Jorhat Institute of Science & Technology

6th Semester B.E. (ETC)

ANTENNA AND WAVE GUIDE

L-3 T-1 P-2

Theory : 100
Practical: 25
Sessional : 50

1. **Electromagnetic Fields:** Review of EM theory, Maxwell's Equations, wave equations, solutions, plane waves, pointing vector, power flow and potentials.

2. **Elementary Radiations:** Hertzian and half wave dipoles and loops, radiation patterns, radiation resistance, gain, beam width, directivity, efficiency, effective length, effect or ground resonant and non resonant antennas, Folded dipoles.

3. **Antenna Arrays:** Two element array, broad side, End fired pattern, Beam width pattern multiplication, multi element array and their properties, Synthesis of an array.

4. **Various Types Of Antenna :** Yagi-Uda antenna, Rhornbic antenna, Log-periodic and helical antennas, Microwave antenna Parabolic reflectors, horns , Lens and slot antennas-Their characteristics and typical applications, Beam-width, polarization and bandwidth

5. **Matching Network:** Antenna coupling and matching networks, Baluns.

6. **Wave Propagation:** Propagation modes for different frequencies, Descriptions and salient features of ground waves, sky wave and space propagation, Tropospheric propagation, ionospheric propagation, Computation of field strength, MUF, virtual height, critical frequency, skip distance, Microwave propagation, Fading Diversity reception.

Text Books/ References:

1. F. C. Jordan & K. G. Balmain - Electromagnetic Waves and Radiating Systems - PHI
2. CA Balanis - Antenna Theory: Analysis and Design - J. Wiley & Sons
3. J. D. Krans - Antennas - Mc Graw Hill
4. P. Krans - Electromagnetics - McGraw Hill
5. R. E. Collin - Antenna & Radio wave Propagation - McGraw Hill.

COMMUNICATION ENGINEERING-II

L-3 T-1 P-0

Theory : 100
Sessional : 50

Introduction: Introduction to Analog pulse communication Systems & digital communications Systems, Channel classification, performance Measure, Geometric representation of signals, bandwidth, mathematical models of communication Channels Merits of digital systems.

Waveform Coding Techniques: Preview of sampling theorem, Impulse Sampling, natural Sampling, Sampler Implementation. Quantizing and coding for discrete sources, Pulse code modulation (PCM), Quantization noise, Companding, DPCM, DELTA modulation (DM), Adaptive differential PCM, Time Division Multiplexing (TDM), Noise in PCM and DM systems.

Data Modulation and Demodulation: Vector Representation of waveforms, Modulation and Demodulation Based on Vector- Space Concept, Vector Channel Model, Optimum Detection with the AWGN Channel. Error Probability for the AWGN Channel

Signal Constellations and Modulation Techniques: Cubic and Orthogonal Constellations, Circular Constellations- M-ary Phase Shift Keying (PSK). Pulse Amplitude Modulation (PAM), Quadrature Amplitude Modulation (QAM).

Baseband Pulse Transmission: Baseband binary PAM systems, Inter-symbol interference (ISI), Nyquists's criterion for distortion less baseband binary transmission, Nyquist and Raised Cosine Pulses, Square- Root Splitting of the Nyquist Pulse, Baseband M-ary, PAM systems, Optimum detection, Matched filters, correlation receivers.

Passband System Analysis: Passband Representation, Equivalent Forms for a Passband Signal, Passband Channels and Their Baseband Equivalent, Baseband Equivalent AWGN Channel, Demodulators for the Generation of the Baseband Equivalent.

Information Theory: Information measure, average information and entropy. Discrete memory less channels. Shannon's theorems (Source-coding theorem, channel-coding theorem, information capacity theorem)

Error Control Coding: Error detection and correction, Parity check bit coding, block code, convolution coding, combined modulation and coding, Trellis Coded Modulation.

