SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
Department of Electrical Engg.

Semester/Year		III /II	Program		B. Tech
Subject Category	Departmental Course	Subject Code:	EE 301	Subject Name:	Electro Mechanical Energy Conversion. –I

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				**Practical**			Total Marks				
ES	MS	Quiz	Assig	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

Basic Law of Electric and Magnetic Circuits and their Application

Course Objective:

1. To recall basic knowledge of transformer and DC machines.
2. To elaborate the knowledge of Electrical Machines used in the industries and domestic applications.
3. To explain the construction, working principle, operation of 1-phase transformer.
4. To explain the construction, working principle, operation, and speed control of D.C. machines and induction motor.

Course Outcomes:

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

CO1: Understand the constructional features and operating principles of transformers, both single-phase and three-phase and to determine the voltage regulation and performance characteristics of transformers.

CO2: Evaluate the constructional details and performance characteristics of DC machines, including their operation as generators and motors.

CO3: Review the constructional details of three-phase induction motors and understand their working principles, analyze the equivalent circuit, interpret the power flow diagram, phasor diagram and evaluate the characteristics.

CO4: Analyze the starting methods of induction motors, importance of power factor control of Schrage motors. Apply open circuit and short circuit tests to determine the performance parameters and compare the performance characteristics of double cage and deep bar induction motors.

CO5: Understand the concept of double revolving field theory; analyze the equivalent circuit of single-phase motors. Evaluate the characteristics and performance parameters; Assess the different starting methods of single-phase motors.

UNITs	Descriptions	Hrs.	CO's
I	**Transformer:** Constructional review of single phase transformer, Equivalent circuits, voltage regulation, short circuit and open circuit tests, Autotransformers, All day efficiency. 3-phase transformers, constructional features, winding arrangements, Scott connections, conditions of parallel operation.	10	CO1

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II	**D.C. Machines**: Review of constructional features, Methods of excitation, Voltage and torque equations, Operation as generator, characteristics, Armature reaction, Commutation. Operation as a Motor, characteristics. Starter, speed control, Losses and Efficiency.	8	CO2
III	**Three phase Induction motor:** Review of constructional details, equivalent circuit, Power flow diagram, Phasor diagram and characteristics..	8	CO3
IV	**Performance of Induction motor.** Starting Methods, Power factor Control (schrage motor)**,** open circuit test and short circuit test, Speed control, Double cage & Deep bar Induction Motor.	7	CO4
V	**Single Phase Motors**: Double revolving field theory, equivalent circuit, characteristics, performance and starting methods of single phase motor.	7	CO5
Expert Lecture			
Total Hours		40	

Suggestive list of experiments:

1) Verification of 3 phase transformer configurations viz Ý/Ý, Δ/Δ, Ý/Δ, Δ/ Ý, open delta etc.(CO1)
2) To perform an open circuit and short test on 1 phase induction motor and to draw the equivalent circuit diagram. (C05)
3) To perform a load test on 3 phase induction motor and to draw its performance characteristics (C03).
4) To perform open circuit and short circuit test on 3 phase induction motors and to draw the circle diagram.(C04).
5) To perform no-load test on DC Machine (Swinburne's test) to find its efficiency at any load (C02).
6) Speed control of DC shunt motor by field weakening and armature rheostatic control method (C02).
7) No-load test on Schrage motor (3 phase inverted induction motor) and to draw graph between injected EMF Vs speed.(C04).
8) Study of DC motor starter (CO4).
9) Study of three phase induction motor starter (CO4).
10) Study of starting method of single phase induction motor (CO5).

Text Book-

1. Nagrath and Kothari, "Electrical Machines", Tata McGraw-Hill Education
2. Dr. P.S. Bimbhra, Electrical Machines, Khanna publishers.

Reference Books-

1. Electrical Machines- Ashfaq Hussain. Dhanpat Rai Publication.
2. Dr. P. S. Bimbhra, Generalized Theory of Electrical Machines khanna publishers
3. J. B. Gupta, Rajeev Manglik, Rohit Manglik, Theory and Performance of Electrical Machines S.K Kataria and sons
4. R. K. Rajput "Electrical Machine " - Laxmi Publication
5. V.Del Toro, "Electrical Machines & Power Systems", 1985, Prentice-Hall, Inc., Englewood Cliffs.
6. V.Del Toro, "Electro mechanical Devices for Energy Conversion & Control Systems", PHI Pvt. Ltd.1975.

