Shri Rawatpura Sarkar University, Raipur

Examination Scheme & Syllabus

for

B.Tech.(Electrical Engineering)

Semester-(IV)

(Effective from the session: 2022-23)

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF ENGINEERING

Four Years B.Tech. Programme

Scheme of Teaching and Examination of B.Tech. Fourth Semester

(Electrical Engineering)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2022-2023)

S.No.	Course Code	Course Title	Hours / Week			Credits	Maximum Marks			Sem End Exam Duration (Hrs)
			L	T	P		Continuous Evaluation	Sem End Exam	Total	
1	BENEE401T	Network Analysis & Synthesis	3	1	-	4	30	70	100	3
2	BENEE402T	Electro Magnetic Theory	2	1	-	3	30	70	100	3
3	BENEE403T	Digital Electronics & Logic Design	3	1	-	4	30	70	100	3
4	BENEE403P	Digital Electronics and Logic Design	-	-	2	1	15	35	50	-
5	BENEE404T	Electrical Power Systems	3	1	-	4	30	70	100	3
6	BENEE404P	Electrical Power Systems	-	-	2	1	15	35	50	-
7	BENEE405T	Modern Instrumentation Techniques	2	1	-	3	30	70	100	3
8	BENEE405P	Modern Instrumentation Techniques	-	-	2	1	15	35	50	-
9	BENEE406T	Elective-I	2	1	-	3	30	70	100	3
						24			750	

Elective-I

A. Analog Electronics
B. Electrical Design and Drafting
C. Electrical Estimation and Costing
D. Microprocessor & Interfacing

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<table>
<tr><td>Course Title</td><td colspan="5">NETWORK ANALYSIS AND SYNTHESIS</td></tr>
<tr><td>Course Code</td><td colspan="5">BENEE401T</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>3</td><td>1</td><td></td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Electrical circuit</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To understand the concept of circuit elements lumped circuits, waveforms, circuit laws and network reduction.
• To analyze circuits using the node-voltage method and the mesh-current method.
• To analyze RL, RC and RLC circuits - step and natural response.
• To apply the Laplace transform in circuit analysis and transform circuits using Thevenin and Norton equivalents.
• To determine the response to any excitation and to identify and use transfer functions in circuit analysis.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT- I
Formulation of network equations, solution of first order differential equations, initial conditions in networks and network solution with Laplace transformation, step, ramp and impulse functions, initial and final value theorem.

UNIT-II
Transform impedance and transform circuits, Thevenin’s and Norton’s theorem, discrete and continuous spectrum, relation and Laplace transforms, poles and zeros with restrictions for driving point functions and transform functions

UNIT- III
Two port parameters(z,y,h,g,Transmission parameters), Interrelation between z, y, g, h, ABCD parameters, Reciprocity & Symmetry, cascade, series, parallel and series-parallel connections of Two port Networks, Barletts bisection Theorem.

UNIT-IV
Identification of network synthesis and positive real function (PRF), properties of PRF, testing of driving point functions, even and odd function, one terminal pair network driving point synthesis with LC, RL and RC elements, Foster-I & II and Cauer-I & II form.

UNIT-V
Low pass filters, high pass filters, band pass filters, band reject filters, Gain equalizer and delay equalizers, mderived filters, constant k-filters, design of filters.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">At the end of this course student will be able to:
• Students will be able to analyze circuits using Kirchhoff's laws and design and conduct experiments using various elements, as well as to analyze and interpret data.
• To develop the ability of understanding the application of network theorems in</td></tr>
</table>

	reducing complicated networks to simpler ones. • Students should have the ability to demonstrate the application of Fourier transform and Laplace transform in networks. • Explain and analyze the different types of network functions. • To understand the different parameters of one port and two port networks. • Derive interrelationship between various parameters. • Analyze the stability of network function and interpret time domain behavior of networks from pole zero plots of network function. • To develop the ability to identify and synthesize the impedance functions using various techniques of synthesis. • An ability to design the low pass and high pass filters.
Text Books	1. "Network Analysis and Synthesis", M. E. Van Valkenburg, PHI Publications. 2. **"**Circuit theory", Kuriakose-PHI Learning Pbs
Reference Books	1. "Engineering Network Analysis and synthesis and filter design", G.G Bhise, P.R. Chadha and D. C. Kulshreshtha, Umesh Publications. 2. "Network Analysis and Synthesis", C. L. Wadhwa, New Age Publications. 3. "Network Analysis and Synthesis", M. E. Van Valkenburg, PHI Publications. 4. "Network Analysis and Synthesis", 2nd Ed, Franklin F. Kuo, Wiley India

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<table>
<tr><td>Course Title</td><td colspan="5">ELECTRO MAGNETIC THEORY</td></tr>
<tr><td>Course Code</td><td colspan="5">BENEE402T</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>2</td><td>1</td><td></td><td>3</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Basic physics</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• The objective of this course is to introduce the concepts of electric field and magnetic fields and their applications which will
• Be utilized in the development of the theory for power transmission lines and electrical machines.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT- I
Basics of Electromagnetic Fields:
Scalars and vectors, vector algebra, Cartesian, Cylindrical and Spherical coordinate systems, transformations between coordinate systems, Coulomb’s law, Electric field intensity, electric field due to point charge, line charge, continuous volume charge and surface charge.