Text Books/references:

1. S. Haykin, *Communication Systems*, 4th ed., John Wiley & Sons
2. J.G. Proakis and M. Salehi, *Communication System Engineering*, Prentice Hall
3. B. Sklar, *Digital Communications: Fundamentals and Applications*, Prentice-Hall
4. G. Kennedy, "Electronics communication system".
5. John. G. Proaki, "Fundamentals of communication Systems", Pearson Education.

DIGITAL SIGNAL PROCESSING

L-3 T-1 P-2

Theory : 100
Practical: 25
Sessional : 50

Module I: Discrete Fourier Transform (10 hours) : Discrete Fourier series - properties of DFS - periodic convolution - DFT - properties – linear convolution using DFT - computation of DFT - circular convolution - decimation in time and decimation in frequency algorithms - FFT algorithm for a composite number

Module II : IIR and FIR Filter Structures (8 hours): Signal flow graph representation - basic filter structures - structures for linear phase – finite word - length effects in digital filters - quantizer characteristics - saturation overflow -quantisation in implementing systems - zero Input limit cycles

Module III: Digital Filter Design (12 hours): Design of IIR digital filters from analog filters - Butterworth and Chebyshev filters – design examples -impulse invariant and bilinear transformation methods - spectral transformation of IIR filters - FIR filter design - linear phase characteristics - window method

Module IV: General and Special Purpose Hardware for DSP (10 hours): Computer architecture for signal processing - hardware architecture - pipelining – hardware multiplier - accumulator - special instructions - general purpose digital signal processors -texas instruments - TMS 320 family - motorola DSP 56000 family - analog devices ADSP 2100 family - implementation of DSP algorithm on general purpose digital signal processors

Tex/Reference books:

1. Oppenheim A.V., Schafer R.W. & Buck J.R., *Discrete - Time Signal Processing,* PHI/Pearson Education
2. Mitra S.K., *Digital Signal Processing: A Computer Based Approach,* Tata McGraw Hill
3. Proakis T.G. & Manolakkis D.G., *Digital Signal Processing - Principles, Algorithms and Applications,* Prentice Hall of India Pvt. Ltd.

PRINCIPLE OF ECONOMICS AND ACCOUNTANCY

Theory: 100
Sessional :50

(Separate answer scripts are to be used for each half)

First Half (50 Marks)

ECONOMICS

L-2-T-1-P-0

1. Definition of Economics-A brief introduction to Microeconomics and Macroeconomics. 5
2. Utility analysis of demand- Law of diminishing marginal utility, Law of demand, Elasticity of demand, Law of supply. 6
3. Economics of large scale production, Division of Lab our, Law of decreasing returns to scale, Law of increasing returns to scale, Law of constant returns to scale. 6
4. Cost of production, Price and output determination in perfect competition, Monopoly and monopolistic competition, Oligopoly. 6
5. National income and its various concepts, Methods of measuring national income. 4
6. Trade cycle- phases and remedial measure. 4
7. Commercial banking and Central banking. 5
8. International trade and doctrine of comparative cost. 4
9. Taxation- Canons of taxation, Direct and indirect taxes. 5
10. Aims and objectives of the current five year plan of India 5

Text and Reference Books:

1. Elementary Economic Theory : K.K Dewett and J.D Verma
2. Modern Economic Theory : K.K Dewett
3. A Text Book of Economic Theory : Stonier and Hague
4. Indian Economics : Dutt, Rudder and Sundaram
5. Indian Economics : K.K Dewett and J.D Verma

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PRINCIPLE OF ECONOMICS AND ACCOUNTANCY

Theory: 100

Sessional :50

(Separate answer scripts are to be used for each half)

Second Half (50 Marks)

ACCOUNTANCY

L-2-T-1-P-0

Unit-I **10 Marks**

Accounting – Objectives, Advantages and limitations, Uses of Accounting information, Concept and classification of accounts, Transitions, Double Entry System of Book Keeping, Golden rules regarding Debit and Credit. Journal- Definition, Journalizing of transaction. Ledger- Definition, Advantages, Rules regarding posting, Balancing of ledger accounts. Trial Balance- Definition, Objectives and Preparation of Trial Balance.

