



# SASURIE COLLEGE OF ENGINEERING

Approved by AICTE, New Delhi. Affiliated to Anna University, Chennai

Near NH544, Coimbatore Bypass, Near Vijayamangalam Tollgate, Tirupur 638056

## NAAC DOCUMENTS

### QUALITY INDICATOR FRAME WORK

#### CRITERION - 1

#### CURRICULAR ASPECTS

SUBMITTED BY

# IQAC

INTERNAL QUALITY ASSURANCE CELL

## SASURIE COLLEGE OF ENGINEERING



Criterion 1	Curricular Aspects	100
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### 1.1 Curricular Planning and Implementation (20)

1.1.1 The Institution ensures effective curriculum planning and delivery through a well-planned and documented process including Academic calendar and conduct of continuous internal Assessment

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9	Corrective Action Report
10	Quality Objective Monitoring Record
11	Internal question paper
12	Internal assessment Test Answer book
13	Assignment Question Paper
14	Assignment Answer Sheet

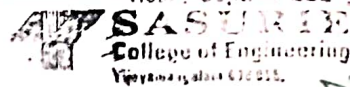


Department : Electrical and Electronics Engineering  
Subject Code & Name : EE8701- HIGH VOLTAGE ENGINEERING  
Class & Batch : IV & 2019-2023  
Semester : VII (ODD)

**CONTENTS - COURSE FILE**

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10	Internal test mark sheet(Consolidated)	
11	Internal test question paper	
12	Model question paper	
13	Sample Answer paper for all test(Min-3)	
14	Content beyond the syllabus	
15	Tutorial Class - schedule and content	Soft copy
16	Assignment - schedule and paper	
17	PPT - handout	Soft copy
18	Video - Animation - Soft copy	Soft copy
19	Question bank	Soft copy
20	Sample university question papers(min 5 QP-recent exam)	Soft copy
21	Personal Log book - Updated	
22	Lecture Note	Soft copy
23	Special Class if any, Approval letter, Schedule, content covered.	Soft copy

	Prepared By	Approved By
Sign:		
Name:	Mr.P.Sudatsan	Mr.P.Sudarjan
	Faculty	HOD Head, Dept. of EEE



**Dr.M.VIJAYAKUMAR ME., Ph.D.,**  
PRINCIPAL  
SASURIE COLLEGE OF ENGINEERING,  
Vijayamangalam - 638 056, Tirupur (Dt).



INDIVIDUAL TIME TABLE


Depa **Electronics Engineering**

w.e.f : 10.08.2022

Name of the faculty : **Mr.P.SUDARSAN -ASP/EEE**

HOOR	I	II		III	IV		V	VI		VII	VIII
DAY/ TIME	09.30a.m TO 10.15 a.m.	10.15a.m. TO 11.00a.m.	11.00a.m TO 11.10 a.m	11.10 a.m. TO 11.55 a.m.	11.55 a.m. TO 12.40p.m.	12.40 p.m. TO 1.20 p.m.	1.20 p.m. TO 2.00p.m.	2.00 p.m. TO 2.40p.m.	2.40 p.m. TO 2.50p.m.	2.50 p.m. TO 3.35 p.m.	3.35 p.m. TO 4.20 p.m.
MONDAY			BREAK			LUNCH			BREAK		
TUESDAY											
WEDNESDAY	HVE										
THURSDAY							HVE				
FRIDAY					HVE						
SATURDAY	HVE										

S.No.	Subject Code	Name of the Subject	Class	No. of
1	EE8701	High Voltage Engineering	IV EEE	6
Sign:	<i>S. Sowmiya</i>	<i>P. Sudarsan</i>	<i>Dr. E. Nandakumar</i>	
Name:	Ms.S.SOWMIYA	Mr.P.SUDARSAN	Dr.E.NANDAKUMAR	
	FACULTY	HOD	Principal	

Head, Dept. of EEE  

**SASURIE**  
 College of Engineering  
 Vijayamangalam-638 056.

*Me*  
**Dr.M.VIJAYAKUMAR ME., Ph.D.,**  
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**SASURIE**  
College of Engineering  
Vijayamangalam, Tirupur

Academic Year 2022 - 2023 ODD Semester

**STUDENTS NAME LIST**

Department: IV EEE

Sl. No	Register Number	Student's Name	H/D
1	732419105001	AJITHKUMAR.S	D
2	732419105002	DINESH.M	D
3	732419105004	NAVEEN KUMAR. A	D
4	732419105005	PRAVEENKUMAR.M	D

  
Head. Dept. of EEE  
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**Dr.M.VIJAYAKUMAR** ME., Ph.D.,  
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Vijayamangalam - 638 056, Tirupur (Dt).