UNIT-II
Electric Flux and Potential:
Electric flux and Electric flux density, Gauss’s law and its application (symmetrical charge distribution only), divergence and divergence theorem, Maxwell’s first equation, Definition of potential difference and potential, potential field of a point charge, potential field between two coaxial cylinders, potential between two conducting spherical shells, conservative property, potential gradient, Energy Density in the Electrostatic field.

UNIT- III
Electric current and Poisson & Laplace equations:
Current and current density, continuity of current, metallic conductors, conductor properties and boundary conditions, the method of images, nature of dielectric materials, boundary conditions for perfect dielectric materials, Poisson and Laplace equation, Uniqueness theorem, examples
of the solution of Laplace equations (one dimension only).

UNIT-IV
Magneto staticsand Magnetic Force:
The steady state magnetic field, BiotSavart Law, Ampere’s circuital Law, Curl, Stoke’s theorem, Magnetic flux and Magnetic flux density, scalar and vector magnetic potentials, force on a moving charge, force on a differential current</td></tr>
</table>

	element, force between differential current elements, force and torque on a closed circuit, magnetic materials, magnetization andpermeability, Magnetic boundary conditions. **UNIT-V** **Time Varying Field and Maxwell's Equations:** Faraday's law of electromagnetic induction, statically and dynamically induced EMFs, displacement current, modification of Maxwell's equations under time varying conditions (point form and integral form), Poynting Theorem and Poynting vector.
Course Outcomes	At the end of this course student will be able to: • Compute electric field intensity for various charge distribution • Compute Electric flux for various charge distribution • Compute potential for different charge distributions. • Compute solution of Laplace and Poisson's equations • Compute magnetic field intensity and magnetic flux density using Ampere's circuital LawandStoke's theorem. • Compute force and torque for various current carrying elements. • Enlist Maxwell's equations for time varying fields and solve them for specific regular geometries
Text Books	1. William H.Hayt and Jr. John A. Buck , "Engineering Electromagnetics", Tata McGraw-Hill, 2. John D. Kraus, "Electromagnetics with Application", McGraw-Hill International Edition 3. Mathew N. O. Sadiku, "Elements of Electromagnetics", 4th Edition, Oxford University Press
Reference Books	1. Ramo, Whinnery and Van Duzer, "Fields and Waves in Communications Electronics", Third Edition, John Wiley & Sons. 2. David J. Grithiths, "Introduction to Electrodynamics", Third Edition, PHI. 3. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems.", Prentice Hall of India 2nd edition.

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<table>
<tr><td>Course Title</td><td colspan="5">DIGITAL ELECTRONICS AND LOGIC DESIGN</td></tr>
<tr><td>Course Code</td><td colspan="5">BENEE403T</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>3</td><td>1</td><td></td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Electric circuit</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To know the different codes used in digital electronics and their application.
• To minimization of Boolean algebra using k-map & tabulation methods.
• To realize the combinational & sequential logic circuits.
• To introduce with digital logic families.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT- I
Binary Number Systems & Codes:
Number System: Decimal, binary, octal, Hexadecimal number systems, conversion of number systems, r's & (r-1)'s complement. Boolean algebra: Reduction of Boolean expression using Identities, Laws & Theorems, Basic & universal logic gates, NAND-NOR implementation, Converting AND/ OR/ Invert logic to NAND/ NOR logic. Binary Codes: Weighted & Non weighted codes, Sequential code, Self-complementing code, Cyclic code, Excess-3 code, Gray code, error detecting & correcting code, Hamming code, ASCII & EBCDIC Codes.

UNIT-II
Minimization Techniques:
Minimization of Boolean function in SOP & POS, Canonical & Standard form, Min-term, Max-term, mapping & minimization of SOP & POS expression using two, three & four variables K-map, concept of Don't care terms, Quine-McCluskey or Tabulation method of minimization.

UNIT- III
Combination logic circuits:
Half adder, Full adder, Half Subtractor, Full subtractor, Binary parallel adder, Binary parallel subtractor, BCD adder, Look ahead carry generator, Serial adder, Code converters, Parity bit generator/ checker, magnitude comparators, Decoders: 3 line to 8 line decoder, BCD to Decimal decoder, BCD to Seven segment decoder. Encoder: Octal to binary encoder, Decimal to BCD encoder, Multiplexer: 2-input Mux, 4-input Mux & 16-input Mux, Demultiplexer: 1 line to 4 line & 1 line to 8 line De-mux, Logic Array: PAL, PLA, PROM, ROM.