Unit-II **10 Marks**

Subsidiary Books, Types of Cash Book, Preparation of Cash Book. Bank Reconciliation Statements-

Meaning, Reasons of disagreements of balances, Preparation of Bank Reconciliation Statements.

Unit-III **8 Marks**

Concept of Capital expenditure and Revenue expenditure, Bad debts, Provision for bad and doubtful debits, Provision for discount on debtors, Outstanding expenses, Accrued income, Depreciation- Meaning, definition, Need for providing depreciation, Methods of recording depreciation.

Unit-IV **12 Marks**

Final Account- Preparation of trading account, Profit and Loss account, Balance sheet with adjustments.

Unit-V **10 Marks**

Cost Sheet or Cost Statement- Preparation of cost Sheet with adjustment of Raw Materials, Work in progress, Finished products, Items excluded from cost statement.

Different Techniques of Project Appraisal and Evaluation-Pay-back period, Average Rate Return, Net Present Value method, Internal Rate of Return.

Text and Reference Books:

1. Book Keeping and Accountancy (Part-I) : C.Mohan Juneja, R.C Chawla, K.K Seksena
2. Cost Accounting-Principles and Practice : S.P Jain, K.L Narang.

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LINEAR INTEGRATED CIRCUITS

L-3 L-3 T-1 P-2

Theory : 100

Practical: 25

Sessional : 50

1. Introduction to Integrated Circuits : Integrated circuits and its types, Classification of IC's, SSI, MSI, LSI, VLSI, Packaging of IC's, Basic outline of IC fabrication.

2. Operational Amplifiers : Ideal and practical operational amplifiers, inverting and non- inverting amplifier, differential amplifier, emitter coupled differential amplifier, transfer characteristics of a differential amplifier, offset error: voltage and current, common mode rejection ratio (CMRR), Slew rate, Effect of slew rate in applications, Virtual ground concept, Comparators

3. Linear Application of Operational Amplifiers: Scale changer, phase shifter, adder, voltage to current converter, current to voltage converter, Integrator, Differentiator, Instrumentation Amplifier

4. Non- Linear Application of Operational Amplifiers : Comparators, sample and hold circuits, Logarithmic amplifier, anti- logarithmic amplifier, Waveform generators, Miller & Bootstrap sweep generators, Schmitt Trigger, ADC, DAC, PLL, Analog Multipliers, Multivibrators

5. Active Filters: Low Pass, High Pass, Band Pass and Band Reject filters, Butterworth filter design, Chebyshev filter design

6. <u>Special Function IC's:</u> Astable & Monostable Multivibrators using 555 timer IC, Positive Voltage regulator IC's, Negative Voltage regulator IC's, Op-amp 741, Audio power amplifier LM 380

<u>Text/ Reference Books:</u>

1. Op-Amps and Linear Integrated Circuits – Ramakant A. Gayakwad, PHI
2. Design with Operational Amplifiers and Analog Integrated Circuits – Sergio Franco, TMH
3. Linear Integrated Circuits- D. Roy Choudhury, Shail B. Jain, New Age International Publishers
4. Microelectronic Circuits – Sedra/ Smith, Oxford University Press
5. Operational Amplifier and Linear Integrated Circuits - K Lal Kishore, Pearson Education

COMMUNICATION ENGINEERING -II

1. **Unit-I**
   Introduction:- Introduction to Analog pulse communication systems & digital communication systems, Geometric representation of signals, bandwidth, mathematical models of communication Channels, Merits of digital systems.