### SUBJECT INFORMATION RECORD

Department : Electrical and Electronics Engineering

Subject : EE8701- HIGH VOLTAGE ENGINEERING

Year : IV

Semester : VII

Last year handled by :

Percentage of Result (last year) :

Quality Objectives : To impart knowledge on the following Topics

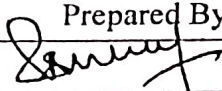
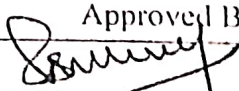
- ❖ Ability to understand Transients in power system, Generation and measurement of high voltage, High voltage testing & various types of over voltages in power system.
- ❖ Ability to measure over voltages.
- ❖ Ability to test power apparatus and insulation coordination
- ❖ *Make the Students; understand all Topics in this Subject and to get Good marks in the university Examination.*
- ❖ *In this subject, I produce more than 85% of the Results in University Examination.*

#### TEXT BOOKS:

1. S.Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, Fifth Edition, 2013.
2. E. Kuffel and W.S. Zaengl, J.Kuffel, 'High voltage Engineering fundamentals', Newnes Second Edition Elsevier, New Delhi, 2005.
3. C.L. Wadhwa, 'High voltage Engineering', New Age International Publishers, Third Edition, 2010.

#### REFERENCES

1. L.L. Alston, 'High Voltage Technology', Oxford University Press, First Indian Edition, 2011
2. Mazen Abdel – Salam, Hussein Anis, Ahdab A-Morshedy, Roshday Radwan, High Voltage Engineering – Theory & Practice, Second Edition Marcel Dekker, Inc., 2010.
3. Subir Ray, 'An Introduction to High Voltage Engineering' PHI Learning Private Limited, New Delhi, Second Edition, 2013.

	Prepared By	Approved By
Sign:		
Name:	Mr.P.Sudarsan	Mr.P.Sudarsan
	Faculty	HOD
		Head, Dept. of EEE
		<b>SASURIE</b> DR. VIJAYAKUMAR ME., Ph.D., College of Engineering PRINCIPAL Vijayamangalam - 638 056, Tiruppur (Dt).

**OBJECTIVES:**

To impart knowledge on the following Topics

- Various types of over voltages in power system and protection methods.
- Generation of over voltages in laboratories.
- Measurement of over voltages.
- Nature of Breakdown mechanism in solid, liquid and gaseous dielectrics.
- Testing of power apparatus and insulation coordination

**UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS** 9

Causes of over voltages and its effects on power system - Lightning, switching surges and temporary over voltages, Corona and its effects - Bewley lattice diagram- Protection against over voltages.

**UNIT II DIELECTRIC BREAKDOWN** 9

Properties of Dielectric materials - Gaseous breakdown in uniform and non-uniform fields Corona discharges - Vacuum breakdown - Conduction and breakdown in pure and commercial liquids, Maintenance of oil Quality - Breakdown mechanisms in solid and composite dielectrics- Applications of insulating materials in electrical equipments.

**UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS** 9

Generation of High DC voltage: Rectifiers, voltage multipliers, vandigriff generator: generation of high impulse voltage: single and multistage Marx circuits - generation of high AC voltages: cascaded transformers, resonant transformer and tesla coil- generation of switching surges - generation of impulse currents - Triggering and control of impulse generators.

**UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS** 9

High Resistance with series ammeter - Dividers, Resistance, Capacitance and Mixed dividers - Peak Voltmeter, Generating Voltmeters - Capacitance Voltage Transformers, Electrostatic Voltmeters - Sphere Gaps - High current shunts- Digital techniques in high voltage measurement.

**UNIT V HIGH VOLTAGE TESTING & INSULATION COORDINATION** 9

High voltage testing of electrical power apparatus as per International and Indian standards - Power frequency, impulse voltage and DC testing of Insulators, circuit breakers, bushing, isolators and transformers- Insulation Coordination & testing of cables.