UNIT-IV
Sequential logic circuits:
Latches: Active low & high S-R Latch, Gated S-R latch. Flip flops: Edge triggered S-R, D, J-K and T flip-flops, Master-Slave flip-flops & its timing diagram, Truth table & Excitation Table. Asynchronous inputs of flip-flop, Conversion of one flip-</td></tr>
</table>

	flop to other flip-flop. Counters: Asynchronous Ripple or Serial Counter, up/down counter, Decade counter, Synchronous counter, State diagram, up/down synchronous counters, Module-N synchronous counters, RING counters, Johnson counter, Shift Registers: SISO, SIPO, PISO, PIPO, Bi-directional shift registers, Universal shift registers. **UNIT-V** **Logic families:** Introduction of Digital terminologies, Transistor Inverter, RTL and DTL, TTL: Totempole arrangement, ECL & its specifications. MOS Logic: NMOS NAND & NOR gate, CMOS Inverter, NAND & NOR Gate, comparison among various logic families, manufacturer's Specification.
Course Outcomes	**At the end of this course student will be able to:** • Student will be to calculate the resistance, inductance and capacitance of transmission line. • Student will be able to learn how to model the element in power system and able to carry out studies of load flow, transient stability, harmonics and other relevant studies. • Student will be able to calculate the voltage regulation of line and analyze the voltage profile of the transmission line. • Student will gain an understanding of VAR control using component to improve p.f,location of capacitor, operation of load tap changing can be examine. • Student will be able to calculate the sag, tension and mechanical stress of a transmission line. • Student will be able to learn different types of conductor and cable with its performance. • Student will able to understand the effect of surges in line
Text Books	1. Electrical power systems, AshfaqHussain, CBS Publications. 2. Elements of Power System Analysis, William D Stevenson, Tata Mc Graw Hill Publishing Company Limited 3. Electrical Power System , D. Das , New Age publication
Reference Books	1. A Course in Electrical Power, by Soni, Gupta and Bhatnagar, Dhanpat Rai Publications. 2. Electrical Power Systems, C. L. Wadhwa, New Age Publications. 3. Power System Engineering, I.J.Nagrath and D.P.Kothari, TMH Publications. 4. Power System, V.K. Mehta and Rohit Mehta, S. Chand Publications

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<table>
<tr><td>Course Title</td><td colspan="5">ELECTRICAL POWER SYSTEM</td></tr>
<tr><td>Course Code</td><td colspan="5">BENEE404T</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>3</td><td>1</td><td></td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Basic electronics , physics</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To learn the fundamentals of transmission system and parameter for the design of transmission system.
• To comprehend the working and performance of transmission line with the help of its circuit model.
• To understand the concept of reactive power and voltage control in generation, transmission and distribution.
• To understand and analyze the performance of cables.
• To model the transmission lines in terms of mechanical parameter and stresses.
• To study the effect of surges in transmission and associated equipment</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT- I
Overhead Lines:
General structure of electrical power system, power generation, power transmission & voltage levels, power distribution through overhead lines, Type of overhead conductors, solid conductors, stranded conductors, bundled conductors, skin effect, proximity effects, corona, calculation of corona loss and factors affecting corona, inductance and capacitance of single-phase, three-phase single circuit and double circuit lines, concept of GMD, transposition of lines, effect of earth on capacitance of transmission lines.

UNIT-II
Transmission Lines:
Transmission lines as four terminal networks, A, B, C, D constants, nominal-T, nominal-π, equivalent-T, and equivalent- π representation of transmission lines, Characteristics and performance of transmission lines, distributed parameters of long lines, hyperbolic solutions, Ferranti effect, surge impedance loadings, power flow equations, sag and tension calculations.

UNIT- III
Cables and Power Factor Correction:
Types of cables, insulation resistance of cables, capacitance of cables, dielectric stress, capacitance grading of cables, use of inter-sheaths, power factor of cables. Causes of low power factor, Methods of Improving power factor, Phase advancing and generation of reactive KVAR using static Capacitors, Most economical power factor for constant KW load and constant KVA type loads, Numerical Problems.

