# JABALPUR ENGINEERING COLLEGE, JABALPUR (MP)
## (An Autonomous Institute of Govt. of M.P. )
## Affiliated to Rajiv Gandhi Technological University, Bhopal (MP)
### Scheme of Study and Examination (w.e.f. July 2010)

**BE (PTDC) Sem : Fourth Branch : Electronics & Telecom Engineering**

| Course Code | Subject | Periods | | | EVALUATION SCHEME | | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | SESSIONAL EXAM | | | ESE | SUB TOTAL | |
| | | | | | TA | CT | TOTAL | | | |
| EC-17 | Analog Communication | 3 | 1 | - | 10 | 20 | 30 | 70 | 100 | 4 |
| EC-14 | Electromagnetic Theory | 3 | 1 | - | 10 | 20 | 30 | 70 | 100 | 4 |
| EC-22 | Analog Integrated Circuit | 3 | 1 | - | 10 | 20 | 30 | 70 | 100 | 4 |
| EC-23 | Digital Signal Processing | 3 | 1 | - | 10 | 20 | 30 | 70 | 100 | 4 |
| **(PRACTICAL/DRAWING/DESIGN)** | | | | | | | | | | |
| EC-18L | Analog Communication Lab | - | - | 2 | 20 | - | 20 | 30 | 50 | 2 |
| EC-24L | Digital Signal Processing Lab | - | - | 2 | 20 | - | 20 | 30 | 50 | 2 |
| EC-21L | Simulation Lab | - | - | 2 | 20 | - | 20 | 30 | 50 | 2 |
| EC-56L | Professional Activity | - | - | 2 | 50 | - | 50 | - | 50 | 2 |
| | **Total** | **12** | **4** | **8** | **150** | **80** | **230** | **370** | **600** | **24** |

T.A. Teachers Assessment, CT- Class Test, ESE - End Semester Examination, Total Marks 600 Total Periods : 24, Total Credits : 24

# COURSE CONTENT & GRADE (w.e.f. July 2010)

| Branch | Subject Title | Subject Code | Grade for End Sem | | CGPA at the end of every even semester |
|---|---|---|---|---|---|
| | | | T | P | |
| B.E/PTDC | ANALOG COMMUNICATION | EC-17 | Min "D" | Min "D" | 5.0 |

**ANALOG COMMUNICATION**

## Unit 1 Amplitude Modulation System

Frequency Translation, A Method of Frequency Translation, Recovery of Baseband Signal, Amplitude Modulation, Maximum Allowable Modulation, Spectrum of an Amplitude Modulated Signal, Generation and Detection of AM waves. Suppressed Carrier Systems (DSB-SC), Single Sideband Modulation, Vestigial Sideband Modulation, Comparison of various AM Systems, Frequency Division Multiplexing, AM Transmitter and AM Radio Broadcasting.

## Unit 2 Angle Modulation System

Angle modulation, Phase & Frequency Modulation, Relation between Phase & Frequency Modulation, Phase & Frequency Deviation, Spectrum of an FM Signal, Features of Bessel Coefficient, Narrowband FM, Wideband FM, Bandwidth of FM Signal, Effect of Modulation Index on Bandwidth, Phasor Diagram of FM signal, FM Generation and Detection, FM Radio Broadcasting.

## Unit 3 Random Variables

Random Variables, CDF, PDF, relation between CDF & PDF, Average Value of Random Variables, Variance of Random Variable, Tchebycheff's Inequality, Guassian Probability Density, Error Function, Rayleigh Probability Density, Correlation between Random Variables, Central Limit Theorem, Autocorrelation.

## Unit 4 Random Processes

Description of Statistical Average, Stationary, Random Processes and Linear System, Power Spectrum of Stochastic Processes, Transmission over LTI System, Gaussian processes , White processes, Bandlimited Processes and Sampling, Bandpass Processes.

## Unit 5 Effect of Noise on Analog Communication Systems

Effect of noise on a Baseband Signal, DSB-SC AM, SSB AM, and Conventional System, The PLL, Effect of Additive Noise on Phase Estimation, Threshold effect in Angle Modulation, Pre-Emphasis and De-Emphasis Filtering, Comparison of Analog Modulation System, Characterization of Thermal Noise Sources, Effective Noise Temperature and Noise Figure, Transmission Losses, Repeaters for Signal Transmission.

