B. TECH. ELECTRICAL & ELECTRONICS ENGINNERING SYLLABUS 2018 BATCH ONWARDS (UPDATED ON 24.05.2019)

3rd SEMESTER

S.No.	Course Code	Course Title	L	T	P	Marks			Credits
						Int	Ext	Total	
1	BEEES1-301	Electronic Devices & Circuits	3	1	0	40	60	100	4
2	BEEES1-302	Electrical Machines-I	3	1	0	40	60	100	4
3	BEEES1-303	Signals and Systems	3	1	0	40	60	100	4
4	BEEES1-304	Network Theory: Analysis & Synthesis	3	1	0	40	60	100	4
5	BEEES1-305	Electronics Devices & Circuits Lab	0	0	2	60	40	100	1
6	BEEES1-306	Electrical Machines lab-I	0	0	2	60	40	100	1
7	BMATH3-301	Mathematics-III*	3	1	0	40	60	100	4
8	BEEES1-307	Training-I	-	-	-	60	40	100	3
TOTAL			**15**	**5**	**4**	**380**	**420**	**800**	**25**

4th SEMESTER

Sr. No.	Course Code	Course Title	Contact Hours			Marks			Credits
			L	T	P	Int	Ext	Total	
1	BEEES1-401	Digital Electronics	3	0	0	40	60	100	3
2	BEEES1-402	Analog Electronic Circuits	3	1	0	40	60	100	4
3	BEEES1-403	Electrical Machines-II	3	1	0	40	60	100	4
4	BEEES1-404	Electromagnetic Theory and Applications	3	1	0	40	60	100	4
5	BEEES1-405	Digital Electronics Lab	0	0	2	60	40	100	1
6	BEEES1-406	Analog Electronic Circuits Lab	0	0	2	60	40	100	1
7	BEEES1-407	Electrical Machines Lab-II	0	0	2	60	40	100	1
8	BMECE0-001	Engineering Mechanics*	3	1	0	40	60	100	4
9	BMNCC0-001	Constitution of India	2	0	0	-	-	-	--
TOTAL			**17**	**4**	**6**	**380**	**420**	**800**	**22**

There will be 4-week Internship as per AICTE Internship Policy after 4th semester.

ELECTRONIC DEVICES & CIRCUITS

Subject Code: BEEES1-301 **L T P C** **Duration: 60 Hrs**
(common to BECES1-301) **3 1 0 4**

Course Objectives:

This course is meant to provide fundamental knowledge to students for understanding of the various electronic devices, their circuits & behaviour under various conditions.

1. To make aware the students about the various electronic devices and their circuits.
2. To impart knowledge of BJTs and FETs.
3. To provide the students detailed concepts of MOSFETs and CMOSFETs.
4. To analyze low and high frequency transistor models.

Course Outcomes:

At the end of this course student will be able to:

1. Understand the principles of semiconductor physics
2. Understand the concepts of junction diodes and their applications.
3. Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems
4. Analyze BJT characteristics and determine their behaviour under low and high frequencies.
5. Analyze various concepts of FETs and their characteristics.
6. Design low and high frequency models and observe and their various characteristics.

UNIT-I (15 Hrs)

Semiconductors: Introduction to Semiconductors and their classification, Energy bands in intrinsic and extrinsic semiconductors, Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, Generation and recombination of carriers.

Semiconductors Diodes: P-N junction diode, diode resistance and capacitance, I-V characteristics, small signal switching models, Avalanche/Zener breakdown, Applications of PN diode: rectifier, clipper and clamper, Zener diode, Schottky diode, LED, photodiode and solar cell

UNIT-II (15 Hrs)

Bipolar Junction Transistor: BJT and its operation, Ebers-Moll Model, Various BJT configurations and their I-V characteristics, Biasing techniques and bias stability, BJT as a switch and as an amplifier.

Field Effect Transistor: JFET and its operation, various configurations and I-V characteristics, Biasing techniques, FET as a switch and as an amplifier, MOS capacitor, C-V characteristics, MOSFETs; their operation and characteristics, biasing and small signal models of MOS transistor, CMOS devices and CMOS inverter.

UNIT-III (15 Hrs)

Low & High Frequency Transistor Models: Small signal low frequency BJT hybrid Model, Analysis of transistor amplifier in CB, CE and CC configuration using h-parameters, small signal low frequency analysis of FET/MOSFET, Need of high frequency BJT model, high frequency T model, hybrid-pi model, hybrid-pi conductances in terms of low frequency h parameters.

