JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS for M.Tech EEE for

I. **POWER SYSTEMS (PS)**
II. **POWER SYSTEM CONTROL AND AUTOMATION (PSC&A)**
III. **POWER SYSTEM ENGINEERING (PSE)**
IV. **POWER SYSTEM CONTROL (PSC)**
V. **ADVANCED POWER SYSTEMS (APS)**
VI. **ELECTRICAL POWER ENGINEERING (EPE)**
VII. **POWER ENGINEERING & ENERGY SYSTEMS (PE&ES)**

Programme

(Applicable for batches admitted from 2019-2020)

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COURSE STRUCTURE

I Semester

S.No	Course No	Category	Course Name	P.Os	L	T	P	C	Marks
1		PC	Power System Operation & Control		3	0	0	3	100
2		PC	Analysis of Power Electronic Converters		3	0	0	3	100
3		PE	Program Elective – I i. Electrical Distribution Automation ii. Renewable Energy Technologies iii. Power System Deregulation		3	0	0	3	100
4		PE	Program Elective – II i. HVDC Transmission ii Advanced Power Systems Protection iii. Power System Reliability		3	0	0	3	100
5			Research Methodology and IPR		2	0	0	2	100
6			Power System Simulation Laboratory – I		0	0	4	2	100
7			Power Systems Laboratory		0	0	4	2	100
8			Audit Course – I		2	0	0	0	100
					16	0	8	18	800

II Semester

S.No	Course No	Category	Course Name	P.Os	L	T	P	C	Marks
1		PC	Power System Dynamics and Stability		3	0	0	3	100
2		PC	Real Time Control of Power Systems		3	0	0	3	100
3		PE	Program Elective – III i. EHVAC Transmission ii. Flexible AC Transmission Systems iii. Hybrid Electric Vehicles		3	0	0	3	100
4		PE	Program Elective – IV i. Generation & Measurement of High Voltages ii. Evolutionary Algorithms and Applications iii. Programmable Logic Controllers & Applications		3	0	0	3	100
5			Power System Simulation Laboratory – II		0	0	4	2	100
6			Power Converters Laboratory		0	0	4	2	100
7			Mini Project with Seminar		0	0	4	2	100
8			Audit Course – II		2	0	0	0	100
					14	0	12	18	800

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III Semester

S.No	Course No	Category	Course Name	P.Os	L	T	P	C	Marks
1		PE	Program Elective – V i. Energy Audit Conservation &Management ii. Smart Grid Technologies iii. Power Quality and Custom Power Devices		3	0	0	3	100
2		OE	Open Elective i. Industrial Safety ii. Artificial Intelligent Techniques iii. Operations Research		3	0	0	3	100
3			Dissertation Phase - I **(to be continued and evaluated next semester)**		0	0	20	10	---
					6	0	20	16	200

IV Semester

S.No	Course No	Category	Course Name	T	P	C	Marks
1			Dissertation Phase-II **(continued from III semester)**	0	32	16	100
				0	32	16	100

Audit course 1 & 2

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills.

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I-Semester	POWER SYSTEM SIMULATION LABORATORY – I	CATEGORY	L-T-P 0-0-4	CREDITS 2

Pre-requisite: Electrical Power Systems

Course Educational Objectives:

- To understand the modelling of different transmission lines
- To understand the mathematical formulation of distribution system load flow
- To understand the configurations of transmission lines
- To understand the transients in transmission lines
- To understand the formation of Z- and Y-bus matrices

List of Experiments:

1. Performance analysis of short and medium transmission lines.
2. Performance analysis of long transmission lines.
3. Computation of sag of transmission lines for equal and unequal heights of towers.
4. Distribution load flow analysis.
5. Computation of B- co-efficient in economic load dispatch problem.
6. Computation of line parameters (R, L, C) for different configuration of 3-ϕ symmetrical transmission lines.
7. Computation of line parameters (R, L, C) for different configuration of 3-ϕ unsymmetrical transmission lines with and without transportation.
8. Computation reflection and refraction co-efficient of voltages and currents of transmission line form different conditions.
9. Formation of Y-bus by direct inspection method.
10. Formations of Z-bus by building algorithm.

