

UTTARAKHAND TECHNICAL UNIVERSITY DEHRADUN

STUDY AND EVALUATION SCHEME

B. TECH. YEAR 2ND SEMESTER-III

ELECTRICAL ENGINEERING, ELECTRICAL & ELECTRONICS ENGINEERING

EFFECTIVE FROM SESSION: 2008-2009

S .No	Course No.	Subject	Periods			Evaluation			Subject Total	
			L	T	P	Sessional Exam.		Exam ESE		
		Theory				CT	TA		Total	
1.	TMA 301	Mathematics-III	3	1	0	30	20	50	100	150
2.	TEE 301	Network Analysis & Synthesis	3	1	0	30	20	50	100	150
3.	TEE 302	Electrical Measurements and Measuring Instruments	3	1	0	30	20	50	100	150
4.	TEC 301	Solid State Devices and Circuits	3	1	0	30	20	50	100	150
5.	TEC 304	PULSE AND DIGITAL ELECTRONICS	3	1	0	30	20	50	100	150
		Practicals / Design								
6.	PEE 351	Network Lab.	0	0	2		25	25	25	50
7.	PEE 352	Electrical Measurement Lab.	0	0	2		25	25	25	50
8.	PEC 353	Analog & Digital Electronics Lab-I	0	0	2		25	25	25	50
		<i>Total</i>								<i>900</i>
	GP 651	General Proficiency	-	-	-	-	-	-	-	100
	DIS 652	Discipline	-	-	-	-	-	-	-	100

** The marks of General Proficiency & Discipline will be awarded at the end of even semester.*

TMA – 301 MATHEMATICS-III

L	T	P
3	1	0

1.) Integral Transforms

8

Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and applications to simple heat transfer equations.

Z – transform and its application to solve difference equations.

2.) Functions of a Complex Variable - I

9

Analytic functions, C-R equations and harmonic functions, Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions, Liouville's theorem, Fundamental theorem of algebra.

3.) Functions of a Complex Variable - II

8

Representation of a function by power series, Taylor's and Laurent's series, Singularities, zeroes and poles, Residue theorem, evaluation of real integrals of type $\int_0^{2\pi} f(\cos \theta, \sin \theta) d\theta$ and $\int_{-\infty}^{+\infty} f(x) dx$, Conformal mapping and bilinear transformations.

4.) Statistics and Probability

8

Moments, Moment generating functions, Skewness, Kurtosis, Correlation and Regression, Binomial distribution, Poisson distribution, Normal distribution.

5.) Curve Fitting and Solution of Equations

5

Method of least squares and curve fitting of straight line and parabola, Solution of cubic and bi-quadratic equations.

TEE 301 NETWORK ANALYSES AND SYNTHESIS

L	T	P
3	1	0

1.) Graph Theory : Graph of a Network, definitions, tree, co tree , link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Node methods of analysis. (8)

2.) Network Theorems (Applications to ac networks): Super-position theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Reciprocity theorem. Millman's theorem, compensation theorem, Tellegen's theorem. (8)

3.) Network Functions :

Concept of Complex frequency , Transform Impedances Network functions of one port and two port networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot, frequency response and Bode plots. (9)

4.) Two Port Networks: Characterization of LTI two port networks ZY, ABCD and h parameters, reciprocity and symmetry. Inter-relationships between the parameters, inter-connections of two port networks, Ladder and Lattice networks. T & π Representation. (8)

5.) Network Synthesis : Positive real function; definition and properties; properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms. (7)

Text Books:

- 1 M.E. Van Valkenburg," Network Analysis", Prentice Hall of India
- 2 D.Roy Choudhary,"Networks and Systems" Wiley Eastern Ltd.
- 3 Donald E. Scott : "An Introduction to Circuit analysis: A System Approach" McGraw Hill Book Company.
- 4 A.Chakrabarti,"Circuit Theory" Dhanpat Rai & Co.

Reference Books :

- 5 M.E. Van Valkenburg,"An Introduction to Modern Network Synthesis",Wiley Eastern Ltd.
- 6 W.H. Hayt & Jack E-Kemmerly, Engineering Circuit analysis" Tata McGraw Hill.
- 7 Soni, Gupta ,"Circuit Analysis", Dhanpat Rai & Sons.

TEE 302 ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS

L	T	P
3	1	0

1. Units, Dimensions and Standards:

Introduction to MKS System, SI Units, Standards of EMF, Resistance, Capacitance and Inductance, Methods of Measurement, Measurement System, Classification of instrument system, Characteristic of instrument & measurement system, Errors in Measurement & its Analysis. (5)

2. General Theory of Analog Measuring Instruments:

Operating torque, damping & controlling torque, T/W ratio, Pointers & Scales. Principles of operation of various types of electro mechanical indicating / registering instruments viz. PMMC, dynamometer, induction, thermal, etc. for dc & ac measurement of V, I, W, frequency, phase & power factor etc., energy meter, their sources of error & compensation, shunts & multipliers, multi- meter. (8)

3. Potentiometers:

Basic Potentiometer circuit, multiple range potentiometers, constructional details of potentiometers, applications of d-c potentiometers; self balancing potentiometers.

