Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

LABORATORY COURSE FILE CONTENTS

Check list Course Outcomes Attainment

S. No.	Contents	Available (Y/N/ NA)	Date of Submission	Signature of HOD
1.	Authenticated Syllabus Copy	Y		
2.	Individual Time Table	Y		
3.	Students' Name List (Approved Copy)	Y		
4.	Course Plan, PO, PSO, COs, CO-PO Mapping, COA Plan, Session Plan and Periodic Monitoring	Y		
5.	Rubrics for Assessment of Laboratory Experiments	Y		
6.	**Lab Manual / Lab Learning Materials** a) List of Experiments (Cycle I & Cycle II) b) Detailed Procedure for Experiments & Field Applications c) Viva-Voce Questions d) Smart Lab Experiments if any	Y		
7.	Dissemination of Syllabus and Course Plan to the Students	Y		
8.	**Continuous Assessment** A. Laboratory Observation B. Laboratory Records C. Evaluation Sheet with Rubrics D. Slow Learners List and RemedialMeasures			
9.	**End Term Examination** A. Question Paper B. Sample Answer Scripts (Best, Average,Poor) if available C. Evaluation Sheet with Rubrics D. Slow Learners List and RemedialMeasures.			
10.	Content Beyond the Syllabus (Proof)			

Year: 2020-2021
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Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

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7. Course : Electrical and Electronics Measurement Lab **L: 0**

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C: 2

11.	Innovative Teaching Tools Used			
12.	Consolidated Mark Statement			
13.	Course End Survey (Indirect Assessment)& Consolidation			
14.	CO Attainment (Continuous Assessment + End Term)			
15.	Gap Analysis & Remedial Measures			
16.	CO - PO Attainment			
17.	Class Record (Faculty Logbook)			

Signature of HOD/ Dean **Signature of Faculty**

Date: **Date:**

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

EEE42203	Electrical and Electronics Measurement Lab	L	T	P	C
Version 1.0		0	0	3	2
Pre-requisites/Exposure	Analog Electronics				
Co-requisites					

Syllabus Copy

Course Objectives

The objective of the course is to provide a brief knowledge of measurements and measuring instruments related to engineering. The basic idea of this course is to give the sufficient information of measurements in any kind of industry viz. electrical, electronics, mechanical etc

Course Content

1. Calibration of A Test Ammeter
2. Calibration of a Test Voltmeter
3. Calibration of A Test Wattmeter
4. Measurement of Capacitance by De-Sauty's Bridge
5. Simulation of De-Sauty's Bridge
6. Measurement of resistance using Anderson's Bridge
7. Wien Bridge
8. Measurement of resistance using Wheatstone Bridge using MATLAB
9. Measurement of resistance using Kelvin Double Bridge using MATLAB
10. Simulation of Modified De Sauty's Bridge
11. Measurement of power in a three-phase circuit using two wattmeter method
12. Calibration Of A C Energy Meter

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

Text Books:

1. J. B. Gupta, Electrical and Electronic Measurements & Instrumentation, S. K. Kataria& Sons, 2013.
2. S. C. Bhargava, Electrical Measuring Instruments and Measurements, CRC Press, 2012.

Reference Books:

1. A. K. Sawhney, A Course in Electrical and Electronics Measurements and Instrumentation, Dhanpat Rai& Co., 2005.
2. E. W. Golding and F. C. Widdis, Electrical Measurements and Measuring Instruments, Reem Publications Pvt. Ltd. 2011.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

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7. Course : Electrical and Electronics Measurement Lab L: 0
8. Program : B.Tech. T: 0
9. Target : 60% P: 3
C: 2

Faculty Individual Time Table

ADAMAS UNIVERSITY, KOLKATA								
SCHOOL OF								
DEPARTMENT OF								
Programme:								
Course Code & Course: Faculty Coordinator:								

Day & Time	10.30 - 11.20	11.20 - 12.10	12.10 - 01.00	01.00 - 01.50	01.50 - 02.40	02.40 - 03.30	03.30 - 04.20	04.20 - 05.10
Monday	-			LUNCH				
Tuesday	-		-					
Wednesday	-				-			
Thursday	-				-			-
Friday	-	-	-		-			

Signature of HOD **Signature of Class Coordinator**

Date: **Date:**

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

Students Name List

Roll Number	Registration Number	Name of the Student
UG/02/BTEE/2020/001	AU/2020/0004481	Saptarshi Bhattacharjee
UG/02/BTEE/2020/002	AU/2020/0004560	Arkajyoti Das

Signature of HOD/Dean **Signature of Class Coordinator**

Date: **Date:**

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

COURSE PLAN

Target	60% (marks)
Level-1	50% (population)
Level-2	60% (population)
Level-3	70% (population)

1. Method of Evaluation

UG	PG
Continuous Assessment (50%)	Continuous Assessment (50%)
End Semester Examination (50%)	End Semester Examination (50%)

*Keep as per Program (UG/PG)

2. Passing Criteria

Scale	PG	UG
Out of 10 Point Scale	CGPA – "5.00" Min. Individual Course Grade – "C" Passing Minimum – 40	CGPA – "5.00" Min. Individual Course Grade – "C" Passing Minimum – 35

*Keep as per Program (UG/PG)

3. Pedagogy

- Direct Instruction
- Kinesthetic Learning
- Flipped Classroom
- Differentiated Instruction
- Expeditionary Learning
- Inquiry Based Learning
- Game Based Learning
- Personalized Learning

4. Topics introduced for the first time in the program through this course

- (New Experiments Introduced & Content Beyond Syllabus)

5. References:

Text Books	Web resources	Journals	Reference books
2	5		2

Signature of HOD/Dean **Signature of Faculty**

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

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7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

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Date: **Date:**

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

GUIDELINES TO STUDY THE SUBJECT

Instructions to Students:

1. Go through the 'Syllabus' in the LMS in order to find out the Reading List.
2. Get your schedule and try to pace your studies as close to the timeline as possible.
3. Get your on-line SmartLab videos section. Make sure you use them during this course.
4. check your LMS regularly
5. go through study material
6. check mails and announcements on blackboard
7. keep updated with the posts, assignments and examinations which shall be conducted on the blackboard
8. Be regular, so that you do not suffer in any way
9. C**ell Phones and other Electronic Communication Devices:** Cell phones and other electronic communication devices (such as Blackberries/Laptops) are not permitted in classes during Tests or the Mid/Final Examination. Such devices MUST be turned off in the class room.
10. **E-Mail and online learning tool:** Each student in the class should have an e-mail id and a pass word to access the LMS system regularly. Regularly, important information – Date of conducting class tests, guest lectures, via online learning tool. The best way to arrange meetings with us or ask specific questions is by email and prior appointment. All the assignments preferably should be uploaded on online learning tool. Various research papers/reference material will be mailed/uploaded on online learning platform time to time.
11. **Attendance:** Students are required to have minimum attendance of 75% in each subject. Students with less than said percentage shall NOT be allowed to appear in the end semester examination.

This much should be enough to get you organized and on your way to having a great semester! If you need us for anything, send your feedback through e-mail XXX@adamasuniversity.ac.in Please use an appropriate subject line to indicate your message details.

There will no doubt be many more activities in the coming weeks. So, to keep up to date with all the latest developments, please keep visiting this website regularly.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

RELATED OUTCOMES

1. The expected outcomes of the Program are:

PO1	Engineering Knowledge
PO2	Problem analysis
PO3	Design/development of solutions
PO4	Conduct investigations of complex problems
PO5	Modern tool usage
PO6	The engineer and society
PO7	Environment and sustainability
PO8	Ethics
PO9	Individual or team work
PO10	Communication
PO11	Project management and finance
PO12	Life-long Learning

2. The expected outcomes of the Specific Program are: (upto3)

PSO1	To educate students in Electrical Engineering domain and guide their instincts
PSO2	To provide quality knowledge on Sustainable Energy that can be used for solving problems
PSO3	To see our students as ethical and responsible engineering professionals...

Year: 2020-2021
Semester: 3rd

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9. Target : 60% **P: 3**

C: 2

3. **The expected outcomes of the Course are: (minimum 4 and maximum 6)**

CO1	**Demonstrate** the basics of different measuring instrument.
CO2	**Demonstrate** and practice the application of different measuring Instrument.
CO3	**Develop** different bridges to measure electrical and electronic circuit elements.
CO4	**Estimate** different measuring instruments with oscilloscope and MATLAB.

4. Co-Relationship Matrix

Indicate the relationships by1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)

Program Outcomes / Course Outcomes	**PO 1**	PO 2	PO 3	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	2	3		3		3						2		3	
CO2	2	3	3			3						2	3		
CO3		3	3	3			2						3	3	
CO4			3	3		3	2						3	3	
Average	2	3	3	3	-	3	2	-	-	-	-	2	3	3	-

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

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7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

5. Course Outcomes Assessment Plan (COA):

Course Outcomes	Continuous Assessment* (50 Marks)		End Term Exam (50 Marks)	Total (100 Marks)
	Cycle I	Cycle II		
CO1	6	6	12	25
CO2	6	6	12	25
CO3	6	6	12	25
CO4	7	7	14	25
Total	25	25	50	100

* Internal Assessment –Continuous Assessment

Year: 2020-2021
Semester: 3rd

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9. Target : 60% **P: 3**

C: 2

OVERVIEW OF COURSE PLAN OF COURSE COVERAGE

Course Activities:

S. No.	Description	Planned			Actual			Remarks
		From	To	No. of Session	From	TO	No. of Session	
1.	Cycle I Experiments	2/09/2021	2/11/2021	6				
2.	Cycle II Experiments	3/11/2021	2/01/2022	6				

Total No. of Instructional periods available for the course: Sessions

Signature of HOD/Dean **Signature of Faculty**

Date: **Date**

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

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7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

Cycle-I
SESSION PLAN

Session Plan				Actual Delivery			
Exp.	Date	Topics to be Covered	CO Mapped	Exp.	Date	Topics Covered	CO Achieved
1	3-09-2021	Calibration of A Test Ammeter	CO1,CO2				
2	10-09-2021	Calibration of a Test Voltmeter	CO1,CO2				
3	17-09-2021	Calibration of A Test Wattmeter	CO1,CO2				
4	24-09-2021	Measurement of Capacitance by De-Sauty's Bridge	CO3,CO4				
5	1-10-2021	Simulation of De-Sauty's Bridge	CO3,CO4				
6	8-10-2021	Measurement of resistance using Anderson's Bridge	CO3,CO4				

Remarks:

Signature of Faculty

Date:

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

SESSION PLAN
Cycle-II

Session Plan				Actual Delivery			
Exp.	Date	Topics to be Covered	CO Mapped	Exp.	Date	Topics Covered	CO Achieved
1	29-10-2021	Wien Bridge	CO1,CO2				
2	5-11-2021	Measurement of resistance using Wheatstone Bridge using MATLAB	CO1,CO2				
3	19-11-2021	Measurement of resistance using Kelvin Double Bridge using MATLAB	CO1,CO2				
4	3-12-2021	Simulation of Modified De Sauty's Bridge	CO3,CO4				
5	10-12-2021	Measurement of power in a three-phase circuit using two wattmeter method	CO3,CO4				
6	21-01-2022	Calibration Of A C Energy Meter	CO3,CO4				

