CVM UNIVERSITY
Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Electrical Engineering)**

Semester: **V**

Course Code: **202050505**

Course Title: **Power Systems-II**

Course Group: **Professional Core Course -X**

Course Objectives: 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 systems.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
4	0	2	5	50 / 18	50 / 17	25/9	25/9	150 / 53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Basic Principles:** Power in single phase AC circuits, Complex power, Complex power balance, Complex power flow, Balanced Three Phase Circuits, Star connected loads, Delta connected loads, Delta-star transformation, Balanced three phase power.	04
2	**Representation of Power System Components:** One line and impedance or reactance diagram, Per unit system, Per unit representation of transformer, Per unit impedance diagram of power system, Steady State model of synchronous machine, Operating chart of a synchronous generator.	07

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3	**Transmission Line Modeling and Performance:** Introduction, Short transmission line, Medium transmission line, Long transmission line – Rigorous solution, Evaluation of ABCD constants, Interpretation of long line equations, Ferranti effect, Power through a transmission line, Circle diagrams.	**12**
4	**Symmetrical Fault Analysis:** Introduction, Transient on a transmission line, Short circuit of a synchronous machine on no load, short circuit of a loaded synchronous machine, Selection of circuit breakers, Z_{BUS} building algorithm (Type – 1, 2, 3, 4 modifications).	**07**
5	**Symmetrical Components:** 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.	**06**
6	**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.	**06**
7	**Corona:** Theory of corona formation, Important terms: Critical disruptive voltage; Visual critical voltage; Power loss due to corona, Factors affecting corona, Methods of reducing corona, Advantages and disadvantages of corona, Line design based on corona, Radio Interference, Inductive interference between power and communication lines.	**06**
8	**Transients in Power Systems:** Traveling waves on transmission lines: Basic derivations; Line terminated through a resistance; Open end line; Short circuited line; Line connected to a cable; Reflection and refraction at a T-junction; Line terminated through a capacitance; Capacitor connection at T, Attenuation of traveling waves, Capacitance switching, Overvoltages due to arcing ground.	**07**

List of Practicals / Tutorials:

1	Write a MATLAB program to plot instantaneous voltage, current and power in a single phase circuit.
2	Performance analysis of short transmission line.
3	Performance analysis of medium transmission line.
4	Write a MATLAB program to calculate voltage regulation and efficiency of long transmission line.
5	Plot the voltage profile and write a MATLAB program for shunt compensation.
6	Write a program for Z_{bus} algorithm.
7	To simulate transients in series R-L circuit using MATLAB.

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8	Write a program to transform 3-phase unbalanced phasor to symmetrical components.
9	TO study fault analysis using MATLAB.
10	Tutorial-I: Per unit systems.
11	Tutorial-II: Transmission line modeling.
12	Tutorial-III: Fault analysis.
13	Tutorial-IV: Corona and Transients in Power System.

Reference Books:

1	Modern Power system Analysis: I. J.Nagrath, D. P. Kothari, McGraw Hill Education.
2	Power System Analysis: Hadi Saadat, McGraw Hill Education India Pvt Ltd.
3	Electrical Power systems: C. L. Wadhwa, New Age International Publishers.
4	Principles of Power System: V. K. Mehta, Rohit Mehta, S. Chand Publications.
5	Power System Analysis and Design: J. Duncan Glover, Thomas J. Overbye, Mulukutla S. Sarma, Cengage Learning India Pvt. Ltd.
6	Elements of Power Systems Analysis: W. D. Stevenson Jr., McGraw Hill Education.
7	Power System Analysis : John J. Grainger, William D. Stevenson Jr., McGraw Hill Education

Supplementary learning Material:	
1	https://swayam.gov.in/nd1_noc19_ee61/preview
2	https://swayam.gov.in/nd1_noc19_ee62/preview
3	www.nptel.ac.in
4	http://vp-dei.vlabs.ac.in/Dreamweaver/list.html

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits
- Course Projects

Internal Evaluation: The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

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Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
10%	25%	20%	30%	15%	0%	

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.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Prepare the model of transmission line, generator and transformer of the power system for single line diagram representation and per unit quantity calculation.	**20**
CO-2	Evaluate performance of short, medium and long transmission lines.	**35**
CO-3	Analyze symmetrical and unsymmetrical faults in the power system.	**30**
CO-4	Describe various aspects of corona in power transmission.	**05**
CO-5	Describe traveling wave and transients in the power system.	**10**

Curriculum Revision:	
Version:	2.0
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	June-2025

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