UNIT-IV (15 Hrs)

Integrated Circuit Fabrication Process: Fundamentals of IC fabrication, photolithography, etching, oxidation, diffusion, ion implantation, chemical vapor deposition, sputtering, twin-tub CMOS process. Monolithic IC-Fabrication: Resistor, PN junction Diode and BJTs.

Text/Reference Books:

1. G.Streetman,andS.K.Banerjee,"SolidStateElectronicDevices,"7thedition,Pearson,2014.
2. D.Neamen,D.Biswas"SemiconductorPhysicsandDevices,"McGraw-HillEducation
3. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd edition, John Wiley & Sons,2006.
4. C.T.Sah,"Fundamentalsofsolidstateelectronics,"WorldScientificPublishingCo.Inc,1991.
5. Y.TsividisandM.Colin,"OperationandModelingoftheMOSTransistor,"OxfordUniv.Press, 2011.
6. J. Luo, "Integrated Modelling of Chemical Mechanical Planarization for sub-micron IC Fabrication", Springer.

ELECTRICAL MACHINES-I

Subject Code: BEEES1-302 **L T P C** **Duration: 60 Hrs**
(common to BELES1-304) **3 1 0 4**

UNIT- I (14 Hours)

Magnetic Fields and Magnetic Circuits

Review of magnetic circuits - MMF, flux, reluctance, inductance; review of Ampere Law and Biot Savart Law; Visualization of magnetic fields produced by a bar magnet and a current carrying coil - through air and through a combination of iron and air

Influence of highly permeable materials on the magnetic flux lines, B-H curve of magnetic materials; flux-linkage v/s current characteristic of magnetic circuits; linear and nonlinear magnetic circuits; energy stored in the magnetic circuit.

UNIT- II (14 Hours)

DC Machines

Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with

armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil.

Armature winding and commutation - Elementary armature coil and commutator, lap and wave windings, construction of commutator, linear commutation, Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.

UNIT- III (14 Hours)

DC machine - motoring and generation

Armature circuit equation for motoring and generation, Types of field excitations - separately excited, shunt and series.
Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. V-I characteristics and torque-speed characteristics of separately excited, shunt and series motors.
Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines

UNIT- IV (18 Hours)

Transformers

Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses

Three-phase transformer - construction, types of connection and their comparative features, Parallel operation of single-phase and three-phase transformers,

Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current,

Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers, Cooling of transformers.

Text / Reference Books:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.
3. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002
4. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
5. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

Course Outcomes:

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

1. Understand the concepts of magnetic circuits.
2. Understand the operation of dc machines.
3. Analyse the differences in operation of different dc machine configurations.
4. Analyse single phase and three phase transformers circuits.

SIGNALS AND SYSTEMS

Subject Code: BEEES1-303	**L T P C**	**Duration: 60 Hrs**
(common with BECES1-303)	**3 1 0 4**	

Course Objectives:

1. To introduce the students about the theoretical concepts associated with processing continuous & discrete time signals & systems.
2. To make the students aware about the signal transmission through linear networks.
3. To be able to think critically & to apply problem solving & reasoning strategies to the analysis of various types of signals & systems.
4. To impart them knowledge of various types of noises.

Course Outcomes:

Upon the completion of the course, students will be able to:

1. Analyze the properties of signals & systems and representation in time and frequency domain.
2. Classify systems based on their properties and determine the response of LSI system.
3. Apply random signal theory and understand various types of noise.
4. Understand the process of sampling and reconstruction.

UNIT-I (15 Hrs)

Classification of Signals and systems: 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.

Fourier Representation: 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, Convolution theorem and its graphical interpretation, Parseval's Theorem, idea of signal space and orthogonal bases.

UNIT-II (15 Hrs)

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,

Introduction to Noise: Thermal Noise, Shot noise, Partition noise, Flicker noise, Gaussian Noise. Equivalent input noise, Signal to Noise Ratio (SNR), Noise Temperature, Noise equivalent Bandwidth, Noise Figure.

UNIT-III (15 Hrs)

Random Signal Theory: Introduction to Probability Theory, Joint and Conditional Probability, Random Events, Probability Mass Function, Statistical Averages. Probability Density Functions (PDF) and Statistical Averages, mean, moments and expectations, standard deviation and variance, Probability models: Uniform, Gaussian, Binomial, Examples of PDF, Transformation of Random Variables, Random Processes, Stationary and Ergodicity, Auto-correlation, cross correlation, energy/power spectral density, properties of correlation and spectral density, inter relation between correlation and spectral density.