Modes of Evaluation and Rubric

Theory (60)	Midsem (20)	Assignment (10)	Quiz (10)	Total (100)
Practical (30)	LW (10)	Quiz (10)		Total (50)

List/Links of e-learning resource

- NPTEL

Recommendation by Board of studies on	19th June 2024
Approval by Academic council on	28th June 2024
Compiled and designed by	Prof. C S Sharma/Dr. Jitendra Kumar Tandekar
Subject handled by department	Electrical Engg.

Abbreviations: ES -End Semester, MS- Mid Semester, LW- Laboratory Work/Assignment. (L: Lecture, T: Tutorial, P: Practical), BSC- Basic Science Course, ESC- Engineering Science Course, HSMC- Humanities Science and Management Course, MAC- Mandatory, Audit Course, AC- Audit Course, HEC- Holistic Education Courses: NSS/NCC/NSO, ITC- Information Technology Course, ILC-Institute Level Course, DC- Department Course, DE-Department Elective, OC- Open Course, DLC- Department Laboratory, PROJ- Project Work, VA-Value Added Course

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Department of Electrical Engineering

Semester/Year		III /II	Program		B.Tech
Subject Category	Departmental Course	Subject Code:	EE 302	Subject Name:	Electronics-II

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				**Practical**			Total Marks				
ES	MS	Quiz	Assig	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

Basic Electronics, Network Analysis

Course Objective:

1. The objective of the subject is to provide students with the importance of Electronics as a subject.
2. To familiarize the importance of the operational amplifier, designing and developing circuits using operational amplifiers like summer, differentiator, integrator, instrumentation amplifier etc use and application of timer circuit.
3. Able to use OPM as a function generator, comparator A to D & D to A convertors, VCO, precision rectifiers
4. Familiarize students with logic families.
5. Provide knowledge for students with an understanding of active filter design.

Course Outcomes:

At the end of this course, students will demonstrate the ability to
CO1: Illustrate the transistor and other semi-controlled device as logic gates
CO2: Understand and analyze operation of Operational amplifier.
CO3: Acquire knowledge and analyze operational amplifier with its application.
CO4: Explore additional application of op-Amp such as VCO, precision rectifiers, sample and hold circuit, basic op-amp comparator circuit etc
CO5: Provide knowledge and designing of active filter.

UNITs	Descriptions	Hrs	CO's
I	Digital Logic Families : Digital integrated circuits ,characteristic of digital IC'S, direct coupled transistor logic (DCTL),register transistor logic(RTL), Diode transistor logic (DTL), integrated injection logic(IIL),transistor transistor logic (TTL)ammeter couple the logic (ECL) unipolar logic family PMOS, NMOS and CMOS circuits .	7	CO1

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II	Introduction, Differential Amplifier, Differential Amplifier Circuit Configuration, Dual-Input, Balanced – Output Differential amplifier , Dual –Input , Unbalanced – Output Differential Amplifier, Single – Input, Balanced – Output Differential amplifier, Single – Input, Unbalanced – Output Differential amplifier.	9	CO2
III	Introduction, Block Diagram Representation of a Typical OP-Amp, Operational amplifier characteristics, slew rate, bandwidth, offset voltage, basic applications inverting, non inverting amplifier and its application summing amplifier, differentiator, integrator, differential amplifier, instrumentation amplifier, log and antilog amplifier, voltage to current and current to voltage converters, comparators Schmitt trigger.	9	CO3
IV	Voltage Controlled Oscillator, precision rectifiers, sample and hold circuit, basic op-amp comparator circuit, zero crossing detector, function generator, peak detectors, analog and digital converters and digital to analog converters.	8	CO4
V	Active filters, LPF, HPF, BPF, BEF, All pass filter, higher order filters & their design, switched capacitor filters, 555 timer and its applications, phase locked ICs (PLL).	7	CO5
Expert Lecture			
Total Hours		40	

Suggestive list of experiments:

1. To test the transistor as NOT gat, then apply it to form RTL and DTL logic family. (CO1)
2. To study operational amplifier as inverting & non inverting amplifier & calculate gain. (CO2)
3. To study and observe operational amplifier as a differentiator and integrator. (CO2)
4. To study and observe operational amplifiers as summing amplifier & difference amplifiers. (CO2)
5. To study operational amplifiers as comparator & Schmitt trigger. (CO3)
6. To design operational amplifier circuit for scaling and averaging. (CO3)
7. To study and design the active first order low pass filter and determine the frequency & gain. (CO3)
8. To Study and perform the conversion using the A/D and D/A converter. (CO4)
9. To study and design the active first order High pass filter and determine the frequency & gain. (CO5)
10. To study and design the active second order low pass filter and determine the frequency and gain.(CO5)

Text Book-

1. K.R.Botkar Integrated Circuits, Khanna Publishers.
2. Gaikward RA; OP- Amp and linear Integrated circuits; PHI

Reference Books-

1. Bogart; Electronic Devices and Circuits; Universal Book Stall, New Delhi
2. I.J. Nagrath; Electronics -Analog and Digital; PHI
3. Tobbey; OP- Amps their design and Application
4. Salivahanan; Linear Integrated Circuits; TMH
5. Linear Integrated Circuits :D. Raychowdhary and Shail Jain

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Modes of Evaluation and Rubric				
Theory (60)	Midsem (20)	Assignment (10)	Quiz (10)	Total (100)
Practical (30)	LW (10)	Quiz (10)		Total (50)

List/Links of e-learning resource
• NPTEL

Recommendation by Board of studies on	19th June 2024
Approval by Academic council on	28th June 2024
Compiled and designed by	Prof. Deepti Jain
Subject handled by department	Electrical Engg. Department

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Semester/Year		II /II	Program		B.Tech
Subject Category	Departmental Course	Subject Code:	EE 303	Subject Name:	Network Analysis

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				**Practical**			Total Marks				
ES	MS	Quiz	Assig	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

Basic physics, calculus and fundamental of Electrical Engineering.

Course Objective:

1. To solve different complex circuits using various network reduction techniques such as Source Transformation, Network theorems etc.
2. To understand basic concepts of DC and AC circuit behaviour.
3. To analyze the transient response of series and parallel A.C. circuits and to solve problems in time domain using Laplace Transform.
4. To analyze two port circuit behaviours.

Course Outcomes:

At the end of this course, students will demonstrate the ability to:
CO1. Acquire and demonstrate the knowledge of circuit elements, different laws and resonating behaviour of circuits.
CO2. Apply the knowledge of basic circuit law to simplify the networks using network theorems.
CO3. Analyze the RL, RC and RLC circuits using Laplace transform and waveform Synthesis.
CO4. Analyze the transient, steady state of RL, RC and RLC circuits for AC and DC excitations.
CO5: Analysis of various two port networks with their connection, interrelationships and interconnection of two port networks (with respect to impedance, admittance, hybrid and transmission parameters).

UNITs	**Descriptions**	**Hrs.**	**CO's**
I	**Introduction to circuit elements** Review of AC Circuits, Analysis of magnetically coupled circuits, Mutual and self Inductance, Dot convention, Energy in a Coupled Circuit. **Resonant Circuits:** Series and parallel resonance, frequency- response of series and Parallel circuits, Q–Factor, Bandwidth	8	CO1

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II	**Network Theorems for AC & DC circuits-** Review of Thevenin's & Superposition Theorems, Norton's Theorem, , Reciprocity, Compensation, Substitution, Maximum power transfer, and Millman's theorem, Tellegen's theorem, problems with dependent & independent sources.	8	CO2
III	**Laplace transforms and properties:** initial conditions in networks and network solution with Laplace transformation, step, ramp and impulse functions, initial and final value theorem, waveform Synthesis	8	CO3
IV	**Network topology**, concept of Network graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices. **Transient behaviour and initial conditions:** Behaviour of circuit elements under switching condition and their Representation, evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations.	8	CO4
V	**Network function & Two port networks** –Network & Transfer functions for one port & two ports, poles and zeros, Necessary condition for driving point & transfer function. Two port parameters – Z, Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks, Terminated two port networks.	8	CO5
Expert Lecture			
Total Hours		40	

Suggestive list of experiments:

1. To verify the Thevenin's Theorem and determine the current flowing through the load resistance.(CO2)
2. To verify the superposition theorem and determine the current flowing through the load resistance. (CO2)
3. To verify the Maximum Power Transfer Theorem. (CO2)
4. To verify Reciprocity theorem and to determine the current flow through the load resistance. (CO2)
5. To verify Norton's theorem and to determine the current flow through the load resistance. (CO2)
6. To verify the Millman's Theorem. (CO2)
7. To verify the Tellegan's Theorem. (CO2)
8. To construct RL & RC transient circuits and to draw the transient curves. (CO4)
9. To obtain the resonance frequency of the given RLC series electrical network. (CO4)
10. To determine open circuit parameters and short circuit parameter of the given two-port network. (CO5)
11. To calculate and verify 'ABCD' parameters of two-port network. (CO5)

TEXT BOOKS:

1. M.E. Van Valkenburg, Network Analysis, Phi Learning, 3rd Edition, 2010
2. Abhijit Chakrabarti, Circuit theory: Dhanpat Rai & Co. 7th Edition, 2017

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REFERENCE BOOKS:

1. William D Stanley : Network Analysis with Applications, Pearson Education, 4th Edition,2013
2. G.K. Mitha; Network Analysis; Khanna Publisher, 14 Edition,1988
3. Roy Choudhary D; Network and systems; New Age Pub,2nd Edition, 2013
4. Russell Mersereau and Joel Jackson, "Circuit Analysis: A Systems Approach; Pearson Pub.2005.

Modes of Evaluation and Rubric

Theory (60)	Midsem (20)	Assignment (10)	Quiz (10)	Total (100)
Practical (30)	LW (10)	Quiz (10)		Total (50)

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/108/105/108105159/

Recommendation by Board of studies on	19th June 2024
Approval by Academic council on	28th June 2024
Compiled and designed by	Dr. Jitendra Kumar Tandekar
Subject handled by department	Electrical Engg.

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Semester/Year		III /II	Program		B.Tech
Subject Category	Departmental Course	Subject Code:	EE 304	Subject Name:	Electrical Instrumentation

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				**Practical**			Total Marks				
ES	MS	Quiz	Assig	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	1	-	4

Prerequisites:

Fundamentals of electrical engineering, Engineering Physics.

Course Objective:

Impart the knowledge of measurement systems, errors and its analysis.

1. Impart the knowledge of measurement systems, errors and its analysis.
2. To provide the knowledge of different types of instruments used in electrical engineering.
3. To provide knowledge of galvanometers, wattmeter, megger, flux meter, multimeter etc.
4. To acquire knowledge of measurement of energy and to understand instrument transformers.
5. To understand power factor meter, resistance measurement and magnetic measurement.

Course Outcomes:

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

CO1: Able to understand the concept of error in different instruments and its utility
CO2: Able to understand the different AC and DC instruments with its features and working.
CO3: Analyse the different power measuring instruments for AC and DC
CO4: Able to understand the working, type, functioning of different energy meters.
CO5: Able to understand and analyse the different bridges required for the measurement of R, L and C.

Units	Descriptions	Hrs.	CO's
I	Measurements, significance & method of measurement. Classification of instruments and their application. Static characteristics of instruments. Error & error analysis,. Loading effects, classification of analog instruments, operating principles, operating forces, Galvanometers - Theory & operation of ballistic D'arsonval Vibration galvanometer	9	CO1
II	Different types of Ammeter & Voltmeter - PMMC, MI, Electrodynamometer, Hotwire, Electrostatic, Induction, Rectifier, Electrothermic, Expression for control & deflection torque, their advantages, disadvantages & error. Extension of range of instruments using shunt & multiplier.	6	CO2

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III	Instrument transformers - Potential and current transformers, ratio and phase angle errors, Difference between CT and PT. Measurement of power - Power in AC and DC Circuit, Electrodynamometer type of wattmeter, Construction, theory, operation & error. Double element and three element dynamometer wattmeter. Measurement of power in three phase circuit by one, two & three wattmeter method.	9	CO3
IV	Measurement of Energy - Single phase induction type energy meter - construction and operating principle ,errors & compensations - Testing by phantom loading - Three phase energy meter - Maximum demand meter, digital energy meter, power factor meter - Single phase and three phase Electrodynamometer type & moving iron type, Net metering and Smart meter	8	CO4
V	Resistance Measurement -Wheatstone Bridge, Kelvin's double bridge & loss of charge methods for resistance measurement, Earth resistance measurement. Sources and detectors, Use of Bridges for measurement of inductance, Capacitance & Q factor Maxwells bridge, Maxwell's inductance capacitance bridge, Hays bridge, Anderson's bridge, Owen's Bridge, Desauty's Bridge, Schering Bridge, Heaviside cambell's bridge, Weins bridge, Q meter and its applications and measurement methods.	8	CO5
Expert Lecture			
Total Hours		40	

Suggestive list of experiments:

No Lab.