**TOTAL: 45 PERIODS****OUTCOMES:**

- Ability to understand Transients in power system.
- Ability to understand Generation and measurement of high voltage.
- Ability to understand High voltage testing.
- Ability to understand various types of over voltages in power system.
- Ability to measure over voltages.
- Ability to test power apparatus and insulation coordination

**TEXT BOOKS:**

1. S.Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, Fifth Edition, 2013.
2. E. Kuffel and W.S. Zaengl, J.Kuffel, 'High voltage Engineering fundamentals', Newnes Second Edition Elsevier, New Delhi, 2005.
3. C.L. Wadhwa, 'High voltage Engineering', New Age International Publishers, Third Edition, 2010.

**REFERENCES**

- L.L. Alston, 'High Voltage Technology', Oxford University Press, First Indian Edition, 2011.
- Mazen Abdel - Salam, Hussein Anis, Ahdab A-Morshedy, Roshday Radwan, High Voltage Engineering - Theory & Practice, Second Edition Marcel Dekker, Inc., 2010.
- Subir Ray, 'An Introduction to High Voltage Engineering' PHI Learning Private Limited New Delhi, Second Edition, 2013.

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**LESSON PLAN**

Faculty: \_\_\_\_\_  
Department : ELECTRICAL AND ELECTRONICS ENGINEERING  
Subject / Code : HIGH VOLTAGE ENGINEERING / EEB701  
Academic Year : 2022-2023

Designation: Associate Professor  
Semester/ Year: IV/ VII

S.No.	Proposed		Details of Topic Covered	TA	Ref.	Actual		HOD
	Date	Period				Date	Period	
<b>UNIT-I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS</b>								
1	10/8/22	1	Introduction	1	1	10/8	1	
2	10/8/22	7	Causes of over voltages	1	1	10/8	7	
3	12/8/22	3	Effects on power system	1	1	12/8	3	
4	12/8/22	4	Lightning, switching surges	1	1	12/8	4	
5	13/8/22	1	Temporary over voltages	1	1	13/8	1	
6	17/8/22	1	Corona and its effects	1	1	17/8	1	
7	17/8/22	7	Bewley lattice diagram	1	1	17/8	7	
8	18/8/22	5	Linear Analysis & Characteristics	1	1	18/8	5	
9	24/8/22	1	Protection against over voltages.	1	1	24/8	1	<i>Sany</i>
<b>UNIT II DIELECTRIC BREAKDOWN</b>								
10	25/8/22	5	Properties of Dielectric materials	1	2	25/8	5	
11	26/8/22	3	Gaseous breakdown in uniform and non-uniform fields	1	2	26/8	3	
12	1/9/22	5	Corona discharges	1	2	1/9	5	
13	2/9/22	3	Vacuum breakdown	1	2	2/9	3	
14	7/9/22	1	Conduction and breakdown in pure liquids, Maintenance of oil Quality	3	2	7/9	1	
15	7/9/22	7	Conduction and breakdown in commercial liquids, Maintenance of oil Quality	3	2	7/9	7	
16	7/9/22	8	Breakdown mechanisms in solid	3	2	7/9	8	
17	14/9/22	7	Breakdown mechanisms in composite dielectrics	3	2	14/9	7	
18	14/9/22	8	Applications of insulating materials in electrical equipments	3	2	14/9	8	<i>Sany</i>
<b>UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS</b>								
19	15/9/22	5	Generation of High DC voltage	1	2	15/9	5	
20	16/9/22	3	Rectifiers & voltage multipliers	1	2	16/9	3	
21	17/9/22	1	vandigrav generator	3	2	17/9	1	
22	21/9/22	1	Generation of high impulse voltage	3	2	21/9	1	
23	21/9/22	7	Single and Multistage Marx circuits	3	2	21/9	7	
24	21/9/22	8	Generation of high AC voltages	3	2	21/9	8	
25	22/9/22	5	cascaded transformers, resonant transformer and tesla coil-generation of switching surges	3	2	22/9	5	
26	23/9/22	3	Generation of impulse currents	3	2	23/9	3	
27	24/9/22	1	Triggering and control of impulse generator	3	2	24/9	1	