Remarks:

Signature of Faculty

Date:

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.
7. Course : Electrical and Electronics Measurement Lab L: 0
8. Program : B.Tech. T: 0
9. Target : 60% P: 3
C: 2

PERIODIC MONITORING

Attainment of the Course (Learning) Outcomes:

Components	Attainment level	Action Plan	Remarks
Cycle I Continuous Assessment	CO1:	VIVA on 1-10-2021	
	CO2:	VIVA on 5-11-2021	
	CO3:		
	CO4:		
Cycle II Continuous Assessment	CO1:	VIVA on 3-12-2021	
	CO2:	VIVA on 7-01-2021	
	CO3:		
	CO4:		
End Semester	CO1:	Scheduled from 07.03.2022	
	CO2:		
	CO3:		
	CO4:		
Any Other	CO1:		
	CO2:		
	CO3:		
	CO4:		

Signature of HOD/ Dean **Signature of Faculty**

Date **Date**

Year: 2020-2021
Semester: 3rd

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9. Target : 60% **P: 3**

C: 2

Rubrics for Assesment

Continuous Assessment Per Lab (10)		
1	Aim	2
2	Theory	2
3	Conduction/Observation	2
4	Conclusion	2
5	Viva/Quiz	2

Internal Marks (50) = Total marks obtained in continuous assessment will get converted to 50

End Term(50)		
1	Write up	10
2	Viva	10
3	Conduction of experiment	20
4	Observation and Conclusion	10

Year: 2020-2021
Semester: 3rd

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7. **Course** : **Electrical and Electronics Measurement Lab** **L: 0**
8. **Program** : **B.Tech.** **T: 0**
9. **Target** : **60%** **P: 3**
C: 2

Lab Manual

Index

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

Cycle-1

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course	**: Electrical and Electronics Measurement Lab**	**L: 0**
8. Program	**: B.Tech.**	**T: 0**
9. Target	**: 60%**	**P: 3**
		C: 2

Experiment No:1

Calibration of A Test Ammeter

Objective: To calibrate a test ammeter with a standard ammeter.

Theory:
An ammeter is an instrument that measures electric current .
To calibrate, the reading of the test instruments are compared with a standard instrument.
The difference is called error .the error may be positive or negative.
The error may be calculated as,
Error=standard reading-indicated reading
The percentage error is calculated as,
%error= {(standard reading-indicated reading)}/(standard reading)*100

Device under test:

Sl. no	Name of device	Quantity	Type	Rating	Maker name

Equipments/instruments required:

Sl. no	Name of device	Quantity	Type	Rating	Maker name
1					
2					
3					
4					

Circuit Diagram:

Year: 2020-2021
Semester: 3rd

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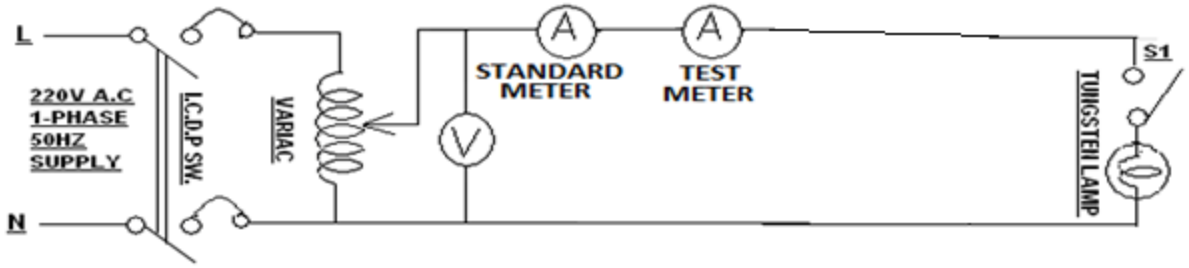
8. **Program** : **B.Tech.** **T: 0**
9. **Target** : **60%** **P: 3**
C: 2



Procedures:
The circuit is connected as shown in the circuit diagram.
The load is connected by setting the switch on.
The supply voltage is varied with help of variac and ten sets of observations are noted covering the entire range of various meters. The reading of ammeters is noted for no load condition.

Experimental data:

Obs no.	Input voltage Vs(v)	Test ammeter (A)	Standard ammeter (A)	error	%error

Calculation:
(Please write in your own)

Precautions:

Year: 2020-2021
Semester: 3rd

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7. Course	**: Electrical and Electronics Measurement Lab**	**L: 0**
8. Program	**: B.Tech.**	**T: 0**
9. Target	**: 60%**	**P: 3**
		C: 2

The following precaution should be taken while performing the experiment.
1. All the connection should be tightened and made as per given ckt diagram.
2. All the meters should be in proper range.
3. Before connecting the meter in the circuit checks their zero setting.

Field of Application:

Calibration is the process of configuring an instrument to provide a result for a sample within an acceptable range. Eliminating or minimizing factors that cause inaccurate measurements is a fundamental aspect of instrumentation design

Conclusion:
(Please write in your own language whatever you have learnt by performing the experiment).

Viva-Voice Question:

1. What is meant by measurement?
Measurement is an act or the result of comparison between the quantity and a predefined standard.

2. Mention the basic requirements of measurement.
· The standard used for comparison purpose must be accurately defined and should be commonly accepted.
· The apparatus used and the method adopted must be provable.

3. Define Instrument.
Instrument is defined as a device for determining the value or magnitude of a quantity or variable.

4. Why calibration of instrument is important?
The calibration of all instruments is important since it affords the opportunity to check the instrument against a known standard and subsequently to errors in accuracy.

5. Explain the calibration procedure.
Calibration procedure involves a comparison of the particular instrument with either.
· A primary standard
· A secondary standard with a higher accuracy than the instrument to be calibrated or an instrument of known accuracy.

Year: 2020-2021
Semester: 3rd

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9. Target : 60% **P: 3**

C: 2

Experiment No:2

Calibration of a Test Voltmeter

Objective:

To calibrate a test voltmeter with a standard voltmeter.

Theory:

A voltmeter is an instrument that measures voltage
To calibrate, the reading of the test instruments are compared with a standard instrument.
The difference is called error. The error may be positive or negative.
The error may be calculated as,
Error=standard reading-indicated reading
The percentage error is calculated as,
%error= {(standard reading-indicated reading)}/(standard reading)*100

Device under test:

Sl. no	Name of device	Quantity	Type	Rating	Maker name

Equipments/instruments required:

Sl. no	Name of device	Quantity	Type	Rating	Maker name
1					
2					
3					
4					

Year: 2020-2021
Semester: 3rd

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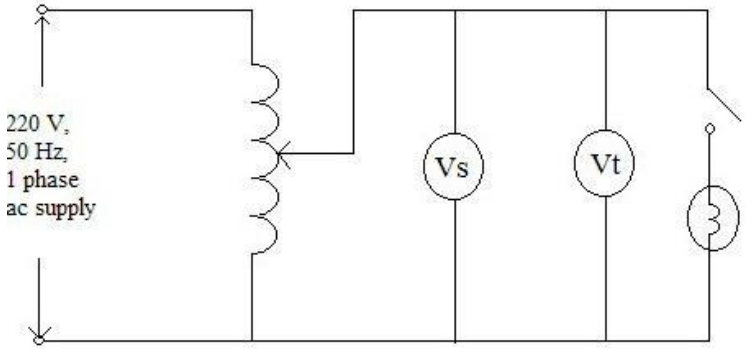
7. **Course** : **Electrical and Electronics Measurement Lab** **L: 0**
8. **Program** : **B.Tech.** **T: 0**
9. **Target** : **60%** **P: 3**
C: 2

Circuit diagram:



Equipments/instruments required:

Sl. no	Name of device	Quantity	Type	Rating	Maker name
1	Voltmeter				
2	Variac				
3	Load				

Procedures:
The circuit is connected as shown in the circuit diagram.
The load is connected by setting the switch on.
The supply voltage is varied with help of variac and sets of observations are noted covering the entire range of voltmeters.
Calculate the error and %error with the help of standard voltmeter and test voltmeter reading.

Year: 2020-2021
Semester: 3rd

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8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

Experimental data:

Obs no.	Test Voltmeter (V)	Standard voltmeter (V)	error	%error

Calculation:
(Please write in your own)

Precautions:

The following precaution should be taken while performing the experiment.
1. All the connection should be tightened and made as per given circuit diagram.
2. All the meters should be in proper range.
3. Before connecting the meter in the circuit checks their zero setting.

Field of Application:

Calibration is the process of configuring an instrument to provide a result for a sample within an acceptable range. Eliminating or minimizing factors that cause inaccurate measurements is a fundamental aspect of instrumentation design

Conclusion:
(Please write in your own language whatever you have learnt by performing the experiment).

Viva-Voice Question:

1. Explain the calibration procedure.
Calibration procedure involves a comparison of the particular instrument with either.
· A primary standard

Year: 2020-2021
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7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

· A secondary standard with a higher accuracy than the instrument to be calibrated or An instrument of known accuracy.

2. Define Calibration.
It is the process by which comparing the instrument with a standard to correct the accuracy.

3. What is voltmeter used for?
Voltmeter, instrument that measures voltages of either direct or alternating electric current

4. What is the resistance of an ideal voltmeter?
We do not want the voltmeter to load the circuit. Consequently an ideal voltmeter will have infinite resistance.

5. What is the unit for voltage?
Volt. The volt is the unit of electric potential difference—electric potential difference is also known as voltage.

Year: 2020-2021
Semester: 3rd

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9. Target : 60% **P: 3**

C: 2

Experiment No:3

Calibration of A Test Wattmeter

Objective: To calibrate a test wattmeter with a standard power reading.

Theory: A wattmeter is an instrument that measures electric power.
For pure resistive load, P=V*I where P is power consumed by the load, V is the voltage across, and I is current through the load.
To calibrate, the reading of the test instruments are compared with a standard instrument.
The difference is called error .the error may be positive or negative.
The error may be calculated as,
Error=standard reading-indicated reading
The percentage error is calculated as,
%error= {(standard reading-indicated reading)}/(standard reading)*100

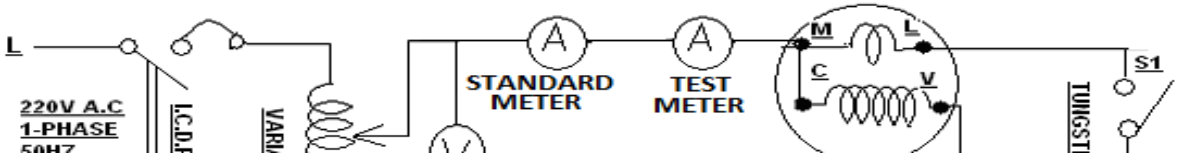
Device under test:

Sl. no	Name of device	Quantity	Type	Rating	Maker name

Equipments/instruments required:

Sl. no	Name of device	Quantity	Type	Rating	Maker name
1					
2					
3					
4					

Circuit Diagram:



Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

Procedures:

The circuit is connected as shown in the circuit diagram.
The reading of ammeters, voltmeter and wattmeter are noted for no load condition.
Any zero error of test meters can be adjusted now. If it is allowed to remain, it would only give a definite offset to the error.
The load is connected by setting the switch on.
The supply voltage is varied with help of variac and ten sets of observations are noted covering the entire range of various meters.