Text Book-

1. A.K.Sawhney, "A course in Electrical and Electronics Instrumentation". Dhanpat Rai & Co.
2. J.B,Gupta, "Electrical and Electronics Instrumentation". Dhanpat Rai & Co. S,K,Kataria Sons

Reference Books-

1. E W Golding & F C Widdis,,"Electrical Measurement & Measuring Instruments". Vedition, Wheeler Publishing
2. H.S.Kalsi,"Electronics Instrumentation ".TMH
3. R.K. Rajput, "Electrical and Electronics Instrumentation". S,Chand.

Modes of Evaluation and Rubric

Theory (60)	Midsem (20)	Assignment (10)	Quiz (10)	Total (100)

List/Links of e-learning resource

- NPTEL

Recommendation by Board of studies on	19th June 2024
Approval by Academic council on	28th June 2024
Compiled and designed by	Prof. S S Thakur/Prof. Sudhir Sharma
Subject handled by department	Electrical Engineering Department

Abbreviations: ES -End Semester, MS- Mid Semester, LW- Laboratory Work/Assignment. (L: Lecture, T: Tutorial, P: Practical), BSC- Basic Science Course, ESC- Engineering Science Course, HSMC- Humanities Science and Management Course, MAC- Mandatory, Audit Course, AC- Audit Course, HEC- Holistic Education Courses: NSS/NCC/NSO, ITC- Information Technology Course, ILC-Institute Level Course, DC- Department Course, DE-Department Elective, OC- Open Course, DLC- Department Laboratory, PROJ- Project Work, VA-Value Added Course

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Semester/Year		V/III	Program		B.Tech
Subject Category	Departmental Course	Subject Code:	EE-305	Subject Name:	Signals and Systems

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Quiz	Assig	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	-	-	3

Prerequisites:

Fundamentals of Mathematics.

Course Objective:

1. To build the knowledge about various signals and system and their properties.
2. To explain the knowledge of behaviour of continues and discrete time LTI systems
3. To discussthe Fourier, Laplace and Z transforms of system.
4. To develop ability to sample & reconstruct the co-continuous signals.

Course Outcomes:

CO1:Understand and represent signals and perform basic operations on signals.
CO2:Classify systems based on their properties and determine the response of LTI system usingconvolution.
CO3:Analyse system properties based on impulse response and Fourier analysis.
CO4:Apply the Laplace transform and Z- transform for analysis of continuous-time and discrete- time signals and systems.
CO5:Explain the process of sampling and the effects of under sampling.

UNITs	Descriptions	Hrs.	CO's
I	**Unit 1:** Introduction of Signal and Systems. Continuous-Time and Discrete-Time Signals, Transformations of the Independent Variable, Exponential and Sinusoidal Signals, The Unit Impulse and Unit Step Functions, Continuous-Time and Discrete-Time Systems, Basic System Properties.	6	CO1
II	**Unit 2**: Linear Time-Invariant Systems. Discrete-Time LTI Systems: The Convolution Sum, Continuous-Time LTI Systems: The Convolution Integral, Properties of Linear Time-Invariant Systems, Causal LTI Systems Described by Differential and DifferenceEquations, Singularity Functions	6	CO2

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III	**Unit 3:** Fourier Series and Fourier Transform. Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem.	6	CO3
IV	**Unit 4:**Laplace and z- Transforms Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behaviour. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.	6	C04
V	**Unit5:**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. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.	6	C05
Expert Lecture			
Total Hours		30	

Text Books-

1. "Signals and Systems", A.V. Oppenheim, A.S. Willsky and I.T. Young, Prentice Hall, 1983.
2. "Signals and Systems",M. J. Roberts,Tata McGraw-Hill, 2003.
3. "Digital signal Processing", S. Salivan, TMH, 2006.

