Curriculum for
UG & PG Programmes
(2024-25 Onwards)

असतो मा सद्गमय

Swami Keshvanand Institute of Technology, Management & Gramothan

(An Autonomous Institute, Affiliated to Rajasthan Technical University, Kota)
(Accredited by NAAC with A ++ Grade)
Approved by AICTE, Ministry of Education, Government of India
Recognized by UGC under Section 2(f) of the UGC Act, 1956

B.Tech. in Electrical Engineering

Syllabus

Name of the Programme: B.Tech. (All Branches)	**Year**: II	**Semester**: III
Course Name: Managerial Economics and Financial Accounting	**Course Code**: HSUL301	**Credit**: 1
Max Marks: 100	**CIE:** 40	**SEE:** 60
End Term Exam Time: 3 Hrs	**Teaching Scheme:**1L+0T+0P	

Module No.	Contents	Hours
1	**Introduction:** Objective, Scope, Outcome of the Course and Prerequisite	1
2	**Basic economic concepts** Meaning, nature and scope of managerial economics, deductive vs inductive methods, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	4
3	**Demand and Supply analysis** Demand-types of demand, determinants of demand, demand function, demand forecasting –purpose, determinants, elasticity of demand Supply-determinants of supply, supply function, elasticity of supply.	3
4	**Production and Cost analysis** Theory of production- production function, production optimization, least cost combination of inputs, isoquants, law of variable proportions, laws of returns to scale. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	3
5	**Financial statement analysis** Capital and accounting, profit and loss statement and related concepts, balance sheet and related concepts, financial ratio analysis.	4
	Total	**15**

Text Books:

1. D. N. Dwivedi, *Managerial Economics*, 2023, Vikas Publishing House.
2. M. R. Agarwal, *Financial Management*, 2022, Garima Publication.

Reference Books:

1. V. Varshney and K. L. Maheswari, *Managerial Economics*, 2023, S. Chand.
2. N. D. Mathur, *Managerial Economics*, 2010.

Prerequisite:

1. Knowledge of basic mathematics & business economics

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Syllabus

Name of the Programme: B.Tech in Electrical Engineering	**Year**: II	**Semester**: III
Course Name: Advanced Engineering Mathematics-I	**Course Code**: MAUL302	**Credit**: 3
Max Marks: 100	**CIE:** 40	**SEE:** 60
End Term Exam Time: 3 Hrs	**Teaching Scheme:**3L+0T+0P	

Module No.	Contents	Hours
1	**Introduction:** Objective, Scope, Outcome of the Course and Prerequisite	1
2	**Laplace Transform:** Laplace transform with its simple properties, Inverse Laplace Transform with applications to the solution of ordinary and partial differential equations. Initial and final value theorem	12
3	**Fourier Transform:** Discrete Fourier transform, Fast Fourier transform, Complex form of Fourier transform and its inverse, Applications of Fourier transforms to Boundary Value Problems.	11
4	**Complex Variables-I**: Analytic functions, Cauchy–Riemann equations, Elementary conformal mapping with simple applications, Line integral in complex domain, Cauchy's theorem, Cauchy's integral formula.	12
5	**Complex Variables-II:** Taylor's series, Laurent's series, poles, Residues. Evaluations of simple definite real integrals using the theorem of residues. Simple contour integration.	9
	Total	**45**

Text Books:

1. H. K. Dass, *Advanced Engineering Mathematics*, 2023, S. Chand and Company Ltd.
2. B. S. Grewal, *Higher Engineering Mathematics*, 2023, Khanna Publication.
3. E. Kreyszig, *Advanced Engineering Mathematics*, 2014, Wiley India.

Reference Books:

1. N. W. McLachlan, *Laplace Transforms and Their Applications to Differential Equations*, 2010, Dover Publications, USA.
2. B. V. Ramana, *Higher Engineering Mathematics*, 2024, Tata McGraw Hill Publications.

Prerequisite:

1. Differential Calculus
2. Integral calculus
3. Convergence of Series

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Syllabus

Name of the Programme: B.Tech. in Electrical Engineering	**Year**: II	**Semester**: III
Course Name: Electrical Measurement &Instrumentation	**Course Code**: EEUL301	**Credit**: 3
Max Marks: 100	**CIE:** 40	**SEE:** 60
End Term Exam Time: 3 Hrs	**Teaching Scheme:** 3L+0T+0P	

Module No.	Contents	Hours
1	**INTRODUCTION:** Objective, scope and outcome of the course.	1
2	**THEORY OF ERRORS & POTENTIOMETERS**: Accuracy & precision, Types & Limits of errors, Combination of errors. DC potentiometers– slide wire and Crompton potentiometers. Use of potentiometer for voltmeter and ammeter calibrations. Introduction of AC potentiometer its types and application.	8
3	**MEASURING INSTRUMENTS**: Significance of instruments, methods of measurement, Classification of instruments, classification of secondary instruments, essentials of indication instruments. Types of instruments, Construction, operation, types and application of moving coil, moving iron, induction and electro dynamic instruments. Range extension of ammeter and voltmeter, Megger.	10
4	**TRANSDUCERS:** Introduction, classification & selection of transducers, Strain Guage, LVDT,Capacitive transducers, Optoelectric transducers, Thermistors and Thermocouple, Piezo-electric Transducer, Hall Effect. Introduction to smart meters and their application. Data acquisition systems.	8
5	**AC BRIDGES & MEASUREMENT OF RESISTANCES**: Measurement of self Inductance: Maxwell's bridge, Hay's bridge and Anderson bridge Measurement of capacitance: De Sauty, Schering. Measurement of low resistances Kelvin's double bridge method. Measurement of medium resistances – ammeter and voltmeter method, substitution method. Measurement of high resistance-Meggar. Measurement of earth resistance, Methods of Earthing.	9
6	**POLYPHASE METERING & INSTRUMENT TRANSFORMERS**: Blondel's Theorem, Measurement of power in 3-phase system using two- wattmeter method. Current and potential transformers. Ratio and phase angle errors and their minimization. Effect of variation of power factor, secondary burden and frequency on errors. Applications of CTs and PTs.	9
	Total	45

Textbooks:

1.A. K. Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai & Sons, 2014.
2.H. S. Kalsi, Electronic Instrumentation, Tata McGraw-Hill Publications, 2012.
3.D. A. Bell, Electronic Instrumentation and Measurements, Oxford University Press, 2006.
4.M. Morris, Electrical Measurements & Instrumentation, ELSEVIER, 2001.

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Reference Books:

1.A. D. Helfrick and W. D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall India, 2004.
2.E. W. Golding and F. C. Widdis, Electrical Measurement & Measuring Instrument, A.W. Wheeler, 2004.
3.F. K. Harries, Electrical Measurement, Wiley Eastern Pvt. Ltd. India, 2008.