Experimental data:

Obs no.	Input voltage Vs(v)	Ammeter (A)	Test wattmeter (W)	Standard wattmeter (W)	error	%error

Calculation:

(Please write in your own)

Precautions:

The following precaution should be taken while performing the experiment.
1. All the connection should be tightened and made as per given ckt diagram.
2. All the meters should be in proper range.
3. Before connecting the meter in the circuit checks their zero setting.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course	**: Electrical and Electronics Measurement Lab**	**L: 0**
8. Program	**: B.Tech.**	**T: 0**
9. Target	**: 60%**	**P: 3**
		C: 2

Field of Application:

Calibration is the process of configuring an instrument to provide a result for a sample within an acceptable range. Eliminating or minimizing factors that cause inaccurate measurements is a fundamental aspect of instrumentation design

Conclusion:
(Please write in your own language whatever you have learnt by performing the experiment).

Viva-Voice Question:

1. How does a wattmeter work?
A wattmeter measures the power flowing through an electrical circuit. It simultaneously measures the voltage and current values and multiplies them to give power in watts

2. What are the constructional parts of dynamometer type wattmeter?
Fixed coil
Moving Coil
Current limiting resister
Helical spring
Spindle attached with pointer
Graduated scale

3. State the disadvantages of Dynamometer type wattmeter.
Readings may be affected by stray magnetic fields.
At low power factor it causes error.

4. Name the errors caused in Dynamometer type wattmeter.
Error due to pressure coil inductance
Error due to pressure coil capacitance
Error due to methods of connection
Error due to stray magnetic fields
Error due to eddy current.

5. Name the methods used in Wattmeter calibration.
By comparing with std wattmeter.
By using voltmeter ammeter method.
By using Potentiometer.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

6. What is the working principle of wattmeter employed in measuring equipment?

A wattmeter consists of two coils namely, current coil and pressure coil.
The current coil is connected in series with the load and it will measures the current flowing through the load whereas the voltage coil is connected across the load and it will measures the voltage across the load.

Experiment No:4

Measurement of Capacitance by De-Sauty's Bridge

Objective: To Measure the unknown loss free capacitance by balancing the De-Sauty's bridge.

Theory: De-Sauty's Bridge is the simplest method of comparing two capacitances. In this method only lossless capacitor like air capacitors can be compared.

This bridge measured an unknown capacitance using standard capacitor. In the bridge two arms consists of two resistance and other two arms consists of two capacitor. (Where, in one arm standard capacitor is connected and the other arm unknown capacitor is connected)

Let, C1 = capacitor whose capacitance is to be measured,
C2 = a standard capacitor, and
R1, R2 = non-inductive resistors.

The balance can be obtained by varying either R1 or R2.

At balance,

$$\left[\frac{1}{jwC1}\right]R2 = \left[\frac{1}{jwC2}\right]R1$$

$$C1 = \frac{C2R2}{R1}$$

Year: 2020-2021
Semester: 3rd

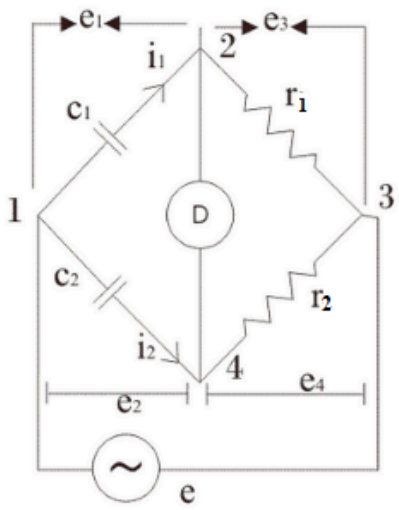
Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

Apparatus: - De- Sauty's Bridge's Kit

Circuit Diagram:-



Procedure:-

1. Connect the De- Sauty's kit by the help of path cords and other apparatus as decrypted in circuit Diagram.
2. Connect head null detector to the circuit of detection of the balanced condition of the bridge.
3. Vary the resistance R1 and R2 and Capacitor C2 and observe the null detector value.
4. Calculate the reading based on the value of unknown capacitance by equation C1=C2xR2/R1.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

Experimental Data:-

Sl. No.	C2	R2	C1	R1

Calculation:-
(Please write in your own)

Precautions:
The following precaution should be taken while performing the experiment.

1. All the connection should be tightened and made as per given ckt diagram.
2. Before taking the value set the null detector value zero.

Field of Application:
De Sauty Bridge is a very simple type of AC Bridge used to measure capacitance.

Conclusion:
(Please write in your own language whatever you have learnt by performing the experiment).

Viva-Voice Question:

1. What is De-Sauty's bridge?
De-Sauty's bridge measures an unknown capacitance in term of a standard capacitance i.e. comparing two capacitance's Two ratio arm of this bridge consist pure resistor and two consist capacitor where one is of known value and another is standard capacitor.

2. What are the uses of De-Sauty's bridge?
De-Sauty's bridge is a very simple type of AC Bridge used to measure capacitance. Here we measure in unknown capacitance in terms of known capacitance and known resistance.

3. What are the Advantages disadvantages of De-Sauty bridge?

The simplicity of the bridge (advantage) is offset by the disadvantage that its almost impossible to obtain balance if capacitors are not free from dielectric losses.

4. On what principle does De-Sauty's bridge work?

De-sauty's bridge provides us the most suitable method for comparing the two values of capacitor if we neglect dielectric losses in the bridge circuit. This bridge measured an unknown capacitance in terms of a standard capacitance of capacitor i.e. comparing two capacitances to ratio arms of this bridge.

Experiment No:5

Simulation of De-Sauty's Bridge

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

Objective: To Measure the unknown loss free capacitance by balancing the De-Sauty's bridge by using MATLAB.

Theory: De-Sauty's Bridge is the simplest method of comparing two capacitances. In this method only lossless capacitor like air capacitors can be compared.

This bridge measured an unknown capacitance using standard capacitor. In the bridge two arms consists of two resistance and other two arms consists of two capacitor. (Where, in one arm standard capacitor is connected and the other arm unknown capacitor is connected)

Let, C1 = capacitor whose capacitance is to be measured,
C2 = a standard capacitor, and
R1, R2 = non-inductive resistors.

The balance can be obtained by varying either R1 or R2.

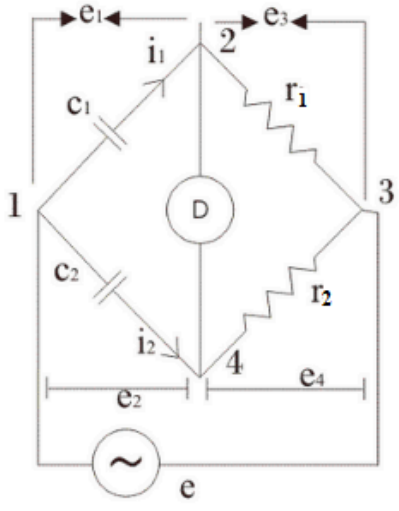
At balance,

$$\left[\frac{1}{jwC1}\right]R2 = \left[\frac{1}{jwC2}\right]R1$$

$$C1 = \frac{C2R2}{R1}$$

Software Used: MATLAB R2010a.

Circuit Diagram:-



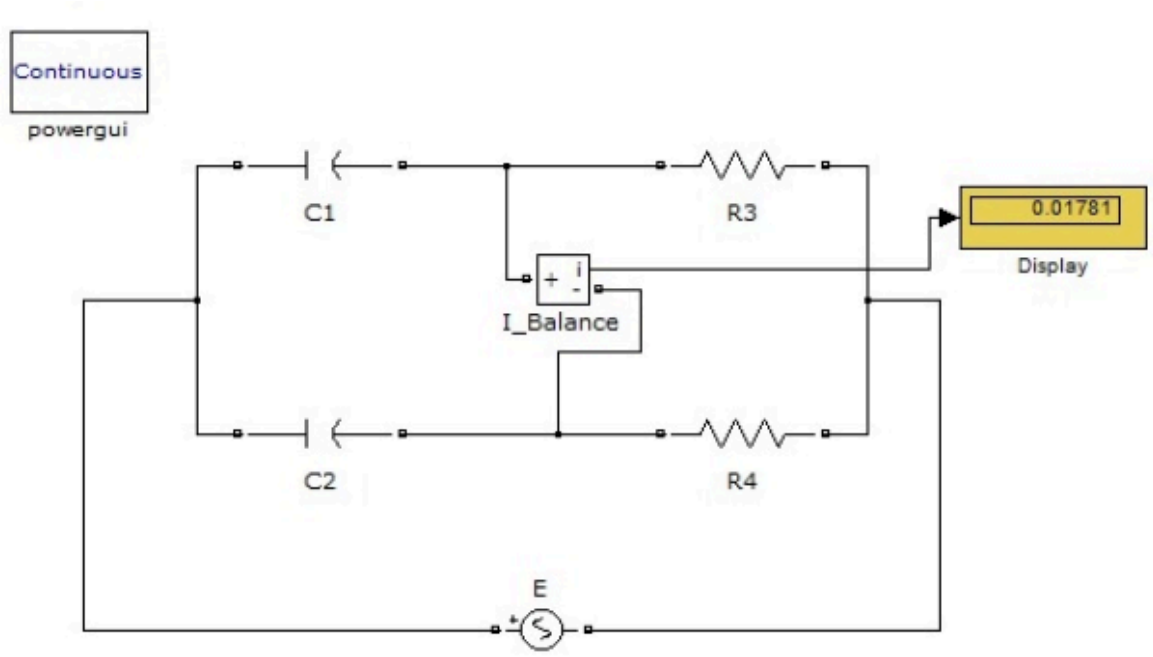
Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

Circuit in MATLAB:



Procedure:-

Step 1: Open the MATLAB window.
Step 2: Click on *Simulink Library Browser*.
Step 3: Click on *New Model*.
Step 4: Click on *SimPowerSystems* in library browser.
Step 5: Click on *Electrical Sources* to get *AC Voltage Source*.
Step 6: Click on *Elements* to get *Series RLC Branch*. Double click on *Series RLC Branch* and modify to have a pure Capacitor. Assume the value of capacitor *C*1 is not known.
Step 7: Follow **Step 6**, to get another capacitor *C*2 . The value of capacitor *C*2 is known and assumes it as 2 F. After giving the new value of capacitance in proper place, click on Apply and OK.
Step 8: Follow **Step 6**, to get a resistor *R*3 . Initially assume the value of *R*3 as 4 k.
Step 9: Follow **Step 6**, to get another resistor for forth branch i.e. *R*4 . Initially assume the value of *R*4 as 0.5 k or 500.

Step 10: Click on *Measurements* to get *Current Measurements*, i.e., to have an ammeter. We

can connect this ammeter as balance detecting device, which will show zero current at balanced condition of the bridge.

Step 11: Click on *Simulink*, and then on *Sinks*, to get a *Display*.
Step 12: Finally click on *Simulink* and drag the *Powergui* block to New Model for successful run.