UNIT-IV</td></tr>
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	Distribution Systems and Voltage Control: Classification of Distribution Systems, Comparison of DC vs. AC and Under-Ground vs. Over - Head Distribution Systems, Radial D.C Distributor, Ring Main Distributor. Generator voltage control, line drop compensation by static capacitors and reactors, control of voltage profile, control of active and reactive power, calculation of synchronous phase modifier capacity, on-load tap changing transformer. **UNIT-V** **Travelling Waves:** Transients in power systems, wave equation, characteristic impedance, energy and power surge, velocity, traveling wave phenomenon in open circuited and short circuited lines, lines with series reactive termination, junction of two dissimilar lines, repeated reflections, Bewley's Lattice diagram.
Course Outcomes	**At the end of this course student will be able to:** • Student will be to calculate the resistance, inductance and capacitance of transmission line. • Student will be able to learn how to model the element in power system and able to carry out studies of load flow, transient stability, harmonics and other relevant studies. • Student will be able to calculate the voltage regulation of line and analyze the voltage profile of the transmission line. • Student will gain an understanding of VAR control using component to improve p.f,location of capacitor, operation of load tap changing can be examine. • Student will be able to calculate the sag, tension and mechanical stress of a transmission line. • Student will be able to learn different types of conductor and cable with its performance. • Student will able to understand the effect of surges in line
Text Books	1. Electrical power systems, AshfaqHussain, CBS Publications. 2. Elements of Power System Analysis, William D Stevenson, Tata Mc Graw Hill Publishing Company Limited 3. Electrical Power System , D. Das , New Age publication
Reference Books	1. A Course in Electrical Power, by Soni, Gupta and Bhatnagar, Dhanpat Rai Publications. 2. Electrical Power Systems, C. L. Wadhwa, New Age Publications. 3. Power System Engineering, I.J.Nagrath and D.P.Kothari, TMH Publications. 4. Power System, V.K. Mehta and Rohit Mehta, S. Chand Publications

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<table>
<tr><td>Course Title</td><td colspan="5">Modern Instrumentation Techniques</td></tr>
<tr><td>Course Code</td><td colspan="5">BENEE405T</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>2</td><td>1</td><td></td><td>3</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Power system</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To provide students with a fundamental knowledge of low , medium & high resistance and there measuring technique with the help of D.C. bridges
• To provide students with a fundamental knowledge of Inductor and capacitor and there measuring technique with the help of various A.C. bridges.
• To provide students with a fundamental knowledge of galvanometer construction and working.
• To provide students with a fundamental knowledge of wattmeter & Energy meter and there testing.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT- I
Measurement of Resistance:
Classification of resistances (low, medium and high), measurement of resistance by volt drop method, loss of charge method, Wheatstone’s bridge, Kelvin’s double bridge, Megger and ohmmeter, AC Potentiometers and their use for calibration of meters (ammeter, voltmeter and wattmeter), Error analysis and sensitivity.

UNIT-II
AC Bridges:
Measurement of inductance (self and mutual) and capacitance by AC bridges: Hay’s, Maxwell’s, Anderson, Desauty’s brigde, Schering bridge, Oven’s bridge and Heaviside bridge and its modification, Wein’s bridge for measurement of frequency, Wagner earthing device.

UNIT- III
Detectors And Magnetic Measurement:
Construction, theory and operation of D’Arsonval vibration galvanometer, (b) Oscilloscope – Basic Principal, CRT feature, Block diagram of Oscilloscope, Triggered sources, Measurement of frequency and phase by Lissajous Figures.

UNIT-IV
Measuring Instruments:
Classification, operation and working principle of PMMC, MI and dynamometer type instruments, controlling, damping and balancing devices, single-phase and three-phase electrodynamometer power factor meter, frequency meters: electrical resonance type, electrodynamometer, ratio-meter type. Phase sequence meter, maximum demand indicator, tri-vector detector meter.

UNIT-V
Power And Energy Measurement:</td></tr>
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	Construction and principle of operation of dynamometer and induction type wattmeter, measurement of power in a three-phase circuit by using single-phase wattmeter, wattmeter errors, low power factor wattmeter, testing of wattmeter, single and poly-phase energy meters, testing of energy meters.
Course Outcomes	**At the end of this course student will be able to:** • The students should be able to Measure low, medium & high Resistances using suitable bridges. • The students should be able to determine the value of inductor and capacitor with the help of A.C. Bridge & they can draw phasor diagram of bridges. • The students should be able to test and calibrate ammeter, voltmeter, and Wattmeter and energy meter. • The students should be able to select proper instrument for measurement various Electrical elements.
Text Books	1. "A Course In Electrical And Electronics Measurement And Instrumentation", Sawhney, DhanpatRaiPbs. 2. Electrical Measurement and Measuring Instruments", Golding, CBS Publication 3. Electronic Instrumentation, H. S. Kalsi, TMH Publications
Reference Books	1. "A Course In Electrical And Electronics Measurement And Instrumentation", J. B. Gupta, KatariaPbs. 2. "Electric Measurements", Harris, Wiley Publication 3. "Electrical Measurements and Instrumentation, Cooper, TMH Publications