UNIT-IV (15 Hrs)

Sampling and Reconstruction: 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.

Concept of State-space analysis: State-space analysis and multi-input, multi-output representation, The state-transition matrix and its role.

Text/Reference Books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
3. A. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.
4. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
5. Douglas K. Lindner, "Introduction to Signals and Systems", Mc-Graw Hill International Edition: c1999.
6. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, c1998.
7. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons (SEA) Private Limited, c1995.
8. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB", Tata Mc Graw Hill Edition, 2003.
9. I. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 2001.
10. Ashok Ambardar, "Analog and Digital Signal Processing", Second Edition, Brooks/ Cole Publishing Company (An international Thomson Publishing Company), c1999.

NETWORK THEORY: ANALYSIS & SYNTHESIS

Subject Code: BEEES1-304 **L T P C** **Duration: 60 Hrs**
(common with BECES1-304) **3 1 0 4**

Course Objectives:

1. To introduce nodal, mesh analysis and network theorems for network analysis.
2. To give knowledge of Trigonometric, exponential Fourier series and Laplace transforms along with its properties.
3. To provide overview of network functions and network synthesis techniques.
4. To familiarize with the classifications of filters and their design.

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. Appreciate electrical network theorems.
3. Apply Laplace Transform for steady state and transient analysis.
4. Determine different network functions.
5. Appreciate the frequency domain techniques.
6. Students will be able to design analog filters.

UNIT-I (15 Hrs)

Fundamentals of Network Analysis: Node and Mesh analysis, Matrix approach of network containing voltage and current sources and reactances, Source transformation and duality.

Network Theorems: Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Compensation and Tallegen's theorem as applied to A.C. circuits.

UNIT-II (15 Hrs)

Trigonometric and Exponential Fourier Series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra.

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.

UNIT-III (15 Hrs)

Network Functions: Transient behaviour, concept of complex frequency, Driving points and transfer functions, poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and Two port network and interconnections, Behaviour of series and parallel resonant circuits.

UNIT-IV (15 Hrs)

Network Synthesis: Fundamental concepts of network synthesis, Hurwitz Polynomials, Properties of RC, RL & LC networks, Foster and Cauer forms of realization.

Network Filters: Classification of filters, characteristics impedance and propagation constant of pure reactive network, Design of constant-K, m-derived and Composite filters.

Text/Reference Books:

1. Van, Valkenburg.; "Network analysis"; Prentice hall of India, 2000
2. Sudhakar, A., Shyammohan, S. P.; "Circuits and Network"; Tata McGraw-Hill New Delhi,1994
3. A William Hayt, "Engineering Circuit Analysis" 8th Edition, McGraw-Hill Education
4. Chakrabarti A., "Network Analysis and Synthesis" DhanpatRai& Co.

ELECTRONIC DEVICES & CIRCUITS LAB

Subject Code: BEEES1-305 **L T P C** **Duration: 30 Hrs**
(common with BECES1-305) **0 0 2 1**

Course Objectives:

1. Able to understand and identification of various electronic components.
2. To understand and plot characteristics of various semiconductor devices.
3. To understand the applications of Transistors as amplifier in various configurations.

Course Outcomes:

1. An ability to understand all types of electronics devices and circuits
2. An ability to conduct experiments, as well as to analyze and interpret various data sheets.

LIST OF EXPERIMENTS

1. To study I-V characteristics of PN junction diode and Zener diode.
2. To perform & analyze the use of PN junction diode as clipper and clamper.
3. To observe and calculate the characteristics/behavior of Half/Full wave rectifier.
4. To perform & analyze the use of Zener diode as voltage regulator.
5. Design of clipper circuit using diode and other components.
6. To plot the input and output characteristics of BJT in CE configuration.
7. To plot the input and output characteristics of BJT in CB/CC configuration.
8. To demonstrate use of BJT as amplifier in a CE configuration.
9. To demonstrate use of a BJT in a CC amplifier circuit configuration.
10. To plot the input and output characteristics of JFET in CG/CD/CS configurations.
11. To perform an experiment to observe the working of JFET as an amplifier.

12. Study and verification of the DC Superposition/Thevenin theorem
13. Study of simple capacitive filters (T & π).
14. Design of constant K filters.
15. Design of m- derived filters.

Note: At least 10 experiments are required to be performed.