Experimental Data:-

Sl. No.	C2	R3	R4	C1

Calculation:-
(Please write in your own)

Field of Application:
De Sauty Bridge is a very simple type of AC Bridge used to measure capacitance.

Precaution:

As we are using software we do not need to take special precautions. But we have to make sure that every time we have to save the circuit values before running the circuit. And shutdown the computer after completing the experiment.

Conclusion:
(Please write in your own language whatever you have learnt by performing the experiment).

Viva-Voice Question:

5. What is De-Sauty's bridge?
De-Sauty's bridge measures an unknown capacitance in term of a standard capacitance i.e. comparing two capacitance's Two ratio arm of this bridge consist pure resistor and two consist capacitor where one is of known value and another is standard capacitor.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

6. What are the uses of De-Sauty's bridge?

De-Sauty's bridge is a very simple type of AC Bridge used to measure capacitance. Here we measure in unknown capacitance in terms of known capacitance and known resistance.

7. What are the Advantages disadvantages of De-Sauty bridge?

The simplicity of the bridge (advantage) is offset by the disadvantage that its almost impossible to obtain balance if capacitors are not free from dielectric losses.

8. On what principle does De-Sauty's bridge work?

De-sauty's bridge provides us the most suitable method for comparing the two values of capacitor if we neglect dielectric losses in the bridge circuit. This bridge measured an unknown capacitance in terms of a standard capacitance of capacitor i.e. comparing two capacitances to ratio arms of this bridge.

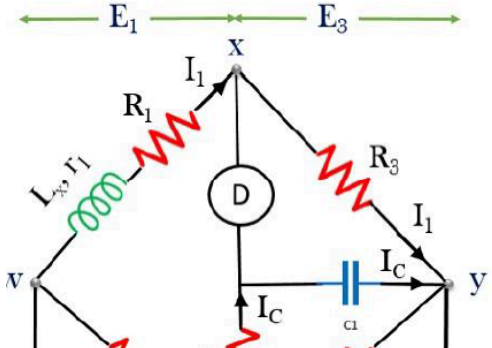
Experiment No:6

Measurement of resistance using Anderson's Bridge

Objective: To get the value of unknown resistor with the help of Anderson's Bridge.

Theory: Anderson's Bridge is an AC bridge that determines the self-inductance of an inductor in the circuit. This bridge offers highly accurate output and is an advancement of Maxwell's inductance capacitance bridge.

By Anderson's bridge, one can measure inductance by utilizing other circuit components like resistors and capacitor. In Maxwell's bridge, the inductance is calculated by comparing it with a standard variable capacitance



Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.
7. **Course** : **Electrical and Electronics Measurement Lab** **L: 0**
8. **Program** : **B.Tech.** **T: 0**
9. **Target** : **60%** **P: 3**
C: 2

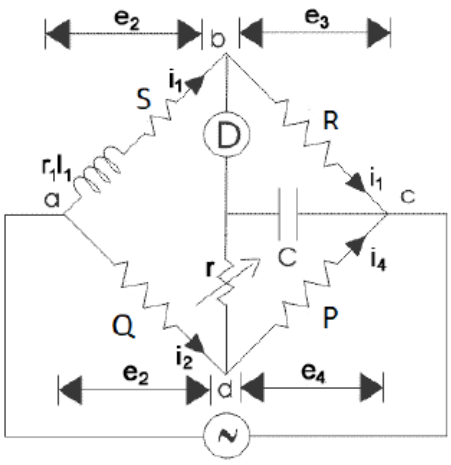
As we can see the bridge has junctions w, x, y and z that jointly forms 4 arms wx, xy, yz, zw.
Here, for the above figure
Lx = is the unknown inductance to be measured,
r1 = is the resistance offered by the coil,
R1 = is the external variable resistance connected serially with the unknown inductance,
r, R2, R3, R4 are the known resistances and C is a fixed capacitor with known capacitance At the balanced condition, the current through the detector must be 0.
At balance,

$$R_1 = \frac{R_2 R_3}{R_4} - r_1$$

$$L_x = \frac{CR_3}{R_4} [r (R_4 + R_2) + R_2 R_4]$$

Apparatus: Anderson's Bridge Kit

Circuit Diagram:



Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

Procedure:

1. Connect the Anderson's Bridge Kit by the help of path cords and other apparatus as decrypted in circuit Diagram.
2. Connect head null detector to the circuit of detection of the balanced condition of the bridge.
3. Vary the resistance r, S and C and observe the null detector value.
4. Calculate the reading based on the value of unknown resistor.

Experimental Data:

SL No.	R (Ω)	r (Ω)	S (Ω)	C (μF)	P (Ω)	Q(Ω)	Lx(mH)	Avg Lx(mH)

Precautions:

The following precaution should be taken while performing the experiment.

1. All the connection should be tightened and made as per given ckt diagram.
2. Before taking the value set the null detector value zero.

Calculation:-

(Please write in your own)

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

Field of Application:
Anderson's Bridge is used to measure unknown resistor.

Conclusion:
(Please write in your own language whatever you have learnt by performing the experiment).

Viva-Voice Question:

1. **Anderson bridge is used for _____**
   a) the measurement of self-inductance
   b) the measurement of resistance
   c) the measurement of capacitance
   d) the measurement of impedance

Answer: a
Explanation: The Anderson bridge is one of the important bridges used for the measurement of self-inductances in terms of a standard capacitance value. Resistance is usually measured by making use of a Whetstone's bridge or Kelvin's double bridge.

2. **Anderson bridge is a modified form of _____**
   a) Whetstone's bridge
   b) Maxwell bridge
   c) Kelvin double bridge
   d) Schering bridge

Answer: b
Explanation: The Anderson's bridge is a modified form of Maxwell's bridge which is used for the measurement of self-inductances in terms of a standard capacitance value. Wheatstone bridge and Kelvin Bridge are used for the measurement of medium and low resistances respectively

3. **Anderson's bridge is basically used for _____**
   a) measurement of capacitance
   b) measurement of resistance
   c) measurement of inductance
   d) measurement of voltage

Answer: c
Explanation: Anderson's bridge is used basically for the precise measurement of self-inductances in terms of a standard capacitance value over a wide range of values.

4. **Balance equation for computing the inductance is _____**
   a) $L_x = R_3 R_5$
   b) $L_x = CR_5$
   c) $L_x = CR_3$
   d) $L_x = CR_3 R_5$

Answer: d
Explanation: The balance equation for computing the self-inductance in an Anderson's bridge is given by the equation, $L_x = CR_3 R_5$.
Where, C is the standard capacitance
R_3 and R_5 are the known non-inductive resistances.

5. **Balance equation for computing the resistance is**
   a) $R_1 = {}^{R}{}_2 R_3 / R4$
   b) $R_1 = {}^{R}{}_2 / R4$
   c) $R_1 = {}^{R}{}_3 / R4$
   d) $R_1 = R_2 R_3$

Answer: a
Explanation: The balance equation for computing the resistance in an Anderson's bridge is given by the equation $R_1 = {}^{R}{}_2 R_3 / R_4$.
Where, R_2, R_3 and R_4 are the known non-inductive resistances.

6. **When the capacitor used is imperfect, the inductance value changes.**
   a) True
   b) False

Answer: b
Explanation: For an imperfect capacitor used in the Anderson bridge, the value of inductance remains unaffected. The value of R_1 changes

7. **Anderson's bridge is used for the measurement of capacitance.**
   a) True
   b) False

Answer: a
Explanation: When a calibrated self-inductance is available, the value of unknown capacitance can be computed by making use of an Anderson's bridge.

8. Anderson's bridge is used for the measurement of _____
a) capacitance
b) resistance
c) inductance
d) impedance

Answer: a
Explanation: Anderson's bridge is used for the measurement of capacitance. Unknown capacitance value can be measured accurately in terms of the self-inductance of one of the ratio arms of the bridge.

9. Anderson's bridge makes use of a variable capacitance.
a) True
b) False

Answer: b
Explanation: An Anderson's bridge makes use of a fixed capacitance value. Most of the other AC bridges used for the measurement of capacitance, inductance or impedance make use of a variable capacitance.

Cycle-2

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

Experiment No:7

Wien Bridge

Objective: To Measurement Of Frequency By Wien Bridge Using Oscilloscope

Theory:

AC measurement bridges are of paramount importance in measurements. Unknown impedances can be determined by AC bridges. Impedances are of complex nature and are composed of an active & reactive component. The reactive component of such impedance depends on frequency. So an AC bridge also allows to determine an unknown frequency if the reactance is known.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

Some bridges have balance equations which involve frequency directly even if the performance of individual bridge elements is independent of frequency. These bridges may be used for determination of frequency in terms of values of various bridge elements. The Wien's bridge is very important AC Bridge for determination of unknown audio frequency. The circuit diagram of this is given in figure (1)

At balance $(\frac{R_1}{1+j\omega C_1 R_1})R_4 = (R_2 - \frac{j}{\omega C_2})R_3$

or, $\frac{R_4}{R_3} = \frac{R_2}{R_1} + \frac{C_1}{C_2} + j(\omega C_1 R_2 - \frac{1}{\omega C_2 R1})$

Equating the real and imaginary parts,

or, $\frac{R_4}{R_3} = \frac{R_2}{R_1} + \frac{C_1}{C}$ ----------(i)

And $\omega C_1 R_2 - \frac{1}{\omega C_2 R_1} = 0$ from which $\omega = \frac{1}{\sqrt{R_1 R_2 C_1 C_2}}$

And frequency $f = \frac{1}{2\Pi\sqrt{R_1 R_2 C_1 C_2}} Hz.$ ----------(ii)

Attainment Of Balance:

In most Wien bridges, the components are so chosen that

(A) R1=R2=R

(B) C1=C2=C

& (C) R4=2R3

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.
7. **Course** : **Electrical and Electronics Measurement Lab** **L: 0**
8. **Program** : **B.Tech.** **T: 0**
9. **Target** : **60%** **P: 3**
C: 2

Then equation (i) reduces to: R4/R3=2

And equation (ii) reduces to f=1/2ΠRC

Circuit Diagram:

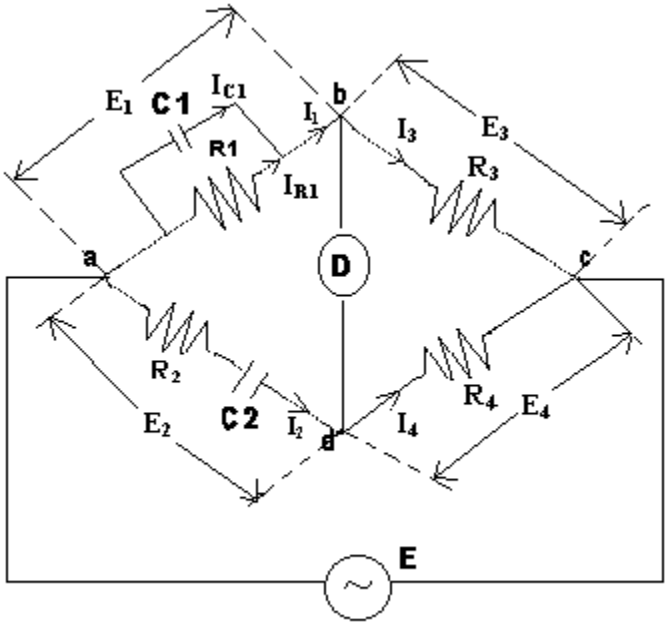


Fig.1 : Wien's Bridge

Apparatus: wien's Bridge Kit

Procedure:

1. Connect the wien's Bridge Kit by the help of path cords and other apparatus as decrypted in circuit Diagram.
2. Connect head null detector to the circuit of detection of the balanced condition of the bridge.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

3. Connect Oscilloscope to the circuit
3. Vary the resistance R and C and observe the null detector value.
4. Calculate the reading based on the value of frequency.

