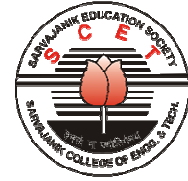




SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology



B.Tech. Semester V

Subject Name: POWER SYSTEM - II

Subject Code: BTEL13502

Type of course: Professional core Course

Prerequisite: Fundamental knowledge of Basic Electrical Engineering & Power System – 1

Rationale: The course is aimed to provide exposure about the modeling of power systems components and transmission line, its analysis and performance including the fault analysis of power systems, brief introduction to corona and transients in power system.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
3	0	2	4	60	25	15	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

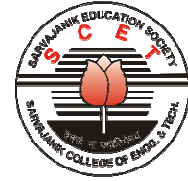
Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	Basic Principles: Power in single phase AC circuits, Complex power, Power triangle, Direction of power flow, Balanced Three Phase Circuits, Star connected loads, Delta connected loads, Delta-star transformation, Per phase analysis, Power in balanced three phase circuit. [2]	03	05
2.	Representation of Power System Components: Single-phase Representation of Balanced Three-phase Networks, One line and impedance/reactance diagram, Per unit system, Per unit representation of transformer, Per unit impedance diagram of power system, Examples – per unit system and reactance diagram, The Steady State Model of Synchronous machine, Power factor and power control, Salient pole synchronous generator, Operating chart of a synchronous generator, Representation of loads. [1,2]	06	10
3.	Characteristics and Performance of Power Transmission	10	25

PCC: Professional Core Course



SARVAJANIK UNIVERSITY
Sarvajnik College of Engineering and Technology
Bachelor of Technology



	<p>Lines: Introduction, Short transmission line, Medium transmission line, Long transmission line – Rigorous solution, Evaluation of ABCD constants, The Equivalent Circuit of a Long Line, Interpretation of long line equations, Ferranti effect, Tuned power lines, Power through a transmission line, Circle diagrams, Reactive Compensation of Transmission Lines.[1,5,6]</p>		
4.	<p>Symmetrical Fault Analysis: Transient on a Transmission Line, Short Circuit currents and the reactances of Synchronous machines, Internal voltages of loaded machines under Fault Condition, Algorithm for Short Circuit Studies, The selection of circuit breakers.[1,2]</p>	06	10
5.	<p>Symmetrical Components and Sequence Networks: Symmetrical component transformation, Phase shift in star-delta transformers, Sequence impedances of transmission lines, Sequence impedances and networks of synchronous machines, Sequence impedances and networks of transformers, Construction of sequence networks of a power system. [1,2]</p>	06	15
6.	<p>Unsymmetrical Fault Analysis: Introduction, Symmetrical component analysis of unsymmetrical faults, Single line to ground fault, Line to line fault, Double line to ground fault, Open conductor faults, Bus Impedance Matrix Method for Analysis of Unsymmetrical Shunt Faults.[1,2]</p>	06	20
7	<p>Corona: Critical Disruptive Voltage, Corona Loss, Line Design based on Corona, Disadvantages of Corona, Radio interference, Inductive interference between Power and Communication lines [3,4]</p>	02	05
8	<p>Transients in Power Systems: Transients in Simple Circuits, 3-phase Sudden Short Circuit of an Alternator, The Restriking Voltage after Removal of Short Circuit, Travelling Waves on Transmission Lines, Open end line, Short circuited line, Line terminated through a resistance, Line connected to a cable, Reflection and refraction at a T-junction, Line terminated through a capacitance, capacitor connection at T, Attenuation of Travelling Waves, Capacitance Switching, Overvoltage due to Arcing Ground. [3,5]</p>	06	10

Suggested Specification table with Marks (Theory/Practical):

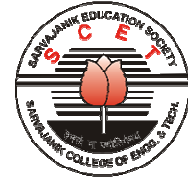
% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	20	25	15	10

PCC: Professional Core Course

W.e.f. AY 2021-22



SARVAJANIK UNIVERSITY
Sarvajnik College of Engineering and Technology
Bachelor of Technology



Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels (**Revised Bloom's Taxonomy**)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of Publication	Publication Edition
1	Modern Power System Analysis	D. P. Kothari, I. J. Nagrath	TMH Publication ISBN (13): 978-0-07-107775-0	2011	Fourth
2	Power Systems Analysis	John J. Grainger W. D. Stevenson	Jr., Tata McGrawHill International ISBN (13): 978-0-07-058515-7	2011	First
3	Electric Power System	C.L.Wadhwa	New Age International Ltd. ISBN: 978-1-906574-39-0	2012	First
4	Electrical Power systems	D.Das	New Age International ISBN: 81-224-1885-6	2008	First
5	Electric Power Transmission and Distribution	S. Sivanagaraju, S. Satyanarayana	Pearson Education ISBN: 978-81-317-0791-3	2009	First
6	Principles of Power System	V.K.Mehta Rohit Mehta	S. Chand ISBN: 81-219-2496-0	2009	First Multi colour
7	Power System Analysis	Hadi Saadat	McGraw Hill Education India Pvt Ltd. ISBN: 0-07-116758-7	1999	First
8	Power System Analysis and Design	J. Duncan Glover, Thomas J. Overbye, Mulukutla S. Sarma	Cengage Learning India Pvt. Ltd. ISBN: 978-81-315-0362-1	2009	Third