**Reference Books:**


1. H.Taub & D.L.Schilling: Principles of Communication System; TMH
2 Simon Haykins- Communication System; John Wiley
3 B P Lathi- Modern Digital and Analog Communication, Oxford University.
4 J.Prokis and Salehi- Communication Engineering System, Prentice Hall.
5 Hwie. P. Hsu- Schaum's Outline of Analog and Digital Communication

# COURSE CONTENT & GRADE (w.e.f. July 2010)

| Branch | Subject Title | Subject Code | Grade for End Sem | | CGPA at the end of every even semester |
|---|---|---|---|---|---|
| | | | T | P | |
| B.E/PTDC | **ELECTROMAGNETIC THEORY** | EC-14 | Min "D" | Min "D" | 5.0 |

**ELECTROMAGNETIC THEORY**

**UNIT I Coordinate systems and transformation**: Cartesian coordinates, circular cylindrical coordinates, spherical coordinates .Vector calculus: Differential length, area and volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector .Green's and Stoke's theorem, Laplacian of a scalar.

**UNIT II Electrostatics**: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses' Law – Maxwell's equation, Electric dipole and flux lines, energy density in electrostatic fields. Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, dielectric constants, continuity equation and relaxation time, boundary condition. Electrostatic boundary value problems: Poisson's and Laplace's equations, general procedures for soling Poisson's or Laplace's equations, resistance and capacitance, method of images.

**UNIT III Magnetostatics**: Magneto-static fields, Biot-Savart's Law, Ampere's circuit law, Maxwell's equation, application of ampere's law, magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential.

Magnetic forces, materials and devices: Forces due to magnetic field, magnetic torque and moment, a magnetic dipole, magnetization in materials, magnetic boundary conditions, inductors and inductances, magnetic energy.

**UNIT IV Waves and applications**: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, displacement current, Maxwell's equation in final form. Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence.

**Transmission lines**: Transmission line parameters, Transmission line equations, input impedance, standing wave ratio and power, The Smith chart, Some applications of transmission lines.

**UNIT V Radiation, EMI and EMC:** Retarded Potentials and concepts of radiation, Radiation from a small current element. Radiation resistance**:** Introduction to Electromagnetic Interference and Electromagnetic compatibility, EMI coupling modes, Methods of eliminating interference, shielding, grounding, conducted EMI, EMI testing: emission testing, susceptibility testing.

**Text Book:**


1. Hayt, W.H. and Buck, J.A. 'Engineering Electromagnetics Tata McGraw Hill Publishing Co. Ltd., New Delhi Seventh edition.
2. Jordan E.C. and Balmain K.G. 'Electromagnetic' wave and radiating systems. PHI Second edition.
3. Krauss J. D. 'Electromagnetics ' Tata McGraw Hill Fifth edition.
4. Ramo S, Whinnery T.R. and Vanduzer T, 'Field and Waves in Communication electronics' John Wiely and Sons Third edition.
5. Elements of Engineering Electromagnetics, N.N. Rao, 5th Ed., PHI.
6. Electromagnetic Waves and Antennas: Collins: TMH

# COURSE CONTENT & GRADE (w.e.f. July 2010)

| Branch | Subject Title | Subject Code | Grade for End Sem | | CGPA at the end of every even semester |
|---|---|---|---|---|---|
| | | | T | P | |
| B.E/PTDC | **ANALOG INTEGRATED CIRCUITS** | EC-22 | Min "D" | Min "D" | 5.0 |

**ANALOG INTEGRATED CIRCUITS**

**UNIT- I Integrated Circuit Fabrication:**
Introduction, Classification, IC Chip Size and Circuit Complexity, Fundamentals of Monolithic IC Technology, Basic Planar Processes, Fabrication of a Typical Circuit, Active and Passive Components of ICs, Fabrication of FET ,Thin & Thick Film Technology

**UNIT -II Operational Amplifier:**
Ideal Operational amplifier, Operational Amplifier Internal Circuit, FET Operational Amplifier, Operational amplifier DC Characteristics : Input bias Current, Input offset Current, Input offset Voltage, Thermal Drift, Operational amplifier AC Characteristics : Frequency Response, Stability of an OP-AMP, Frequency Compensation (External & Internal), Slew Rate.