Observation Table : Applied Voltage (in Volt) =

SL. NO	Value of R (Variable)	Value of C (Variable)	Value of R3	Value of R4	Value of frequency	Mean frequency Value	% Error in frequency

Calculation:-
(Please write in your own)

Precaution:

1. Make sure that all connections are perfect.

2. The keys for variable resistance of the AC Bridge should be perfectly connected.

3. Stray capacitances are assumed to be negligible.

Field of Application:
wien's Bridge is used to measure unknown frequency.

Conclusion:

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course	**: Electrical and Electronics Measurement Lab**	**L: 0**
8. Program	**: B.Tech.**	**T: 0**
9. Target	**: 60%**	**P: 3**
		C: 2

(Please write in your own language whatever you have learnt by performing the experiment).

Viva-Voice Question:

1. **State the advantages of Wien's bridge.**

The advantage of wien's bridge is the balance equation is independent of frequency and therefore is more accurate.

2. State the disadvantage of Wien's bridge.

The disadvantage of wien's bridge is a standard variable capacitor. Variable capacitor is more costly.

3. State the use of Wien's bridge.

Wien bridge is used for the measurement of unknown frequency.

4. Why is the bridge of the Wien's bridge oscillator made slightly unbalanced?

When the bridge is balanced the input voltage to the amplifier becomes zero, so in order to produce the sustained oscillations input to the amplifier must be non-vanishing. Therefore the bridge is unbalanced by adjusting the proper values of the resistors.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

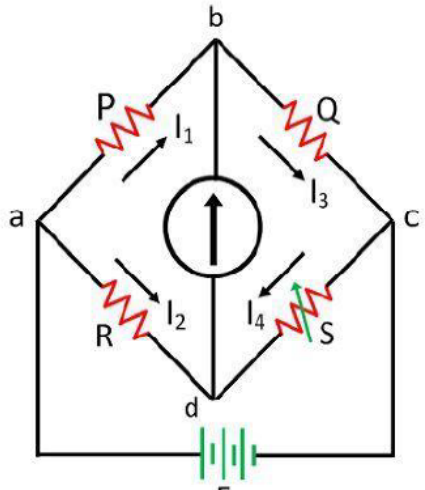
7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

Experiment No:8

Measurement of resistance using Wheatstone Bridge using MATLAB

Objective: To get the value of unknown resistor with the help of Wheatstone bridge.

Theory: For measuring accurately any electrical resistance Wheatstone bridge is widely used. There are two known resistors, one variable resistor and one unknown resistor connected in bridge form as shown below. By adjusting the variable resistor the current through the Galvanometer is made zero. When the current through the galvanometer becomes zero, the ratio of two known resistors is exactly equal to the ratio of adjusted value of variable resistance and the value of unknown resistance. In this way the value of unknown electrical resistance can easily be measured by using a Wheatstone bridge.



Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

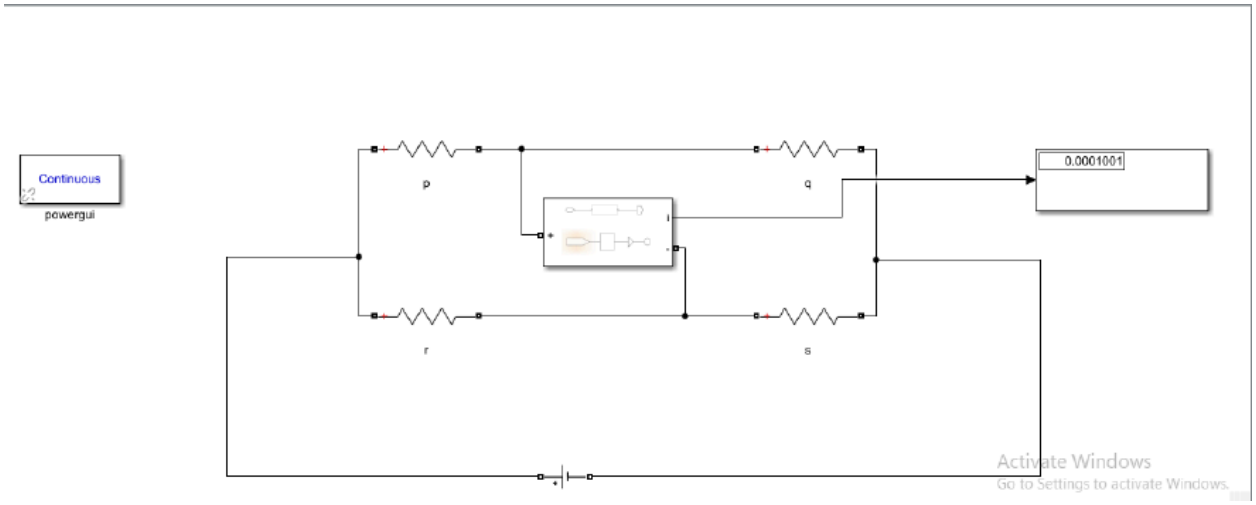
At balance,

R=(P*S)/Q

Where,
R = The unknown resistance
S = Standard side of the bridge
P and Q = The ratio of the sides of the bridge.
Circuit Diagram

Apparatus: MATLAB R2010a.

Circuit Diagram:



Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

Procedure:

I. Open the MATLAB software.

II. Click on *Simulink Library Browser.*

III. Draw the corresponding circuit.

IV. Give the appropriate values of all elements.

V. Observe the output.

Experimental Data:

SL No.	P (Ω)	Q (Ω)	R (Ω)	S (Ω)

Calculation:-
(Please write in your own)

Precaution:

As we are using software we do not need to take special precautions. But we have to make sure that every time we have to save the circuit values before running the circuit. And shutdown the computer after completing the experiment.

Field of Application:
Wheatstone bridge is used to measure unknown resistor.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course	**: Electrical and Electronics Measurement Lab**	**L: 0**
8. Program	**: B.Tech.**	**T: 0**
9. Target	**: 60%**	**P: 3**
		C: 2

Conclusion:
(Please write in your own language whatever you have learnt by performing the experiment).

Viva-Voice Question:

1. What is the purpose of Wheatstone bridge experiment?

This circuit is most commonly used to determine the value of an unknown resistance to an electrical current.

2. What is the working principle of Wheatstone bridge?

The Wheatstone bridge works on the principle of null deflection, i.e. the ratio of their resistances are equal and no current flows through the circuit. Under normal conditions, the bridge is in the unbalanced condition where current flows through the galvanometer

3. Why it is called Meter Bridge?

The reason why this bridge is called as Meter Bridge is because of the fact that it works on the Wheatstone bridge's principle. So, people also popularly call it as Wheatstone's meter bridge. Another thing is that the wire length used in this circuit is of 1 meter, so it has got its name as a meter bridge

4. What is a DC bridge?

DC bridges can be operated with only DC voltage signal. DC bridges are useful for measuring the value of unknown resistance, which is present in the bridge.

Experiment No:9

Measurement of resistance using Kelvin Double Bridge using MATLAB

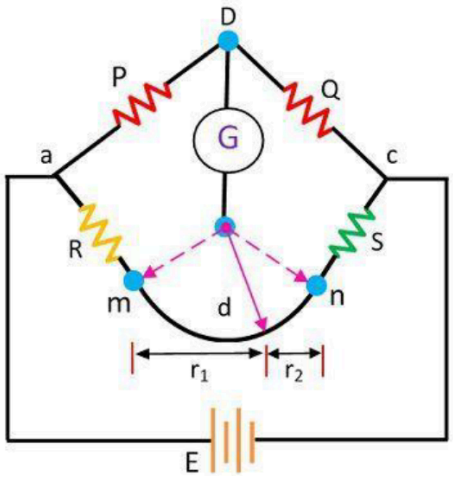
Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.
7. **Course** : **Electrical and Electronics Measurement Lab** **L: 0**
8. **Program** : **B.Tech.** **T: 0**
9. **Target** : **60%** **P: 3**
C: 2

Objective: To get the value of unknown resistor with the help of Kelvin Double Bridge.

Theory: The Kelvin Double Bridge circuit is a modification of Wheatstone bridge. An understanding of the Kelvin Bridge arrangement may PV be obtained by a study of difficulties that arise in a Wheatstone bridge on account of the resistance of the leads and the contact resistances while measuring low valued resistors.



Consider the bridge circuit shown in the figure where 'r' represents the resistance of the lead that connects the unknown resistance 'R' to standard resistance 'S'.Two galvanometer connections indicated by dotted lines are possible. The connection may be either to point 'm' or to point 'n'.When the galvanometer is connected to point 'm', the resistance 'r',of the connecting leads is added to the standard resistance 'S' resulting in indication of too low an induction for unknown resistance R.When the connection is made to point 'n', the resistance 'r', is added to the unknown resistance resulting in indication of too high a value for R.
Suppose that instead of using point 'm' , which gives a low result or 'n',which makes the result high,we make the galvanometer connection to any intermediate point 'd as shown by full line in below figure. If a point 'd' the resistance 'r' is divided into two parts r1 and r2, such that ,

$$\frac{r_1}{r_2} = \frac{P}{Q}$$

Then the presence of r1, the resistance of connecting leads, causes no error in the result. We have,

$$R + r_1 = \frac{P}{Q}(s + r_2)$$

$$but \quad \frac{r_1}{r_2} = \frac{P}{Q}$$

$$or \quad \frac{r_1}{r_1 + r_2} = \frac{P}{P+Q}$$

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.
7. **Course** : **Electrical and Electronics Measurement Lab** **L: 0**
8. **Program** : **B.Tech.** **T: 0**
9. **Target** : **60%** **P: 3**
C: 2

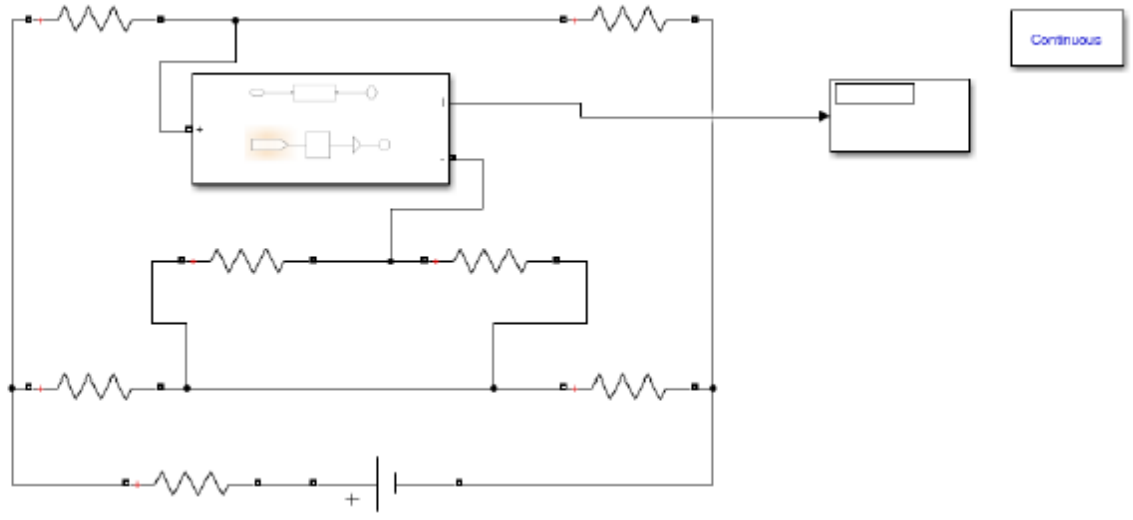
$$or \qquad r_1 = \frac{P}{P+Q} r$$

$$as\ r_1 + r_2 = r\ and\ r_2 = \frac{Q}{P+Q} r$$

$$or \qquad R = \frac{P}{Q} S$$

Apparatus: MATLAB R2010a.