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<table>
<tr><td>Course Title</td><td colspan="5">ANALOG ELECTRONICS</td></tr>
<tr><td>Course Code</td><td colspan="5">BENEE406TA</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>2</td><td>1</td><td></td><td>3</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Basic electronics</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To clearly understand and demonstrate the knowledge of transistors at low frequencies and in the process build a strong base of mathematics, science and engineering.
• To clearly understand and demonstrate the knowledge of amplifiers at low frequencies.
• To conceptualize the concepts of multistage amplifiers and their applications.
• To understand the basics of feedback in amplifiers.
• To gain a thorough understanding of oscillators, their applications and in the process gain substantial knowledge of system analysis & design as well as team work</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT- I
DC Analysis of Transistor and FET Amplifiers:
Transistor Biasing and Thermal stabilization: The operating point, Bias stability, Stability factor, Emitter Bias, Collector to base bias, Voltage divider bias with emitter bias, Emitter bypass capacitor, Bias compensation FET Biasing: Field Effect Transistor (FET): biasing of FET and MOSFET

UNIT-II
AC Analysis of Transistor and FET Amplifiers:
Small signal Analysis: h-parameter Models for CB, CE, CC configurations and their interrelationship; Analysis and Comparison of the three configurations; Linear analysis of Transistor Circuits: Miller's Theorem and its Dual, Cascading: Simplified Models and Calculation of CE, CB and CC Amplifiers; Effect of emitter Resistance in CE amplifiers, Darlington Pair. Analysis of Single stage FET amplifier.

UNIT- III
High Frequency Transistor Amplifiers:
CE hybrid- pi model: Validity and parameter Variation: Current Gain with Resistive load: frequency response of a single stage CE Amplifier: Gain-Bandwidth product: CC stage High frequencies
UNIT-IV

Multistage Amplifiers
Classification: Distortion in Amplifiers: Frequency Response: Bode plots: Step Response: pass band of Cascaded Stages: Response of a Two-stage RC Coupled Amplifier at Low and high frequencies, Sources of noise in Transistor Circuits; Noise Figure.</td></tr>
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	UNIT-V **Feedback Amplifiers** Classification: Feedback concept; Ideal Feedback amplifier: Properties of Negative Feedback Amplifier Topologies: Method of Analysis of Feedback amplifiers: Voltage series Feedback: Voltage series Feedback pair: Current series, Current shunt and Voltage shunt feedback; Effect of feedback on amplifier Bandwidth and stability.
Course Outcomes	After studying the contents of the syllabus in detail the students will be able to: • An ability to apply knowledge of mathematics, science and engineering. • An ability to design and conduct experiments, as well as to analyze and interpret data. • To develop a clear understanding of transistor as an amplifier. • To understand the working of amplifiers at low frequencies and study about the hybrid model. • To know about the different amplifier configurations and the Millers theorem. • To gain knowledge about transistors at high frequencies. • An ability to work professionally in electronic systems areas including the design and analysis of such systems. • To learn about the different configurations of power amplifiers and their applications. • To understand the inadequacy of single stage amplifiers and learn about multistage amplifiers. • To grasp the concept of feedback and learn about feedback in amplifiers, oscillators and their applications
Text Books	1. Integrated Electronics – Millman&Halkias, TMH Publications 2. Electronic Devices and Circuits, A.K. Maini& V. Agrawal, Wiley India
Reference Books	1. **.** Electronic Circuit Discrete And Integrated: D. L. Schilling and C. Belove, McGraw-Hill edition 2. Electronic Devices & Circuits – David A. Bell, PHI 3. Microelectronics – Millman and Grabel, TMH Publications 4. Electronic Devices and Circuit Theory – Boylestad&Nashelsky, 8th Ed. PHI

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<table>
<tr><td>Course Title</td><td colspan="5">ELECTRICAL DESIGN AND DRAFTING</td></tr>
<tr><td>Course Code</td><td colspan="5">BENEE406TB</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>2</td><td>1</td><td></td><td>3</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Engineering drawing</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To provide basic concepts in engineering drawing.
• To impart knowledge about standard principles of orthographic projection of objects.
• To draw sectional views and pictorial views of solids.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT-I
Symbols and Codes
ISI Symbols in electrical engineering, Conventions for circuit and schematic representation of electrical and Electronic components, instruments and equipment
UNIT-II
Mountings
Different types of mountings, Enclosures for electrical equipments, Panel wiring with CB, isolator, synchroscope, regulator, etc Plate & Pipe earthing
Domestic Wiring
All types of light circuit, Fluorescent tube & fan circuit wiring, Intermediate switch circuit
UNIT-III
Instrument circuit
Connection of all types of meters (PMMC, Moving Iron, dynamo meter, Induction type. Extension of range using shunt, multiplier, CT, PT
Constructional Features of Electrical Machines
Parts of a transformer, D.C. machines, alternators, induction motors, Development diagram of windings of D.C. and A.C. machines, AC& DC Motor starter
UNIT-IV
Power System
Transmission line structure, Bushings, insulators, Overhead conductor joints
Substation drawing, lightning arrestors
Cables
Cross-section of cables, Power claying, Cable joints
UNIT-V</td></tr>
</table>