ELECTRICAL MACHINES LAB-I

Subject Code: BEEES1-306	**L T P C**	**Duration: 30 Hrs**
(common with BELES1-305)	**0 0 2 1**	

Course Objectives

1. To understand the characteristics of D.C. Machines.
2. To understand speed control methods and testing methods.
3. To determine efficiency and voltage regulation of transformers.

Course Outcomes

1. To acquire skills to operate all types of dc machines.
2. Ability to analyse the speed control methods and efficiency of DC machines.
3. To be able to compute efficiency and voltage regulation of transformers.

LIST OF EXPERIMENTS

1. To study three point and four point starters of DC shunt motor.
2. To obtain torque and speed characteristics of a D.C. motor.
3. To obtain external characteristics of D.C. shunt generators.
4. To obtain external characteristics of D.C. series generators.
5. Speed control of a dc shunt motor by varying armature circuit and field circuit methods.
6. To calculate the power rating of DC machines.
7. To determine losses and efficiency of DC machines.
8. To check the transformation ratio and polarity of single phase transformer.
9. To perform open and short circuit test onsingle phase transformer and to determine its efficiency
10. To perform load test on a single phase transformer and to determine voltage regulation.
11. To perform parallel operation on single phase transformers.

Note: At least ten experiments should be performed in semester.

MATHEMATICS-III

Subject Code: BMATH3-301 **L T P C** **Duration: 60 Hrs**

3 1 0 4

UNIT-I (15 Hrs)

Fourier Series & Fourier Transform: Definition of Periodic functions, Euler's formula, Even and odd functions, half range expansions, Fourier series of different wave forms, Fourier transform, Dirichlet's conditions, Fourier integral formula (without proof), properties of Fourier transform, inversion formula, convolution, Parseval's equality; Fourier transform of generalized functions, application of transforms to heat wave and Laplace equation.

UNIT-II (15 Hrs)

Partial Differential Equations: Definition of PDE, origin of first-order PDE; determination of integral surfaces of linear first order partial differential equations passing through a given curve; surfaces orthogonal to given system of surfaces; non-linear PDE of first order, Cauchy's method of characteristic; compatible system of first order PDE; Charpit's method of solution.

UNIT-III (15 Hrs)

Solution to Linear Partial Differential Equations: Solution to homogenous and non-homogenous linear partial differential equations second and higher order by complimentary function and particular integral method, Separation of variables in a PDE; wave and heat equations in one dimensional form, Elementary solutions of Laplace equations.

UNIT-IV (15 Hrs)

Propositional Logic: Syntax and semantics, proof systems, satisfiability, validity, soundness, completeness, deduction theorem, etc., Decision problems of propositional logic, Introduction to first order logic and first order theory.

Partially Ordered Sets: Complete partial ordering, chain, lattice, complete, distributive, modular and complemented lattices, Boolean and pseudo Boolean lattices.

References Books:

1. Kreyszing, E., Advanced Engineering Mathematics, 8th edition, John Wiley, New Delhi.
2. Grewal, B. S., Higher Engineering Mathematics, Khanna Publishers, New Delhi.
3. Ian N. Sneedon, Elements of Partial Differential Equations, McGraw- Hill, Singapore, 1957.
4. Advanced Engineering Mathematics, O'Neil, Cengage Learning.
5. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
6. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
7. R. Haberman, Elementary Applied Partial Differential equations with Fourier Series and Boundary Value Problem, 4th Ed., Prentice Hall, 1998.
8. C.L. Liu, Elements of Discrete Mathematics, 2nd Edition, Tata McGraw Hill, 2000.

DIGITAL ELECTRONICS

Subject Code: BEEES1-401 (common with BELES1-401)	L T P C 3 0 0 3	Duration: 45 Hrs

UNIT- I (10 Hours)

Fundamentals of Digital Systems and Logic Families

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates

Number systems-binary, signed binary, octal and hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes.

UNIT- II (10 Hours)

Combinational Digital Circuits

Standard representation for logic functions, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, Carry look ahead adder, Serial adder, Arithmetic and Logic unit (ALU), elementary ALU design, popular MSI chips, Digital comparator, Parity checker/generator, Code converters, Priority encoders, Decoders/drivers for display devices.

UNIT- III (10 Hours)

Sequential Circuits and Systems

A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K and D and T flipflops, Applications of flipflops, Shift registers, Applications of shift registers, Serial to parallel converter, Parallel to serial converter.

Ring counter, Sequence generator, Ripple(Asynchronous) counters, Synchronous counters, Counters design using flipflops, special counter IC's, Asynchronous sequential counters, applications of counters.