Circuit Diagram:



Procedure:

Year: 2020-2021
Semester: 3rd

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6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

i. Open the MATLAB software.

ii. Click on *Simulink Library Browser.*

iii. Draw the corresponding circuit.

iv. Give the appropriate values of all elements.

v. Observe the output.

Experimental Data:

SL No.	P (Ω)	Q (Ω)	R (Ω)	S (Ω)

Calculation:-
(Please write in your own)

Precaution:

As we are using software we do not need to take special precautions. But we have to make sure that every time we have to save the circuit values before running the circuit. And shutdown the computer after completing the experiment.

Field of Application:
Wheatstone bridge is used to measure unknown resistor.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

Conclusion:
(Please write in your own language whatever you have learnt by performing the experiment).

Viva-Voice Question:

1. **Kelvin's bridge consists of _____**
   a) double bridge
   b) single bridge
   c) half bridge
   d) three fourth bridge

Answer: a
Explanation: Kelvin's bridge consists of two additional arms compared to a Wheatstone bridge. Hence it is also known as a double bridge.

2. **The range of resistance measured in a Kelvin bridge is _____**
   a) 10Ω to 10 mΩ
   b) 1Ω to 10 μΩ
   c) 0.01Ω to 10 MΩ
   d) 0.1Ω to 10 nΩ

Answer: b
Explanation: Kelvin bridge is used for the measurement of low resistances. Low resistances vary in the range of 1Ω to 10 μΩ

3. **Accuracy of Kelvin bridge is of the order of _____**
   a) ±0.5 to ±2 %
   b) ±0.05 to ±0.02 %
   c) ±0.05 to ±0.2 %
   d) ±0.005 to ±0.02 %

Answer: c
Explanation: As Kelvin bridge is used for the measurement of low resistance values, the accuracy of measurement of low resistances in a Kelvin bridge is of the order of ±0.05 to ±0.2 %.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.
7. **Course** : **Electrical and Electronics Measurement Lab** **L: 0**
8. **Program** : **B.Tech.** **T: 0**
9. **Target** : **60%** **P: 3**
C: 2

4. The balance equation of Kelvin bridge is

a) $R_x = \frac{R_2 R_3}{R_1}$

b) $R_x = \frac{R_1 R_2}{R_3}$

c) $R_x = \frac{R_1}{R_2}$

d) $R_x = \frac{R_1 R_3}{R_2}$

Answer: d
Explanation: The balance equation in a Kelvin bridge is given by the relation $R_x = {}^{R}{}_1 R_3 \diagup_{R2}$.
where,
R_1, R_2, R_3, and R_x form the ratio arms
Rx is the value of the unknown resistance.

5. What is the effect of load and contact resistance in Kelvin bridge?
a) independent
b) fully dependent
c) partially dependent
d) depends on the resistance value

Answer: a
Explanation: Effect of contact and lead resistances are completely eliminated in a Kelvin bridge as they don't appear in the balance equation. Hence the Kelvin bridge is independent of the load and contact resistances.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

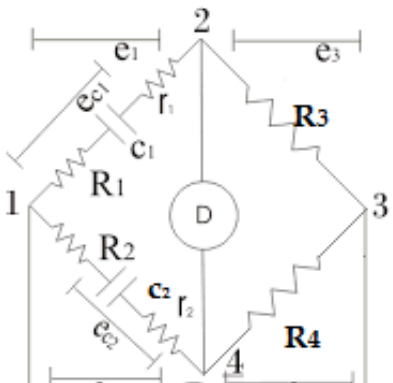
7.	Course	: Electrical and Electronics Measurement Lab	L: 0
8.	Program	: B.Tech.	T: 0
9.	Target	: 60%	P: 3
			C: 2

Experiment No:10

Simulation of Modified De Sauty's Bridge

Objective: To measure unknown value of capacitance using Modified De Sauty's bridge by MATLAB

Theory:



Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

where, $C1$ is the capacitor whose capacitance is to be measured,
$R1$ is the resistance connected in series with unknown capacitor,
$C2$ is a standard capacitor,
$R2$ is the resistance connected in series with standard capacitor,
$r1$ and $r2$ are the resistances representing loss components of two capacitors $C1$ and $C2$ respectively,
$R3$ and $R4$ are non-inductive resistors.
At balanced condition,

$$\left(R_1 + r_1 + \frac{1}{j\omega C_1}\right) R_4 = \left(R_2 + r_2 + \frac{1}{j\omega C_2}\right) R_3$$

From which we have,

$$\frac{C_1}{C_2} = \frac{R_2 + r_2}{R_1 + r_1} = \frac{R_4}{R_3}$$

In Modified De Sauty's bridge the balance may be obtained by varying the resistances $R1$, $R2$, $R3$ and $R4$. But this method does not give accurate result for dissipation factor, because its value depends on difference of quantities (R1R4)/R3and $R2$.

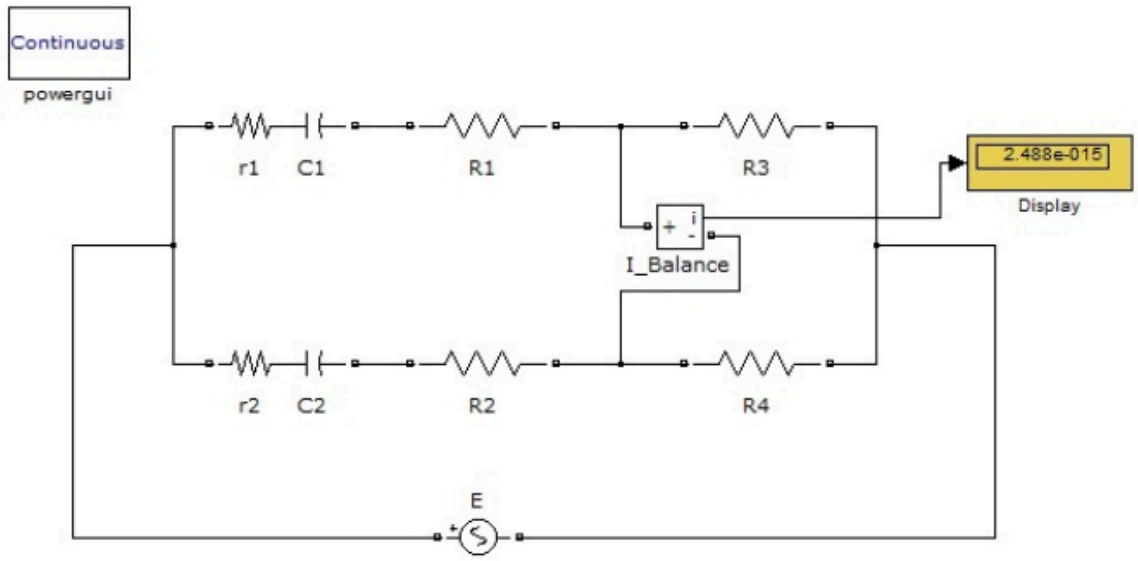
Software Used: MATLAB R2010a.
Circuit Diagram:

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2



Procedures:
Step 1: Open the MATLAB window.
Step 2: Click on *Simulink Library Browser*.
Step 3: Click on *New Model*.
Step 4: Click on *SimPowerSystems* in library browser.

Step 5: Click on *Electrical Sources* to get *AC Voltage Source*.
Step 6: Click on *Elements* to get *Series RLC Branch*. Double click on *Series RLC Branch* and Modify to have a practical capacitor that means a capacitor in series with a resistance representing its loss component. Assume the value of capacitor *C*1 is not known.
Step 7: Follow **Step 6**, to get another capacitor *C*2 in series with a resistance representing its loss component. The value of capacitor *C*2 is known and assumes it as 2 F. After giving the new value of capacitance in proper place, click on Apply and OK.
Step 8: Follow **Step 6**, to get a resistor *R*1 . Assume the value of *R*1 as 2 k.
Step 9: Follow **Step 6**, to get a resistor *R*2 . Assume the value of *R*2 as 1 k
Step 10: Follow **Step 6**, to get two standard resistors *R*3 and *R*4 . Initially assume the values of *R*3 and *R*4 as 1 k and 200 respectively.
Step 11: Click on *Measurements* to get *Current Measurements*, i.e., to have an ammeter. We can connect this ammeter as balance detecting device of the bridge.

Step 12: Click on *Simulink*, and then on *Sinks*, to get a *Display*.
Step 13: Finally click on *Simulink* and drag the *Powergui* block to New Model for successful

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

run.

Experimental Data:-

Sl. No.	C2	r 2	R3	R4	C1

Calculation:-
(Please write in your own)

Precaution:

As we are using software we do not need to take special precautions. But we have to make sure that every time we have to save the circuit values before running the circuit. And shutdown the computer after completing the experiment.

Field of Application:
De Sauty Bridge is a very simple type of AC Bridge used to measure capacitance.

Conclusion:
(Please write in your own language whatever you have learnt by performing the experiment).

Viva-Voice Question:

1. What are the advantages and disadvantages of de sauty's bridge?

The simplicity of the bridge (advantage) is offset by the disadvantage that its almost impossible to obtain balance if capacitors are not free from dielectric losses.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

Experiment No:11

Measurement of power in a three-phase circuit using two wattmeter method

Objective:

To measure the total power consumed in a balanced three phase star or delta connected load by using two wattmeter's and calculate power factor.

Theory:

Wattmeter consists of two coils a low resistance current coil which is connected in series with the line carrying the current and a high resistance potential coil which is connected across the two points whose potential difference is to be measured. Thus, a wattmeter shows a reading which is propoprtional to the product of the current through its current coil, the potential drop across its voltage coil and the cosine of the angle between this voltage and the current.

In order to measure the power consumed in a three phase ac circuit (**whether star or delta**) by two wattmeters, the current coils of the wattmeters are inserted in series in any of the two lines and the potential coils are shorted and connected to the third line.

