

B. Tech. Electronics & Telecommunication Engineering
Four-Year (Eight Semesters) Course

Syllabus for Second Year (Semester IV)

w.e.f. (Jan 2012)



Department of Electronics and Telecommunication
Dr. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,
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Dr. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Department of Electronics and Telecommunication Engineering

Semester-IV

CODE	SUBJECT	L	P	C	MSE	ESE
BET401	Microprocessor	4	0	8	30	70
BET402	Electronic Devices and Circuits II	4	0	8	30	70
BET403	Signals and Systems	4	0	8	30	70
BET404	Principles of Communication	4	0	8	30	70
BET405	Elective-I	3	0	6	30	70
ID406	History of Science & Technology*	0	0	4	50	--
BET407	Communication Engineering Laboratory I**	0	6	6	50	50
BET408	Industrial Exposure***	0	0	0	0	0
XC409	NSS/NCC/Sports/Arts	0	0	0	0	0
		19	6	48	250	400

Elective – I:

Linear Algebra

Electronic Measurements & Instruments

Industrial Instrumentation

***Self Study Course (Objective University Level Common Exam)**

**** BET407: Practicals of Electronic Devices and Circuits I, Digital Electronics, Numerical Methods & Computer Programming and Electrical Technology courses**

***** Two Weeks in Electronics or Telecommunication Industry**

[BET401] Microprocessor

Weekly Teaching Hours	TH : 04	
Examination Hours	TH : 03	
Marking Scheme	MSE: 30	ESE: 70
Credits	08	

UNIT I

Architecture of Microprocessors

General definitions of Mini Computers, Microprocessors, Microcontrollers and Digital Signal Processors. Overview of 8085 Microprocessor. Overview of 8086 Microprocessor. Signals and pins of 8086 Microprocessor.

UNIT II

Assembly language of 8086

Description of Instructions, Assembly directives, Assembly software programs with algorithms.

UNIT III

Interfacing with 8086

Interfacing with RAMs, ROMs along with the explanation of timing diagrams. Interfacing with peripheral ICs like 8255, 8254, 8279, 8259, 8259 etc. Interfacing with key boards, LEDs, LCDs, ADCs, and DACs etc.

UNIT IV

Coprocessor 8087

Architecture of 8087, Interfacing with 8086. Data types, Instructions and Programming.

UNIT V

High end processors

Introduction to 80386 and 80486.

UNIT VI

Introduction to Pentium and its higher generations

Architecture, Memory Management.

Assembler, Debugger, Introduction to bit Slice Processor, Signal Processing Processor and Transputers, Introduction to development tools, MDS, Logic Analyzer, and in-circuit emulator.

Texts/References:

1. R. S. Gaonkar, "Microprocessor Architecture, Programming and Applications with the 8085", Pen Ram International, 3rd Edition
2. Liu, Gibson, "Microcomputer System: The 8086/88 Family Architecture, Program Design", PHI, New Delhi, 1996 , 2nd edition
3. Douglas Hall, "Microprocessor Interfacing: Programming and Hardware", TMH, Illinois, 1991, 2nd edition
4. Walter Triebel, Avtar Singh, "The 8088 & 8086 microprocessors", PHI, 4th edition
5. Barry B. Brey, "The Intel Microprocessor", Pearson education, 6th edition

[BET402] Electronic Devices and Circuits II

Weekly Teaching Hours	TH : 04	
Examination Hours	TH : 03	
Marking Scheme	MSE: 30	ESE: 70
Credits	08	

UNIT I

Diode Applications: Voltage multiplier circuits: Working and comparison of voltage doubler, tripler and voltage quadrupler configurations, Limitations of voltage multiplier circuits, Effect of frequency on load regulation, Clipping and clamping circuits: Series and parallel forms of clipping circuits, Biased clipper, their operation and transfer characteristics. Clamping circuits.