UNIT IV (15 Hours)

Semiconductor Memories and Programmable Logic Devices

Memory organization and operation, Expanding memory size, Classification and characteristics of memories, Sequential memory, Read only memory (ROM), Read and write memory(RAM), Content addressable memory (CAM), Charge de-coupled device memory (CCD), Commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, Complex programmable logic devices (CPLDS), Field programmable gate array (FPGA).

Analog-to-Digital (A/D) and Digital-to-Analog (D/A) Converters

Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit, Analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, Dualslope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, Example of A/D converter ICs.

Text/Reference Books:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
4. Malvino and Leach, “Digital Principles and Applications”, TMH, 4th Ed.1991

Course Outcomes:

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

1. Understand working of logic families and logic gates.
2. Design and implement Combinational and Sequential logic circuits.
3. Understand the process of Analog to Digital conversion and Digital to Analog conversion.
4. Be able to use PLDs to implement the given logical problem.

ANALOG ELECTRONIC CIRCUITS

Subject Code: BEEES1-402 **L T P C** **Duration: 60 Hrs**
(common with BECES1-402) **3 1 0 4**

Course Objectives:

1. To understand the characteristics of various power amplifiers.
2. To understand various sources of oscillations.
3. Able to understand, identification and selection of various amplifiers.
4. To make the students aware about the various multivibrator circuits.
5. To understand various Applications of Op amp.

Course Outcomes:

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

1. Understand the characteristics of diodes and transistors
2. Design and analyze various rectifier and 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

UNIT-I (15 Hrs)

Amplifiers: Review of small signal low frequency BJT models and their analysis, Amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier.

Feedback Amplifiers: Concept of negative feedback, Feedback topologies, effect of feedback on gain, bandwidth, input/output impedances etc., practical circuits, concept of stability.

Oscillators: Concept of positive feedback, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.) their operation and conditions for sustained oscillations, crystal oscillator.

UNIT-II (15 Hrs)

Power Amplifiers: Frequency response of single stage amplifiers, Multistage amplifiers, cascade and cascade amplifiers, Different coupling schemes for multi stage amplifiers, different classes of operation(Class A, B,AB, C etc.),their power efficiency and linearity issues. Push-pull amplifier, cross over distortion, transistor phase inverter, complementary symmetry push-pull amplifier.

UNIT-III (15 Hrs)

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.

OP-AMP Applications: Review of inverting and non inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications, Active filters: Low pass, high pass, band pass and band stop, design guidelines.

UNIT-IV (15 Hrs)

Multivibrators: Collector/Emitter Coupled- Astable, Mono-stable multivibrators and Fixed/Self biased Bistable mutlivibrators, Triggering methods of Monostable and Bistable multivibrators.

Converter Circuits Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc. Analog-to- digital converters (ADC): Single slope, dual slope, successive approximation, flash etc.

Text/Reference Books:

1. J.V. Wait, L.P. Huelsman and GA Korn, Introduction to Operational Amplifier theory and applications, McGraw Hill, 1992.
2. J. Millmanand A. Grabel, Microelectronics, 2nd edition, McGraw Hill, 1988.
3. P. Horowitz and W. Hill, The Art of Electronics, 2nd edition, Cambridge University Press, 1989.
4. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder'sCollege11
5. Publishing,EditionIV
6. Paul R. Gray and Robert G. Meyer, Analysis and Design of Analog Integrated Circuits, JohnWiley, 3rd Edition

ELECTRICAL MACHINES-II

Subject Code: BEEES1-403 **L T P C** **Duration: 60 Hrs**
(common with BELES1-403) **3 1 0 4**

UNIT- I (12 Hours)

Fundamentals of AC machine windings

Physical arrangement of windings in stator and cylindrical rotor; Slots for windings; Single-turn coil - active portion and overhang; Full-pitch coils, Concentrated winding, Distributed winding, Winding axis, 3D visualization of the above winding types.

Air-gap MMF distribution with fixed current through winding, Concentrated and distributed winding, Sinusoidally distributed winding, Winding distribution factor.

UNIT- II (12 Hours)

Pulsating and revolving magnetic fields

Constant magnetic field, Magnetic field produced by a single winding - fixed current and alternating current, Pulsating fields produced by spatially displaced windings, Windings spatially shifted by 90 degrees, Addition of pulsating magnetic fields, Three windings spatially shifted by 120 degrees (carrying three-phase balanced currents), Revolving magnetic field.