**Dr. M. VIJAYAKUMAR**  
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(Accredited by NAAC, Under 2f and 12B status)

**SASURIE**  
College of Engineering  
Vijayamangalam, Tirupur, Tamil Nadu

**LESSON PLAN**

Faculty Name : Mr.P.Sudarsan  
Department : ELECTRICAL AND ELECTRONICS ENGINEERING  
Subject / Code : HIGH VOLTAGE ENGINEERING / EE8701  
Academic Year : 2022-2023

Designation: Associate Prof  
Semester/ Year: III

S.No.	Proposed		Details of Topic Covered	TA	Ref.	Actual	
	Date	Period				Date	Period
<b>UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS</b>							
28	28/9/22	1	High Resistance with series ammeter	1	1	28/9/22	1
29	29/9/22	5	Dividers, Resistance, Capacitance and Mixed dividers	1	1	29/9	5
30	7/10/22	3	Peak Voltmeter, Generating Voltmeters	3	1	7/10	3
31	12/10/22	1	Capacitance Voltage Transformers	3	1	12/10	1
32	13/10/22	5	Electrostatic Voltmeters	3	1		
33	14/10	3	Sphere Gaps	3	1		
34	15/10	1	High current shunts	3	1		
35	16/10	1	Digital techniques in high voltage measurement	3	1		
<b>UNIT V HIGH VOLTAGE TESTING &amp; INSULATION COORDINATION</b>							
36	17/10	7	High voltage testing of electrical power apparatus as per International and Indian standards	1	2		
37	18/10	3	Power frequency, impulse voltage	1	2		
38	22/10	4	DC testing of Insulators, circuit breakers, bushing,	1	2		
39	23/10	1	DC testing of isolators and transformers	1	2		
40	24/10	1	Insulation Coordination	3	2		
41	25/10	7	Testing of cables	3	2		

Reference books (Ref):

1. CL Wadhwa, 'High voltage Engineering', New Age International Publishers, Third Edition, 2010.
2. S.Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, Fifth Edition, 2013.

Teaching Aids (TA):

1. Black Board with Chalk
2. LCD Projector

*M.V.*

**Dr.M.VIJAYAKUMAR ME., Ph.D.,**  
PRINCIPAL  
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Vijayamangalam - 638 056, (Tirupur Dt).

Prepared by	Verified by	
Sign: <i>[Signature]</i>	Sign: <i>[Signature]</i>	
Name: Mr. P.Sudarsan	Name: Mr. P.Sudarsan	
Faculty	HOD	Dr.E.Nandakumar
	Head, Dept. of EEE	Principal



### TEST PLAN FOR SUBJECT

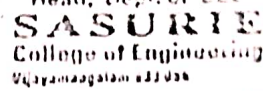
Subject : EE8701- HIGH VOLTAGE ENGINEERING Faculty: Mr.P.Sudarsan

Semester : VII Year: IV

Department : Electrical and Electronics Engineering

S. No.	Description	Planned Date/Month	Actual Conducted Date / Month	Remarks
	Internal Test-I	24.9.22	24.9.22	—
	Internal Test-II	15.10.22	15.10.22	—

	Prepared By	Approved By
Sign:		
Name:	Mr.P.Sudarsan	Mr.P.Sudarsan
	Faculty	Head, Dept. of EEE





### RESULT ANALYSIS OF TEST

Subject : EE8701- HIGH VOLTAGE ENGINEERING Date  
Class : IV Department III  
Semester : VII  
Exam details & date : Internal Exam-I  
Faculty : Mr.P.Sudarsan  
Number of students : 04  
No. of students attended : 03  
No. of students absent : 01  
No. of students passed : 02  
No. of students failed : 01  
Percentage of failures : 66.67%

### RESULT DATA:

Marks	0-25	26-50	51-75	76-90	91-100
No. of Students	—	01	02	—	—

	Prepared By	Approved By
Sign:		
Name:	Mr.P.Sudarsan	Mr.P.Sudarsan
	Faculty	HOD Head, Dept. of EES



Dr.M.VIJAYAKUMAR ME., Ph.D.,  
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SASURIE COLLEGE OF ENGINEERING,  
Vijayamangalam - 638 056, Tirupur (Dt).

