Devi Ahilya University, Indore, India Institute of Engineering & Technology				**II Year B.E. (Electronics and Telecommunication Engg.)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR4C2 ELECTRICAL AND ELECTRONIC MEASUREMENT	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To introduce students to monitor, analyze and control any physical system.
- To understand students how different types of meters work and their construction.
- To provide a student a knowledge to design and create novel products and solutions for real life problems.
- To introduce students a knowledge to use modern tools necessary for electrical projects.

Prerequisites(s): Basic Electrical Engg and Basic Electronics

COURSE CONTENTS

UNIT-I

Basic concept of Measurements and Instruments, Measurement Methods, Generalized measurement System, Classification of Instruments, Static & Dynamic Characteristics, Errors & Uncertainty measurement of system, Linear & Non-linear Systems.

UNIT-II

Operation principles of Analog Instruments - Moving coil, Moving iron, PMMC, Dynamometer and
Induction type instruments, Measurement of Voltage, Current, Power, Power Factor, Energy, Instrument Transformer - current and potential transformer, Measurement of Phase & Frequency.

UNIT-III

Measurement of Resistance- low, medium and high resistance measurement, A.C. Bridges- general equation, Potentiometer- DC potentiometer, Multi-range potentiometer, AC potentiometer and their applications, High Frequency Measurement , Twin T & Bridge Networks, Q-meter and its applications.

UNIT-IV

Display Devices I- Construction & working of Basic CRO, its Components (Deflection plates, Screen, Aquadag, Time Base Generator, Oscilloscope Amplifiers), Measurements of phase and frequency (Lissajous Patterns), Types of CRO, Special types of CRO, Types of CRO Probes.

UNIT-V

Display Devices II- Digital Voltmeter (ramp type DVM, Integrating and Potentiometric type DVMs, Signal Generator, Function Generator, Wave Analyzer, Distortion Analyzer, Spectrum Analyzer, Frequency Counter, Display Devices & Recorders.

Learning Outcomes:

Upon Completing the Course, Student will able to:

- To use the techniques and skills for electrical projects.
- Design a system, component or process to meet desired needs in electrical engineering.
- Measurement of R,L,C ,Voltage, Current, Power factor , Power, Energy.
- Ability to balance Bridges to find unknown values.
- Ability to measure frequency, phase with Oscilloscope.
- Ability to use Digital voltmeters

BOOKS RECOMMENDED:

[1] A.K.Sawhney & Puneet Sawhney, "*A Course in Electrical And Electronic measurements and Instrumentation"*, 7/e, Dhanpat Rai & Co.(P) Ltd.,2005
[2] Albert D.Helfrick & William D.Cooper, "*Modern Electronic Instrumentation and measurement Technique"*,Low Price Edition, Pearson Education, 2005
[3] Ernest O.Doebelin, "*Measurement Systems Application and Design"*, 5/e, Tata McGraw – Hill Publishing Company Ltd., 2004
[4] H.S.Kalsi, "*Electronic Instrumentaion"*, Technical Education Series, Tata McGraw –Hill Publishing Company Ltd.,2001
[5] Alan S.Morris, "*The Essence of Measurement"*, Eastern Economic Edition, Prentice Hall of India Private Limited.,1997

List of Practical Assignments:

1. To calibrate test Ammeter with reference Ammeter and hence detection of deviation of the test ammeter from reference ammeter using comparison method.
2. To calibrate test Voltmeter with reference Voltmeter and hence detection of deviation of the test Voltmeter from reference Voltmeter using comparison method.

3. To calibrate test Wattmeter with reference Wattmeter and hence detection of deviation of the test Wattmeter from reference Wattmeter using comparison method.
4. To calibrate test Energy meter with reference Energy meter and hence detection of deviation of the test Energy meter from reference Energy meter using comparison method.
5. To study Hay's Bridge and hence determination of unknown value of Self Inductance of given coil using Hay's Bridge.
6. To study Anderson Bridge and hence determination of unknown value of Self Inductance of given coil using Anderson Bridge.
7. To study Schering's Bridge and hence determination of unknown value of Capacitance of given coil using Schering's Bridge.
8. To study Maxwell's Bridge and hence determination of unknown value of Inductance of given coil using Maxwell's Bridge.
9. To study Wien's Bridge and hence determination of unknown value of Capacitance of given coil using Wien's Bridge.
10. To study De Sauty Bridge and hence determination of unknown value of Capacitance of given coil using De Sauty Bridge.
11. To study Kelvin's Bridge and hence determination of unknown value of very low resistance of given coil using Kelvin's Bridge.
12. To study the construction detail of CRO including measurement of voltage, Phase and frequency with the help of CRO.