Prerequisite:

1. Basic Electrical Engineering
2. Circuit Analysis

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Syllabus

Name of the Programme: B.Tech. in Electrical Engineering	**Year**: II	**Semester**: III
Course Name: Generation of Electrical Power	**Course Code**: EEUL302	**Credit**: 2
Max Marks: 100	**CIE:** 40	**SEE:** 60
End Term Exam Time: 3 Hrs	**Teaching Scheme:** 2L+0T+0P	

Module No.	Contents	Hours
1	**Introduction:** Objective, Scope, Outcome of the Course and Prerequisite	1
2	**Conventional Energy Generation:** **Thermal Power plants:** Selection of site, Elements of the plant, Plant layout. **Gas Power Plants:** Elements of the plant, Plant layout, open cycle, and closed cycle gas turbine plants, Combined gas & steam plants-basic schemes. **Hydro Power Plants:** Selection of site, Elements of the plant, Classification of hydroelectric plants, Layout of hydroelectric and pumped storage plants. **Nuclear Power Plants:** Selection of site, Nuclear reaction – fission and fusion process and chain reaction, Plant layout, Nuclear Reactor – working, and control (boiling water reactor, heavy water reactor, and fast breeder reactor), Disposal of radioactive waste and safety measures.	7
3	**Renewable Power plants**: Renewable and nonrenewable energy sources. **Solar Power generation** – Photo-voltaic and solar thermal generation – solar concentrators. **Wind Power generation** – Types of wind turbines, Wind generators. **Other Generation** -Tidal, Biomass, Geothermal, and Fuel cell power plants. Integration of renewable energy and conventional energy sources, Zero Carbon emission	6
4	**Loads and Load Curves** Types of load, chronological load curve, load duration curve, energy load curve, and mass curve. Maximum demand, demand factor, load factor, diversity factor, capacity factor, and utilization factor.	6
5	**Power Plant Economics** Capital cost of plants, annual fixed and operating costs of plants, generation cost, and depreciation. Effect of load factor on unit energy cost. Role of load diversity in power system economics.	5
6	**Tariff** Objectives of tariffs. General tariff form. Flat demand rate, straight meter rate, block meter rate. Two-part tariff, power factor dependent tariffs, Maximum demand tariff, three-part tariff, Time-of-Day (ToD) Tariff, Availability-Based Tariff (ABT), Agricultural Tariff, Calculation of Electricity Consumption.	5
	Total	**30**

Textbooks:

1. A. Chakrabarti, M. L. Soni, P. V. Gupta, and U. S. Bhatnagar, *A Textbook on Power Systems Engineering*, 2nd revised ed., 2010, Dhanpat Rai and Sons.
2. C. L. Wadhwa, *Generation, Distribution and Utilization of Electrical Energy*, 3rd ed., 2010, New Age International Publishers.

3. B. R. Gupta, *Generation of Electrical Energy*, 2017, S. Chand Limited.
4. G.D. Rai, *Non Conventional Energy Sources*, 2005, Khanna Publication

Reference Books:

1. S. P. Sukhatme , J K. Nayak , *Solar Energy*, 2017 TMH
2. M. V. Deshpande, *Elements of Electrical Power Systems Design*, 1st ed., 2009, Pitman, New Delhi, PHI Learning Private Limited.

Prerequisite:

1. Elements of Power System.

Syllabus

Name of the Programme: B.Tech. in Electrical Engineering	**Year**: II	**Semester**: III
Course Name: Circuit Analysis-I	**Course Code**: EEUL303	**Credit**: 3
Max Marks: 100	**CIE:** 40	**SEE:** 60
End Term Exam Time: 3 Hrs	**Teaching Scheme:** 3L+0T+0P	

Module No.	Contents	Hours
1	**Introduction:** Objective, Scope, Outcome of the Course and Prerequisite	1
2	**DC Circuits:** Basic components and electric circuits, Voltage and current laws, Nodal and Mesh Analysis. Network Theorems: Linearity and Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Tellegen's theorem, Millman's theorem. Concept of duality and dual networks.	15
3	**AC Circuits:** Introduction to energy storing elements: inductor and capacitor, Instantaneous, Peak, Average and RMS value, Phasor Representation of AC quantities, real power, reactive power, apparent power, and power factor. Single phase AC circuits containing R, L & C, RL, RC and RLC elements. Three-phase Circuits - Balanced and Unbalanced System.	10
4	**Transient Analysis of RLC Circuits**: Solution of first and second order differential equations for Series and parallel R-L, R-C, RLC circuits, initial and final conditions in network elements, time constants, steady state and transient state response.	10
5	**Advanced Circuit Analysis:** Introduction, Circuit Element Models, Nodal and Mesh Analysis in s-domain, Analysis of electrical circuits using Laplace Transform for standard test signals.	9
	Total	**45**

Text Books:

1. C. K. Alexander and M. N. O. Sadiku, *Fundamentals of Electric Circuits*, McGraw-Hill, 2017.
2. M. E. Van Valkenburg and T. S. Rathore, *Network Analysis*, 2019, Pearson Publication.
3. W. H. Hayt, Jr., J. E. Kemmerly, and S. M. Durbin, *Engineering Circuit Analysis*, 2024, Tata McGraw-Hill Publications.

Reference Books:

1. J. David and R. M. Nelms, *Basic Engineering Circuit Analysis*, 2020, Wiley.
2. J. A. Svaboda, *Introduction to Electric Circuits*, 2013, Wiley.
3. J. S. Kang, *Electric Circuits*, 2017, Cengage Learning.
4. A. Chakrabarti, *Circuit Theory*, 2018, Dhanpat Rai & Co.
5. J. Bird, *Electric Circuit Theory & Technology*, 2018, Elsevier.
6. N. Nagsarkar and M. S. Sukhija, *Circuits & Networks*, 2018, Oxford Publications.

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Prerequisite:

1. Linear algebra, vector analysis, matrix analysis and complex calculus.

2. Basic Electrical Engineering

Syllabus

Name of the Programme: B.Tech. in Electrical Engineering	**Year**: II	**Semester**: III
Course Name: Analog Electronics	**Course Code**: EEUL304	**Credit**: 2
Max Marks: 100	**CIE:** 40	**SEE:** 60
End Term Exam Time: 3 Hrs	**Teaching Scheme:** 2L+0T+0P	

Module No.	Contents	Hours
1	**Introduction:** Objective, Scope, Outcome of the Course and Prerequisite	1
2	**Diode circuits:** Basics of P-N junction diode, I-V characteristics of a diode, diode equivalent circuits. Review of half-wave and full-wave rectifiers. Zener diodes. Clipping and clamping circuits.	6
3	**BJT circuits:** Basic Structure, I-V characteristics and configurations of a BJT. BJT as a switch. BJT as an amplifier. BJT DC biasing: Operating point, Fixed, Emitter, collector feedback and voltage divider bias circuits. r_e Small-signal model: common-emitter (CE) Fixed bias, CE voltage divider bias, CE Emitter bias, CE collector feedback bias.	6
4	**MOSFET circuits:** Basic MOSFET structure and I-V characteristics. MOSFET as a switch. MOSFET as an amplifier. Biasing circuits: Drain-Feedback and Voltage-Divider Configurations. Small signal model: gain, input and output impedances.	6
5	**Oscillators:** Basic principle of sinusoidal oscillator, phase shift, Wein bridge, Hartley & Colpitts oscillators. UJT as a relaxation oscillator. **Power Amplifier:** Introduction, Classification of power amplifier: Class A, Class B, Class AB, Class C and Class D.	5
6	**Operational amplifier:** Introduction, Ideal op-amp, op-amp specification: Offset voltage, input bias current, input offset current, slew rate, gain bandwidth, Common-Mode Rejection Ratio (CMRR). Voltage Transfer Curve. Linear applications: Inverting amplifier, non-inverting amplifier, voltage summing, differential amplifier, instrumentation amplifier, integrator. Nonlinear applications: Hysteretic comparator, square-wave and triangular-wave generators, peak detector. Feedback Amplifier: positive, negative, voltage, current, series and parallel.	6
	Total	**30**