Course Outcomes: The student shall be able to

1. Analyse the performance of thevarious transmission lines at different loading conditions
2. Perform the load flow study on distribution systems
3. Calculate the different line parameters of 3-phase symmetrical and unsymmetrical transmission lines
4. Compute the reflection and refraction coefficients of voltages and currents in the transmissions
5. Form the Z- and Y-bus matrices for the given power transmission system

I-Semester	POWER SYSTEMS LABORATORY	CATEGORY	L-T-P 0 -0-4	CREDITS 2

Course Educational Objectives:

To understand the experimental determination of various parameters used in power system area and to analyse the performance of transmission line with and without compensation.

List of Experiments:

1. Determination of Sequence Impendence of an Alternator by direct method.

2. Determination of Sequence impedance of an Alternator by fault Analysis.

3. Measurement of sequence impedance of a three phase transformer

(a). by application of sequence voltage. (b). using fault analysis.

4. Power angle characteristics of a salient pole Synchronous Machine.

5. Poly-phase connection on three single phase transformers and measurement of phase displacement.

6.Determination of equivalent circuit of 3-winding Transformer.

7. Measurement of ABCD parameters on transmission line model.

8. Performance of long transmission line without compensation.

9. Study of Ferranti effect in long transmission line.

10. Performance of long transmission line with shunt compensation.

Course Outcomes:

After the Completion of lab they will understand procedure for determination of various parameters used in power system as well as performance of transmission line.

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II-Semester	POWER SYSTEM SIMULATION LABORATORY-II	CATEGORY	L-T-P 3 -0-0	CREDITS 3

Pre-requisite: Power systems

Course Educational Objectives:

The student should understand the modelling of various aspects of Power System analysis and develop the MATLAB programming.

List of Experiments

1. Load Flow Solution Using Gauss Siedel Method
2. Load Flow Solution Using Newton Raphson Method
3. Load Flow Solution Using Decoupled Method
4. Symmetrical Fault analysis using Z-bus
5. Unsymmetrical Fault analysis using Z-bus
6. Economic Load Dispatch with & without transmission losses
7. Transient Stability Analysis using modified Euler's method.
8. Transient Stability Analysis using modified R-K method.
9. Transient Stability Analysis Using Point By Point Method
10. Load Frequency Control of Single Area Control & Two Area Control system with and without controllers.

Course Outcomes:

The student should analyze load flow solution obtained using GS and NR methods, symmetrical and unsymmetrical faults, Transient stability and load frequency deviation in single and two area systems

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II-Semester	POWER CONVERTERS LABORATORY	CATEGORY	L-T-P 3 -0-0	CREDITS 3

Pre-requisite: Fundamentals of Power Electronics

Course Educational Objectives: To study and understand the different converters and inverters for single and three phase loads.

Any 10 of the following experiments are to be conducted.

List of experiments

1. Study of DC-DC non-isolated converters such as Buck & Boost converter.
2. Study of DC-DC Buck-Boost and Cuk converters.
3. Study of 1-ϕ dual converter.
4. Determination of input p.f. and harmonic factor for 1-ϕ semi- converter and 1-ϕ full-converter (Inductive load)
5. Study of p.f. improvement in 1-ϕ full-converter with symmetric and extinction angle control.
6. Study of 1-ϕ square wave and sinusoidal PWM inverter.
7. Study of 3-ϕ inverter with 120^o and 180^o mode of operation.
8. Study of 3-ϕ sinusoidal PWM inverter.
9. Study of 3-level NPC inverter.
10. Study of 5-level cascaded H-bridge inverter.
11. Determination of input p.f. and harmonic factor for 3-ϕ full converter (Inductive load).
12. Determination of input p.f. and harmonic factor for 3-ϕ semi converter (Inductive load).
13. Study the characteristics of IGBT, MOSFET & GTO's.
14. Design of gate drive circuits for IGBT & MOSFET's.

Course Outcomes: Students are able to implement the converter and inverters in real time applications.

II-Semester	MINI PROJECT WITH SEMINAR	CATEGORY	L-T-P 0-0-4	CREDITS 2

Note:
It is recommended that a Supervisor/advisor should be allotted to each student at the end of the semester-I or allot at the start of the semester-II

Syllabus content:

A Student has to select one paper published in any of the IEEE Transactions and simulate the same. The student has to present the progress of the work at the middle of the semester. At the end of the semester, the student has to present the results by explaining the idea of the topic, methodology, finding of the simulations. A Student should also submit a report of the entire work carried out under this course. The end semester presentation must be video recorded and preserved.