DR. A.P.J. ABDUL KALAM TECHNICALUNIVERSITY, LUCKNOW

Evaluation Scheme & Syllabus
For
B. Tech. 2nd Year

- **ELECTRONICS ENGINEERING**
- **ELECTRONICS AND COMMUNICATION ENGINEERING**
- **ELECTRONICS AND TELECOMMUNICATION ENGINEERING**
- **ELECTRONICS AND INSTRUMENTATION ENGINEERING**
- **INSTRUMENTATION ANDCONTROL ENGINEERING**
- **APPLIED ELECTRONICS AND INSTRUMENTATION**
- **INSTRUMENTATION ENGINEERING**

[Effective from the Session: 2023-2024]

DR. A.P.J. ABDUL KALAM TECHNICALUNIVERSITY, LUCKNOW

SEMESTER III

SN	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)	Total SW+ESE	Credit Cr
					L	T	P	CT	TA	CT+TA	TE/PE		
1	BOE3** / BAS303	Science Based Open Elective/BSC (Maths-III/Math IV/ Math V)	T	ES/BS	3	1	0	20	10	30	70	100	4
2	BVE301 / BAS301	Universal Human Value and Professional Ethics/ Technical Communication	T	VA/HS	2	1	0	20	10	30	70	100	3
3	BEC301	Electronic Devices	T	PC	3	1	0	20	10	30	70	100	4
4	BEC302	Digital System Design	T	PC	3	1	0	20	10	30	70	100	4
5	BEC303	Network Analysis and Synthesis	T	PC	2	1	0	20	10	30	70	100	3
6	BEC351	Electronic Devices Lab	P	PC	0	0	2		50	50	50	100	1
7	BEC352	Digital System Design Lab	P	PC	0	0	2		50	50	50	100	1
8	BEC353	Network Analysis and Synthesis lab	P	PC	0	0	2		50	50	50	100	1
10	BCC301 / BCC302	Cyber Security/Python programming	T	VA	2	0	0	20	10	30	70	100	2
11	BCC351	Internship Assessment /Mini Project	P							100		100	2
		Total			15	5	6						**25**

- **Mathematics –III** for CE / ENV and allied branches
- **Mathematics-IV** for Computer/Electronics/Electrical & allied Branches, Mechanical & Allied Branches Textile/Chemical & allied Branches
- **Mathematics-V** for Bio Technology / Agriculture Engineering

SEMESTER –IV

SN	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)	Total SW+ESE	Credit Cr
					L	T	P	CT	TA	CT+TA	TE/PE		
1	BAS403 / BOE4**	BSC(Maths-III/Math IV/ Math V)/Science Based Open Elective	T	BS/ES	3	1	0	20	10	30	70	100	4
2	BAS401 / BVE401	Technical Communication / Universal Human Value and Professional Ethics	T	HS/VA	2	1	0	20	10	30	70	100	3
3	BEC401	Communication Engineering	T	PC	3	1	0	20	10	30	70	100	4
4	BEC402	Analog Circuits	T	PC	3	1	0	20	10	30	70	100	4
5	BEC403	Signal System	T	PC	2	1	0	20	10	30	70	100	3
6	BEC451	Communication Engineering Lab	P	PC	0	0	2		50	50	50	100	1
7	BEC452	Analog Circuits Lab	P	PC	0	0	2		50	50	50	100	1
8	BEC453	Signal System Lab	P	PC	0	0	2		50	50	50	100	1
9	BCC402 / BCC401	Python Programming/Cyber Security	P	VA	2	0	0	20	10	30	70	100	2
10	BVE451 / BVE452	Sports and Yoga - II / NSS-II	P	VA	0	0	3			100		100	0
		Total			**15**	**5**	**9**						**23**
		Minor Degree/ Honors Degree MT-1/HT-1											

*****The Mini Project or internship (4 weeks) will be done during summer break after 4th Semester and will be assessed during V semester.