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Textbooks:

1. R. L. Boylestad and L. Nashelsky, *Electronic Devices & Circuits Theory*, 2005, Pearson Education.
2. Salivahnan, *Electronics Devices and Circuits*, 3rd ed., 2017, Tata Mc Graw Hill Publications.
3. R. Gayakwad, *Op-Amps and Linear Integrated Circuits*, 4th ed., 2018, PHI Learning.

Reference Books:

1. D. A. Bell, *Electronic Devices and Circuits*, 2015, Oxford University Press.
2. K. R. Botkar, *Integrated Circuits*, 2003, Khanna Publications.
3. H. Millman, J. Halkias, and S. Jit, *Electronics Devices & Circuits*, 2009, Tata Mc Graw Hill Publications.

Prerequisite:

1. Basic Electrical Engineering
2. Basics of semiconductor physics
3. Basic knowledge of Semiconductor Devices

Syllabus

Name of the Programme: B.Tech. in Electrical Engineering	**Year**: II	**Semester**: III
Course Name: Electrical Machine-I	**Course Code**: EEUL305	**Credit**: 3
Max Marks: 100	**CIE:** 40	**SEE:** 60
End Term Exam Time: 3 Hrs	**Teaching Scheme:** 3L+0T+0P	

Module No.	Contents	Hours
1	**Introduction:** Objective, Scope, Outcome of the Course and Prerequisite	1
2	**Basic Concepts of Electromagnetic Conversion** 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. Electromagnetic force and torque: 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; force as a partial derivative of stored energy with respect to position of a moving element; torque as a partial derivative of stored energy with respect to angular position of a rotating element.	12
3	**DC machines** Basic working Principle, construction of a DC machine, Induced EMF/Back EMF in an armature coil. Armature winding and commutation – Elementary armature coil and commutator, linear commutation derivation of torque equation, armature reaction, Armature circuit equation for motoring and generation, Types of field excitations. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, V-I characteristics and torque speed characteristics of separately excited, shunt and series motors. Speed control and braking of DC motors. Losses, load testing and back-to-back testing of DC machines.	12
4	**Transformers** Basic working 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	13

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	transformers.	
5	**Brushless DC Motor**: Constructional features, principle of operation, Torque production, Performance characteristics and applications. **Stepper Motors**: Constructional features, Principle of operation, Variable reluctance motor Torque Production, Torque equation, characteristics and applications.	7
	Total	**45**

Text Books:

1.S. J. Chapman, *Electrical Machine Fundamentals*, McGraw-Hill, 2018.
2.A. E. Fitzgerald, C. Kingsley Jr., and S. D. Umans, *Electric Machinery*, McGraw-Hill, 2018.
3.D. P. Kothari and I. J. Nagarth, *Electric Machine*, McGraw-Hill, 2017.

Reference Books:

1.A. Hussain and H. Ashfaq, *Electric Machine*, Dhanpat Rai & Co., 2018.
2.M. G. Say, *Performance & Design of AC Machines*, CBS, 2002.
3.Jacek F. Gieras ,"*Electrical Machines: Fundamentals of Electromechanical Energy Conversion* "CRC Press,2017

Prerequisite:

1. Basic Physics
2. Electromagnetic Theory
3. Circuit Analysis

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Syllabus

Name of the Programme: B.Tech. in Electrical Engineering	**Year**: II	**Semester**: III
Course Name: Analog Electronics Lab	**Course Code**: EEUP320	**Credit**: 1.5
Max Marks: 100	**CIE:** 60	**SEE:** 40
End Term Exam Time: 3 Hrs	**Teaching Scheme:** 0L+0T+3P	

Exp. No.	Experiment List
1.	Plot gain-frequency characteristics of BJT amplifier with and without negative feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1 kHz frequency with and without negative feedback.
2.	Design series and shunt voltage regulators using a Zener diode and BJT to deliver 8.5 volts DC at 500 mA. The input supply is 15V±5V DC and also measure the line and load regulations.
3.	Study and design a small signal amplifier using MOSFET for 1 kHz frequency and plot gain-frequency characteristics (frequency response curve).
4.	Study and design Wein bridge oscillator for 3 MHz frequency. Observe the effect of variation in R & C on the oscillator frequency and compare it with the theoretical value.
5.	Study and design transistor phase shift oscillator for 3 MHz frequency.Observe the effect of variation in R & C on the oscillator frequency and compare it with the theoretical value.
6.	Study the Hartley and Colpitts oscillators for 3 MHz frequency. Observe the effect of variation of C on the oscillator frequency and compare it with the theoretical value.
7.	Design inverting amplifier for gain A_f = 10 and a non-inverting amplifier for gain A_f = 11 using op-amp 741.
8.	Study and design summing amplifiers using op-amp 741 for 0-5V input signals and observe the output voltage and compare it with the theoretical value.
9	Design a triangular and square wave generator of 10 kHz frequency using 555 timer IC and trace the output waveforms for the same.
10	To design an Integrator circuit for the 1 KHz frequency using Op-Amp IC 741.

Prerequisite:

1. . Basic Electrical Engineering
2. Analog Electronics
3. Circuit Analysis

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Syllabus

Name of the Programme: B.Tech in Electrical Engineering	**Year**:	**Semester**:
Course Name: Electrical Machine Lab-I	**Course Code**: EEUP321	**Credit**: 1.5
Max Marks: 100	**CIE:** 60	**SEE:** 40
End Term Exam Time:	**Teaching Scheme:** 0L+0T+3P	

Exp No.	Experiment List
1	To determine the parameters of the equivalent circuit of a single-phase transformer by performing open-circuit and short-circuit tests on it. Estimate its efficiency at zero, 25%, 50%, 100% and 125% of full-load at 0.8 power factor lagging. Plot efficiency versus load graph. Estimate the regulation at full-load and 0.8 power factor lagging, unity power factor and 0.8 power factor leading. Estimate the load (fraction of full load) at 0.8 power factor lagging for maximum efficiency.
2	To perform parallel operation of two single-phase transformers at different loads. Ensure that no transformer gets overloaded. Obtain from observations the kVA loads and power factor of the individual transformers and plot them against total kVA load.
3	To perform Sumpner's test on two identical single-phase transformers and obtain efficiencies of the transformer at 25%, 50%, 75% and 100% of full-load. Plot a graph of efficiency against total load.
4	To separate core-loss of a single-phase transformer into hysteresis and eddy current loss components keeping V/f ratio constant. Vary frequency within ± 10% only.
5	To obtain balanced two-phase supply from balanced three-phase supply by Scott-T connection of two single-phase transformers.
6	To carry out variation of speed of a DC shunt motor by varying i) armature voltage under constant field excitation and ii) field excitation under constant armature voltage. Plot speed versus armature voltage and speed versus field current curves.
7	To determine the efficiency of a DC shunt machine for both motor and generator operations at full-load by Swinburne's test.
8	To perform Hopkinson's test on two similar DC shunt machines and obtain efficiency at various loads for both motor and generator operations and plot efficiency versus load current for both cases.
9	To study the working of a Universal Motor (230V, 50Hz, 0.5 HP), compare its operation on AC (230V) and DC (230V rectified) supply, and observe the effect of load (0–2 Nm torque) on speed.

