

SEMESTER - VI

EC 1601 – INDUSTRIAL ELECTRONICS

(2-1-0)

Thyristor characteristics, Two-Transistor Model of Thyristor, thyristor Turn-On di/dt Protection, dv/dt - Thyristor Turn-On, Series Operation of Thyristor, Parallel Operation of Thyristors, Snubber reverse Recovery Transients.

Thyristor Commutation Techniques

Natural Commutation, Forced Commutation, Self Commutation, Impulse Commutation; resonant pulse commutation, complementary commutation, External Pulse commutation, Load side commutation, line side commutation.

Controlled rectifiers

Introduction, principle of phase controlled converter operation, Single phase semi Converters, single phase dual converters, single phase series converters, three phase half wave converters, three phase semi converters, three phase full converters, three phase dual converters.

AC Voltage Controllers

Introduction, principle of on-off control; principle of phase control, single-phase bidirectional controllers with resistive loads, single phase controllers with Inductive loads. Three phase half wave controllers.

Three phase full wave controllers, three phase bi-directional delta connected controllers, single phase transformer tap changers, cycloconverters, single phase cycloconverters, three phase cycloconverters, reduction of output harmonics.

DC Choppers

Introduction, principle of step-down operation, Step-down choppers with RL Load principle of step-up operation, performance parameters, switch-mode regulators, thyristor, chopper circuits' Impulse commutated choppers. Effects of source and load inductance, Impulse-commutated three thyristor choppers, resonant pulse choppers.

Inverters

Introduction, principle of operation, performance parameters, single phase bridge Inverters, three phase inverters, voltage control of three phase inverter, Harmonic Reductions.

Suggested Text Books & References

- Rasid, "Power Electronics", Prentice Hall.
- Sen, P.C., "Power Electronics", Wiley eastern.
- Dubey, G.K., "Thyristor Engineering", Prentice Hall

1602 - ADVANCED SOLID STATE DEVICES

(2-1-0)

AC-DC

Resonant c-dc converters: Analysis, design equations, control techniques and application, SMPS (forward, fly back, and push-pull configurations), current controlled PWM inverters -SPWM, advanced modulation techniques (bang-bang and space vector modulation techniques etc.)

Resonant voltage source inverters-operation, control, and design. Intelligent power Electronic Modules (IPEC), Non-drive applications of inverters; Ups, induction heating, metal cutting, active power line conditioning. Drive applications: Scalar, vector and direct torque control of ac drives, self-controlled synchronous motor drive-constant power factor and constant margin angle control. Modern application case studies of power Electronics and drives.

EEE

EC 1603 – ADVANCED ELECTRIC CIRCUITS

(3-1-0)

Introduction to Networks and Layered Architecture. OSI model. Data Communication Concepts. Transmission media Topology, Multiplexing. Circuit switching & packet switching Data Link Layer. Layer 2 switches and ATM, SONET/SDH. Medium Access Control. CSMA CD, TDMA. FDMA, COMA. Network Layer and address version 4 and 6. Routing Algorithms. Transmission Layer. TCP and UDP. Congestion Control Technique. ATM. Internetworking. Wireless communications. Network Management and security.

Suggested text books and references

- Black, "computer networks".
- Schwartz, "Communication network".
- Stevens, "UNIX Network Programming".
- Dugglas, "TCP/IP and internetworking".

EC 1604 - COMMUNICATION HARDWARE DESIGN

(3-1-0)

Amplitude Modulation & Demodulation AM, DSB-SC, SSB and VSB signals; Low level AM using diodes, transistors, ICs; High level modulators Class B and Class C, ring modulators and balanced modulators; Generation of SSB signal using frequency discrimination and phase discrimination; Envelope detectors and coherent detectors; Square Law Detectors; Costas receiver, Squaring loop.

Frequency Modulation and Demodulation

NBFM and WBFM, Reactance modulator, Varactor modulator; Modulators using voltage controlled oscillators, and function generators; Armstrong modulator, slope detector, ratio detector, Foster-Seeley discriminator.

Receivers

Motivation and principles of super-heterodyne receivers, sensitivity, selectivity and image frequency rejection; Sub-systems of a communication receiver; Receiver evaluation and measurements.

Amplifier and Mixers

Amplifier design using admittance parameters; Broad banding techniques; mixers using diodes; transistors, IC; Multipliers.

Phase locked loops and Frequency Synthesizers

Linear model of PLL, phase detectors, voltage controlled oscillators, loop filters, FM demodulation using PLL; PLL Applications: Digital PLL; Steady state, stability and transient analysis of PLL, Direct frequency synthesis, PLL as a Frequency synthesizer, Direct Digital Synthesis.

Introduction to Electronic Switching

Single stage, two stage networks; Non blocking networks, Networks with concentrators, switching centres, store program control, Distributed SPC, CPU based exchange, switching Hierarchy and Routing

Introduction to Television

interlaced scanning, luminance and chrominance signals, composite video signal, Television Transmitters.