BEC-301	ELECTRONIC DEVICES	3L:1T:0P	4 Credits

Unit	Topics	Lectures
I	Introduction to semiconductor physics: Review of quantum mechanics, electrons in periodic lattices, E-k diagrams, Effective Mass.	8
II	Energy bands in intrinsic and extrinsic silicon, carrier transport, diffusion current, drift current, mobility and resistivity, sheet resistance, Generation and recombination of carriers, Poisson and continuity equation.	8
III	P-N junction characteristics, I-V characteristics, and small signal switching models, Avalanche breakdown, Zener diode, Schottky diode, LED, photodiode and solar cell.	8
IV	Bipolar Junction Transistor, various configurations (such as CE, CB & CC) and their features I-V characteristics, DC biasing schemes for BJT, bias stability, Ebers-Moll model.	8
V	Field Effect Transistor, configurations (such as CS, CD & CG), DC biasing schemes, MOSFET, I-V characteristics, MOS capacitor, C-V characteristics.	8

Text/Reference Books:

1. G. Streetman, and S. K. Banerjee, “Solid State Electronic Devices,” 7th edition, Pearson, 2014.
2. D. Neamen , D. Biswas, "Semiconductor Physics and Devices," McGraw-Hill Education.
3. S. M. Sze and K. N. Kwok, “Physics of Semiconductor Devices,” 3rd edition, John Wiley & Sons, 2006.
4. C.T. Sah, “Fundamentals of Solid State Electronics,” World Scientific Publishing Co. Inc, 1991.
5. Y. Tsividis and M. Colin, “Operation and Modeling of the MOS Transistor,” Oxford univ. press, 2011.
6. Muhammad H. Rashid, “Electronic Devices and Circuits,” Cengage publication, 2014.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand the principles of semiconductor Physics.
2. Understand the carrier transport in semiconductors.
3. Analyze and find application of special purpose diodes.
4. Understand the working principle and design of Bipolar Junction Transistor.
5. Realize the mathematical models of MOS transistors

BEC-302	DIGITAL SYSTEM DESIGN	3L:1T:0P	4 Credits

Unit	Topics	Lectures
I	**Logic simplification and combinational logic design:** Number Systems, Binary arithmetic, signed magnitude representation, Binary codes, code conversion, review of Boolean algebra and Demorgans theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 5 variables, tabulation method.	8
II	**Combinational circuits:** Analysis and Design of combinational circuits, MSI devices like comparators, multiplexers, demultiplexers, encoder, decoder, circuit realization using Multiplexers and decoders, half and full adders, subtractors, serial and parallel adders, BCD adder, barrel shifter and ALU.	8
III	**Sequential logic design:** Building blocks like S-R, JK and Master-Slave JK FF, D FF, T FF, edge triggered FF, Flip flop conversion, Applications of Flip Flops: ripple and synchronous counters, Ring counter, Johnson counter, shift registers: SISO, SIPO, PISO, PIPO, Bidirectional shift register, Universal shift register; Finite state machines: Mealy and Moore machines, State diagrams, state reduction, Analysis of clocked sequential circuits, Design of clocked sequential circuits	8
IV	**Logic families and semiconductor memories:** TTL NAND gate, specifications, noise margin, propagation delay, fan-in, fan-out, tristate TTL, ECL, CMOS families and their interfacing, memory elements, concept of programmable logic devices like FPGA, logic implementation using programmable devices.	8
V	**Digital-to-Analog converters (DAC):** Specifications of DACs, Weighted resistor, R-2R ladder, Analog-to-digital converters (ADC): Specifications of ADCs, principle of ADC, switched capacitor circuits: Basic concept, practical configurations, ADC etc. ADC Types: dual slope, successive approximation, counting type, flash etc.	8

Text/Reference Books:

1. R.P. Jain, "Modern Digital Electronics," Tata McGraw Hill, 4th edition, 2009.
2. A. Anand Kumar, "Fundamental of Digital Circuits," PHI 4th edition, 2018.
3. W.H. Gothmann, "Digital Electronics- An Introduction to Theory and Practice," PHI, 2nd edition, 2006.
4. D.V. Hall, "Digital Circuits and Systems," Tata McGraw Hill, 1989.
5. A. K. Singh, "Foundation of Digital Electronics & Logic Design," New Age Int. Publishers.
6. Subrata Ghosal, "Digital Electronics," Cengage publication, 2nd edition, 2018

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Perform numerous arithmetic and logic simplification using various methods.
2. Design and analyze modular combinational circuits with MUX / DEMUX, Decoder & Encoder
3. Design & analyze synchronous sequential logic circuits
4. Analyze various logic families and design circuits using PLDs.
5. Design various ADCs and DACs according to the given specifications.

