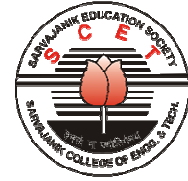




SARVAJANIK UNIVERSITY
Sarvajnik College of Engineering and Technology
Bachelor of Technology



B.Tech. Semester VI

Subject Name: Computer Aided Power System Analysis

Subject Code: BTEL14633

Type of course: Professional Elective courses

Prerequisite: Power System - 1 & Power System - 2

Rationale: The course is aimed to provide exposure about the modeling and analysis methods for the power flow, short circuit, contingency and voltage stability analyses, required to be carried out for the power systems. Necessary details of numerical techniques to solve nonlinear algebraic as well as differential equations and handling of sparse matrices will also be included.

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.	Modeling of power system components: Generator model, Transmission line model, Tap changing transformer model, Load model, Bus Admission matrix, Bus Admission matrix in the presence of mutually coupled elements	5	10
2.	Power Flow Analysis: Power Flow Equation, Classification of buses, Power Flow Solution Algorithms, Gauss Seidel Load Flow Method, Newton Raphson Load Flow Method in Polar Co-ordinate, Newton Raphson Load Flow Method in Rectangular Co-ordinate, Fast Decoupled Load Flow Method, AC-DC System Power Flow Analysis- Sequential and Simultaneous Solution Algorithms	12	25
3.	Sparse Matrices: Sparsity & Gauss Elimination method, Example of Gauss Elimination method, Sparsity directed Optimal Ordering Schemes, Solution Algorithms – Triangular Factorization, LU	5	15

PEC: Professional Elective courses



SARVAJANIK UNIVERSITY
Sarvajnik College of Engineering and Technology
Bachelor of Technology



	Decomposition		
4.	Security Analysis: Basic Concepts, Static Security Analysis at Control Centers, Contingency Analysis, Sensitivity factor, Contingency Ranking, Contingency Selection	5	10
5.	Fault analysis in phase domain: Formulation of Y_{BUS} matrix of three phase unbalanced system, Three phase Transformer in Y_{BUS} matrix, Fault Admittance matrix for different type of fault, Y_{BUS} matrix for different transformer configuration	10	25
6.	Voltage Stability: Voltage stability, instability and collapse, Factors contributing voltage instability, Criteria for assessing voltage stability, The continuation power flow, Predictor corrector technique, Q-V and P-V curves	8	15

Suggested Specification table with Marks (Theory/Practical):

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

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	Power Systems Analysis	John J. Grainger W. D. Stevenson	Jr., Tata McGrawHill International ISBN (13): 978-0-07-058515-7	2011	First
2	Power System Analysis	Hadi Saadat	McGraw Hill Education India Pvt Ltd. ISBN: 0-07-116758-7	1999	First
3	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
4	Power Generation Operation and Control	A. J. Wood, B. F. Woolenberg	John Wiley and Sons. ISBN: 978-81-265-0838-9	2009	Second

PEC: Professional Elective courses



SARVAJANIK UNIVERSITY
Sarvajani College of Engineering and Technology
Bachelor of Technology



5	Power System Analysis	T.K. Nagsarkar M.S. Sukhija	Oxford University Press ISBN: 0-19-568451-6	2016	Second
6	An introduction to Reactive Power Control and Voltage Stability in Power Transmission Systems	A Chakrabarti D P Kothari A K Mukhopadhyay Abhinandan De	PHI Learning ISBN: 978-81-203-4050-3	2010	First
7	Power System Analysis Operation and Control	Abhijit Chakrabarti Sunita Halder	PHI Learning ISBN: 978-81-203-4015-2	2011	Third
8	Power System Stability and Control	P.Kundur	Mc Graw Hill ISBN: 978-0-07-063515-9	1994	11 th Reprint
9	Computer Methods in Power System Analysis	Glenn Stagg El-abiad	McGraw-Hill ISBN: 0070606587	1968	First
10	Computer Aided Power System Analysis	G.L. Kusic	CRC Press ISBN: 978-1-4200-6106-2	2005	Second

LIST OF PRACTICALS:

1. To write a programme for Formation of Y_{bus} matrix for given power system network using direct inspection method.
2. To write a programme for solution of static load flow equation using Gauss-Seidel Method of Load Flow with & without considering generator reactive power limit.
3. To write a programme for solution of static load flow equation using Newton Raphson Method of Load Flow in Polar Co-ordinate.
4. To write a programme for solution of static load flow equation using Newton Raphson Method of Load Flow in Rectangular Co-ordinate.
5. To write a programme for Solution of static load flow equation using Fast Decoupled Load Flow Method.
6. To write a computer program for LU Factorization method.
7. To write a computer program for to obtain Sensitivity factor for power system security analysis.
8. To Simulate Contingency analysis for given power system network using PowerWorld Simulator/ MiPower Software.
9. To Simulate Symmetrical & unsymmetrical fault for a given power system network using PowerWorld Simulator/ MiPower Software.
10. To write a computer program for to obtain PV curves for different values of power factor for a given transmission line.

Major Equipment:

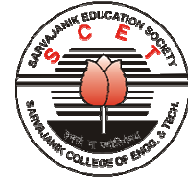
1. Computer LAB equipped with MATLAB/ PSCAD /MiPower / PowerWorld Simulator software

PEC: Professional Elective courses

W.e.f. AY 2021-22



SARVAJANIK UNIVERSITY
Sarvajanik 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 appropriate models for an interconnected power system.	10
CO-2	Evaluate power flow analysis using different numerical techniques.	25
CO-3	Demonstrate contingency analysis.	15
CO-4	Evaluate triangular factorization for sparsity of admittance matrix.	10
CO-5	Demonstrate fault analysis in phase domain.	25
CO-6	Describe the concepts of voltage stability analysis.	15

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	-	-	-	-	-	2	-	1	3	3	1	-
CO-2	3	3	3	3	3	3	2	2	3	3	3	3	3	3	2
CO-3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO-4	3	3	2	2	2	-	-	1	2	-	1	3	3	2	-
CO-5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
CO-6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Rationale*	18	18	16	14	10	12	11	12	16	12	14	18	18	15	10

List of Open Source/learning website:

1. https://onlinecourses.nptel.ac.in/noc21_ee84/preview
2. <https://nptel.ac.in/courses/108/107/108107028/>
3. <https://nptel.ac.in/courses/108/106/108106026/>