Text Books:

1. D. P. Kothari and I. J. Nagarth, *Electric Machine*, TataMcGraw-Hill Publications, 2017.
2. P. S. Bimbhra, *Electric Machinery*, Khanna Publications, 2021.

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Reference Books:

1.S. J. Chapman, *Electrical Machine Fundamentals*, TataMcGraw-Hill Publications, 2018.
2.A. E. Fitzgerald, C. Kingsley Jr., and S. D. Umans, *Electric Machinery*, TataMcGraw-Hill Publications, 2013.

Prerequisite:

1. Basic Electrical Engineering
2. Circuit Analysis

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Syllabus

Name of the Programme: B.Tech. in Electrical Engineering	**Year**: II	**Semester**: III
Course Name: Computer Programming Lab (C++)	**Course Code**: EEUP322	**Credit**: 1.5
Max Marks: 100	**CIE:** 60	**SEE:** 40
End Term Exam Time: 3 Hrs	**Teaching Scheme:** 0L+0T+3P	

Exp No.	Experiment List
1.	Study of C++ Standard library functions
2.	a) Write a C++ program to find the sum of individual digits of a positive integer. b) Write a C++ program to generate the first terms of the sequence.
3.	a) Write a C++ program to generate all the prime numbers between 1and n, where n is a value supplied by the user. b) Write a C++ program to find both the largest and smallest number in a list of integers.
4.	a) Write a C++ program to sort a list of numbers in ascending order. b) Write a Program to illustrate New and Delete Keywords for dynamic memory allocation.
5.	a) Write a program Illustrating Class Declarations, Definition, and Accessing Class Members. b) Program to illustrate default constructor, parameterized constructor and copy constructors
6.	a) Write a Program to demonstrate the i)Operator Overloading. ii)Function Overloading. b) Write a Program to Demonstrate Friend Function and Friend Class.
7.	a) Write a Program to Access Members of a STUDENT Class Using Pointer to Object Members. b) Write a Program to Generate Fibonacci Series use Constructor to Initialize the Data Members.
8.	Write a C++ program to implement the matrix ADTusinga class. The operations supported by this ADT are: a) Reading a matrix. b) Addition of matrices. c) Printing a matrix. d) Subtraction of matrices e) Multiplication of matrices
9.	Write C++ programs that illustrate how the following forms of inheritance are supported: a) Single inheritance b) Multiple inheritance c) Multi level inheritance d) Hierarchical inheritance

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10.	a) Write a C++ program that illustrates the order of execution of constructors and destructors when new class is derived from more than one base class. b) Write a Program to Invoking Derived Class Member Through Base Class Pointer.
11.	a) Write a Template Based Program to Sort the Given List of Elements. b) Write a C++ program that uses function templates to find the largest and smallest number in a list of integers and to sort a list of numbers in ascending order.
12.	a) Write a Program Containing a Possible Exception. Use a Try Block to throw it and a Catch Block to handle it properly. b) Write a Program to Demonstrate the Catching of All Exceptions.

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Syllabus

Name of the Programme: B.Tech. in Electrical Engineering	**Year**: II	**Semester**: III
Course Name: Electrical Circuit Design Lab	**Course Code**: EEUP323	**Credit**: 1.5
Max Marks: 100	**CIE:** 60	**SEE:** 40
End Term Exam Time: 3 Hrs	**Teaching Scheme:** 0L+0T+3P	

Exp No.	Experiment List
1	Introduction to different types of components like Resistor, Inductor, Capacitor, Transformer, Diodes like p-n Junction diode, Zener diode, Photodiode, light emitting diode, BJT,MOSFET, Breadboard layout etc. and practice Soldering -Desoldering Process with tools.
2	Obtain input-output characteristics of BJT (BC 107 NPN Transistor, maximum collector current of 200mA, a maximum collector-emitter voltage of 45V, and a power dissipation rating of 300mW) in CE,CB & CC Configuration .
3	**(a)** Design a **Half wave rectifier** for 220 volt AC to 12 volt DC circuit & maximum load current of 40 mA and assemble on breadboard. Also calculate the form factor, ripple factor, and peak inverse voltage . **(b)** Design a **Full wave center tap rectifier** for 220 volt AC to 12 volt DC circuit & maximum load current of 40 mA and assemble on breadboard. Also calculate the form factor, ripple factor, and peak inverse voltage . **(c)** Design a **Full wave bridge type rectifier** for 220 volt AC to 12 volt DC circuit & maximum load current of 40 mA and assemble on breadboard. Also calculate the form factor, ripple factor, and peak inverse voltage .
4	Design a suitable circuit for the speed control of 6/12V,4.8 Watt,100 rpm centre shaft DC geared motor using MOSFET on bread board.(By varying gate to source (V_{GS}) voltage from 0 to 12 volt).
5	**(a)** Design and assemble series resonance circuit for constant capacitor and variable inductor and frequency. (By keeping supply voltage constant before taking any reading.) **(b)** Draw the characteristic between current v/s frequency. **(c)** Calculate resonance frequency, quality factor, supply voltage, voltage across inductor & capacitor, and bandwidth.
6	Design a series R-C circuit for given time constant (0.5 Second) and plot the voltage and current (V-I) characteristics in case of switching on and off a capacitor.
7	Design a series R-L circuit for given time constant (0.5 Second) and plot the voltage and current (V-I) characteristics in case of switching on and off a inductor.
8	To verify the following network theorem for electrical circuits using P-Spice Software. (a) Thevenin's Theorem (b) Superposition Theorem (c) Norton's Theorem

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Prerequisite:

1. Basic Electrical Engineering
2. Analog Electronics
3. Circuit Analysis

Syllabus

Name of the Programme: B.Tech. in Electrical Engineering	**Year**: II	**Semester**: IV
Course Name: Technical Communication	**Course Code**: HSUL402	**Credit**: 1
Max Marks: 100	**CIE: 40**	**SEE: 60**
End Term Exam Time: 3 hrs	**Teaching Scheme: 1**L+0T+0P	

Module No.	Contents	Hours
1	**Introduction:** Objective, Scope, Outcome of the Course and Prerequisite	1
2	**Basics of Technical Communication** Meaning, aspects and style of technical communication Reading Strategies: Skimming, Scanning, SQ3R, ERRQ	2
3	**Advanced Grammar** Articles Prepositions Conditionals Common Errors	6
4	**Technical Writing** Business Letters E-mail Writing Minutes of Meeting Resume Writing	4
5	**Advanced Technical Writing** Technical Reports Technical Proposals	2
	Total	**15**

Text Book:

1. M. Raman and S. Sharma, *Technical Communication: Principles and Practice*, 3rd ed. New Delhi, India: Oxford University Press, 2017.

