

# Jorhat Institute of Science & Technology

6<sup>th</sup> Semester B.E. (PEI)

## COMMUNICATION THEORY

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

Theory : 100

Practical: 25

Sessional : 50

- 1. Amplitude Modulation:** Analog signal transmission (AM & FM diagram), Need for modulation, Equation for AM wave, modulation index and power relationships, Linear CW modulation schemes, Double Sideband Suppressed Carrier (DSB-SC), Single-Sideband (SSB), Vestigial Sideband (VSB), Generation and detection, AM broadcasting.
- 2. Angle Modulation:** Phase Modulation (PM), Frequency Modulation (FM), Bessel functions and FM spectral analysis, Narrowband FM and Wideband FM, Frequency division multiplexing (FDM), Generation and detection of PM and FM (reactance modulator and indirect method), Stereophonic FM broadcasting.
- 3. Noise in Communication Systems:** Sources and characteristics of different noise, Concept of white Gaussian noise, Thermal noise, Shot noise, S/N ratio and noise equivalent bandwidth noise temperature and noise figure.
- 4. Performance of CW Modulation Systems:** Super-heterodyne receivers, Receiver sensitivity and selectivity, Selection of IF
- 5. Waveform Formatting Technique (DM):** Digital communications Systems, channel classification, performance Measure, Geometric representation of signals, bandwidth, mathematical models of communication channels Merits of digital systems. Preview of sampling theorem, Impulse Sampling, natural Sampling, Sampler Implementation. Quantizing and coding for discrete sources. Pulse code modulation (PCM), Time Division Multiplexing (TDM), DPCM, DELTA modulation (DM), ADM, Noise in PCM and DM systems.
- 6. Baseband & Passband Pulse Transmission:** Baseband binary PAM systems. Nyquist criterion for distortion less baseband binary transmission, Baseband M-ary PAM systems, Pass-band Representation, Coherent phase-shift Keying, Coherent frequency-shift keying.
- 7. Information Theory:** Discrete message and information content, Concept of amount of information, Average information, Entropy, Information rate. Shannon's theorems, Source-coding theorem, Channel-coding theorem, information capacity theorem. Spread spectrum modulation, Pseudo-noise sequence, Direct-sequence spread spectrum, Frequency-hopping spread spectrum
- 8. 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*, 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 Labour, 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:**

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|-----------------------------------|-----------------------------|
| 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**

**Marks 10**

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**

**Marks 10**

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**

**Marks 8**

Concept of Capital expenditure and Revenue expenditure, Bad debts, Provision for bad and doubtful debts, Provision for discount on debtors, Outstanding expenses, Accrued income,

Depreciation- Meaning, definition, Need for providing depreciation, Methods of recording depreciation.

**Unit-IV**

**Marks 12**

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

**Unit-V**

**Marks 10**

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. Special Function IC's:** 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

**Text/ Reference Books:**

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

## ELECTRICAL AND ELECTRONIC MEASUREMENT-II

L-3 T-1 P-2

Theory:100

Sessional : 50

Practical-25

1. **Instrument Transformers:** Theory and construction of current and potential transformers. Ratio and phase angle errors and their minimization. Effects of variation of power factor, secondary burden and frequency errors. Testing of CTs and PTs.
2. **Potentiometers:** Theory of operation and construction of D.C. and A.C. potentiometers (polar and coordinate type). Their standardization and applications
3. **Measurement of Resistance:** Methods of measurement of medium, low and high resistances. Loss of charge method. Measurement of earth resistance and insulation resistance.
4. **A.C. Bridges:** Generalized treatment of four-arm a.c. bridges. Sources and detectors. Maxwell's Inductance and capacitance bridges, Hay's bridge, Anderson Bridge, Heaviside mutual inductance bridge, Schering bridge, De-sauty bridge and Wein's bridge. Sources of errors and their minimization in bridge measurement. Screens and Wagner earth device.
5. **Magnetic Measurements:** Determination of B-H curve and hysteric loop of ring and bar specimens. Measurement and separation of iron looses.
6. **High Voltage Measurement:** High voltage tests and testing equipments, Low frequency HV tests, DC tests, High frequency tests, Impulse tests, HV testing of insulators, transformer oil and cable.
7. **Data Acquisition System & Telemetry:** Objective and configuration and applications of DAS. Introduction to telemetry systems.

## Texts/References:

1. Sawhney A.K., "A course in Electrical and Electronic Measurement and Instrumentation", Dhanpat Rai and sons
2. D. Helfrick and W. D. Cooper, Modern Electronic Instrumentation and Measuring Techniques. Prentice-Hall of India
3. Kalsi H.S., "Electronic Instrumentation", Second Edition, Tata Mc Graw Hill Company
4. B. M. Oliver and J. M. Cage, Electronic Measurements and Instrumentation. McGraw-Hill
5. Gupta J.B., "A course in Electrical and Electronic Measurement and Instrumentation", Katson Publishing House
6. E.W. Golding & F.C Widdis – Electrical Measurement and Measuring Instruments.

## ***INDUSTRIAL PROCESS CONTROL***

### **L-3 T-1 P-0**

Theory : 100

Sessional : 50

- 1) **Introduction:** Definition of process & process control systems; Objectives & requirements; Levels of process control systems, Classification & selection of process variables; Sources & nature of disturbances; Hardware elements of process control systems.
- 2) **Modeling of physical systems:** Mathematical model of physical systems-liquid level system, interacting and non interacting systems, RLC elements in process, linearization of non linear systems.
- 3) **Transient response analysis:** Transient response specifications ,Response of first and second systems with P, I, P-I, P-D and P-I-D controllers; effect of time delay and measurement lag on system response.
- 4) **Controllability and stability:** Concept of controllability, DRF & SR, stability analysis using Routh's criteria, Root locus, Bode plot, GM & PM, System controllability using Bode plot.
- 5) **Control action and controllers:** On-Off, P, I, D, P-I, P-D and PID control actions; pneumatic, hydraulic and electronic controllers.
- 6) **Design of feed back controllers:** Selection criterion for type of controllers, controller tuning-process reaction curve, Zeigler-Nichol's method, Cohen and Coon method and frequency domain method.
- 7) **Multi loop control systems:** Cascade control, override control, feed-forward control and ratio control systems.
- 8) **Control valve:** Construction and working principle, valve sizing, valve plug, valve characteristics, selection of control valve, valve positioners.
- 9) **Computer aided control system:** Control computer-Basic functions, specifications, hardware elements and architecture of computer aided process control system –Data transmission & standard interfaces-Data acquisition system –Centralized, Distributed and Hierarchical computer control system -Supervisory control-Programmable Logic controller-Architecture, Ladder diagram and programming.

### **Text/ Ref. Books:**

- 1) Stephanopoulos G- Chemical process control (PHI).
- 2) Coughanowr – Process System Analysis and Control (MH)

- 3) Hariot P-Process Control (TMH).
- 4) Johnson-Process Control Instrumentation Technology (JW)
- 5) Singh S.K- Industrial Instrumentation & Control (MH)
- 6) Patranabis D- Process Control
- 7) Singh S.K-Computer Aided Process Control ((PHI)