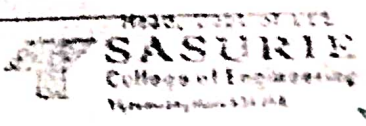


CORRECTIVE ACTION REPORT

Dept. : Electrical and Electronics Engineering      Year :  
Subject : EE3701- HIGH VOLTAGE ENGINEERING      Semester :

S.No	Internal Test	Percentage of marks	Root Cause (Metric)	Corrective Action	Deadline Date

	Prepared By	Approved By
Sign:		
Name:	Mr.P.Sudarsan	Mr.P.Sudarsan
	Faculty	HOD



Dr.M.VIJAYAKUMAR ME., Ph.D.,  
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**SASURIE**  
College of Engineering  
Vijayamangalam, Tirupur.

### QUALITY OBJECTIVE MONITORING RECORD

Department : Electrical and Electronics Engineering

Year : IV

Semester : VII

Subject : EE8701- HIGH VOLTAGE ENGINEERING

S.No	Quality Objective	Internal Test-I		Internal Test-II		Model Test-I	
		Expecting result	Obtained result	Expecting result	Obtained result	Expecting Result	Obtained result

	Prepared By	Approved By
Sign:		
Name:	Mr.P.Sudarsan	Mr.P.Sudarsan
	Faculty	HOD

Dr.M.VIJAYAKUMAR ME., Ph.D.,  
PRINCIPAL

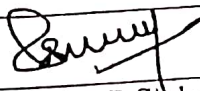
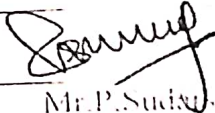


SASURIE COLLEGE OF ENGINEERING,  
Vijayamangalam - 638 056, Tirupur (Dt).

Department of Electrical and Electronics Engineering

**ASSIGNMENT SCHEDULE**

S.No	Particulars	Target Date
1	Mechanism of Lightning Storms Mathematical model of lightning Protection against OMS voltages	29.8.2022
2		
3		

	Prepared by	Verified by
Sign		
Name	Mr.P.Sudarsan	Mr.P.Sudarsan
	Faculty	HOD

Register Number: [ ]



**SASURIE**  
College of Engineering  
Vijayamangalam, Tiruppur.

Internal test-1			Date/Session	24.9.22	Marks	50
Course code	EE8701	Course Title	High voltage engineering			
Regulation	2017	Duration	3 Hours	Academic Year	2022-23	
Year	IV	Semester	VII	Department	EEE	

**COURSE OUTCOMES**

CO1:	Ability to understand Transients in power system.
CO2:	Ability to understand Generation and measurement of high voltage
CO3:	Ability to understand High voltage testing.
CO4:	Ability to understand various types of over voltages in power system
CO5:	Ability to measure over voltages
CO6:	Ability to test power apparatus and insulation coordination.

Q.No.	Question	CO	BTS
<b>PART A</b> (Answer all the Questions 10 x 2 = 20 Marks)			
1	List-out the practical generation voltage levels used?	CO1	R
2	Whar are the applications of HVDC systems.	CO1	R
3	Define Lightning phenomenon	CO2	R
4	Mention the diffeent kinds of over voltages	CO4	R
5	How can the tower-footing resistance be varied?	CO4	R
6	What is ionization?	CO5	R
7	Define Gas law	CO5	R
8	State paschen`s law	CO6	R
9	What are commercial liquids?	CO6	R
10	ame the various mechanism of breakdown in solid dielectrics?	CO6	R
<b>PART B</b> (Answer all the Questions 2 x 15 = 30Marks)			
11a	Explain in detail the protection of power system equipments using protective devices. OR	CO5	C
11b	Show the charge distribution patterens in the cloud following wilsonsand simpons theories.	CO6	A
12a	Explain the phenomenon of corona discharge and breakdown mechanism in non uniform fields. OR	CO5	C
12b	Explain in detail the breakdown mechanisms in solid dielectric with neat sketches	CO6	C