MOSFET Applications: MOSFET in VLSI: V-I characteristic equation in terms of W/L ratio, MOSFET scaling and small geometry effects, and MOSFET capacitances. Modeling MOS transistors using SPICE. CMOS inverter, Static characteristics – Noise margin, threshold voltage, Layout and latch-up prevention, other logic gates-NAND and NOR gates.

UNIT II

Power MOSFET: Construction- Lateral double diffused MOSFET, VMOSFET. Drive requirements, Comparison with power BJT, one example of drive circuit for POWER MOSFET.

POWER BJT: Power BJT construction, Data sheet specifications, Thermal resistance, Second breakdown, Safe operating area (SOA), Thermal runaway, BJT as a switch in display and relay drive applications, Drive considerations, Antisaturation circuits, Comparison with POWER MOSFET.

UNIT III

Large signal AF BJT amplifiers: Block schematic of AF amplifier. Classes of power amplifiers An overview and applications of Class C and Class D amplifiers. Class A with resistive load, Transformer coupled class A amplifier, Class B Push-pull, Class AB, Complementary symmetry and Quasi-complementary configurations. Efficiency analyses for Class A transformer coupled amplifier, Class B

push-Pull amplifiers, Comparison of efficiencies of other configurations, Distortions in amplifiers, concept of Total Harmonic Distortion (THD).

UNIT IV

High frequency, small signal BJT amplifiers: Behavior of transistor at high frequencies. Modified T equivalent circuit, High frequency hybrid π CE amplifier model. CE short circuit current gains for T and hybrid models, Definitions and derivations for f_a , f_b and f_T , Amplifier bandwidth considering source and load resistances, Techniques to improve bandwidth, Single tuned, Double tuned and stagger tuned amplifiers. Effect of staggering on bandwidth

UNIT V

Feedback Amplifiers And Oscillators: Concept of feedback, Negative and positive feedback. Classification of amplifiers based on feedback topology, Transfer gain with feedback. Advantages and disadvantages of negative feedback, Effect of feedback on input and output impedances and bandwidth of an amplifier, Analysis of one circuit for each feedback topology.

OSCILLATORS: Oscillator startup mechanism, need for amplitude limiting. Study of LC oscillators – General form of LC oscillator, Hartley oscillator, Colpitts oscillator, Clapp oscillator, Crystal oscillator, Crystal clock.

UNIT VI

Linear Voltage Regulators And Voltage References: Block schematic of linear regulators, Emitter follower regulator, Transistor series regulator and its analysis for performance parameters, 3 terminal floating, dual and adjustable regulators. Method of boosting output current using external series pass transistor, Performance parameters – Load and Line regulation, Ripple rejection, Output resistance and efficiency, Protection circuits – Reverse polarity protection, over current, fold back current limiting, over voltage protections, Important data sheet specifications of linear regulators, Voltage references, their peculiarities and applications.

Texts/References:

1. Electronic devices and circuits theory, Boylestead & Nashelsky Pearson/Prentice Hall, 9th Edition, 2006.
2. Electronic Devices, Thomas L. Floyd, Pearson Education- Sixth edition
3. Electronic circuit analysis & Design, Donald A. Neamen, Tata McGraw Hill -Second Edition

4. Microelectronic Circuits & Devices, Mark N. Horenstein, Prentice Hall- Second Edition.
5. Electronic Device & Circuits, Millman Halkies, Tata McGraw Hill-2nd edition-2007.
6. Switched mode power supplies – Chryssis
7. Electronic Devices and Circuits, David A. Bell, PHI, New Delhi, 2002, 3rd edition

[BET403] Signals and Systems

Weekly Teaching Hours	TH : 04	
Examination Hours	TH : 03	
Marking Scheme	MSE: 30	ESE: 70
Credits	08	

UNIT I

An introduction to signals and systems

Signals and systems as seen in everyday life, and in various branches of engineering and science electrical, mechanical, hydraulic, thermal, biomedical signals and systems as examples. Extracting the common essence and requirements of signal and system analysis from these examples.