UNIT- III (20 Hours)

Three-phase induction machines

Construction, Types (squirrel cage and slip-ring), Torque-slip characteristics, Starting and maximum torque. Equivalent circuit. Phasor diagram, Losses and efficiency.

Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for induction motors.

Generator operation. Self-excitation. Doubly-fed induction machines.

Single-phase induction motors

Constructional features, Double revolving field theory, Equivalent circuit, Determination of parameters. Split-phase, Starting methods and applications.

UNIT- IV (16 Hours)

Synchronous machines

Constructional features, Cylindrical rotor synchronous machine - Generated EMF, Equivalent circuit and phasor diagram, Armature reaction, Synchronous impedance, Voltage regulation. Operating characteristics of synchronous machines, V-curves.

Salient pole machine - Two reaction theory, Analysis of phasor diagram, Power angle characteristics. Parallel operation of alternators - Synchronization and Load division.

Text/Reference Books:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
3. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
4. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
5. A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.
6. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007.

Course Outcomes:

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

1. Understand the concepts of rotating magnetic fields.
2. Understand the operation of ac machines.
3. Analyse performance characteristics of ac machines.

ELECTROMAGNETIC THEORY & APPLICATIONS

Subject Code: BEEES1-404 **L T P C** **Duration: 60 Hrs**
(common with BECES1-403) **3 1 0 4**

Course Objectives:

1. To introduce students with different coordinate systems.
2. To familiarize the students with the different concepts of electrostatic, magneto static and time varying electromagnetic systems.
3. To expose the students to the ideas of electromagnetic waves and structure of transmission lines.

Course Outcomes:

After the completion of this course the students shall be able to:

1. Examine the phenomena of wave propagation in different media and its interfaces and in applications of microwave engineering.
2. Understand the concepts of magnetic field and magnetic field intensity.
3. Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems.
4. Understand transmission lines and use of smith chart in electromagnetic engineering problems.

UNIT-I (10 Hrs)

Introduction: The Electromagnetic model, vector algebra: vector addition, subtraction and product, orthogonal coordinate system and their transformations, vector calculus: del operator, gradient,

divergence and curl operations and their physical significance, Divergence and Stokes's Theorem and their physical significance, Null Identities, Helmholtz's Equation

UNIT-II (20 Hrs)

Electrostatic Fields: Fundamental Postulates of Electrostatic in free space, Coloumb' s law, Gauss's law and its applications, Electric potential, Electric flux density and dielectric constant, Electrostatic fields in material space, polarization of dielectrics, Boundary conditions for electrostatic fields, Poisson's, Laplace's and Uniqueness Equation, Continuity equation & Relaxation time, Applications of electrostatic fields in Electrostatic discharge and multi-dielectric systems.

Magnetostatic Fields: Fundamental Postulates of Magnetostatics in free space, Ampere's circuit Law & its applications, Biot-Savart Law and applications, Magnetic dipole, Magnetic scalar and vector potentials, Behaviour of magnetic materials, Magnetization, magnetic field intensity and relative permeability, Boundary conditions for Magnetostatic fields, Applications of magneto static fields in lightning and magnetic levitation.

UNIT-III (15 Hrs)

Time Varying Electromagnetic fields & Maxwell's Equations: Faraday's Law of Electromagnetic Induction and its applications, Maxwell's Equations in Integral form & their physical significance, Electromagnetic boundary conditions, Time Harmonic Fields, Wave Propagation and wave equations, Plane electromagnetic waves in Lossless and Lossy media, reflection and refraction of plane waves at boundaries for normal and oblique incidence, Group Velocity, Flow of Electromagnetic Power and Poynting Vector Theorem, Application of EM waves in telecommunications, radar systems and microwave heating.

UNIT-IV (15Hrs)

Transmission Lines: Introduction, Transverse Electromagnetic wave along a parallel plate, General transmission line equations and transmission line parameters, Wave characteristics on Finite Transmission Lines, Transients on Transmission Lines, Transmission Line Impedance matching, Single stub matching, Double stub matching, Smith chart and its use in transmission lines**.**

Text/Reference Books:

1. Sadiku, Elements of Electromagnetics, Oxford Press.
2. W. H. Hayt. Engineering Electromagnetics, McGraw Hill, New York
3. E.C. Jordan, Electromagnetic Waves and radiating systems, Prentice Hall of India, New Delhi.
4. T.A. John, Engg. Electromagnetics & Fields
5. D.K. Cheng, Fields and Wave Electromagnetics, Pearson education.
6. Kraus, Electromagnetics, McGraw Hill., New York

DIGITAL ELECTRONICS LAB

Subject Code: BEEES1-405 **L T P C** **Duration: 30 Hrs**
(common with BELES1-402) **0 0 2 1**

Course Objectives

1. To give students a practical knowledge about various types of gates and verify their truth tables.
2. To give students a working knowledge to connect digital circuits and verify their truth tables.
3. To give students knowledge of working of different combinational and sequential circuits.