Reference Books:

1.M. A. Rizvi, *Effective Technical Communication*. New Delhi, India: Tata McGraw-Hill Publishing Company Ltd., 2018.
2.G. Venkatraman, Ed., *Effective Technical Communication*. Pearson Publications, 2024.
3.S. Gerson and S. Gerson, *Technical Communication: Process and Product*. Pearson Publications, 2014.

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Prerequisite:

1. Basics of Technical Communication

a) Introduction to technical communication
b) knowledge of technical documents
c) use of tools for reading and writing

2. Advanced Grammar

Basic Strategies of Grammar

3. Technical Writing

Differentiating between technical and creative writing

4. Advanced Technical Writing

a) Knowing the basics of advance writing strategies.
b) Knowing the part of language in advance writing

Syllabus

Name of the Programme: B.Tech in Electrical Engineering	**Year**: II	**Semester**: IV
Course Name: Advanced Engineering Mathematics-III	**Course Code**: MAUL401	**Credit**: 3
Max Marks: 100	**CIE:** 40	**SEE:** 60
End Term Exam Time: 3 Hrs	**Teaching Scheme:**3L+0T+0P	

Module No.	Contents	Hours
1	**Introduction:** Objective, Scope, Outcome of the Course and Prerequisite	1
2	**Numerical Methods-I:** Sources of errors; round-off errors, truncation errors, floating point arithmetic, Convergence, Finite differences, Newton's formulae. Sterling's formulae, Lagrange's interpolation formula, Numerical differentiation, Numerical integration: Trapezoidal rule, Simpson's one-third and three eighth rule.	12
3	**Numerical Methods-II:** Solution of algebraic and transcendental equations by Newton Raphson and RegulaFalsi methods, Solution of ordinary differential equations of first order by Picard's method, Euler's & modified Euler's methods, Miline's method and RungeKutta fourth order method.	11
4	**Statistics & Probability-I:** Elementary theory of probability, Baye's theorem with simple applications, Random Variables and Mathematical Expectation. Probability distributions – Binomial, Poisson, Normal, Exponential distributions and their applications	12
5	**Statistics & Probability-II:** Correlation and rank correlation, Regression Analysis, Curve Fitting by method of least squares.	9
	Total	**45**

Text Books:

1.H. K. Dass, *Advanced Engineering Mathematics*, S. Chand and Company Ltd., 2024.
2.B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publications, 2023.
3.T. Veerarajan, *Probability, Statistics and Random Process*, Tata McGraw-Hill Publications, 2017.

Reference Books:

1.E. Kreyszig, *Advanced Engineering Mathematics*, Wiley India, 2008.
2.B. V. Ramana, *Higher Engineering Mathematics*, Tata McGraw-Hill Publications, 2017.
3.S. S. Sastry, *Introductory Methods of Numerical Analysis*, PHI Learning India, 2002.
4.R. K. Jain and S. R. K. Iyenger, *Applied Numerical Methods for Engineers*, Narosa Publications, 2010.

Prerequisite:

1. Basic differentiation and integrations
2. Permutations and Combination

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Syllabus

Name of the Programme: B.Tech. in Electrical Engineering	**Year**: II	**Semester**: IV
Course Name: Circuit Analysis-II	**Course Code**: EEUL401	**Credit**: 3
Max Marks: 100	**CIE:** 40	**SEE:** 60
End Term Exam Time: 3 Hrs	**Teaching Scheme:** 3L+0T+0P	

Module No.	Contents	Hours
1	**Introduction:** Objective, Scope, Outcome of the Course and Prerequisite	1
2	**Analysis of Coupled Circuits:** Self Inductance, Mutual Induction, Coefficient of Coupling, Mutual Coupled Circuits, Dot Convention in Coupled Circuits, Electrical Equivalents of Magnetically Coupled Circuits, Ideal Transformer.	7
3	**Network Synthesis:** Introduction to Network Functions, Concept of Stability, Hurwitz Polynomials, Positive Real Functions, Concept of Network Synthesis, Reactive Networks, Pole Zero Interpretation in LC Networks, Foster and Cauer Forms.	10
4	**Introduction to Frequency Response:** Transfer Function, Series Resonance, Parallel Resonance, Passive Filters- Low Pass and High Pass Filters, Band Pass Filters, Band Stop filter, Active Filters- First Order Low Pass and High Pass Filter, Band-Pass Filter and Notch Filter.	10
5	**Introduction to Graph Theory:** Concept of Network Graph, Relation between Twigs and Links, Properties of a Tree in a Graph, Formation of Incidence Matrix, Tie-Set Matrix, Cut Set Matrix, Duality.	10
6	**Analysis of Two Port Network**: Two Port Networks, Relationship of Two Port Variables, Impedance Parameters, Admittance Parameters, Transmission Parameters and Hybrid Parameters, Interconnections of Two Port Networks.	7
	Total	**45**

Textbooks:

1.C. K. Alexander and M. N. O. Sadiku, *Fundamentals of Electric Circuits*, McGraw-Hill, 2017.
2.M. E. Van Valkenburg and T. S. Rathore, *Network Analysis*, Pearson Publication, 2019.
3.W. H. Hayt Jr., J. E. Kemmerly, and S. M. Durbin, *Engineering Circuit Analysis*, McGraw-Hill, 2024.

Reference Books:

1. J. David and R. M. Nelms, *Basic Engineering Circuit Analysis*, Wiley , 2021.
2. J. A. Svaboda, *Introduction to Electric Circuits*, Wiley, 2013.
3. M. E. Van Valkenburg, *Introduction to Modern Network Synthesis*, CBLS Publishers, 1991.
4. J. S. Kang, *Electric Circuits*, Cengage Learning, 2017.
5. A. Chakrabarti, *Circuit Theory*, Dhanpat Rai & Co., 2018.
6. J. Bird, *Electric Circuit Theory & Technology*, ELSEVIER, 2018.
7. M. Nagsarkar and S. Sukhija, *Circuits & Networks*, Oxford University Press, 2018.
8.B. C. Kuo, *Linear Network and Systems*, Tata McGraw-Hill Publications, 1967.

