | Chalk & Talk | | | Understanding | Cycle Test | |
| 3 | Narrow band noise | Chapter 4  147 | Chalk & Talk | | | Understanding | Cycle Test | |
| 4 | PSD of in-phase and quadrature noise | Chapter 4  137-145 | Chalk & Talk | | | Understanding | Cycle Test | |
| 5 | Noise performance in AM systems | Chapter 8  287-296 | Chalk & Talk | | | Evaluating | Cycle Test | |
| 6 | Noise performance in FM systems | Chapter 10  364-369 | Chalk & Talk | | | Evaluating | Cycle Test | |
| 7 | Pre-emphasis and de-emphasis | Chapter 10  369-370 | Chalk & Talk | | | Understanding | Cycle Test | |
| 8 | Capture effect, threshold effect. | Chapter 10  369-370 | Chalk & Talk | | | Understanding | Cycle Test | |
| 9 | Pre-emphasis and de-emphasis in FM, Comparison of performance of AM and FM systems | Chapter 10  373 | Chalk & Talk | | | Evaluating | Cycle Test | |
| **5.Information Theory:** Entropy, Discrete Memoryless channel, Channel capacity, Hartley, Shannon law, Source coding theorem, Huffman and Shannon,  Fano codes. | | | | | | | | | | | |
| **Session No.** | **Topics to be covered** | **Text book** | **Chapter and**  **Page No** | **Content Delivery** | | | | **Testing method** | | **Instructional Objective** | **Instructional Outcome** |
| **Method** | | | **Level** |
| 1 | Discrete Memoryless channel | Principles of Communication Systems by Taub Schilling , Second Edition. | Chapter 13  511-513 | Chalk & Talk | | | Understanding | Cycle Test | | 3.To Study basic information theory with channel coding theorem | d.Discuss the different coding techniques to minimize  the channel distortion. |
| 2 | Entropy and its properties | Chapter 13  514-517 | Chalk & Talk | | | Understanding | Cycle Test | |
| 3 | Channel capacity | Chapter 13  518 | Chalk & Talk | | | Understanding | Cycle Test | |
| 4 | Huffman Codes | Chapter 13  517-575 | Chalk & Talk | | | Understanding | Assignment | |
| 5 | Shannon Fano Codes | Chapter 13  517-575 | Chalk & Talk | | | Understanding | Assignment | |
| 6 | Shannon law | Chapter 13  517-575 | Chalk & Talk | | | Analyzing | Cycle Test | |
| 7 | Source coding theorem | Chapter 13  517-575 | Chalk & Talk | | | Analyzing | Cycle Test | |
| 8 | Hartley Codes | Chapter 13  517-575 | | Chalk & Talk | Analyzing | | | Cycle Test |
| 9 | Problems in Huffman Coding |  | Chapter 13  517-575 | | Chalk & Talk | Analyzing | | | Cycle Test |  |  |

**Outcome Mapping.**

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| PEO/ Instructional Outcome | A | B | C | D |
| a. Graduates will demonstrate knowledge of Differential equation, vector calculus, complex variables, matrix theory, probability theory, random process, physics, chemistry and basics of computer. |  |  |  |  |
| b. Graduates will demonstrate an ability to solve electronics and communication problems. |  |  |  |  |
| c. Graduates can draw the technical drawing regarding electrical and mechanical field |  |  |  |  |
| d. Graduate will be able to communicate effectively in both verbal and written. |  |  |  |  |
| e. Graduate will have the design ability in electrons circuits and devices analyze and interpret data. |  |  |  |  |
| f. Graduate will have an ability to design digital & analog system and components. |  |  |  |  |
| g. Graduate will have the skill to use modern engineering software and equipment. |  |  |  |  |
| h. Graduate will have the awareness of environment |  |  |  |  |
| i. Graduate will have the knowledge of signals, signal processing, digital signal processing |  |  |  |  |
| j. Graduate will have the knowledge of designing program in microprocessor and microcontroller to meet industrial needs |  |  |  |  |
| k. Graduate will have professional and ethical responsibility |  |  |  |  |
| l. Graduates will have the depth knowledge in communication, telecommunication, mobile communication, digital communication, Optical networks security. |  |  |  |  |
| m. Graduates who can participate and succeed in competitive exam like GATE, TANCET, UPSC and will have the awareness of lifelong learning |  |  |  |  |

**Assignments :**

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| S.No | Assignment Title | Marks |
| 1. | Brief introduction about AM modulation | 50 |
| 2. | Explain Random Process, Gaussian and Stationary Process. | 50 |
| 3. | Explain Huffman and Shannon codes | 50 |
| 4. | Innovative 1 | 50 |
| 5. | Innovative 2 | 50 |

**TEACHING AIDS:**

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| **S.NO** | **TEACHING AID** |
| 1 | Chalk and Board |
| 2 | Multimedia Projector & Laser Pointer |

**Prepared by**

**Reviewed by**

**HOD/ECE**