A-C potentiometers, polar and co- ordinate types. (4)

4. Bridges:

Sources and Detectors, General equation for bridge balance, Measurement of R,L,C,M, F etc by Wheatstone, Kelvin, Maxwell, Hay's, Anderson, Owen, Heaviside, Campbell, schering, Wien bridges. Bridge sensitivity. Errors, Wagner Earthing Device. (5)

5. Magnetic Measurements:

Flux meter, B-H Curve, Hysteresis loop, Permeameters, AC Testing of Magnetic materials, Separation of iron losses, iron loss measurement by Wattmeter and Bridge methods. Ballistic Galvanometer. (3)

6. Instrument Transformers:

Theory and construction of current and potential transformers, ratio and phase angle errors and their minimization, Characteristics of CTs. & PTs.,.

Introduction to measurement of speed, Frequency and Power factor. (5)

7.) Power and Energy Measurements:

Electrodynamic Wattmeter, Three Phase Wattmeter, Power in three Phase System , Errors & remedies in Wattmeter and energy meter. (4)

8.) Digital Measurement of Electrical Quantities: Concept of digital Measurement, Block Diagram Study of digital voltmeter, frequency meter, power analyzer and harmonics analyzer; Electronic Multimeter., Basic CRO circuit (Block Diagram), Cathode ray tube (CRT) & its component , Application of CRO in measurement , Lissajous Pattern. (6)

Text Book: W. Golding & F.C. Widdis, "Electrical Measurement & Measuring Instrument", A.W. Wheeler & Co. Pvt. Ltd. India .

1. A.K. Sawhney : " Electrical & Electronic Measurement & Instrument " , Dhanpat Rai & Sons , India .
2. Electronic Inst. & Measurement techniques. By W.D. Cooper

References :

1. Forest K. Harries , "Electrical Measurement " Willey Eastern Pvt. Ltd. India .
2. M.B. Stout , "Basic Electrical Measurement" Prentice hall of India , India.

TEC-301

SOLID-STATE DEVICES AND CIRCUITS

L	T	P
3	1	0

Unit-I : Special Diodes

LED, Varactor, Photodiode, Schotkey, tunnel diodes and their constructions and characteristics.

Bipolar Junction Transistors: Transistor as an amplifier, small signal Equivalent circuits (Hybrid- π , Ebers moll), Review of transistor biasing. Thermal runaway

Unit-II :Field Effect Transistors:

Field Effect transistor-Structure and physical operation of Enhancement and depletion types MOSFET, I/V characteristics, MOSFET circuits at DC, MOSFET as an amplifier, biasing in MOS amplifier circuits.

Unit-III : Frequency Response

Low and high frequency response of common emitter and common source amplifiers. Multistage amplifiers: Cascade, cascode and Darlington pair.

Unit IV: Power Amplifiers

Class A, B, AB power amplifiers, transformer coupling, conversion efficiency and power considerations.

Unit-V: Feed Back and Oscillators

General feed back structure, properties of negative feed back, four basic feed back topologies series shunt; series-series; shunt-shunt; & shunt-series feedback amplifier, determination of Loop gain, stability problem.

Basic principles of sinusoidal oscillator, RC oscillators: Weinbridge and phases shift oscillators: Collpits, Hartley and Clap. Crystal Oscillators.

Text book:

1. A.S. Sedra and K.C. Smith, "Microelectronic circuits", Oxford University Press (India).
2. B.P. Singh & R. Singh, Electronics Devices & Integrated Circuits, Pearson.

Reference Book

1. Millman, J. and Grabel, A./"Microelectronics"/McGraw Hill.
2. Bell, David A/ "Electronic Devices & Circuits"/Prentice Hall (India)4th Edition.
3. Nair, B. Somanathan /"Electronics Devices & Applications"/Prentice-Hall (India)
4. Neamen, Donald A./ "Electronic Circuit Analysis & Design"/Tata McGraw Hill.
5. Neamen, Donald A./"Semiconductor Physics & Devices"/Tata McGraw Hill.
6. Sedra, "Micro Electronics Circuits" Oxford University Press.