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Prerequisite:

1. Linear algebra, vector analysis, matrix analysis and complex calculus.
2. Basic Electrical Engineering
3. Circuit Analysis-I

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Head,Department of Electrical Engineering

Syllabus

Name of the Programme: B.Tech. in Electrical Engineering	**Year**: II	**Semester**: IV
Course Name: Signals and Systems	**Course Code**: **EEUL402**	**Credit**: 2
Max Marks: 100	**CIE:** 40	**SEE:** 60
End Term Exam Time: 3 Hrs	**Teaching Scheme:** 2L+0T+0P	

Module No.	Contents	Hours
1	**Introduction:** Objective, Scope, Outcome of the Course and Prerequisite	1
2	**Introduction to Signals and Systems:** Signals and systems in various branches of engineering and science. Some basic type of signals and their significance, Classification of Signals, continuous and discrete time signals, continuous and discrete amplitude signals. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Introduction to System, System properties: linearity: shift-invariance, causality, stability, realizability.	8
3	**Behavior of continuous and discrete-time LTI systems**: Impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations.	5
4	**Transformation Tools**: Fourier series, Calculation of Fourier Coefficients. Fourier Transform, Properties of Fourier Transform, Fourier domain duality. The Discrete Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Properties of DTFT, Parseval's Theorem. Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.	10
5	**Sampling and Reconstruction**: The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems.	6
	Total	**30**

Textbooks:

1. A. V. Oppenheim, *Signals and Systems*, 2006, Pearson Publication.
2. A. Nagoor Kani, *Signals & Systems*, 2022, Tata McGraw-Hill Publication.

Reference Books:

1. A. Anand Kumar, *Signals & Systems*, 2019, PHI Publication.
2. A. V. Oppenheim, *Digital Signal Processing*, 2015, Pearson Publication.
3. M. J. Roberts, *Signals and Systems*, 2017, Tata McGraw-Hill Publication.

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Head,Department of Electrical Engineering

Prerequisite:

1. Advanced Mathematics (M-1,M-2)
2. Basic Electrical Engineering (BEE)
3. Circuit Analysis

Dr. Sarfaraz Nawaz(Convener,BOS-EE)
Head,Department of Electrical Engineering

Syllabus

Name of the Programme: B.Tech. in Electrical Engineering	**Year**: II	**Semester**: IV
Course Name: Electrical Machine-II	**Course Code**: EEUL403	**Credit**: 3
Max Marks: 100	**CIE:** 40	**SEE:** 60
End Term Exam Time: 3 Hrs	**Teaching Scheme:** 3L+1T+0P	

Module No.	Contents	Hours
1	**Introduction:** Objective, Scope, Outcome of the Course and Prerequisite	1
2	**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, Sinusoidally distributed winding, winding distribution factor.	8
3	**Induction Machines** Pulsating and revolving magnetic fields, 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. Selfexcitation. Doubly-Fed Induction Machines	11
4	**Single-phase induction motors** Constructional features double revolving field theory, equivalent circuits, and determination of parameters. Starting methods : Split-Phase, Capacitor-Start ,Capacitor-Start and Capacitor-Run, Permanent Split Capacitor (PSC) and Shaded-Pole motors. Application of single phase induction motor.	6
5	**Synchronous machines**: Types and constructional features. EMF equation and the concept of synchronous reactance. Phasor diagram as a generator. Regulation and the effect of excitation variation when the generator is connected to the bus. Power-angle characteristic and steady-state stability limit. Synchronous machine connected to the bus and operating as a motor. Phasor diagrams under various operating conditions and the effect of excitation variation. Salient pole synchronous machine: Concept of direct-axis and quadrature-axis reactance. Phasor diagrams under various operating conditions for both motoring and generating modes. Synchronizing an incoming generator (alternator) to the bus.	13
6	**Special Electrical Machines and their Applications:** Introduction to basic concepts and construction details of modern machines-PMSMs (Permanent Magnet Synchronous Motor), SRM (Switched Reluctance Motor), Reluctance Motors, and Universal motor & applications.	6
	Total	**45**

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Text Books:

1 S. J. Chapman, *Electrical Machine Fundamentals*, Tata McGraw-Hill Publications, 2011.
2.A. E. Fitzgerald, C. Kingsley Jr., and S. D. Umans, *Electric Machinery*, Tata McGraw-Hill Publications, 2014.
3.D. P. Kothari and I. J. Nagarth, *Electric Machine*, Tata McGraw-Hill Publications, 2017.

Reference Books:

1.P. S. Bimbhra, *Electric Machinery*, Khanna Publications, 2021.
2.A. Hussain and H. Ashfaq, *Electric Machine*, Dhanpat Rai & Co., 2018.

Prerequisite:

1. **Basic Physics:** Understanding of fundamental principles of physics, including electromagnetism, mechanics, and thermodynamics.
2. **Electromagnetic Theory:** Understanding of electromagnetic fields, magnetic circuits, and related principles is crucial for understanding how electrical machines operate.
3. **Circuit Analysis:** Knowledge of basic electrical circuits, including Ohm's law, Kirchhoff's laws, and analysis techniques such as nodal and mesh analysis.

Syllabus

Name of the Programme: B.Tech. in Electrical Engineering	**Year**: II	**Semester**: IV
Course Name: Power Electronics	**Course Code**: EEUL404	**Credit**: 3
Max Marks: 100	**CIE:** 40	**SEE:** 60
End Term Exam Time: 3 Hrs	**Teaching Scheme:** 3L+0T+0P	

Module No.	Contents	Hours
1	**Introduction:** Objective, Scope, Outcome of the Course and Prerequisite	1
2	**Power Semiconductor Devices:** Construction, Principle of operation, Characteristics and applications of Power Diode. Construction, Principle of operation, static I-V characteristics and applications of Thyristor (SCR). Construction and Principle of operation of Power MOSFET & IGBT. Two-transistor Model of a Thyristor.	8
3	**Thyristor; Triggering, commutation, and Protection:** Triggering methods of SCR, thyristor commutation techniques: basic circuits and waveform. Switching characteristics during turn On and turn Off of SCR, Firing circuits for thyristor; R, RC, UJT relaxation oscillator. Protection of SCR-Protection against over voltage, over current, dv/dt, di/dt, Gate protection.	9
4	**Single Phase Rectifiers:** Single Phase half wave-controlled converters with R load, RL load, RL load with freewheeling diode & RLE load. Single Phase full wave-controlled converters with RL & RLE load, Single phase dual converters, Single phase semi converters with RL & RLE load. Inversion operation. Effect of source impedances on the performance of Single-Phase converters.	11
5	**Three Phase Rectifiers:** Three phase half wave-controlled converters with R and RL load. Three phase full wave-controlled converters with RLE load. Three-phase semi converters with RL & RLE load. Three phase dual converters. **Power factor improvement:** Extinction angle control, symmetrical angle control and pulse width modulation control.	7
6	**DC-DC Converters:** Principle of chopper operation, Step-down chopper, Step-up chopper, Control strategies, Types of chopper circuits (Type A, B, C, D & E). Voltage-commutated chopper, current-commutated chopper, load-commutated chopper. Buck, Boost and Buck-Boost choppers.	9
	Total	**45**

Text Books:

1. P. S. Bimbhra, *Power Electronics*, Khanna Publishers, New Delhi, 2022.
2. M. D. Singh and K. B. Khanchandani, *Power Electronics*, 2nd ed., Tata McGraw-Hill Publications, 2018.
3. N. Mohan, T. M. Undeland, *Power Electronics: Converters, Applications, and Design*, John Wiley & Sons, 2013.
4. D. W. Hart, *Power Electronics*, Tata McGraw-Hill Pubications, 2017.