	Electrical CAD, Electrical power system software(Mi-Power , PS CAD), MATLAB, SCADA, tools used in simulation software
Course Outcomes	**At the end of this course student will be able to:** • Assemble single point house wiring for incandescent wiring, fans with electromechanical and electronics regulators. • Assemble single and double fluorescent tube wiring circuit • Assemble Staircase wiring using two-way switches • Assemble Godown wiring circuit • Assemble Panel board wiring using MCBs, and ELCBs.
Text Books	1. Geometrical and Machine Drawing 28th, 1993 Bhatt, N.D,:Charoter Pub., Anand Gujarat 2. Elementary Engineering Drawing 32nd, 1992 Bhatt, N.D,:Charoter Pub., Anand, Gujarat 3. Engineering Drawing 1996 Gujral and Shende, Khanna Pub. New.Delhi
Reference Books	*1. Engineering Drawing 1995 Gupta, R.B. Satya Prakashan, Delhi*

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Course Title	**Electrical Estimation and Costing**				
Course Code	**BENEE406TC**				
Course Credits	**L**	**T**	**P**	**TC**	
	2	**1**	**-**	**3**	
Prerequisites	Applied mathematics & basic electrical Engineering				
Course Objectives	• Identify and differentiate between the two types of estimate. • Define a unit cost estimate. • Draw up a check list for estimate control.				
Course Contents	**UNIT-I** **Elements of estimating and costing** : Types of estimation and estimation tools,Overhead and service charges,Purchase procedure **Domestic and Industrial Wiring :** Layout and wiring diagram for residential building,Layout and wiring diagram for industrial wiring,Selection of number of circuit for project as per IE rules, Estimation for residential wiring and industrial wiring,IE rules observed for above wiring. **UNIT-II** **Domestic and Industrial Service Connection :** Survey work for domestic and industrial service connection,Wiring diagram of domestic and industrial service connections,Specifications of materials and accessories for service connection,Estimation of service connection for domestic and industrial (1phase and 3 phase) service connections. **UNIT-III** **Overhead and Underground Distribution System** Planning and layout of overhead electrical distribution,Specifications of materials and accessories for overhead project,Planning and layout of underground electrical distribution,Specifications of materials and accessories for underground project,Drawings of overhead and underground service connection,IE rules pertaining to above project. **UNIT-IV**				

	Estimating and Costing of Electrical Product Market survey for cost of given product like D.O.L. starter, small motor, MCBs, etc.,Market survey for availability of required materials, their cost and other, requirements,Vf cost schedule. **Maintenance of Electrical Equipment** Estimation of repairs, servicing and testing cost including labour cost (service charge),Tools used for repairs & testing work, Detailed estimation and preparation of cost schedule for repair and maintenance of electric fan, automatic electric iron, single-phase transformer, mixer, D.O.L. starter etc. **UNIT-V** **Principles of Contracting** Terms, conditions and types of contract system,Types of tenders, tendering procedure and preparation of single tender,Terms and conditions of tender, procedure for inviting and scrutinizing of tender,Importance of earnest money deposit, security deposit and S.O.R.
Course Outcomes	**At the end of this course student will be able to:** • Perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives. • understand various types of materials required for wiring • understand different systems of illumination • Comprehend the estimation of industrial installations.
Text Books	1. Electrical estimating and costing Bajpai, M.N., Saroj Publication, New Delhi.
Reference Books	1. Electrical wiring, estimating and costing Uppal, S.L., Khanna Publisher, New Delhi 2. I.E. rules Central Law Agency, Allahabad.S.O.R P.W.D. Govt. Deptt.

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<table>
<tr><td>Course Title</td><td colspan="5">MICROPROCESSOR & INTERFACING</td></tr>
<tr><td>Course Code</td><td colspan="5">BENEE406TD</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>2</td><td>1</td><td>-</td><td>3</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Basic Electronics and Digital electronics</td></tr>
<tr><td>Course Objectives</td><td colspan="5">This course will enable students to:
The objective of this course is to provide knowledge about the fundamentals of Microprocessors their evolution internal architecture and construction.
This course is also useful to provide the knowledge of various supporting chips provided with the Microprocessor 8085.
The aim of this course is to give the knowledge of various instructions, basic programming with Microprocessors 8085, data transfer schemes, Instruction format and addressing modes.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT-I
Microprocessor Architecture:
Brief Introduction to Microprocessors, Architecture of 8085, Pin Configuration and their Function; internal registers & flag register, memory-stack organization, Generation of Control Signals, demultiplexing of address / data bus, Instruction Fetch Cycle, Execute Cycle, Instruction Cycle.
UNIT-II
Instruction Set and Programming with 8085:
Instruction for Data Transfer, Arithmetic, Logical Operations and Branching Operation. Stacks, Subroutine and Related Instructions. Elementary Concept of Timing Diagram and Machine Cycle. Addressing Modes, Instructions Format. Looping and Counting, Software Counters with Time Delays. Simple Programs using Instruction Set of 8085 like Program for Addition/Subtraction/ Multiplication and Division of Unsigned Binary Numbers. Programs for Code Conversion e.g. BCD to Binary/ Binary to BCD, Binary to Seven-Segment LED Display, Binary to ASCII/ ASCII to Binary
UNIT-III
Data Transfer and Device Selection:
Format of Data Transfer, Modes of Data Transfer, Type of I/O Addressing, Condition of Data Transfer: Microprocessor Controlled Data Transfer/ Peripheral Controlled Data Transfer, Absolute and Linear Select Decoding,</td></tr>
</table>