TEC-304 PULSE AND DIGITAL ELECTRONICS

L	T	P
3	1	0

- 1.) **Logic Families:** Circuit concepts and comparison of logic families: TTL, CMOS, NMOS and ECL; characteristic parameters: logic levels/fan-in and fan out, noise margin, propagation delay and power consumption. (4)
Minimization of Boolean functions using (i) Karnaugh Map having don't care entries and (ii) tabular method. (3)

- 2.) **Arithmetic Logic Circuits:** Representation of negative numbers, 9's and 1's complements, 10's and 2's complements, arithmetic using 2's complements. Adders and Subtractors, magnitude comparator. (4)
Combinational Logic Circuits: Multiplexers/ Demultiplexers, encoders/decoders, PAL and PLA. (4)

- 3.) **Sequential Logic Circuits:** Latches & Flip-Flops : SR, D, T, JK and Master-slave JK.
Shift Registers: Basic principle, serial and parallel data transfer, shift left/right register, universal shift register. (4)
Counters: Mode N counters, ripple counters, synchronous counters, ring & Johnson counters (4)

- 4.) **Memories:** Read Only Memories; Random Access Memories; Static and dynamic; sequential memory: Memory Organisation. (3)

- 5.) **Linear Wave shaping :** RC low pass and high pass circuits and response to sine and square wave inputs, RC circuit as differentiator, integrator & compensated attenuator.
Converters : Sample & hold circuit, A/D and D/A converters (5)

- 6.) **Op-Amp Applications:**
Astable and monostable multivibrators, Schmitt trigger, VCO and PLL; simple active filters (LP, NP, BP and notch type). (5)

- 7.) **Timer:** 1C 555 timer and its applications . (1)
Voltage regulators : Concept of series, shunt and switching regulators, Op-amp based configurations, fixed and adjustable voltage IC regulators. (3)

Text Books:

1. Malvino & Leach, "Digital Principles and Applications" Tata McGraw Hill
2. Signov & Donovan, "Digital Electronics" Delmar Thomson Learning.
3. R.A. Gayakwad, "Op-Amps and Linear Integrated Circuits" Prentice Hall of India,

Reference Books:

4. Taub & Schilling, "Digital Electronics" Tata McGraw Hill
5. IJ. Nagrath, "Electronics Analog and Digital" Prentice Hall of India Ltd.
6. R.P. Jain, "Modern Digital Electronics" Tata McGraw Hill.

7. Ronald J. Tocci & Neal S. Widmer. "Digital Systems" Pearson Education.

PEE 351 NETWORK LABORATORY

List of experiments

L T P

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Note: Minimum eight experiments are to be performed from the following list.

- 1 Verification of principle of superposition with dc and ac sources
- 2 Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits
- 3 Verification of Tellegen's theorem for two networks of the same topology
- 4 Determination of transient response of current in RL and RC circuits with step voltage input
- 5 Determination of transient response of current in RLC circuit with step voltage input for underdamp, critically damp and overdamp cases
- 6 Determination of frequency response of current in RLC circuit with sinusoidal ac input
- 7 Determination of z and h parameters (dc only) for a network and computation of Y and ABCD parameters
- 8 Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values
- 9 Determination of image impedance and characteristic impedance of T and Π networks, using O.C. and S.C. tests
Write Demo for the following (in Ms-Power point)
- 10 Verification of parameter properties in inter-connected two port networks : series, parallel and cascade also study loading effect in cascade
- 11 Determination of frequency response of a Twin – T notch filter

*College may add any three experiments in the above list.

**PEE – 352 ELECTRICAL MEASUREMENTS & MEASURING
INSTRUMENTATIONS LAB.**

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List of experiments:

Note: Minimum of TEN experiments from the following :

- 1 Calibration of ac voltmeter and ac ammeter
- 2 Determination of frequency and phase angle using CRO.
- 3 Measurement of low resistance by Kelvin's double bridge
- 4 Measurement of voltage, current and resistance using dc potentiometer
- 5 Measurement of inductance by Maxwell's bridge
- 6 Measurement of inductance by Hay's bridge
- 7 Measurement of inductance by Anderson's bridge
- 8 Measurement of capacitance by Owen's bridge
- 9 Measurement of capacitance by De Sauty bridge
- 10 Measurement of capacitance by Schering bridge
- 11 Plotting of Hysteresis loop for a magnetic material using flux meter.
- 12 Measurement of frequency using Wein's Bridge.
- 13 To study the connections and use of Current and potential transformers and to find out ratio error

*College may add any two experiments in the above list

PEC-353 ANALOG & DIGITAL ELECTRONICS LAB-1

List of Experiments

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1. Study of CRO and multimeter applications.
2. Plot the I/P output characteristics for the common-base transistor.
3. To plot output characteristics of FET & measure pinch-off voltage. Calculate FET parameters at a given operating point.
4. Realize a voltage regulator using zener diode and study the load characteristics.
5. Design of P.S : 220/230 V (AC), 5VDC, 200 mA.
6. To study operation of Op-Amp based Schmit trigger as 1C oscillator and triangular wave generator.
7. To study operation of Modulo N Counter using programmable counter 1C 74190.
8. To study waveform generation using 1C 555 in Astable and Monostable multivibrator modes.
9. To experimentally verify the output of an A/D counter.
10. To experimentally verify the output of a D/A converter.

College may add two more experiments in the above list