Star connection

Let the phase voltages be $V_1=V_2=V_3=V_P$, the line-to-line voltage be V_L, phase currents be I_P and line currents be I_L. For a star connection, the phase and line voltages are realated as

$$V_L = \sqrt{3}V_P \qquad (1)$$

and the phase and line currents are related as

$$I_L = I_P \qquad (2)$$

If the power factor of the load is cos θ, then, the power measured by wattmeter W_1 is $I_L V_L \cos(30^o-\theta)$. Similarly, the power measured by wattmeter W_2 is $I_L V_L \cos(30^o+\theta)$. Adding the two readings,

$$W_1 + W_2 = \sqrt{3} V_L I_L \cos\theta \qquad (3)$$

Similarly,

$$W_1 - W_2 = V_L I_L \sin\theta \qquad (4)$$

Therefore,

$$\tan\theta = \sqrt{3}\frac{(W_1 - W_2)}{W_1 + W_2} \qquad (5)$$

or,

$$\cos\theta = \cos\left(\tan^{-1}\sqrt{3}\frac{W_1 - W_2}{W_1 + W_2}\right) \qquad (6)$$

Delta Connection

Let the phase voltages be $V_1=V_2=V_3=V_P$, the line-to-line voltage be V_L, phase currents be I_P and line currents be I_L. For a delta connection, the phase and line voltages are realated as

$$V_L = V_P \qquad (7)$$

and the phase and line currents are related as

$$I_L = \sqrt{3} I_P \qquad (8)$$

If the power factor of the load is cos θ, then, the power measured by wattmeter W_1 is $I_L V_L \cos(30^o-\theta)$. Similarly, the power measured by wattmeter W_2 is $I_L V_L \cos(30^o+\theta)$. Adding the two readings,

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

$$W_1 + W_2 = \sqrt{3} V_L I_L \cos\theta \quad (9)$$

Similarly,

$$W_1 - W_2 = V_L I_L \sin\theta \quad (10)$$

Therefore,
$$\tan\theta = \sqrt{3}\frac{(W_1 - W_2)}{W_1 + W_2} \quad (11)$$

or,
$$\cos\theta = \cos\left(\tan^{-1}\sqrt{3}\frac{W_1 - W_2}{W_1 + W_2}\right) \quad (12)$$

Instrument Required:

Sl. No.	Instruments Required	Qty	Type	Range	Make
1	Voltmeter				
2	Ammeter				
3	Variac				
4	Load (Rheostat)				

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

Circuit Diagram:

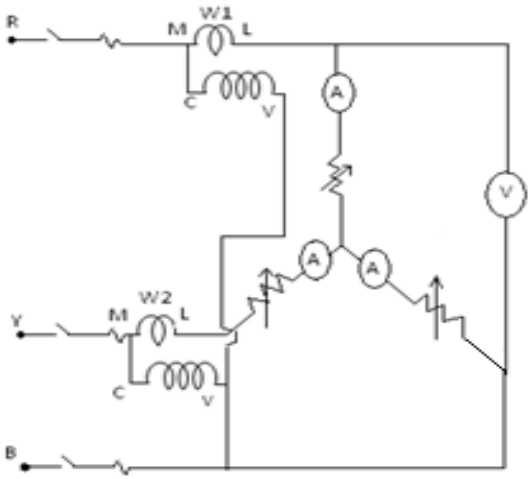


Fig. 1 Star connected

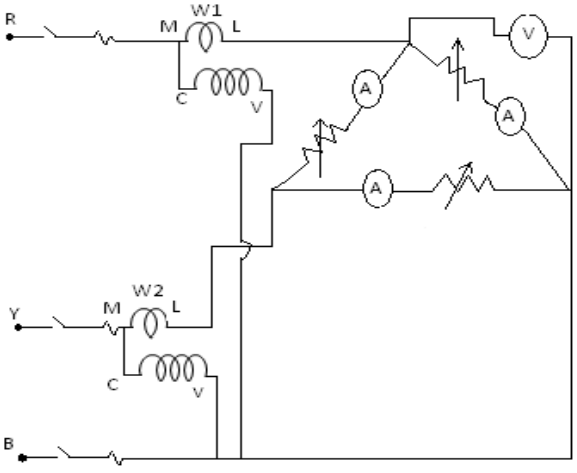


Fig. 2 Delta connected

Procedure:

1. Connections are made as shown in the circuit diagram (Fig.1 or Fig. 2).
2. Supply is switched on and the variac is gradually increased to a fixed value.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

3. Load is adjusted till all the ammeters show the same readings approximately.
4. Voltmeter, ammeter and wattmeter readings are noted down.
5. Above steps are again repeated with different values of variac voltage or different values of load current.
6. Variac is brought to zero and switched off the supply.

Observation Table:

For **Star** and **Delta** connected load

Sl. No.	V_{RY} (V_L)	I_R (I_L)	I_Y (I_L)	I_B (I_L)	P_1 (W_1)	P_2 (W_2)	Total Power $P_1+P_2=$ $W_1 + W_2$
1							
2							
3							

Calculation:
(Please write in your own)

Precautions:
The following precaution should be taken while performing the experiment.
1. All the connection should be tightened and made as per given ckt diagram.
2. All the meters should be in proper range.
3. Before connecting the meter in the circuit checks their zero setting.

Field of Application:

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

Calibration is the process of configuring an instrument to provide a result for a sample within an acceptable range. Eliminating or minimizing factors that cause inaccurate measurements is a fundamental aspect of instrumentation design

Conclusion:
(Please write in your own language whatever you have learnt by performing the experiment).

Viva-Voice Question:

1. **What are the methods to measure power in a three phase circuit?**

In ac circuits power is measured with the help of wattmeter

Methods are-

- One wattmeter method.
- Two wattmeter method.
- Three wattmeter method.

2. **Why is it important to measure the three phase power using only two wattmeters?**

Uses. The two wattmeter method is used in determining total power derived from the three phase load which is always constant, regardless of variations in phase power as well as angular displacement. Thus, the power output from a three-phase motor is also constant based on the findings using the said measurement.

3. **What is the difference between 1 phase and 3 phase power?**

Single phase requires the single wire to connect the circuit whereas; 3-phase needs 3-wires. The voltage of the single phase is 230V, whereas three phase voltage is 415V. ... The loss in single phase is maximum whereas in three phase is minimum. The single-phase efficiency is less whereas in three phase is high.

4. **Which of the following is methods is the commonest method of measuring three balanced or unbalanced power?**

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course	**: Electrical and Electronics Measurement Lab**	**L: 0**
8. Program	**: B.Tech.**	**T: 0**
9. Target	**: 60%**	**P: 3**
		C: 2

a)One wattmeter method
b)Two wattmeter method
c)Three wattmeter method
d)Ammeter method
Answer: b

5. One-Wattmeter method is used to measure
a) The power when load is balance in three phase circuit
b) The power when load is unbalanced in three phase circuit
c) (a) or (b)
d) Single phase power with balanced load

Answer: a

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

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7. Course	**: Electrical and Electronics Measurement Lab**	**L: 0**
8. Program	**: B.Tech.**	**T: 0**
9. Target	**: 60%**	**P: 3**
		C: 2

Experiment No:12

Calibration Of A C Energy Meter

Objective: To calibrate a test ammeter with a standard ammeter.

Theory :

Energy is the total power delivered or consumed over a time interval, that is

Energy = Power X Time

Electrical energy developed as work or dissipated as heat may be expressed .

If V is expressed in Volts , I in Amperes and T in seconds the unit of energy is joule or watt second which is 1 watt over an interval of kilowatt-hour or KWh i.e. Energy consumed when power is delivered at an average rate of 1000 watts for one hour.

The energy consumed is measured by induction type watt hour meter. Normally commercial meters are having register with four digit for units (KWh) and one digit for 0.1 unit.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course	**: Electrical and Electronics Measurement Lab**	**L: 0**
8. Program	**: B.Tech.**	**T: 0**
9. Target	**: 60%**	**P: 3**
		C: 2

A C meters are tested for calibration for the following conditions,

1 At 5% of marked current with unit power factor

2 At 100 % of marked current with unit power factor

3 At intermediate loads with unit power factor.

4 At marked current and 0.5 lagging power factor.

With our present setup we shall test the calibration for first three conditions.

We may compute the power at unit power factor as W = V I , where V is the supply voltage , and I is the operating current.

So for a set current and voltage we may get the power from the ammeter and voltmeter reading.

On the other hand energy consumed may be seen from the register of the meter. But as the unit is KWh the meter is to put for a long run to get a precise reading. A short time measurement procedure is to count the no of revolution of the disc of the meter for a predetermined time interval and convert it to energy consumed if "no of rev. per unit" of the meter is known.

Energy may be calculated by the following formula,

$$E = \frac{R \times 3600}{T \times K}$$

Where E = Energy consumed in Kwh

R = No. of revolution

T = Time interval in seconds

K = No. of rev. per unit.

Energy consumed by Ammeter and Voltmeter

$$E = \frac{V \times I}{1000}$$

Where W = Power of the circuit in Kw

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

V = Supply voltage in volts

I = Supply current in Amps.

If considered for a operation of one Hour,

E = W Where E = Energy consumed in Kwh

W = Power in Kw

$$\text{Error in \%} = \frac{(E_1 - E_2)\times 100}{E_1}$$

Where E1 = Energy computed from volt and amps reading

E2 = Energy calculated from energy meter.

Device under test:

Sl. no	Name of device	Quantity	Type	Rating	Maker name

Equipments/instruments required:

Sl. no	Name of device	Quantity	Type	Rating	Maker name
1					

Year: 2020-2021
Semester: 3rd

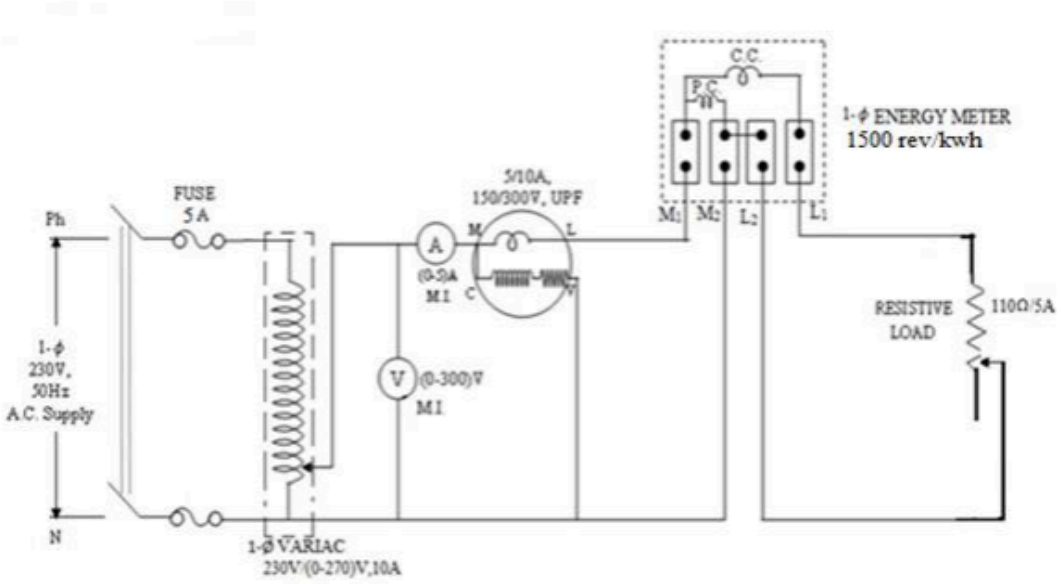
Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. **Course** : **Electrical and Electronics Measurement Lab** **L: 0**
8. **Program** : **B.Tech.** **T: 0**
9. **Target** : **60%** **P: 3**
C: 2

2					
3					
4					

Circuit Diagram:



Procedures:

i. The circuit is connected as shown in the circuit diagram.
ii. The load is connected by setting the switch on.
iii. The supply voltage is varied with help of variac and ten sets of observations are noted
iv. covering the entire range of various meters. The reading of ammeters is noted for no load condition.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

Observations table:

Voltage is fixed to 200 V

Ammeter	Voltmeter	Time set in seconds	No. of Revolutions	E_1 according to E meter	E_2 V I cos ϕ	Error in %	Average error in %

Calculation:
(Please write in your own)

Precaution:

1. As the circuit is operating from 230 V AC mains. Be carefully about shock Hazards.
2. Ensure connections are perfect before switching on, wrong connections may damage the equipments.
3. Turn both the variacs (Specially current variac) to zero position before starting and end of the experiment.
4. Do not exceed the specification voltage and current limit, Exceeding the limit may damage the meters. Recommended maximum limits are,
Voltage = 250 Volts,
Current =10 Amps.