LIST OF EXPERIMENTS

1. To Study Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates and realization of OR, AND, NOT and XOR functions using universal gates.
2. To design Half Adder using Logic gates on bread board.
3. To design Full Adder using Logic gates on bread board.
4. To design Half Subtractor using Logic gates on bread board.
5. To design Full Subtractor using Logic gates on bread board.
6. To design 4-Bit Binary-to-Gray Code Converter on bread board.
7. To design 4-Bit Gray-to-Binary Code Converter on bread board.
8. To study and design 4-Bit magnitude comparator using logic gates on bread board.
9. Design and verification of Truth-table of multiplexer.
10. Realization of Half adder and Full adder using MUX.
11. Design and verification of Truth-table of Demultiplexer.
12. Realization of half subtractor and full subtractor using DEMUX.
13. To study and verify Truth-table of RS, JK, D, JK Master Slave Flip Flops.
14. To design MOD-7 Synchronous up-counter using JK/RS/D Flip Flops.
15. To Study different shift registers: SIPO, SISO, PIPO, and PISO.

Note: At least ten experiments should be performed in semester.

ANALOG ELECTRONIC CIRCUITS LAB

Subject Code: BEEES1-406 **L T P C** **Duration: 30 Hrs**
(common with BECES1-405) **0 0 2 1**

Course Objectives:

1. To understand the characteristics of various power amplifiers.
2. To understand various sources of oscillations.
3. Able to understand, identification and selection of various amplifiers.
4. To make the students aware about the various multivibrator circuits.
5. To understand various Applications of Op amp.

Course Outcomes:

1. An ability to understand different types of electronics devices and circuits
2. An ability to design and conduct experiments, as well as to analyse and interpret output.

LIST OF EXPERIMENTS

1. To observe and analyze the frequency response of Class- A amplifier.
2. To observe and analyze the frequency response of Class- B amplifier.
3. To observe and analyze the frequency response of Class- B push-pull amplifier.
4. To observe and analyze the frequency response of complementary symmetry push-pull amplifier.
5. To study frequency response of a tuned amplifier.
6. To demonstrate and study a single stage RC coupled amplifier.
7. To demonstrate and study a two stage RC coupled amplifier.
8. To demonstrate and study a Transformer coupled amplifier.
9. To observe the response of RC phase shift oscillator/Wien Bridge oscillator and determine frequency of oscillation.
10. To observe the response of Hartley/Colpitts oscillator and determine frequency of oscillation.
11. To observe the response of Clapp's oscillator and determine frequency of oscillation
12. To understand and plot working of Monostable and Astable Multivibrators.
13. To demonstrate Application of Op amp as Inverting and Non Inverting amplifier.
14. To demonstrate the use of Op-Amp as summing, scaling & averaging amplifier.
15. Design of differentiator and Integrator using Op-Amp.

Note: At least 10 experiments are required to be performed.

ELECTRICAL MACHINES LAB-II

Subject Code: BEEES1-407 **L T P C** **Duration: 30 Hrs**
(common with BELES1-404) **0 0 2 1**

Course Objectives:

1. To plot speed-torque characteristics of three-phase and single-phase induction motors.
2. To obtain equivalent circuit parameters of three-phase and single-phase induction motors.
3. To study speed control of induction motors using different techniques.
4. To plot characteristics of a three-phase alternator and a synchronous motor.
5. To synchronise two 3-phase alternators by different methods

Course Outcomes:

Students will be able to

1. Obtain equivalent circuit parameters of single-phase and three- phase Induction motors.
2. Control speed of Induction motors by different methods.
3. Draw open and short circuit characteristics of three-phase alternator and V and inverted V curves of synchronous motor.
4. Find out voltage regulation of an alternator by different tests.
5. Synchronise two or more 3-phase alternators.

