GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Master of Technology		Branch/Spec.	Electrical (Renewable Energy)	
Semester	II		Version	1.0.0.0	
Effective from Academic Year	2025-2026		Effective for the batch Admitted in	July 2025	
Course code	3EE21PE7	Course Name	Energy System Modelling and Analysis		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:

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Course Outcomes:

On successful completion of the course, the students will be able to:

CO1	To understand the various mathematical methods for energy system modelling.
CO2	To demonstrate the various economic models and convergence solution.
CO3	To apply the optimization techniques in energy system.

Theory syllabus

Unit	Content	Hrs
1	**Modelling Overview:** Levels of analysis, steps in model development, Examples of models, Quantitative techniques, Interpolation, Polynomial, Lagrangian, Curve fitting, Regression analysis, Solution of transcendental equations.	**07**
2	**Systems Simulation:** Information flow diagram, Solution of set of nonlinear algebraic equations, Successive substitution, Newton Raphson, Examples of energy systems simulation.	**08**
3	**Optimization:** Objectives/constraints, Problem formulation, Unconstrained problems, Necessary and sufficiency conditions, Constrained optimization, Lagrange multipliers, Constrained variations, Kuhn-Tucker conditions, Linear programming, Simplex tableau, Pivoting, Sensitivity analysis.	**10**
4	**Dynamic Programming:** Search Techniques, Univariate / multivariate, Case studies of optimization in energy systems, Dealing with uncertainty, Probabilistic techniques, Trade-offs between capital and energy using Pinch analysis.	**09**
5	**Energy Economy Models:** Scenario generation, Input output model, Numerical solution of differential equations, Overview, Convergence, Accuracy, Transient analysis, Application examples.	**11**

Practical content

Practicals, assignments and tutorials are based on above syllabus.

Text Books

1.	W. F. Stoecker, Design of Thermal Systems, McGraw Hill.
2.	S. S. Rao, Optimization theory and applications, Wiley Eastern.

Reference Books

1.	S. S. Sastry, Introductory methods of numerical analysis, Prentice Hall
2.	S. C. Chapra, R. P. Canale, Numerical methods for Engineers, Tata McGraw Hill, New Delhi

ICT/MOOCS

1.	https://www.youtube.com/watch?v=4rz7ohieuXA&list=PLyqSpQzTE6M_b6b57hv9Bh6OqoWesWWX5
2.	https://www.youtube.com/watch?v=gw_ZEUjI9KM&list=PLYihddLF-CgZGDFVwB1v699kvl4FMeAr-

Mapping of CO with PO and PSO:															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	1	3	0	0	1	1	1	1	0	2
CO2	3	2	2	1	2	0	2	0	0	0	1	0	1	2	2
CO3	3	2	2	2	1	0	1	0	0	0	0	0	0	2	3
CO4	2	1	1	2	2	0	1	0	0	0	0	0	3	2	2