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Reference Books:

1.M. H. Rashid, *Power Electronics - Circuits, Devices and Applications*, Prentice Hall of India, 2021.
2. G. K. Dubey, *Thyristorised Power Controller*, New Age Publications, 2015.
3.B. K. Bose, *Modern Power Electronics & AC Drives*, Prentice Hall India, 2016.
4.L. Umanand, *Power Electronics Essentials and Applications*, John Wiley & Sons, 2009.
5. Robert W. Erickson Dragan Maksimović, Third Edition, *Fundamentals of Power Electronics*,Springer Publisher

Prerequisite:

1. Basic Electrical Engineering
2. Analog Electronics

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Syllabus

Name of the Programme: B.Tech. in Electrical Engineering	**Year**: II	**Semester**: IV
Course Name: Digital Electronics	**Course Code**: EEUL405	**Credit**: 2
Max Marks: 100	**CIE:** 40	**SEE:** 60
End Term Exam Time: 3 Hrs	**Teaching Scheme:** 2L+0T+0P	

Module No.	Contents	Hours
1	**INTRODUCTION:** Objective, scope, outcome of the course and Prerequisite	1
2	**FUNDAMENTALS OF DIGITAL SYSTEMS:** Introduction to digital system. Logic gates, Number system, Boolean Algebra. Simplification of logic expressions using Boolean Algebra. Implementation of Boolean expressions using universal gates. Binary codes & Code Conversion, binary arithmetic, one's and two's complements arithmetic.	4
3	**COMBINATIONAL LOGIC CIRCUITS:** Standard representation for logic functions, minimization of logical functions, K-map representation, simplification of logic functions using K-map, simplification of logic functions using QM Method, Adders, Subtractors, BCD adders, ripple carry look-ahead adders, Comparators, Parity Generator, Decoders, Encoders, multiplexers, de-multiplexers, Realization of Boolean expressions- using decoders & using multiplexers.	8
4	**SEQUENTIAL CIRCUITS:** Latches, Flip flops, applications of flip flops, Shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter. Design of Binary counters– Synchronous and asynchronous up/down counters, mod N counter, Counters for random sequence, applications of counters.	5
5	**LOGIC FAMILIES:** Brief overview of Transistor as a switch; Logic gate characteristics – propagation delay, speed, noise margin, fan-out and power dissipation; TTL, ECL and static CMOS gates. **Semiconductor Memories:** ROM and RAM, PLA, PAL and FPGA.	5
6	**A/D AND 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 lCs, 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, dual slope 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	7
	Total	**30**

Text Books:

1 .M. M. R. Mano and M. D. Ciletti, *Digital Design with an Introduction to the Verilog HDL*, 6th ed., Prentice Hall of India, India, 2017.
2.D. D. Givone, *Digital Principles and Design*, Tata McGraw-Hill Publications, New Delhi, 2003.
3.S. Salivahanan, *Digital Circuits and Design*, Oxford University Press, 2018.

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Reference Books:

1.S. Brown and Z. Vranesic, *Fundamentals of Digital Logic with Verilog Design*, Tata McGraw-Hill Publications, 2008.
2.C. H. Roth Jr., *Fundamentals of Logic Design*, 7th ed. (Reprint), Brooks/Cole, Pacific Grove, US, 2014.
3.D. P. Leach, A. P. Malvino, and G. Guha, *Digital Principles and Applications*, Tata McGraw-Hill Publications, New Delhi, 2011.

Prerequisite:

1. Basics Logic Gates
2. Basics of Number system
3. Basics of Boolean Algebra

Syllabus

Name of the Programme: B.Tech in Electrical Engineering	**Year**: II	**Semester**: IV
Course Name: Electrical Machine Lab -II	**Course Code**: EEUP420	**Credit**: 1.5
Max Marks: 100	**CIE:** 60	**SEE:** 40
End Term Exam Time: 3 hrs	**Teaching Scheme:** 0L-0T-3P	

Module No.	Contents
1	**Introduction:** Objective, Scope, Outcome of the Course and Prerequisite
2	To perform a direct load test on a 3-phase squirrel cage induction motor and calculate torque, output power, input power, efficiency, input power factor and slip at 25%, 50%, 75% & 100% of full load.
3	To perform no-load and blocked rotor test on a 3-phase squirrel-cage induction motor and determine the parameters of its equivalent circuit. Draw the circle diagram and compute the following at full-load (i) Slip (ii) Torque (iii) Output Power (iv) Losses (v) Efficiency (vi) Power Factor. Also calculate the maximum torque or pull-out torque.
4	To understand the construction and operational principles of three different types of 3-phase induction motor starters: i) Direct-on-Line (DOL) Starter ii) Star-Delta Starter iii) Auto-Transformer Starter
5	To determine the open-circuit and short-circuit characteristics of a 3-phase alternator and plot the corresponding curves. From these characteristics, calculate the synchronous impedance (Z_s) and determine the voltage regulation using the synchronous impedance method at **different power factor conditions**.
6	To conduct a slip test on a 3-phase salient pole alternator and determine the Direct-axis reactance (X_d) and Quadrature-axis reactance (Xq).
7	To determine the voltage regulation of a 3-phase alternator by **Potier triangle method**.
8	To conduct the V-curve and inverted V-curve tests on a 3-phase synchronous motor at load conditions of 25%, 50%, 75%, and 100% of full load, and plot the corresponding curves.
9	To synchronize 3-phase cylindrical rotor alternator with the infinite bus using three dark lamp method.

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Text Books:

1 D. P. Kothari and I. J. Nagarth, *Electric Machine*, Tata McGraw-Hill Publications, 2017.
2.P. S. Bimbhra, *Electric Machinery*, Khanna Publication, 2021.

Reference Books:

1.S. J. Chapman, *Electrical Machine Fundamentals*, Tata McGraw-Hill Publications, 2002.
2.A. E. Fitzgerald, C. Kingsley Jr., and S. D. Umans, *Electric Machinery*, Tata McGraw-Hill Publications, 2003.

Prerequisite:

1. Basic Electrical Engineering
2. Circuit Analysis

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Syllabus

Name of the Programme: B. Tech. in Electrical Engineering	**Year**: II	**Semester**: IV
Course Name: MATLAB Programming Lab	**Course Code**: EEUP421	**Credit**: 3
Max Marks: 100	**CIE:** 40	**SEE:** 60
End Term Exam Time: 3 Hrs	**Teaching Scheme:** 0L+0T+3P	

Module No.	Contents
1.	**To comprehend MATLAB environment with simple exercises to familiarize with Command Window, History, Workspace, Current Directory, Figure window, Edit window and Help files.**
2.	**To write a MATLAB program to understand fundamentals of MATLAB programming and perform basic operation on matrices such as addition, subtraction and multiplication.**
3.	**Write a MATLAB program which incorporates MATLAB Graphics such as:** • Print • Graph functions • Subplots and other types of plots • X-Y plots and annotations
4.	**Write a MATLAB program to get acquainted with various types of MATLAB Operators which includes:** • Arithmetic Operators • Logical Operators • Relational Operators
5.	**Write a MATLAB program to understand Branching and Looping functions such as:** • While loops • If-else statements • For loops
6.	**Write a program using an user defined function and show the use of function files to solve ordinary differential equations and numerical integration.**
7.	**To comprehend Simulink library browser and model file. Construct a Simulink block diagram to understand basic operations of Simulink model environment.**
8.	**Model a circuit containing resistive load and measure the voltage, current and active power for a resistive load using SimPowerSystems toolbox.**
9.	**Simulate a half and full wave uncontrolled rectifier with R and RL Load. Observe the effect**