BEC-303	NETWORK ANALYSIS AND SYNTHESIS	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	Node and mesh analysis, matrix approach of network containing voltage & current sources and reactances, source transformation and duality.	8
II	Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power transfer, compensation and Tallegen's theorem as applied to A.C. circuits.	8
III	Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions. Steady state response of a network to non-sinusoidal periodic inputs, Power factor, effective values.	8
IV	Network function for one-port and two-port, calculation of network function for ladder and general networks, poles and zeros with restrictions for driving point functions and transform functions. Two-Port Network: Introduction, Parameters, and Condition for reciprocity and symmetry, Relation between port parameters, Interconnection of two ports networks.	8
V	Sinusoidal response from pole-zero locations, convolution theorem, behaviour of series and parallel resonant circuits. Introduction to band pass, low pass, high pass and band reject filters.	8

Text/Reference Books:

1. Franklin F. Kuo, "Network Analysis and Synthesis," Wiley India Education, 2nd Ed., 2006.
2. Van, Valkenburg, "Network analysis," Pearson, 2019.
3. Sudhakar, A., Shyammohan, S. P., "Circuits and Network," Tata McGraw-Hill New Delhi, 1994.
4. A William Hayt, "Engineering Circuit Analysis," 8th Edition, McGraw-Hill Education.
5. A. Anand Kumar, "Network Analysis and Synthesis," PHI publication, 2019.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Apply electrical network theorems.
3. Apply Laplace transform for analysis steady state and transient behaviour of network circuit.
4. Determine different network functions of Two Port network
5. Analyse the frequency response of various filters.

BEC351	ELECTRONIC DEVICES LAB	0L:0T:2P	1 Credits

SUGGESTIVE LIST OF EXPERIMENTS

1. **Study of Lab Equipment and Components:** CRO, multimeter, and function generator, power supply- active, passive components and bread board.
2. **P-N Junction diode:** Characteristics of PN junction diode - static and dynamic resistance measurement from graph.
3. **Applications of PN Junction diode:** Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor.
4. **Characteristics of Zener diode:** V-I characteristics of Zener diode, graphical measurement of forward and reverse resistance.
5. **Characteristics of Photo diode:** V-I characteristics of photo diode, graphical measurement of forward and reverse resistance.
6. **Characteristics of Solar cell:** V-I characteristics of solar cell, graphical measurement of forward and reverse resistance.
7. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
8. **Characteristic of BJT:** BJT in CE configuration- graphical measurement of h- parameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
9. **Field Effect Transistors:** Single stage common source FET amplifier –plot of gain in dB Vs frequency, measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
10. **Metal Oxide Semiconductor Field Effect Transistors:** Single stage MOSFET amplifier –plot of gain in dB Vs frequency, measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
11. Simulation of amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand working of basic electronics lab equipment.
2. Understand working of PN junction diode and its applications.
3. Understand characteristics of Zener diode.
4. Design a voltage regulator using Zener diode.
5. Understand working of BJT, FET, MOSFET and apply the concept in designing ofamplifiers.

BEC352	DIGITAL SYSTEM DESIGN LAB	0L:0T:2P	1 Credits

SUGGESTIVE LIST OF EXPERIMENTS

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder using logic gates.
5. Implementation and verification of Encoder using logic gates.
6. Implementation of 4:1 multiplexer using logic gates.
7. Implementation of 1:4 demultiplexer using logic gates.
8. Implementation of 4-bit parallel adder using 7483 IC.
9. Design, and verify the 4-bit synchronous counter.
10. Design, and verify the 4-bit asynchronous counter.
11. Implementation of Mini Project using digital integrated circuits and other components.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Design and analyze combinational logic circuits.
2. Design & analyze modular combinational circuits with MUX/DEMUX, decoder, encoder.
3. Design & analyze synchronous sequential logic circuits.
4. Design & build mini project using digital ICs.