Formalizing signals

Energy and power signals, signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals.

Formalizing systems

System properties: linearity: Additivity and Homogeneity, Shift- invariance, Causality, Stability, Realizability. Examples.

UNIT II

Time Domain Representation of Analog and Digital Linear Time Invariant Systems (CT and DT LTI)

The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects. Relation between continuous and discrete time systems.

Continuous time and discrete time linear shift-invariant (LSI) systems in detail: the impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations.

UNIT III

Fourier Representation of CT and DT Signals

Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform,

Convolution/ multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and orthogonal bases of signals.

UNIT IV

The Laplace Transform for continuous time signals and systems

The notion of Eigen functions of LSI systems, a basis of Eigen functions, region of convergence, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. Generalization of Parseval's Theorem.

UNIT V

The z-Transform for discrete time signals and systems

Eigen functions, region of convergence, system functions, poles and zeros of systems and sequences, z-domain analysis. Generalization of Parseval's Theorem.

System realization through block-diagram representation and system interconnection. State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role.

UNIT VI

Applications of signal and system theory

Modulation for communication, filtering and so on.

Advanced topics: time-frequency representation and the uncertainty principle, Short-time Fourier Transforms and wavelet transforms.

Texts/References:

1. Oppenheim, Willsky and Nawab, "Signals and Systems", PHI, 2003, 3rd edition
2. Ziemer, "Signals and Systems, Continuous and Discrete", Macmillan
3. Hsu, "Signals and Systems", TMH
4. Taylor, "Principles of Signals and Systems", McGraw-Hill, New York, 1994

[BET404] Principles of Communication

Weekly Teaching Hours	TH : 04	
Examination Hours	TH : 03	
Marking Scheme	MSE: 30	ESE: 70
Credits	08	

UNIT I

Introduction to Communication Systems

Introduction to transmitter, the dB in communications, noise, noise designation & calculation, noise measurement, concept of modulation, Bandwidth requirement, Frequency allocation, Noise in modulation systems, Introduction to random processes and random signals as applicable to noise.

UNIT II

Linear Modulation

Amplitude modulation, DSB-SC modulation, Generation of AM and DSB-SC signals, Envelope detector, Theory of single sideband, Generation of SSB signals, Demodulation of SSB, Vestigial SideBand (VSB) Modulation, Envelope detection of VSB+C, Superheterodyne Receiver

UNIT III

Angle Modulation

Introduction, Bandwidth of FM, Tone Modulation, Phase Modulation, Generation of FM, Demodulation of FM, Bandpass Linear (BPL), Broadcast FM

UNIT IV

Digital Transmission of Analog Signals: PCM, DPCM AND DM

Introduction, The PCM system, Sampling, Quantization, Encoding, Electrical waveform representation of binary sequences, Bandwidth requirements of PCM, Differential Pulse Code Modulation (DPCM), Delta Modulation

UNIT V

Noise Performance of Various Modulation Schemes

Introduction, Receiver Model and Figure of Merit: Linear Modulation, Coherent Demodulation, Envelope Detection, Receiver Model: Angle Modulation, Calculation FOM, Pre-Emphasis and de-Emphasis in FM, Noise performance of a PCM system

UNIT VI

Communication Techniques

Introduction, Frequency conversion, Special techniques, receiver noise & sensitivity, dynamic range, Intermodulation distortion testing, Frequency synthesis, direct digital synthesis, FM communications transceivers. Review of telegraphy, Telephony and telemetry. Microphones and Loudspeakers: Concept, classifications & working. PA system.

Texts/References:

1. Beasley & Miller, "Modern Electronic Communication", Prentice-Hall India-2006, 8th Edition
2. Wayne Tomasi, "Electronic Communication Systems", Pearson Education-2005, 5th Edition
3. Kennedy, "Electronics Communications Systems", McGraw-Hill New Delhi-1997, 4th Edition
4. R.G.Gupta, "Audio & Video Systems" Tata McGraw-Hill New Delhi-2008.