Suggested Text Books & References

- Smith, Jack, "Modern Communication Circuits", McGraw Hill, 1986.
- Clarke, K.K. and Hess, D.T., "Communication Circuits: Analysis & Design", Addison Wesley Publishing Co., 1971.
- Kennedy, George, "Electronic Communication Systems", 3rd Ed., McGraw Hill, 1984.
- Gulati, R.R., "Monochrome and Colour Television", Wiley Eastern Ltd., 1986.
- Grinsec, "Electronic Switching", Elsevier Science Publishers, 1983.

EC 1605 - MICROWAVE ENGINEERING

(3-1-0)

Microwave tubes:

UHF and microwave frequency limitations of a conventional tubes, Cavity resonator (single & two-cavity) Analysis and operation of klystron amplifier, Two- cavity klystron amplifier, reflex klystron oscillator, Travelling wave tube, Backward wave oscillator, GUNN oscillator, Magnetron oscillator, avalanche diode oscillator, Transferred electron oscillator.

Microwave components:

Tees. E-plane tee, H- plane tee, Magic tee, two-hole directional coupler, isolators, linear & rotary phase shifters, Microwave variable attenuators, Matched loads.

Microwave Integrated circuits - strip line, microstrip line, slotted line, microstrip antenna.

Ferrite devices – property, faraday rotation in isolators, faraday rotation in two & four – port circulator.

Scattering Matrix representation and its properties.

Microwave devices:

Basic principal of - IMPATT diode, GUNN diode, PIN diode, Tunnel diode.

Suggested Text books & References

- Liao, "Microwave Devices and Circuits" Prentice hall of India.
- Reich, "Microwave Principles" CBS.
- Kulkarni, "Microwave and Radar Engineering",
- Watson, "Microwave Semiconductor Devices and their Circuit applications", McGraw Hill

Baseband Pulse Transmission

Matched filter, inter-symbol Interference, Eye pattern, Nyquist's criterion for Distortionless Baseband Binary Transmission, Correlative level coding (Partial response signalling) and line coding: Adaptive Equalization, Clock recovery schemes.

Bandpass Digital Transmission

BPSK, QPSK, MSK, PDSK, FSK, OOK and QAM techniques, Carrier recovery schemes.

Performance of Continuous Wave and Digital Modulation Schemes in Noise

White noise, Narrow band noise, Noise Analysis of AM, DSB-SC and SSB using coherent detection, Noise Analysis of AM using envelope detection, Noise analysis of FM, Threshold effect in FM, Pre emphasis and de-emphasis in FM, Quantization noise, Noise considerations in PCM, Probability of Error, Analysis for the above digital modulation techniques.

Noise Sources and Characterizations

Shot noise, thermal noise, Available noise power Available power gain of a two port network, noise figure, Noise Bandwidth, Noise Temperature, Noise Figure measurement, System noise calculations.

Information Theory

Entropy and information rate of a discrete memory less source, entropy of a Markov source, Source coding Theorem, Huffman coding, Mutual information and channel capacity, capacity with additive white Gaussian noise.

Error Control Coding

Channel coding Theorem, Linear block codes and syndrome decoding, Cyclic codes, Introduction to convolution codes and Viterbi algorithm.

Suggested Text books &References

- Simon. Haykin, "Communication Systems", 3rd Ed., John Wiley & Sons, 1997.
- Simon, Haykin, "Communication Systems", 2nd Ed., John Wiley & Sons, 1996.
- Taub and Schilling, "Principles of Communication Systems", Tata McGraw Hill, 1998.
- Lathi, "Analog and Digital Communication Systems", 2nd ed., John Wiley & Sons, 1993.
- Bruce Carlson, A., "Communication Systems", McGraw Hill Kogakuslla, 1986.
- Sam Shanmugam, K., "Digital and Analog Communication Systems", John Wiley & Sons, 1997.

PRACTICAL / DRAWING / DESIGN

EC 1607-P - Communication Systems Lab. - II

(0-0-3)

List of experiments:

- IF amplifier using Transistors
- Amplitude Modulator using transistors and demodulation by envelope detection
- IC based Balanced Modulator and Demodulator
- Frequency Modulators using 8038 and 566
- Capture range & Lock range measurement of a PLL
- Frequency demodulation using PLL
- IC based Sample and Hold
- Pulse Width Modulator
- Delta Modulator using D-Flip Flop
- IF Amplifier using IC 3018
- Frequency Synthesizer using PLL

EC 1608 -P - Microwave Engineering Lab.

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List of experiments:

- Study of Microwave Bench and its components and instruments.
- Measurement of Klystron characteristics.
- Measurement of VSWR and Standing wave ratio.
- Measurement of dielectric constants.
- Measurement of directivity and coupling coefficient of a Directional coupler.
- Determination of attenuation constant of an Attenuator.
- Determination of phase shift of a Phase shifter.
- Measurement of Q of a cavity

EC 1609-P - Advanced Electric circuits Lab.

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- Simulation Experiments for protocol performance.
- Configuring, testing and measuring Network devices and parameters/policies;
- Network management experiments;
- Exercises in Network programming.

EC 1610 - P Communication Hardware Design Lab.

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- Study of SSB, DSB modulators
- Study of Square law detectors
- Design of superhetrodyne receiver
- Study of EN modulation using PLL and its application
- Design of FM communication system

HS 1606 - P GENERAL PROFICIENCY - VI

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