BEC353	NETWORK ANALYSIS AND SYNTHESIS LAB	0L:0T:2P	1 Credits

SUGGESTIVE LIST OF EXPERIMENTS

1. Verification of Kirchhoff's laws.
2. Verification of Superposition theorem.
3. Verification of Thevenin's Theorem and Maximum power transfer theorem.
4. Verification of Tallegen's theorem.
5. Measurement of power and power factor in a single phase AC series inductive circuitand study improvement of power factor using capacitor.
6. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
7. Determination of parameters of AC single phase series RLC circuit.
8. To find poles and zeros of immittance function.
9. Design and find cut-off frequency of low pass and high pass filters.
10. Design and find the pass band frequencies of band pass filters.
11. Design and find the stop band frequencies of band reject filters.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand basics of electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Analyse RLC circuits.
4. Determine the stability of an electrical circuit.
5. Design network filters.

SEMESTER-IV

BEC401	COMMUNICATION ENGINEERING	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	Review of signals and systems, frequency domain representation of signals, principles of amplitude modulation systems- DSB, SSB and VSB modulations.	8
II	Angle modulation, representation of FM and PM signals, spectral characteristics of angle modulated signals.	8
III	Review of probability and random process, Gaussian and white noise characteristics, noise in amplitude modulation systems, noise in frequency modulation systems, pre-emphasis and de-emphasis, threshold effect in angle modulation.	8
IV	Pulse modulation, sampling process, pulse amplitude and pulse code modulation (PCM), differential pulse code modulation. Delta modulation, noise considerations in PCM, time division multiplexing, digital multiplexers.	8
V	Digital modulation schemes- phase shift keying, frequency shift keying, quadrature amplitude modulation, continuous phase modulation and minimum shift keying.	8

Text/Reference Books:

1. Haykin S., "Communications Systems," John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M., "Communication Systems Engineering," Pearson Education,2002.
3. Taub H. and Schilling D.L., "Principles of Communication Systems," Tata McGraw Hill,2001.
4. Wozencraft J. M. and Jacobs I. M., "Principles of Communication Engineering," JohnWiley, 1965.
5. Barry J. R., Lee E. A. and Messerschmitt D. G., "Digital Communication," KluwerAcademic Publishers, 2004.
6. Proakis J.G., "Digital Communications',' 4th Edition, McGraw Hill, 2000.
7. Abhay Gandhi, "Analog and Digital Communication," Cengage publication, 2015.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Analyze and compare different analog modulation schemes for their efficiency andbandwidth.
2. Analyze the behavior of a communication system in presence of noise.
3. Investigate pulsed modulation system and analyze their system performance.
4. Investigate various multiplexing techniques.
5. Analyze different digital modulation schemes and compute the bit error performance.

BEC-402	ANALOG CIRCUITS	3L:1T:0P	4 Credits

Unit	Topics	Lectures
I	**Amplifier models:** Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.	8
II	**Frequency response of Amplifiers:** High frequency transistor models, frequency response of single stage and multistage amplifiers, cascade amplifier, Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation, concept of stability, gain margin and phase margin.	8
III	**Oscillators:** Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), Crystal Oscillator.	8
IV	**Current mirror:** Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load, differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR, **Op-Amp design:** Design of differential amplifier for a given specification, design of gain stages and output stages, compensation.	8
V	**Op-Amp applications:** Review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications. Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues.	8

Text/Reference Books:

1. J.V. Wait, L.P. Huelsman and GA Korn, "Introduction to Operational Amplifier theoryand applications," Mc Graw Hill, 1992.
2. J. Millman and A. Grabel, "Microelectronics," 2nd edition, McGraw Hill, 1988.
3. P. Horowitz and W. Hill, "The Art of Electronics," 2nd edition, Cambridge UniversityPress, 1989.
4. A.S. Sedra and K.C. Smith, "Microelectronic Circuits," Saunder's College11 Publishing,4th edition.
5. Paul R. Gray and Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits,"John Wiley, 3rd edition.
6. Muhammad H. Rashid, "Electronic Devices and Circuits," Cengage publication, 2014.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand and design of the various amplifiers.
2. Understand the concept of feedback topologies.
3. Design the different types of oscillators.
4. Understand the functioning of OP-AMP and design OP-AMP based circuits.
5. Apply the concept of Operational amplifier to design linear and non-linear applications.