	Memory and I/O Interfacing, Use of Decoders Selection, Memory Mapping. **UNIT-IV** **Interrupts:** Restart Instruction; Hardware Implementation, Interrupt Processing; Multiple Interrupts and Priority Concepts, Interrupt Structure of 8085, Instructions related to interrupts, Pending Interrupts, Application of Interrupts and simple illustrative Programs. **UNIT-V** **Architecture of Peripheral Interfacing Devices :** Architecture, Pin Diagram and functioning of 8155/8156(RAM), 8255 (PPI). Simple programs like Initialization and I/O operations of the ports using simple I/O mode, Timer operation of 8155. Architecture, Pin diagram & description of USART (8251).Programmable Interval Timer8253/8254: Block Diagram, Pin Configuration, Modes, Initialization Instruction, Interfacing and Simple Programs to generate various types of signals.
Course Outcomes	**At the end of this course student will be able to:** • Understand the basicarchitectureofMicroprocessor8085. • Understand various instructions and their application in programming. • Understand memory organization and mapping
Text Books	1. Microprocessor Architecture, Programming and Application by R. S. Gaonkar, Wiley Eastern 2. Digital Systems–From Gatesto Microprocessors by Sanjay K. Bose, New Age International Publishers.
Reference Books	1. 8085MicroprocessorProgramming&Interfacing–N.K.Srinath,PHI 2. DigitalComputerElectronics–Malvino,TMH 3. Microprocessors: Theory and Applications – Intel and Motorolla, Rafiquuzzaman, PHI. 4. 0000 to 8085: Introduction to Microprocessor for Engineers and Scientists, Ghosh & Sridhar, PHI

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<table>
<tr><td>Course Title</td><td colspan="5">DIGITAL ELECTRONICS & LOGIC DESIGN</td></tr>
<tr><td>Course Code</td><td colspan="5">BENEE403P</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td></td><td></td><td>2</td><td>1</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Digital electronics</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To know the different codes used in digital electronics and their application.
• To minimization of Boolean algebra using k-map & tabulation methods.
• To realize the combinational & sequential logic circuits.
• To introduce with digital logic families.</td></tr>
<tr><td>Course Contents</td><td colspan="5">LIST OF EXPERIMENTS

(At least Ten experiments are to be performed by each student)
1. To Verify the Properties of NOR & NAND Gates As Universal Building Block.
2. Realization of Boolean Expression Using NAND Or NOR Gates.
3. To Construct X- OR Gate Using Only NAND Or NOR Gates Only.
4. To Construct a Half Adder Circuit. And Logic Gates And Verify its Truth table.
5. To Construct a Full Adder Circuit and Verify its truth table (Using Two X-OR And 3 nandgates).
6. To Construct a Half Subtractor Circuit. by Using Basic Gates and Verify its truth table.
7. To Construct a Full Subtractor Circuit by using Basic Gates And Verify its truth table.
8. To Construct a Circuit of 4 -Bit Parity Checker & Verify its truth table.
9. To Construct a Programmable Inverter Using X-OR Gates & Verify its truth table.
10. To Design a Comparator Circuit & Verify its truth table.
11. To Construct A RS Flip Flop Using Basic & Universal Gates (NOT, NOR & NAND)
12. To Construct a J.K. Master Slave Flip Flop & Verify its truth table
13. To Verify the Operation of a Clocked S-R Flip Flop and J. K. Flip Flop
14. To Construct a T & D Flip Flop Using J. K. Flip Flop and Verify Its Operations & truth table.
15. To Verify the Operation of Asynchronous Decade Counter
16. To verify the operation of various decoding and driving devices
17. To perform the operation of BCD Counter Using 7490</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">At the end of this course student will be able to:
• Be able to design, build, test, troubleshoot, and evaluate digital circuits.
• Be able to utilize computer software such as Electronic Work Bench (Multisim).
• Be able to evaluate and revise designs as actual performance is reviewed.
• Be able to prepare a written report that effectively communicates the objective, the design procedure, the
• experimental results, and the conclusion for any project design.</td></tr>
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Text Books	1. “Digital logic and concept design”, Morris Mano, PHI Publications 2. “Study, theory and logic design” Jain, TMH Publications