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course	**: Electrical and Electronics Measurement Lab**	**L: 0**
8. Program	**: B.Tech.**	**T: 0**
9. Target	**: 60%**	**P: 3**
		C: 2

Conclusion:
(Please write in your own language whatever you have learnt by performing the experiment).

Field of Application:

Calibration is the process of configuring an instrument to provide a result for a sample within an acceptable range. Eliminating or minimizing factors that cause inaccurate measurements is a fundamental aspect of instrumentation design

Viva- Voice:

1. What are the types of energy meter?
Electrolytic meters
Motor meters.
Clock meters

2. Name the constructional parts of induction type energy meter.
Current coil with series magnet
Voltage coil with shunt magnet
Al disc
Braking magnet
Registering mechanism.

3. How voltage coil is connected in induction type energy meter.
It is connected in parallel to supply and load.

4. How current coil is connected in induction type energy meter.
It is connected in series to the load.

5. What metal is used in Al disc in induction type energy meter
Aluminum

6. What is creeping in energy meters?

A slow but continuous rotation of the energy meter disc even when there is no current flowing through the current coil but only the pressure coil is energized is called creeping. Some of the factors that cause creeping are excessive voltage across the pressure coil, vibrations and external magnetic fields.

Year: 2020-2021
Semester: 3rd

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9. Target : 60% **P: 3**

C: 2

7.How it is prevented?

Creeping can be prevented by drilling two diametrically opposite holes in the disc which makes the disc comes to rest with one of the holes under the edge of a pole of the shunt magnet.

8. Which torque is absent in energy meter?

The controlling torque is absent in energy meter. As the disc of energy meter has to rotate continously and there is no need to reset its position any time,the controlling torque is not required.

Continuous Evaluation Sheet

Roll Number	Registration Number	Name of the Student	Continuous Assessment*								
			Cycle I (25)					Cycle II (25)			
			Ex 1	Ex 2	Ex 3	Ex 4	Ex 5	Ex 6	Ex 7	etc	Total (50)
UG/02/BTEE/2020/001	AU/2020/0004481	Saptarshi Bhattacharjee									
UG/02/BTEE/2020/002	AU/2020/0004560	Arkajyoti Das									

***Depends on Number of Experiments Divide the Total Marks and Prepare Rubrics for Evaluating Experiments**

Signature of HOD/Dean **Signature of Faculty**

Date: **Date:**

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

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9. Target : 60% **P: 3**

C: 2

Planning for Remedial Classes

Sl. No.	Name of Student	Roll No.	Reg. No.	Mid Sem Marks	Remedial Classes Held							Retest on the basis of Remedial Classes	End Sem Marks	Improvement (Y/N)
					Date									
					Venue									
					Time									
1.	Saptarshi Bhattacharjee	UG/02/BTE/20200/001	AU/20200/000481											
2.	Arkajyoti Das	UG/02/BTE/202	AU/20200/00004											

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

		0/0 02	56 0										

Signature of HOD/ Dean **Signature of Faculty**

Date: **Date:**

Evaluation Sheet (End Semester)

Roll Number	Registration Number	Name of the Student	Marks (50)
UG/02/BTEE/2020/001	AU/2020/0004481	Saptarshi Bhattacharjee	
UG/02/BTEE/2020/002	AU/2020/0004560	Arkajyoti Das	

Signature of HOD/Dean **Signature of Faculty**

Date: **Date:**

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

Planning for Remedial Classes – End Semester

Sl. No.	Name of Student	Roll No.	Reg. No.	End Sem Marks	Remedial Classes Held							Retest on the basis of Remedial Classes	Supple Exam Marks	Improvement (Y/N)
					Date									
					Venue									
					Time									
1.	Saptarshi Bhattacharjee	UG/02/BTE/20200/00101	AU/2020/00048481											
2.	Arkajyoti Das	UG/02/BTE/202	AU/2020/00004											

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

		0/002	560										

Signature of HOD/ Dean **Signature of Faculty**

Date **Date**

Consolidated Mark Statement

Roll Number	Registration Number	Name of the Student	Marks			
			Continuous Assessment (50)		End Semester (50)	Total (100)
			Cycle I (25)	Cycle II (25)		
UG/02/BTEE/2020/001	AU/2020/0004481	Saptarshi Bhattacharjee				
UG/02/BTEE/2020/002	AU/2020/0004560	Arkajyoti Das				

Signature of Dean/HOD **Signature of Faculty**

Date: **Date:**

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

COURSE END SURVEY

INDIRECT ASSESSMENT

Sample format for Indirect Assessment of Course outcomes:

NAME:
ENROLLMENT NO:
REG. No.:
COURSE:
PROGRAM:

Please rate the following aspects of course outcomes of

Use the scale 1-3*

Course Outcomes	Statement	1	2	3
CO1				
CO2				
CO3				
CO4				

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7. Course : Electrical and Electronics Measurement Lab **L: 0**

8. Program : B.Tech. **T: 0**

9. Target : 60% **P: 3**

C: 2

CO5				

* 1 WEAK 2 MODERATE 3 STRONG

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.
7. **Course** : **Electrical and Electronics Measurement Lab** **L: 0**
8. **Program** : **B.Tech.** **T: 0**
9. **Target** : **60%** **P: 3**
C: 2

INDIRECT ASSESSMENT CONSOLIDATION

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF
DEPARTMENT OF
CO Indirect Assessment

Programme: **Academic Year:2020-21** **Batch: 2020-21**

Course Code & Name: **EEE42203 & Electrical and Electronics Measurement Lab**

Course Outcome	Students Feed Back	Attainment
CO1		
CO2		
CO3		
CO4		
CO5		

Signature of HOD/Dean
Date:

Signature of Faculty
Date:

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.
7. Course : Electrical and Electronics Measurement Lab L: 0
8. Program : B.Tech. T: 0
9. Target : 60% P: 3
C: 2

CO ATTAINMENT – GAP ANALYSIS & REMEDIAL MEASURES

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF
DEPARTMENT OF
CO ATTAINMENT - GAP ANALYSIS & REMEDIAL MEASURES

Batch :	2020-21		Academic Year: 2020-21
Course Code & Name		Name of the Coordinator	Year & Semester
EEE42203 & Electrical and Electronics Measurement Lab		Ms. Sunam Saha	2nd & 3rd

CO	Direct Assessment	Indirect Assessment	CO Attainment	Target	CO Attainment Gaps	Action for Bridge the Gap	Target Modification
CO1							
CO2							
CO3							
CO4							
CO5							

Signature of HOD/Dean **Signature of Faculty**

Date: **Date:**

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.
7. Course : Electrical and Electronics Measurement Lab L: 0
8. Program : B.Tech. T: 0
9. Target : 60% P: 3
C: 2

CO-PO ATTAINMENT

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF
DEPARTMENT OF
CO-PO ATTAINMENT

Programme :	B.Tech	Year & Sem:	2nd year & 3rd Sem	Academic Year:	2020-21
Batch:2020-21					

Course Code	Course Name	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
EEE442203	Electrical and Electronics Measurement Lab	Relationship															
		Mapping Value															
		Attainment															

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

Signature of HOD/Dean **Signature of Faculty**

Date: **Date:**

PO ATTAINMENT OF THE COURSE

Signature of HOD/Dean **Signature of Faculty**

Date: **Date:**

Year: 2020-2021
Semester: 3rd

Name of the Faculty: Ms. Sunam Saha **Course Code: EEE42203**

6.

7.	**Course**	**: Electrical and Electronics Measurement Lab**	**L: 0**
8.	**Program**	**: B.Tech.**	**T: 0**
9.	**Target**	**: 60%**	**P: 3**
			C: 2

INSTRUCTIONS FOR FACULTY

Instructions for Faculty

- Faculty should keep track of the students with low attendance and counsel them regularly.
- Course coordinator will arrange to communicate the short attendance (as per University policy) cases to the students and their parents monthly.
- Experiment covered in each lab should be recorded in the table of RECORD OF CLASS TEACHING (Suggested Format).
- Internal assessment marks should be communicated to the students twice in a semester.
- The file will be audited by respective Academic Monitoring and Review Committee (AMRC) members for theory as well as for lab as per AMRC schedule.
- The faculty is required to maintain these files for a period of at least three years.
- This register should be handed over to the head of department, whenever the faculty member goes on long leave or leaves the Colleges/University.
- For labs, continuous evaluation format (break-up given in the guidelines for result preparation in the same file) should be followed.
- Department should monitor the actual execution of the components of continuous lab evaluation regularly.
- Instructor should maintain record of experiments conducted by the students in the lab weekly.
- Instructor should promote students for self-study and to make concept diary, due weightage in the internal should be given under faculty assessment for the same.
- Course outcome assessment: To assess the fulfilment of course outcomes two different approaches have been decided. Degree of fulfillment of course outcomes will be assessed in different ways through direct assessment and indirect assessment. In Direct Assessment, it is measured through quizzes, tests, assignment, Mid-term and/or End-term examinations. It is suggested that each examination is designed in such a way that it can address one or two outcomes (depending upon the course completion). Indirect assessment is done through the student survey which needs to be designed by the faculty (sample format is given below) and it shall be conducted towards the end of course completion. The evaluation of the achievement of the Course Outcomes shall be done by analyzing the inputs received through Direct and Indirect Assessments and then corrective actions suggested for further improvement.
- **Submission Targets of Course Contents:**
  - **S. No. 1 to 7 : Before Starting the Course**
  - **S. No. 8 : After Mid Semester Examination**
  - **S. No. 9 to 12 : Immediately After End Semester Examination**
  - **S. No. 13 to 17 : After Declaration of Result of the Course**
-