**UNIT- III Basic Operational Amplifier Applications:**
Instrumentation amplifier, AC amplifier, V to I and I to V Converter, Op-amp circuits using diodes, Sample and hold circuits ,Log & antilog amplifier Multiplier & Divider, Differentiator, Integrator, Electronic Analog Computation, Operational Transconductance Amplifier(OTA).

**UNIT- IV**
**Comparator:** Regenerative Comparator (Schmitt Trigger), Square Wave generator (Astable Multivibrator), Monstable Multivibrator, Triangular Wave Generator, Basic Principle of Sine Wave Oscillators,
**Voltage Regulator:** Series OP-AMP Regulator, IC Voltage Regulators, 723 General Purpose Regulators, Switching Regulator,
**Active Filters:** RC Active filters, Transformation, State variable filter, Switched capacitor filters, Active filters using OTA's.

**UNIT -V**
**IC 555 Timers:** Description of Functional Diagram, Monostable Operation, Astable Operation, Schmitt Trigger,
**Phased- Locked Loops:** Basic Principles, Phase Detector /Comparator, Voltage Controlled Oscillator (VCO), Low Pass Filter, Monolithic Phase- Locked Loop, PLL Applications.
D-A & A-D Converters: Basic DAC Techniques, A-D Converters.

**REFERENCES:**

1. Millman and Halkias : Integrated Electronics, TMH
2. Gayakwad: OP-AMP and Linear Integrated Circuits, Pearson Education
3. D. Roy Choudhury and Shail B. Jain: Linear Integrated Circuits, New Age
4. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, PHI
5. Sedra and Smith : Microelectronics, Oxford Press
6. Graham Bell : Electronics Devices and Circuits, PHI
7. Donald A Neamen: Electronic Circuits Analysis and Design, TMH
8. S. Rama Reddy: Electronic Devices and Circuits, Alpha Science International Limited

# COURSE CONTENT & GRADE (w.e.f. July 2010)

| Branch | Subject Title | Subject Code | Grade for End Sem | | CGPA at the end of every even semester |
|---|---|---|---|---|---|
| | | | T | P | |
| B.E/PTDC | **DIGITAL SIGNAL PROCESSING** | EC-23 | Min "D" | Min "D" | 5.0 |

**DIGITAL SIGNAL PROCESSING**

**Unit – I**

**Discrete-Time Signals and Systems** Discrete-Time Signals, Discrete-Time Systems, Analysis of Discrete-Time Linear Time-Invariant Systems, Discrete Time systems described by Difference Equation, properties of the LTI system, Frequency Domain Representation of discrete time signals & systems, Signal flow Graph representation of digital network, matrix representation.

**Unit - II**

**The z-Transform:** The Direct z-transform, Properties of the z-transform, Stability of system in Z-domain Rational z-transforms, , analysis of Linear Time-Invariant systems in the z- domain, Inverse- Z transform, chirp – Z transform.

**Unit - III**

**Frequency Analysis of Discrete Time Signals:** Discrete Fourier series (DFS), Properties of the DFS, Discrete Fourier Transform (DFT), Properties of DFT , Circular Convolution , Two dimensional DFT . FFT algorithms, Radix-2 FFT Algorithm, Goertzel's Algorithm, decimation in time, Decimation in frequency algorithm, Decomposition for 'N' composite number.

**Unit – IV**

**Basic filter structures** –Recursive and non -recursive networks, System connectivity, Basic structures of IIR and FIR filters, Determining of system response, Impulse response and transfer function of filters, Determining impulse response using Recursion formula ,finite word -length effects in digital filters.

**Unit - V**

**Digital filters Design Techniques**: Design of IIR and FIR digital filters, Impulse invariant and bilinear transformation, windowing techniques- rectangular and other windows, Application of MATLAB for design of digital filters, Concept of Adaptive filtering and applications.