Reference Books-

1. "Signals and Systems - Continuous and Discrete",R.F. Ziemer, W.H. Tranter and D.R. Fannin,4th Edition. Prentice Hall, 1998.
2. "Circuits and Systems", Modern Approach",A. Papoulis, HRW, 1980.
3. "Signals and Systems", Simon Haykin and Barry Van Veen,Second Edition,Wiley International.

Modes of Evaluation and Rubric

Theory (60)	Midsem (20)	Assignment (10)	Quiz (10)	Total (100)

List/Links of e-learning resource

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NPTEL- NOC: Principles of Signal and Systems by Prof. Aditya K. Jagannatham, Dept. of electrical engineering, IIT Kanpur : https://archive.nptel.ac.in/courses/108/104/108104100/	
Recommendation by Board of studies on	19th June 2024
Approval by Academic council on	28th June 2024
Compiled and designed by	Pro. Abhishek Sonker
Subject handled by department	Electrical Engg. Department

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SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
Department of Electrical Engineering

Semester/Year		III /II	Program		B.Tech
Subject Category	Departmental -Lab	Subject Code:	EE- 306	Subject Name:	Lab - Testing Electrical Equipments

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				**Practical**			Total Marks				
ES	MS	Quiz	Assig	ES	LW	Quiz		L	T	P	
-	-	-	-	30	10	10	50	-	-	4	2

Prerequisites:

Fundamentals of Electrical Engineering, Engineering Physics.

Course Objective:

1. Impart the knowledge of measurement systems, errors and its analysis.
2. To provide the knowledge of different types of instruments used in electrical engg.
3. To provide knowledge of galvanometers, wattmeter, megger, flux meter, multimeter etc.
4. To acquire knowledge of measurement of energy and to understand instrument transformer.
5. To understand power factor meter, resistance measurement and magnetic measurement.

Course Outcomes:

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

CO1. Able to understand the concept of error in different instruments and its utility.
CO2. Able to understand the different AC and DC instruments with its features and working.
CO3. Analyze the different power measuring instruments for AC and DC.
CO4. Able to understand the working, type, functioning of different energy meters.
CO5. Able to understand and analyze the different bridges required for the measurement of R, L, and C.

UNITs		Hrs	CO's
		30	

Suggestive list of experiments:

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1) Error Analysis and Loading Effects

Objective: Measure and analyze errors in different instruments, and study the loading effects.

2) Static Characteristics of Instruments

Objective: Determine the static characteristics (accuracy, precision, sensitivity, etc.) of various analog instruments.

3) Operation of Galvanometers

Objective: Study the theory and operation of different types of galvanometers.

4) Types of Ammeters and Voltmeters

Objective: Compare and contrast different types of ammeters and voltmeters (PMMC, MI, Electrodynamometer, etc.).

5) Extension of Range Using Shunts and Multipliers

Objective: Extend the range of ammeters and voltmeters using shunts and multipliers.

6) Measurement Using Instrument Transformers

Objective: Measure voltage and current using potential transformers (PT) and current transformers (CT), and analyze ratio and phase angle errors.

7) Measurement of Power in AC and DC Circuits

Objective: Measure power in AC and DC circuits using an electrodynamometer-type wattmeter.

8) Single-Phase Energy Meter Testing

Objective: Test the performance of a single-phase induction-type energy meter, including error compensation and phantom loading.

9) Digital Energy Meter and Power Factor Meter

Objective: Understand and measure the performance of digital energy meters and power factor meters.

10) Wheatstone Bridge and Kelvin's Double Bridge

Objective: Measure low and high resistance using Wheatstone bridge and Kelvin's double bridge methods.

11) Measurement of Inductance and Capacitance Using Bridges

Objective: Measure inductance and capacitance using Maxwell's bridge, Hay's bridge, and Schering bridge.

12) Q Factor Measurement Using Q Meter

Objective: Measure the Q factor of inductors and capacitors using a Q meter.

13) Earth Resistance Measurement

Objective: Measure earth resistance using appropriate methods.