BEC403	SIGNAL SYSTEM	3L:1T:0P	4 Credits

Unit	Topics	Lectures
I	Signals and systems as seen in everyday life, and in various branches of engineering and science, energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals, system properties: linearity, additivity and homogeneity, shift-invariance, causality, stability, realizability.	8
II	Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input-output behaviour with aperiodic convergent inputs, characterization of causality and stability of linear shift invariant systems, system representation through differential equations and difference equations, Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response	8
III	Fourier series representation, Fourier transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality , Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier transform (DFT), Parseval's Theorem, the idea of signal space and orthogonal bases, the Laplace transform, notion of Eigen functions of LSI systems, a basis of Eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behaviour.	8
IV	The z-Transform for discrete time signals and systems-Eigen functions, region of convergence, z-domain analysis.	8
V	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.	8

Text/Reference books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems," Pearson, 2015.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous andDiscrete," 4th edition, Prentice Hall, 1998.
3. B.P. Lathi, "Signal Processing and Linear Systems," Oxford University Press, 1998.
4. Douglas K. Lindner, "Introduction to Signals and Systems," McGraw Hill InternationalEdition: 1999.
5. Simon Haykin, Barry van Veen, "Signals and Systems," John Wiley and Sons (Asia)Private Limited, 1998.
6. V. Krishnaveni, A. Rajeswari, ""Signals and Systems," Wiley India Private Limited,2012.
7. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems," John Wiley andSons, 1995.
8. M. J. Roberts, "Signals and Systems - Analysis using Transform methods andMATLAB," TMH, 2003.
9. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems," TMH New Delhi,2001.
10. A. Anand Kumar, "Signals and Systems," PHI 3rd edition, 2018.
11. D. Ganesh Rao, K.N. Hari Bhat, K. Anitha Sheela, "Signal, Systems, and StochasticProcesses," Cengage publication, 2018.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Analyze different types of signals.
2. Analyze linear shift-invariant (LSI) systems.
3. Represent continuous and discrete systems in time and frequency domain using Fourierseries and transform.
4. Analyze discrete time signals in z-domain.
5. Study sampling and reconstruction of a signal.

BEC451	COMMUNICATION ENGINEERING LAB	0L:0T:2P	1 Credits

SUGGESTIVE LIST OF EXPERIMENTS

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector.
3. To study frequency modulation and determine its modulation factor.
4. To study sampling and reconstruction of pulse amplitude modulation system.
5. To study pulse amplitude modulation.
   a) Using switching method
   b) By sample and hold circuit
6. To demodulate the obtained PAM signal by 2nd order LPF.
7. To study pulse width modulation and pulse position modulation.
8. To study pulse code modulation and demodulation technique.
9. To study delta modulation and demodulation technique.
10. To construct a square wave with the help of fundamental frequency and its harmoniccomponent.
11. Study of amplitude shift keying modulator and demodulator.
12. Study of frequency shift keying modulator and demodulator.
13. Study of phase shift keying modulator and demodulator.
14. Study of single bit error detection and correction using hamming code.
15. Study of quadrature phase shift keying modulator and demodulator.
16. To simulate differential phase shift keying technique using MATLAB software.
17. To simulate M-ary Phase shift keying technique using MATLAB software (8PSK,16PSK) and perform BER calculations.
18. Design a front end BPSK modulator and demodulator.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Analyze and compare different analog modulation schemes for their modulation factorand power.
2. Study pulse amplitude modulation.
3. Analyze different digital modulation schemes and can compute the bit error performance.
4. Study and simulate the Phase shift keying.
5. Design a front end BPSK modulator and demodulator.