Elective-I- [BET405 A]

Linear Algebra (Open to all)

Weekly Teaching Hours	TH : 03	
Examination Hours	TH : 03	
Marking Scheme	MSE: 30	ESE: 70
Credits	06	

UNIT I

Linear Equations

Systems of linear equations, Matrices, Elementary row operations, Row-reduced echelon matrices.

UNIT II

Vector Spaces

Groups, Fields, Rings, Vector spaces, Subspaces, Bases and dimension, Ordered bases and coordinates.

UNIT III

Linear Transformations

Linear transformations, Rank-nullity theorem, Algebra of linear transformations, Isomorphism, Matrix representation, Linear functionals, Annihilator, Double dual, Transpose of a linear transformation.

UNIT IV

Elementary Canonical Forms

Characteristic values and characteristic vectors of linear transformations, Diagonalizability, Minimal polynomial of a linear transformation, Cayley- Hamilton theorem, Invariant subspaces, Direct-sum decompositions, Invariant direct sums, The primary decomposition theorem, Cyclic subspaces and annihilators, Cyclic decomposition, Rational, Jordan forms.

UNIT V

Inner Product Spaces

Inner product spaces, Orthonormal bases, Gram-Schmidt process, Linear Functional and Adjoints, Unitary Operators, normal Operators.

UNIT VI

Bilinear Forms

Bilinear Forms, Symmetric Bilinear Forms, Skew Symmetric Bilinear Forms.

Texts/References:

1. K.Hoffman and R. Kunze, Linear Algebra, 2nd Edition, Prentice- Hall of India, 2005.
2. M. Artin, “Algebra”, Prentice-Hall of India, 2005.

Elective-I- [BET405 B]
Electronic Measurements & Instruments

Weekly Teaching Hours	TH : 03	
Examination Hours	TH : 03	
Marking Scheme	MSE: 30	ESE: 70
Credits	06	

Unit I

Introduction

Accuracy, Resolution, Precision, Linearity of measuring instruments, Voltage, Current, Resistance, Measurement using DMM- 4 1/2 & 6 1/2, Auto zero, Auto ranging. True RMS Measurement Principle, method & application, Phase and Magnitude Measurement at high frequency using instruments such as vector voltmeter and vector impedance meter, LCR-Q meter - principle of digital LCR-Q meter, Important specification & Application.

Unit II

Standards

Standards - Primary, secondary, working. Need of calibration, Procedure, Traceability & It's requirements, Statistical Analysis - Mean, Mode, Deviation, Variance & Probability for error finding. Regression Analysis, Various methods & it's advantages, Time, Frequency, Ratio, Time interval, Period & Multiple Period averaging using digital universal frequency counter, High frequency measurements on frequency counter using various techniques, such as pre-scalar, Heterodyne, Time standards - Stability using oscillators like TCXO, OCXO.

Unit III

Oscilloscopes

Overview of analog CRO, dual/ Multi-trace CRO, Block diagram, functioning, specifications & Applications, Various CRO probes & its applications.

Digital Storage Oscilloscope - Block Diagram, Functioning, specifications & Applications, Advantages as compared to analog CRO, Sampling speed & Memory depth of DSO, Design considerations, Attachments to DSO for enhancing the functionality / Measurements such as FFT, MATHS Functions, Automatic Measurements.

Unit IV

Analyzers

Signal Analyzing instrument, harmonic and wave analyzer, distortion factor meter spectrum analyzer - FFT analyzer, logic analyzer, Protocol analyzer, for all above mentioned instruments, explanation of block diagram with function of each block, important specification and applications of each.