Textbooks

1. "A Course in Electrical and Electronic Measurements and Instrumentation" by A.K. Sawhney
2. "Electrical Measurements and Measuring Instruments" by E.W. Golding and F.C. Widdis
3. "Modern Electronic Instrumentation and Measurement Techniques" by Albert D. Helfrick and William D. Cooper

Reference Books

1. "Electronic Measurements and Instrumentation" by K. Lal Kishore
2. "Instrumentation, Measurement, and Analysis" by B.C. Nakra and K.K. Chaudhry
3. "Introduction to Instrumentation and Measurements" by Robert B. Northrop

1.

Modes of Evaluation and Rubric

Practical (30)	Lab Work (10)	Quiz (10)	Total (50)

List/Links of e-learning resource

- Virtual Lab

Recommendation by Board of studies on	19th June 2024
Approval by Academic council on	28th June 2024
Compiled and designed by	Prof. S S Thakur/Prof. Sudhir Sharma
Subject handled by department	Electrical Engineering

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Department of Electrical Engineering

Semester/Year		III/II	Program		B.Tech
Subject Category	MAC	Subject Code:	MAC 308	Subject Name:	Energy Ecology Environment & Society

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				**Practical**			Total Marks				
End Sem	Mid-Sem	Quiz	Assig	End Sem	LW	Quiz		L	T	P	
-	-	-	-	-	-	-	-	-	-	-	Grade

Prerequisites:

Basic of Chemistry, Basic of Physics

Course Objective:

The main objective is to get familiar with the air pollution, sound pollution, its effects, remedies
To get knowledge of different sources available in the system
To get knowledge of ecosystem life cycle

Course Outcomes:

CO1: Able to understand the different sources available for energy generation.
CO2: Able to understand the effects of ecosystem and its cycle.
CO3: Able to understand and evaluate the adverse effect of air pollution in society.
CO4: Able to understand and evaluate the adverse effect of water pollution in society
CO5: Analyse the effect of pollution on the human health, society as well as moral duties required to get the environment free from these effects.

UNITs	Descriptions	Hrs	CO's
I	**Energy- Sources of Energy**: Renewable & Non Renewable, Fossil fuel, Biomass Geothermal, Hydrogen, Solar, Wind, hydal, nuclear sources.	6	CO1
II	**Ecosystem** – Segments of Environment: Atmosphere, hydrosphere, Lithosphere, biosphere. Cycles in Ecosystem – Water, Carbon, Nitrogen. Biodiversity: Threats and conservation	6	CO2
III	**Air Pollution & Sound Pollution -** Air Pollution: Air pollutants, classification, (Primary & secondary Pollutants) Adverse effects of pollutants. Causes of Air pollution chemical, photochemical, Green house effect, ozone layer depletion, acid Rain. Sound Pollution: Causes, controlling measures, measurement of sound pollution (deciblage), Industrial and non – industrial.	6	CO3

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IV	**Water Pollution– Water Pollution:** Pollutants in water, adverse effects. Treatment of Domestic & Industrial water effluent. Soil Pollution – Soil Profile, Pollutants in soil, their adverse effects, controlling measures.	6	CO4
V	**Society, Ethics & Human values**– Impact of waste on society. Solid waste management (Nuclear, Thermal, Plastic, medical, Agriculture, domestic and ewaste). Ethics and moral values, ethical situations, objectives of ethics and its study . Preliminary studies regarding Environmental Protection Acts, introduction to value education, self exploration, sanyam & swasthya.	6	CO5
	Expert Lecture		
Total Hours		30	

Suggestive list of experiments:

Nill

Text Book-

1. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
2. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai

Reference Books-

1. Harris, CE, Prichard MS, Rabin's MJ, "Engineering Ethics";Cengage Pub.
2. Svakumar; Energy Environment & Ethics in society; TMH
3. Bala Krishnamoorthy; "Environmental management";PHI
4. Joseph, B. Environmental Studies, 2009 Tata Mcgraw Hill, Edu India Ltd. New Delhi.