BEC452	ANALOG CIRCUIT LAB	0L:0T:2P	1 Credits

SUGGESTIVE LIST OF EXPERIMENTS

1. Characteristic of BJT: Study of BJT in various configurations (such as CE/CS, CB/CG, CC/CD).
2. BJT in CE configuration: Graphical measurement of h-parameters from input and output characteristics, measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
3. Study of Multi-stage amplifiers: Frequency response of single stage and multistage amplifiers.
4. Feedback topologies: Study of voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc.
5. Measurement of Op-Amp parameters: Common mode gain, differential mode gain, CMRR, slew rate.
6. Applications of Op-Amp: Op-Amp as summing amplifier, difference amplifier, integrator and differentiator.
7. Field effect transistors: Single stage common source FET amplifier –plot of gain in dB vs frequency, measurement of bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
8. Oscillators: Study of sinusoidal oscillators- RC oscillators (phase shift, Wien bridge etc.).
9. Study of LC oscillators (Hartley, Colpitt, Clapp etc.),
10. Study of non-sinusoidal oscillators.
11. Simulation of amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.
12. ADC/DAC: Design and study of Analog to Digital Converter.
13. Design and study of Digital to Analog Converter.

Course Outcome

At the end of this course students will demonstrate the ability to:

1. Understand the characteristics of transistors.
2. Design and analyze various configurations of amplifier circuits.
3. Design sinusoidal and non-sinusoidal oscillators.
4. Understand the functioning of OP-AMP and design OP-AMP based circuits.
5. Design ADC and DAC.

BEC453	SIGNAL SYSTEM LAB	0L:0T:2P	1 Credits

SUGGESTIVE LIST OF EXPERIMENTS

1. Introduction to MATLAB
    a. To define and use variables and functions in MATLAB.
    b. To define and use Vectors and Matrices in MATLAB.
    c. To study various MATLAB arithmetic operators and mathematical functions.
    d. To create and use m-files.
2. Basic plotting of signals
    a. To study various MATLAB commands for creating two and three dimensional plots.
    b. Write a MATLAB program to plot the following continuous time and discrete time signals.
        i. Step Function
        ii. Impulse Function
        iii. Exponential Function
        iv. Ramp Function
        v. Sine Function
3. Time and Amplitude transformations
   Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.
4. Convolution of given signals
   Write a MATLAB program to obtain linear convolution of the given sequences.
5. Autocorrelation and Cross-correlation
    a. Write a MATLAB program to compute autocorrelation of a sequence x(n) and verify the property.
    b. Write a MATLAB program to compute cross-correlation of sequences x(n) and y(n) and verify the property.
6. Fourier Series and Gibbs Phenomenon
    a. To calculate Fourier series coefficients associated with Square Wave.
    b. To Sum the first 10 terms and plot the Fourier series as a function of time.
    c. To Sum the first 50 terms and plot the Fourier series as a function of time.
7. Calculating transforms using MATLAB
    a. Calculate and plot Fourier transform of a given signal.
    b. Calculate and plot Z-transform of a given signal.
8. Impulse response and Step response of a given system
    a. Write a MATLAB program to find the impulse response and step response of a system form its difference equation.
    b. Compute and plot the response of a given system to a given input.
9. Pole-zero diagram and bode diagram
    a. Write a MATLAB program to find pole-zero diagram, bode diagram of a given system from the given system function.
    b. Write a MATLAB program to find, bode diagram of a given system from the given system function.
10. Frequency response of a system
    Write a MATLAB program to plot magnitude and phase response of a given system.
11. Checking linearity/non-linearity of a system using SIMULINK
    a. Build a system that amplifies a sine wave by a factor of two.
    b. Test the linearity of this system using SIMULINK.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand the basics operation of MATLAB.
2. Analysis the time domain and frequency domain signals.
3. Implement the concept of Fourier series and Fourier transforms.
4. Find the stability of system using pole-zero diagrams and bode diagram.
5. Design frequency response of the system.