LIST OF EXPERIMENTS

1. To perform load-test on three-phase induction motor and to plot speed-torque characteristics.
2. To perform no-load and blocked rotor test on three-phase induction motor to obtain equivalent circuit parameters and to draw circle diagram.
3. To study the speed control of three-phase induction motor by Kramer's method.
4. To study the speed control of three-phase induction motor by cascading of two induction motors.
5. To study star- delta starters and
   a) To draw electrical connection diagram.
   b) To start the three-phase induction motor using it.
   c) To reverse the direction of three-phase induction motor.
6. To start a three-phase slip ring induction motor by inserting different levels of resistance in the rotor circuits and to plot speed- torque characteristics.
7. To perform no-load and blocked rotor test on single-phase induction motor and to determine the parameters of equivalent circuit.
8. To perform load test on single-phase induction motor and plot speed-torque characteristics.
9. To perform no load and short circuit test on three-phase alternator and draw open and short circuit characteristics.

10. To find voltage regulation of an alternator by zero power factor (ZPF) method.
11. To study effect of variation of field current upon the stator current and power factor of synchronous motor running at no load and draw V and inverted V curves of motor.
12. To synchronise two 3-phase alternators using dark lamp method, and two-bright & one dark lamp method.
13. To start a synchronous motor using appropriate method.

Note: At least ten experiments should be performed in the semester.

ENGINEERING MECHANICS

Subject Code: BMECE0-001 **L T P C** **Duration: 60 Hrs**

3 1 0 4

Course Objectives:

1. The concepts of friction in screw jack & inclined plane.
2. To draw shear force and bending moment diagrams by analytical method
3. To find forces in simple trusses by using joints and section methods
4. The concepts related to torsions and mechanics of fluids.

UNIT-I (14 Hours)

Introduction to Engineering Mechanics

Force Systems, Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy.

UNIT-II (13 Hours)

Friction

Types of Friction, Limiting Friction, Angle of Repose, Coefficient of Friction, Laws of Friction, Static & dynamic Friction, Screw Jack, Minimum force required to drag a body on rough horizontal plane, body tending to move upwards on an inclined plane, body moving down the plane.

UNIT-III (21 Hours)

Centroid, Centre of gravity and Moments

Centroid of composite sections, Parallel & perpendicular axes theorem, Moment of area, Moment of inertia of standard sections and composite sections, mass moment of inertia of cylinder cone sphere, and Polar moment of inertia, Shear force and bending moment diagram, simple trusses, Method of joints, Method of section

UNIT-IV (12 Hours)

Kinematics of Particles

Rectilinear motion, plane curvilinear motion-rectangular coordinates, normal and tangential component, Kinetics of Particles: Equation of motion, rectilinear motion and curvilinear motion, work energy equation, conservation of energy, impulse and momentum, conservation of momentum, impact of bodies, co-efficient of restitution, loss of energy during impact. **Expected Outcomes:**

After going through these contents the student shall be able to solve the simple problems related to Kinematics of particles, Co-planar and concurrent forces, Solids mechanics, Moment of inertia and centre of gravity and Role of friction in screw Jack and inclined planes.

Recommended Books:

1. Theory of machines by V.P Singh Dhanpat rai& Co
2. Jindal U.C Engineering Mechanics Part-I, Galgotia Publications
3. Sadhu Singh, 'Strength of Materials', Khanna Publishers
4. Dr. Kirpal Singh, 'Mechanics of Materials', Standard Publishers
5. E.P.Popov, 'Mechanics of Materials', Pearson Education
6. K.L. Kumar, 'Engineering Fluid Mechanics', S. Chand
7. P.N. Chandramouli, 'Engineering Mechanics', PHI

CONSTITUTION OF INDIA

Subject Code: BMNCC0-001 **L T P C** **Duration: 30 Hrs**
2 0 0 0

Course Contents:

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India.
3. Salient features and characteristics of Constitution of India.
4. Scheme of the fundamental rights.
5. The scheme of the fundamental Duties and its legal status.
6. The directive Principles of State Policy – its importance and implementation.
7. Federal structure and distribution of legislative and financial powers between the Union and the States.
8. Parliamentary Form of Government in India – The constitution powers and the status of the president of India.

9. Amendment of the constitutional Powers and Procedure.
10. The historical perspectives of the constitutional amendments in India.
11. Emergency Provisions: National emergency, President Rule, Financial Emergency.
12. Local Self Government – Constitutional Scheme in India.
13. Scheme of the Fundamental Right to Equality.
14. Scheme of the Fundamental Right to certain Freedom under Article 19.
15. Scope of the Right to Life and Personal Liberty under Article 21.