Modes of Evaluation and Rubric

Grade

List/Links of e-learning resource

- NPTEL

Recommendation by Board of studies on	19th June 2024
Approval by Academic council on	28th June 2024
Compiled and designed by	Dr. Monika Jain
Subject handled by department	Electrical Engg. Department

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Department of Electrical Engineering

Semester/Year		III /II		Program		B. Tech
Subject Category	Holistic Education course	Subject Code:	HEC	Subject Name:	Introduction to Yoga for Well-being	

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				**Practical**			Total Marks				
ES	MS	Quiz	Assig	ES	LW	Quiz		L	T	P	
-	20	10	10	-	-	-	-	-	-	-	Grade

Prerequisites:

Early to bed and early to rise

Course Objective:

Yoga education helps in self discipline and self-control, leading to immense amount of awareness, concentration and higher level of consciousness. Briefly the aims and objectives of Yoga education are:
1) To enable the student to have good physical health.
2) Practice of keeping hygiene.

Course Outcomes:

On the successful complication of this course student should be able to:
CO1: Yoga improves strength, balance and flexibility, Yoga promotes better self-care.
CO2: Yoga can ease arthritis symptoms, Yoga benefits heart health. Yoga helps you manage stress, Yoga helps with back pain relief.
CO3: Yoga relaxes you, to help you sleep better, Yoga can mean more energy and brighter moods.
CO4: Perform the physical exercise with slow and fast walk, cycling.
CO5: Introduce the concept of health- Physical, mental, social and spiritual health

UNITs	Descriptions	Hrs.	CO's
I	Yogasanas Part 1: Meaning and classification of Yoga, benefits of yogasanas, Types of Yogasanas - Ardha Chakrsana, Tadasana, Trikonasana, Veerabhadrasana, Parshwa Konasana, Bhujangaasana, Padahastasana, Ustrasana.		CO1
II	Yogasanas part 2: Padmasana, Ananta Shayanasana, Pavana Muktasana, Purvauttanasan, Sarvangasana, Halasana , Gomukhasana, Shavasana, Makaraasana.		CO2

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III	Pranayama : Bhastrika, Bhramari Pranayama, Anuloma pranayama, Kapalbhati Pranayama, Bhramari Pranayama, Ujjayi Pranayama, Sheetkari pranayama, Simhasana.		CO3
IV	Physical Excersise: Warm up, Running, slow and fast walk, Cycling, Skipping, Planks, Push-Ups, standing knee lift, stretching .		CO4
V	Yoga & Wellness: Holistic health care- concept of health- Physical, mental, social and spiritual health-- Drug de-addiction-Disease prevention-Relaxation Techniques		CO5
Total Hours		30	

Suggestive list of experiments:

Text Book-

1. Yogacharya Mitthanlal,Sampurna Yogasan , Sahni publication Delhi, 2009
2. Swami Satchidananda,The Yoga Sutras of Patanjali, **Integral Yoga P**ublications, 2012

Reference Books-

1. B.K.S. Iyengar , Light on Yoga: The Classic Guide to Yoga by the World's Foremost Authority, **Thorsons** publication, 2006.
2. The Seven Spiritual Laws of Yoga By Deepak Chopra.
3. The Secret Power of Yoga: A Woman's Guide To The Heart and Spirit Of The Yoga Sutras by Nischala Joy Devi

Modes of Evaluation and Rubric

MS	Assignment	Quiz	Total
20	20	10	50

List/Links of e-learning resource

- Yogasanas:

Ministry of Ayurveda, Yoga & Naturopathy, Unani, Siddha, and Homoeopathy (AYUSH), Government of India - Yoga Portal: https://yoga.ayush.gov.in/yoga/
Art of Living Foundation - Online Yoga Classes: https://www.artofliving.org/yoga/yoga-online

- Pranayama:

Yoga International - Pranayama Resources: https://yogainternational.com/article/view/pranayama-resources
Yoga Journal - Pranayama Techniques: https://www.yogajournal.com/practice/poses/types/pranayama

- Physical Exercise:

Fitness Blender - Free Workout Videos: https://www.fitnessblender.com/videos
Darebee - Exercise Library: https://darebee.com/exercises.html

- Yoga & Wellness:

International Association of Yoga Therapists (IAYT) - Resources: https://www.iayt.org/page/Resources
Mayo Clinic - Yoga: A way to stay flexible and balanced: https://www.mayoclinic.org/healthy-lifestyle/stress-management/in-depth/yoga/art-20044733

Recommendation by Board of studies on	19th June 2024
Approval by Academic council on	28th June 2024
Compiled and designed by	Prof. C S Sharma & Prof. Deepti Jain
Subject handled by department	Electrical Engineering

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