Unit V

Communication Measurements

Communication measurements, Measurements on transmitter and receiver: sensitivity, selectivity, phase jitter, s/n ratio, co-channel interference, SINAD test etc. Network analyzer- system element, measurement accuracy, scalar network analyzer, vector network analyzer, S-parameter measurement using network analyzer

Unit VI

Computer controlled test measurements, Virtual measurements and its application in TDM, FDM, ASK, PSK, IEEE 488, PCI/PCI express, buses, Introduction of Lab view

Text Books:

1. A. J. Bowon, "Digital Communication".
2. Oliver Cage, "Electric Instrumentation", Tata McGraw Hill.
3. H.S. Kalsi, "Digital Instrumentation", Tata McGraw Hill.
4. Coombs "Electronic Instrumentation Handbook".
5. Cooper Herfric, "Electric Instrumentation & Measurement Techniques", PHIL
6. J. J. Carr, "Digital Instrumentation"
7. M. M. S. Anand, "Electric Instrument & Instrumentation Techniques"

**Elective-I- [BET405 C]
Industrial Instrumentation**

Weekly Teaching Hours	TH : 04	
Examination Hours	TH : 03	
Marking Scheme	MSE: 30	ESE: 70
Credits	08	

UNIT I

Introduction

Basic terminologies (Range, Span, Settling time dead zone, input impedance ...) 1st order and 2nd order instruments with step, ramp and sinusoidal input/output characteristics, Transducer and types

UNIT II

Measurement of force torque, velocity

Electric balance, different types of load cells, magnets, elastics load cell-strain gauge load cell-different methods of torque measurement, strain gauge, relative regular twist-speed measurement-revaluation counter- capacitive tacho-drag up type tacho D.C and A.C tacho generators – stroboscope.

UNIT III

Measurement of acceleration, vibration and density

Accelerometers – LVDT, piezo-electric, strain gauge and variable reluctance type accelerometers – mechanical type vibration instruments – seismic instrument as an accelerometer and vibrometer – calibration of vibration pickups – units of density, specific gravity and viscosity used in industries – Baume scale API scale – pressure head type densitometer – float type densitometer – ultrasonic densitometer Bridge type gas densitometer.

UNIT IV

Pressure measurement

Units of pressure – manometers – different types – elastic type pressure gauges – Bourde type bellows – diaphragms – Electrical methods – elastic elements with LVDT and strain gauges – capacitive type pressure gauge – piezo resistive pressure sensor – resonator pressure sensor – measurement of vacuum – McLeod gauge – thermal conductivity gauges – Ionization gauge cold cathode and hot cathode types – testing and calibration of pressure gauges – dead weight tester.

UNIT V

Temperature measurement

Definitions and standards – primary and secondary fixed points – calibration of thermometers different types of filled in system thermometer – sources of errors in filled in systems and their compensation – Bimetallic thermometers – Electrical methods of temperature measurement – signal conditioning of industrial RTDs and their characteristics – 3 lead and 4 lead RTDs.

UNIT VI

Thermocouples and pyrometers

Thermocouples, law of thermocouple, fabrication of industrial thermocouples, signal conditioning of thermocouple output, thermal block references functions, commercial circuits for cold junction compensation, response of thermocouple, special techniques for measuring high temperature using thermocouples, Radiation methods of temperature measurement, radiation fundamentals, total radiation and selective radiation pyrometers, optical pyrometer, two colour radiation pyrometer.

Texts/ References:

1. Ernest O.Doebelin, Measurement systems Application and Design, International Student Edition, IV Edition, McGraw Hill Book Company, 1998.
2. R.K.Jain, Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 1999.
3. D.Patranabis, Principles of Industrial Instrumentation, Tata McGraw Hill Publishing Ltd., New Delhi, 1999.
4. A.K.Sawhney, A course in Electrical and Electronic Measurement and Instrumentation – Dhanpat Raj and Sons, New Delhi, 1999.
5. P.Holman, Experimental Methods for Engineers International Student Edition, McGraw Hill Book Company, 1971.
6. B.C.Nakra and K.K.Chaudary, Instrumentation Measurement and Analysis, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1985.