Course Faculty  
(Name / Sign / Date)  
Mr. P. SUDARSHAN

HoD  
(Name / Sign / Date)  
Mr. P. SUDARSHAN

Principal  
(Name / Sign / Date)  
Dr. M. VIJAYAKUMAR, Ph.D.  
PRINCIPAL

**SASURIE COLLEGE OF ENGINEERING,**  
Vijayamangalam - 638 056, Tirupur (Dt).



Internal Assessment Test Answer Book

Name	S. AJITH KUMAR		Year/ Semester/Section	IV / VI	
Register Number	732419105001	Date/Session	24.9 22 FAJ	Department	EEE
Course code	FE8701	Course Title	High Voltage Engineering		
Internal Assessment Test	IAT 1 <input checked="" type="checkbox"/>	IAT 2 <input type="checkbox"/>	IAT 3 <input type="checkbox"/>	Model <input type="checkbox"/>	
Name and Signature of the Invigilator with date	 S. AJITH KUMAR 24/9/22				

Instruction to the Student: Put tick mark to the question attended in the column against question.

Part A			Part B/ Part C				Total Marks	
Q. No.	<input checked="" type="checkbox"/>	Marks	Q. NO.	<input checked="" type="checkbox"/>	a Marks	<input checked="" type="checkbox"/>		b Marks
1	<input checked="" type="checkbox"/>	2	11	<input checked="" type="checkbox"/>	4			4
2	<input checked="" type="checkbox"/>	2	12		-			
3	<input checked="" type="checkbox"/>	2	13		-			
4	<input checked="" type="checkbox"/>	2	14					
5	<input checked="" type="checkbox"/>	2	15					
6	<input checked="" type="checkbox"/>	2	16					
7	<input checked="" type="checkbox"/>	2	Grand Total				4	
8	<input checked="" type="checkbox"/>	08	18				 P. SUDARSAN Name and Signature of the Examiner with date	
9	<input checked="" type="checkbox"/>	08						
10	<input checked="" type="checkbox"/>	08						
Total		14	Grand Total					

To be filled by the examiner							Total
Course Outcomes	1	2	3	4	5	6	Total
Marks allotted	4	2	-	4	19	21	50
Marks Obtained	4	2	-	4	8	-	18
IQAC Audit - Remarks							
Marks Verified							 K. VANITHA Name and Signature of the IQAC member
Dr. M. VIJAYAKUMAR PRINCIPAL SASURIE COLLEGE OF ENGINEERING Vijayamangalam - 635 006, Tiruppur (TN)							Dr. M. VIJAYAKUMAR M.E., Ph.D. DEPUTY PRINCIPAL SASURIE COLLEGE OF ENGINEERING Vijayamangalam - 635 006, Tiruppur (TN)





**SASURIE**  
College of Engineering

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**Assignment Question Paper**

Name of the Student: S. Ajithkumar

AU Register Number: 722419105001

Assignment - 01		Date of Issue:	22/8/2022	Marks	10
Course code	EEES001	Course Title	High voltage engineering		
Year	IV	Semester Section	VII	Date of Submission:	29/8/2022

Q.No	Questions	CO
1	Explain in detail the Mechanism of lightning strokes.	CO2
2	Develop mathematical model for Lightning.	CO4
3	Explain in detail the protection of against over voltages.	CO5

*[Signature]*

Name and Signature of the Faculty Incharge

S. Sudharsan

*[Signature]*

HOD,EEE

*[Signature]*  
Dr.M.VIJAYAKUMAR ME., Ph.D.

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*[Signature]*

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**SASURIE**  
College of Engineering  
Vijayamangalam, Tiruppur

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**Assignment Answer Sheet**

Name of the Student: *S. Ajithkumar*

AU Register Number: *732419105001*

Assignment - 01			Date of Issue:	22.8.2022	Marks	10
Course code	EE8701	Course Title	High voltage engineering			
Year	IV	Semester/Section	VII	Date of Submission:	29.8.2022	

Q.No	Questions	CO
1	Explain in detail the Mechanism of lightning strokes.	CO2
2	Develop mathematical model for Lightning.	CO4
3	Explain in detail the protection of against over voltages.	CO5

**Mark Allocation**

Rubrics	Marks Allocated	Marks obtained
Content Quality	6	5
Presentation Quality	2	2
Timely submission	2	2
Total marks	10	9

Name and Signature of the Faculty Incharge

*S. Sudhawan*

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HOD/EEE

*M. V. Vijayakumar*  
Dr. M. VIJAYAKUMAR M.E., Ph.D.,  
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