**Books:**


1. A.V. Oppenheim and R. W. Schafer: Digital Signal Processing, Prentice Hall.
2. . L.R. Rabiner and B. Gold: Theory and Application of Digital Signal Processing, Prentice Hall
3. John. G. Proakis and Monolakis: Digital Signal Processing, Pearson Education
4. Salivahanan and Vallavraj: Digital Signal Processing, Mc Graw Hill.
5. S. K. Mitra: Digital Signal Processing- A Computer based Approach, Mc Graw Hill.
6. Schilling and Harris: Fundamentals of DSP using MATLAB, Cengage Learning.

# COURSE CONTENT & GRADE (w.e.f. July 2010)

| Branch | Subject Title | Subject Code | Grade for End Sem | | CGPA at the end of every even semester |
|---|---|---|---|---|---|
| | | | T | P | |
| B.E/PTDC | **ANALOG COMMUNICATION LAB** | EC-18L | Min "D" | Min "D" | 5.0 |

**ANALOG COMMUNICATION LAB**

**(Suggested Exercise)**

**List of Experiments :**

1) Study of AM, DSB – SC & SSB.
2) Study of AM Transmitter.
3) Study of AM receiver.
4) Study of FM Generation by Armstrong Method.
5) Study of FM Generation by Reactance Modulator.
6) Study of Superhetrodyne receiver.
7) Study of Sampling Theorem and Reconstruction of Bandlimited signal.

# COURSE CONTENT & GRADE (w.e.f. July 2010)

| Branch | Subject Title | Subject Code | Grade for End Sem | | CGPA at the end of every even semester |
|---|---|---|---|---|---|
| | | | T | P | |
| B.E/PTDC | **DIGITAL SIGNAL PROCESSING LAB** | EC-24L | Min "D" | Min "D" | 5.0 |

## DIGITAL SIGNAL PROCESSING LAB
## (Suggested Exercise)

**The following practicals should be performed using Scilab/ Matlab/ any DSP simulation software -**

1. Generation, analysis and plots of discrete-time signals.
2. Implementation of operations on sequences (addition, multiplication, scaling, shifting, folding etc).
3. Implementation of Linear time-invariant (LTI) systems and testing them for stability and causality.
4. Computation and plots of z-transforms, verification of properties of z-transforms.
5. Computation and plot of DFT of sequences, verification of properties of DFT.
6. Computation and plots of linear/circular convolution of two sequences.
7. Computation of radix-2 FFT- Decimation in time and Decimation in frequency.
8. Implementation of IIR and FIR filter structures (direct, cascade, parallel etc).
9. Implementation of windowing design techniques of FIR.

# COURSE CONTENT & GRADE (w.e.f. July 2010)

| Branch | Subject Title | Subject Code | Grade for End Sem | | CGPA at the end of every even semester |
|---|---|---|---|---|---|
| | | | T | P | |
| B.E/PTDC | **SIMULATION LAB** | EC-21L | Min "D" | Min "D" | 5.0 |

**SIMULATION LAB**

## List of Experiments

(1) Implementation of linear convolution sequence using MATLAB .

(2) Compensation N/W design through MATLAB simulation.

(3) Designing PID controller.

(4) Designing of amplifier using MAT LAB by measuring its Bandwidth and Rise Time.

(5) Designing of Hamming code, Encoder & Decoder.

(6) Performance analysis of CRO using simulink.

(7) Analysis & design of login gates using simulink by measuring propagation delay & Transmission delay.

## COURSE CONTENT & GRADE (w.e.f. July 2010)

| Branch | Subject Title | Subject Code | Grade for End Sem | | CGPA at the end of every even semester |
|---|---|---|---|---|---|
| | | | T | P | |
| B.E/PTDC | **PROFESSIONAL ACTIVITY (SEMINAR)** | EC-56L | Min "D" | Min "D" | 5.0 |

**PROFESSIONAL ACTIVITY (SEMINAR)**

**Objective –** The aim of professional activity is to impart training in developing capabilities of students in expressing views on technical topics. Students can choose any topics related to electronics & communication branch theoretically or can fabricate practical working models on which lecture could be delivered . Practical working model demonstration in group is also permitted. Model fabrication under the professional activity shall be encouraged. Students who have visited, some technical places can also write & present report on it.