2. **Unit-II**
   Random Processes
   Random variables:- Cumulative distribution function, Probability density function, Mean, Variance and standard deviations of random variable, Gaussian distribution, Error function, Correlation and autocorrelation, Central-limit theorem, Error probability, Power Spectral density of digital data.
3. **Unit-III**
   Pulse Modulation
   Analog Signals:- Sampling of Signal, Sampling Theorem for Low Pass and Band Pass Signals, Aliasing, Pulse Amplitude Modulation (PAM), Time Division Multiplexing (TDM), Channel Bandwidth for PAM-TDM Signal, Types of Sampling, Instantaneous, Natural and Flat Top (Mathematical and Spectral Analysis),
4. **Unit-IV**
   Pulse Code Modulation
   Digital Signal:- Quantization, Quantization Error, Pulse Code Modulation (PCM), Signal-to-Noise Ratio in PCM, Companding, Data Rate and Bandwidth of Multiplexed PCM Signal, Inter-symbol Interference (ISI) Nyquist criterion for distortion less baseband binary transmission, Baseband M-ary PAM systems, Ideal Nyquist channel, Raised cosine spectrum.
   Differential PCM (DPCM), Delta Modulation (DM), and Adaptive Delta Modulation (ADM), Comparison of various system in terms of Bandwidth and Signal-to-Noise Ratio, Noise in PCM and DM systems.
5. **Unit-V**
   Digital Modulation Techniques :- Analysis, Generation and Detection (Block Diagram), Spectrum and Bandwidth of Amplitude Shift Keying (ASK), Binary Phase Shift Keying (BPSK), Differential Phase Shift Keying (DPSK), Quadrature Phase Shift Keying (QPSK), M-ary PSK, Binary Frequency Shift Keying (BFSK), M-ary FSK, Minimum Shift Keying, Quadrature Amplitude Modulation (QAM), Comparison of digital modulation techniques on the basis of probability of error, Matched Filter, optimum Detection with the AWGN Channel, correlation receiver,

6. **Unit–VI**

Information Theory:- Information measure, average information and entropy, Discrete memoryless channels, Shannon's theorems (Source-coding theorem, channel coding theorem, information capacity theorem)

Error Control Coding: Error detection and correction, Parity check bit coding, Hamming code, Trellis coded modulation.

References:

1. Taub and Schilling: Principles of Communication System, TMH
2. Simon Haykins: Communication Systems, 4th Edition, John Wiley.
3. Singh and Sapre: Communication System, TMH
4. B.P. Lathi: Modern Analog and Digital Communication System, Oxford University Press
5. Tomasi: Advanced Electronics Communication Systems, 6th Edition, PHI
6. Couch: Digital and Analog Communication, Pearson Education.
7. David Smith : Digital Transmission Systems, Springer- Macmillan India Ltd

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6th Semester B.E. (ETC)

MICROWAVE ENGINEERING

L-3 T-1 P-2

Theory : 100
Practical: 25
Sessional : 50

1.Transmission Lines: Review of transmission line theory- Co-axial cable- MIC lines- Standing waves- VSWR and reflection coefficient- Smith chart- Stub matching calculation.

2. Waveguides: Rectangular and circular waveguides- Solution of wave equations- TE and TM modes-Dominant mode- Filed Patterns-Cut-off frequencies-Wave impedance-Power transmission-Waveguide resonators.

3. Network Representation: Scattering matrix parameters.

4. Components: Directional couplers- isolators- circulators- power splitters, E-H and magic Tees- Attenuators- Phase shifters-Short circuit and matched terminations-Filters.

5. Microwave Devices: High frequency limitations- Klystrons-magnetrons-TWTs-Microwave transistors – BJTs and GaAs MOSFETs-Transferred electron devices-avalanche transit-time devices-Read diode-IMPATT diode-BARITT diode and the tunnel diode-Parametric devices-Quantum electronic devices- MASERS and LASERS- MICs.

Text Books/references:

1. S. Y. Liao - Microwave Devices and Circuits, Prentice Hall of India.
2. M. M. Radmanesh - Radio Frequency and Microwave Electronics, Pearson Education Asia.
3. R. E. Collin - Foundation for Microwave Engineering, McGraw-Hill.
4. K. C. Gupta - Microwaves. John Wiley and Sons.