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	of LC filter on the performance of rectifier.
10.	**Simulate a half and a full wave controlled rectifier with R and RL Load. Observe the effect of LC filter on the performance of rectifier.**

Text Books:

1 S. Attaway, *MATLAB: A Practical Introduction to Programming and Problem Solving*, 5th ed., 2021.
2.H. Moore, *MATLAB for Engineers*, 5th ed., 2022.
3.A. Gilat, *MATLAB: An Introduction with Applications*, 6th ed., 2017.
4. B. Hahn and D. T. Valentine, *Essential MATLAB for Engineers and Scientists*, 7th ed., 2018.
5.S. J. Chapman, *MATLAB Programming for Engineers*, 5th ed., 2017.

Reference Books:

1. J. Kiusalaas, *Numerical Methods in Engineering with MATLAB*, 2nd ed., 2013.
2.S. C. Chapra, *Applied Numerical Methods with MATLAB for Engineers and Scientists*, 4th ed., 2018.
3. L. F. Shampine, I. Gladwell, and S. Thompson, *Solving ODEs with MATLAB*, 3rd ed., 2003.

Prerequisite:

1. Basic Programming Concepts
2. Engg. Mathematics

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Syllabus

Name of the Program: B. Tech. in **Electrical Engineering**	**Year**: II Year	**Semester**: IV
Course Name: Digital Electronics Lab	**Course Code**: EEUP422	**Credit**: 1.5
Max Marks: 100	**CIE:** 40	**SEE:** 60
End Term Exam Time: 3 Hrs	**Teaching Scheme:**0L + 0T + 3P	

Module No.	Contents
1	Verify the truth tables of logic gates: AND, OR, NOR, NAND, NOR, EX-OR and EX-NOR.
2	Verify the truth table of OR, AND, NOR, NAND, NOT, Ex-OR, and Ex-NOR logic gates realized using NAND & NOR gates.
3	Realize a Sum of product (SOP) and Product of Sum (POS) expressions.
4	Design half adder/ subtractor & full adder/ subtractor using NAND & NOR gates and verify their truth tables.
5	Design a 4-bit ripple adder/ subtractor using basic half adder/ subtractor & basic full adder/ subtractor and verify their outputs.
6	Design the following code converters using logic gates. (a) Binary to gray code & (b) Gray to Binary
7	Verify the truth table of 4:1 multiplexer and 1:4 demultiplexer using IC. Also construct the 8:1 multiplexer and 1:8 demultiplexer using blocks of 4:1 multiplexer and 1:4 demultiplexer, respectively.
8	Design a combinational circuit that will accept a 8421 Binary Coded Decimal (BCD) code and drive a TIL-312 seven-segment display.
9	Design a 2x4 decoder using basic gates and verify the truth table. Also, verify the truth table of 3x8 decoder using IC.
10	Realize the R-S, J-K and D-flip flops with and without clock signal using basic logic gates and verify their truth tables.
11	Design 2, 3 & 4 – bit asynchronous counter. Also design 4-bit binary counter and a ring counter for a particular output pattern using D-flip flop.
12	Design serial in serial out (SISO) and serial in parallel out (SIPO) shift registers using Flip-flops.

Text Books:

1 M. M. R. Mano and M. D. Ciletti, *Digital Design with an Introduction to the Verilog HDL*, 6th ed., Prentice Hall of India, India, 2014.

2.H. Taub and D. L. Schilling, *Digital Integrated Electronics*, Tata McGraw-Hill, 2008.

3.S. Salivahanan and S. Sarivazhagan, *Digital Circuit Design*, Vikas Publications, 2009.

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Reference Books:

1.A. Anandkumar, *Fundamentals of Digital Circuits*, PHI, 2009.
2.C. H. Roth Jr., *Fundamentals of Logic Design*, 7th ed. (Reprint), Brooks/Cole, Pacific Grove, US, 2014.
3.D. P. Leach, A. P. Malvino, and G. Guha, *Digital Principles and Applications*, Tata McGraw-Hill, New Delhi, 2011.

Prerequisite:

1. Basics Logic Gates
2. Basics of Number system
3. Basics of Boolean Algebra

Syllabus

Name of the Programme: B.Tech. in Electrical Engineering	**Year**: II	**Semester**: IV
Course Name: Electrical Measurement Lab	**Course Code**: EEUP423	**Credit**: 1.5
Max Marks: 100	**CIE:** 40	**SEE:** 60
End Term Exam Time: 3 Hrs	**Teaching Scheme:** 0L+0T+3P	

Module No.	Contents
1	To prepare house wiring using lamp load with current, voltage and active power measurement, switching control and MCB protection scheme.
2	Calculate voltage and frequency of a sinusoidal waveform using DSO and function generator.
3	Measure power and power factor in 3-phase load by Two-wattmeter method.
4	Calibrate an ammeter and voltmeter using DC slide wire potentiometer.
5	Calibrate a single-phase energy meter by phantom loading at different power factors.
6	Measure self-inductance using Anderson's bridge.
7	Measure capacitance using Schering bridge and De Sauty bridge.
8	Measure frequency using Wein's bridge.
9	Measure and verify the value of a low resistance using Kelvin's double bridge.
10	Measure earth resistance using fall of potential method and earth resistance meter. Also measure insulation resistance using Megger.
11	To measure output voltage w.r.t the displacement of the core on the LVDT kit and find the graphical relationship between the two.
12	Plot characteristics of Strain gauge Vs displacement and Determine its of Gauge factor.
13	Measurement of Displacement by (a) Piezoelectric pickup and (b) Light dependent resistor
14	Installation, commissioning & testing of complete set of Chemical Earthing.

Text Books:

1 A. K. Sawhney, *A Course in Electrical and Electronic Measurements and Instrumentation*, Dhanpat Rai & Sons, 2019.
2.H. S. Kalsi, *Electronic Instrumentation*, Tata McGraw-Hill, 2004.
3.D. A. Bell, *Electronic Instrumentation and Measurements*, Oxford, 2013.
4.Morris, *Electrical Measurements & Instrumentation*, ELSEVIER, 2010.

Reference Books:

1.Helfrick and W. D. Cooper, *Modern Electronic Instrumentation and Measurement Techniques*, Prentice Hall, India, 2004.
2.E. W. Golding and F. C. Widdis, *Electrical Measurement & Measuring Instrument*, A.W. Wheeler, 2004.
3.F. K. Harries, *Electrical Measurement*, Wiley Eastern Pvt. Ltd. India, 2008.

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Prerequisite:

1. Basic Electrical Engineering
2. Circuit Analysis

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