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<table>
<tr><td>Course Title</td><td colspan="5">ELECTRICAL POWER SYSTEMS</td></tr>
<tr><td>Course Code</td><td colspan="5">BENEE404P</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td></td><td></td><td>2</td><td>1</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Electrical power system</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To learn the fundamentals of transmission system and parameter for the design of transmission system.
• To comprehend the working and performance of transmission line with the help of its circuit model.
• To understand the concept of reactive power and voltage control in generation, transmission and distribution.
• To understand and analyze the performance of cables.
• To model the transmission lines in terms of mechanical parameter and stresses.
• To study the effect of surges in transmission and associated equipment</td></tr>
<tr><td>Course Contents</td><td colspan="5">LIST OF EXPERIMENTS

(At leastTen experiments are to be performed by each student)
1. Study of types of cables.
2. Study of types of Insulator used in power system
3. Study of Bus –bar arrangement of a power supply sub – station.
4. Study of Synchronous phase modifier and calculation of its rating.
5. To measure the A, B, C, D constants of transmission lines.
6. To measure the A, B, C, D constants of series transmission lines (HV-HV).
7. To measure the A, B, C, D constants of series transmission lines (LV-LV).
8. To measure the A, B, C, D constants of parallel transmission lines.
9. To locate faults in a cable by Murray loop test.
10. Measurement of capacitance between conductor –conductor and conductor – earth.
11. Comparison of conductor Characteristics (Self GMD) between two different groups of conductors.
12. To find out the rating of capacitor required for improving the power factor of an inductive load.
13. Study of Ferranti effect.
14. Study of transmission structure used for different types of power supply system.
15. Study the lay out diagram of college power supply system.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">At the end of this course student will be able to:
• Student will be to calculate the resistance, inductance and capacitance of transmission line.
• Student will be able to learn how to model the element in power system and able to carry out studies of load flow, transient stability,harmonics and other relevant studies.
• Student will be able to calculate the voltage regulation of line and analyze the</td></tr>
</table>

	voltage profile of the transmission line. • Student will gain an understanding of VAR control using component to improve p.f,location of capacitor, operation of load tap changing can be examine. • Student will be able to calculate the sag, tension and mechanical stress of a transmission line. • Student will be able to learn different types of conductor and cable with its performance. • Student will able to understand the effect of surges in line
Text Books	1. Power system analysis by C.L Wadhava, New Age 2. Power system analysis by V.K Mehta, S. Chand.

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<table>
<tr><td>Course Title</td><td colspan="5">Modern Instrumentation Techniques</td></tr>
<tr><td>Course Code</td><td colspan="5">BENEE405P</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td></td><td></td><td>2</td><td>1</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Basic electronics</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To provide students with a fundamental knowledge of low , medium & high resistance and there measuring technique with the help of D.C. bridges
• To provide students with a fundamental knowledge of Inductor and capacitor and there measuring technique with the help of various A.C. bridges.
• To provide students with a fundamental knowledge of galvanometer construction and working.
• 4. To provide students with a fundamental knowledge of wattmeter & Energy meter and there testing.</td></tr>
<tr><td>Course Contents</td><td colspan="5">LIST OF EXPERIMENTS

(At leastTen experiments are to be performed by each student)

1. To determine unknown resistance or value resistance by Kelvin Bridge Method.
2. To determine unknown resistance R by Wheatstone Bridge Method.
3. To determine unknown inductance of a given coil by Maxwell Bridge Method.
4. To determine the inductance of the given coil by Anderson Bridge Method.
5. To determine unknown capacitance of a given capacitor by Desauty Bridge Method.
6. To determine capacitance of a given capacitor by Schering Bridge Method.
7. To determine the inductance by Owen’s Bridge Method.
8. To determine unknown inductance by Hay Bridge Method.
9. To calibrate a given single phase induction type Energy Meter.
10. To find the phase sequence of the supply by the rotating type phase sequence meter.
11. To find the phase sequence of the supply by the Static type phase sequence meter.
12. To determine the unknown resistance R by Voltmeter-Ammeter Method.
13. To observe the B-H curve and hysteresis loop of agiven transformer core on CRO.
14. Measurement of high resistance by using Meggar.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">At the end of this course student will be able to:
• The students should be able to Measure low, medium & high Resistances using suitable bridges.
• The students should be able to determine the value of inductor and capacitor with the help of A.C. Bridge & they can draw phasor diagram of bridges.
• The students should be able to test and calibrate ammeter, voltmeter, and Wattmeter and energy meter.</td></tr>
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	• The students should be able to select proper instrument for measurement various Electrical elements.
Text Books	• Electrical measurement & measuring instrument by A.K.Sawhney. • Electrical measurement & measuring instrument by J.B.Gupta