LIST OF PRACTICALS:

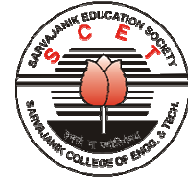
1. To write a computer program for plotting instantaneous voltage, current and power in a single phase ac circuit.
2. To write a computer program to obtain voltage regulation and efficiency of Short transmission line for different
 - a) Specified set of receiving end quantities (load at leading, unity and lagging power factor).
 - b) Specified set of sending end quantities (load at leading, unity and lagging power factor).

PCC: Professional Core Course

W.e.f. AY 2021-22



SARVAJANIK UNIVERSITY
Sarvajani College of Engineering and Technology
Bachelor of Technology



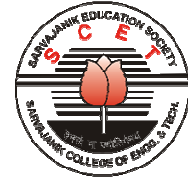
3. To write a computer program to obtain voltage regulation and efficiency of a Medium transmission line (using End condenser method, T model & π model) for different
 - a) Specified set of receiving end quantities (load at leading, unity and lagging power factor).
 - b) Specified set of sending end quantities (load at leading, unity and lagging power factor).
4. To write a computer program to obtain voltage regulation and efficiency of a Long transmission line using rigorous method, equivalent T model & equivalent π model for different
 - a) Specified set of receiving end quantities (load at leading, unity and lagging power factor).
 - b) Specified set of sending end quantities (load at leading, unity and lagging power factor).
5. To analyse the performance of long transmission line for specified load impedance.
6. To obtain voltage profile and loadability curve for a transmission line.
7. To write a computer program to obtain receiving end power circle diagram of a transmission line.
8. To simulate transient in series R-L circuit to change in DC offset current for application of excitation at different instant.
9. To study phase shifting in star- delta transformer with emphasis on the labelling on HV and LV sides for positive sequence and negative sequence.
10. To write a computer program for obtaining symmetrical components for a given set of unbalanced phasors.
11. To write a computer program to obtain fault current, bus voltages & line flow for a three phase fault in a small power system.
12. To write a computer program for L-G fault of a small system (containing generator, transformer and lines) using interconnection of sequence networks.
13. To write a computer program for L-L fault of a small system (containing generators, transformers and lines) using interconnection of sequence network.
14. To write a computer program for L-L-G fault of a small system (containing generators, transformers and lines) using interconnection of sequence network.
15. To study about travelling waves of a long transmission line with different operating conditions.
16. To write a computer program to obtain corona losses of transmission line.

Major Equipment:

1. Computer LAB equipped with MATLAB, PowerWorld Simulator, MiPower software



SARVAJANIK UNIVERSITY
Sarvajnik College of Engineering and Technology
Bachelor of Technology



Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Describe the representation of different power system components and loading capability of a generator.	12
CO-2	Evaluate the performance of Short, Medium & long transmission line.	15
CO-3	Describe the symmetrical components and its applications.	15
CO-4	Analyze Symmetrical and Unsymmetrical faults in power systems.	40
CO-5	Describe corona effect in power transmission.	08
CO-6	Describe travelling wave & transients in power systems.	10

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	3	2	1	-	-	1	-	2	2	3	3	3	2	2
CO-2	3	3	3	3	2	3	2	2	2	2	3	3	3	3	2
CO-3	3	3	2	3	2	1	2	-	2	1	2	3	3	3	-
CO-4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-
CO-5	2	1	3	3	2	3	3	3	2	2	2	3	2	2	3
CO-6	3	1	2	1	1	2	3	2	1	2	2	3	2	3	2
Rationale*	15	14	15	14	10	12	14	10	12	12	15	18	16	16	09

***Rationale:** Explaining why it is matching this particular program outcome

List of Open Source/learning website:

- https://swayam.gov.in/nd1_noc19_ee62/preview
- https://swayam.gov.in/nd1_noc19_ee61/preview
- <https://nptel.ac.in/courses/108/104/108104051/>
- <https://nptel.ac.in/courses/108/105/108105067/>
- <http://vp-dei.vlabs.ac.in/Dreamweaver/list.htmlhttps://www.powerworld.com/download-purchase/demo-software/simulator-demodownload>