

COURSE OUTCOMES (COURSE ARTICULATION MATRIX) Ph.D., REE

The course articulation matrix has been presented as under. The correlation level 1, 2 and 3 means: 1- Slight (low), 2- Moderate (medium) and 3-Substantial (high)

Course	CO	Statements	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EST 601, Agricultural Energetics , 2+0														
	EST 601.1	To understand various input energy sources involved in agricultural operations.	3	2	2	1	2	3	2	-	2	3	2	3
	EST 601.2	To analyze the energy use in agricultural production and techniques to improve efficiency.	2	3	-	3	2	2	3	1	2	3	3	3
	EST 601.3	To understand the use of emerging technologies in	2	3	3	-	1	3	2	1	3	2	3	3

		agriculture production and renewable energy systems to enhance energy efficiency.												
	EST 601.4	Energy auditing of household activities, crop and livestock production systems.	3	-	2	1	2	3	3	-	3	2	3	3
	EST 601.5	Use of alternate energy sources for agricultural purposes	3	2	2	1	2	3	2	-	2	3	2	3
	EST 601.6	Evaluation of alternate energy sources and its substitution.	2	3	3	-	1	3	2	1	3	2	3	3
EST 602, Biomass Energy Conversion, 2+1														
	EST 602.1	To characterize various biomass resources for energy	2	3	3	-	2	3	2	2	2	3	-	3

		conversion potential.												
	EST 602.2	To understand the principles and processes involved in the conversion of biomass into energy, through thermochemical conversion.	2	3	3	-	2	3	2	2	3	2	3	2
	EST 602.3	To assess and compare different biomass energy conversion technologies	3	3	2	-	2	3	2	3	3	3	2	3
	EST 602.4	To study methods for the production of biodiesel and its application as an alternative of petroleum products (diesel).	-	3	2	2	2	-	3	2	3	2	3	3
	EST 602.5	Study of fuel related properties of biomass. Its conversion in Producer gas, Biogas, biodiesel and their analysis.	3	3	2	-	2	3	2	3	3	3	2	3

EST 603, Energy Conservation and Management in Production Agriculture, 2+0														
	EST 603.1	To compute the energy requirement in production agriculture, including crop, livestock, and aquaculture.	3	3	3	-	2	3	3	-	2	2	3	3
	EST 603.2	To understand energy conservation through proper management and maintenance of farm machinery.	-	1	2	3	2	3	3	-	2	3	3	3
	EST 603.3	To plan and manage agricultural production systems for	3	3	3	-	3	2	3	2	2	2	3	3

		energy conservation and energy returns assessment.												
	EST 603.4	To develop computer program for efficient energy management in a given agricultural production system.	3	2	3	-	2	3	3	2	2	3	3	3
	EST 603.5	To understand energy use planning and forecasting for a given system.	3	2	3	-	2	3	3	2	2	3	3	3
EST 604, Advances in Biochemical Conversion of Biomass, 2+1														
	EST 604.1	Characterization and classification of biomass	3	2	2	1	2	3	2	-	2	3	2	3

	EST 604.2	Biochemical basis of biogas production	2	3	-	3	2	2	3	1	2	3	3	3
	EST 604.3	Microbiological aspects of biogas formation and process parameters of biomethanation	2	3	3	-	1	3	2	1	3	2	3	3
	EST 604.4	Study on biogas digester types, their designing. Storage and purification of biogas. Biogas utilization and slurry management	3	2	2	1	2	3	2	-	2	3	2	3
	EST 604.5	Chemical kinetics and mathematical modeling of biomethanation process	2	3	-	3	2	2	3	1	2	3	3	3
	EST 604.6	Computation of economics of biogas plants and environmental/ social impact	2	3	3	-	1	3	2	1	3	2	3	3

	EST 604.7	Pretreatment of biomass, biochemistry/ microbiology of alcohol production. Bio-hydrogen from algae/biomass. Environmental benefits of bioconversion processes	3	2	2	1	2	3	2	-	2	3	2	3
	EST 604.8	Fermentor designing and their evaluation. Alcohol purification. Economic calculations of biogas/alcohol generation from biomass	2	3	-	3	2	2	3	1	2	3	3	3
EST 605, Computer-based Energy Management, 3+0			2	3	3	-	1	3	2	1	3	2	3	3
	EST 605.1	Study of trends in computer based energy management and philosophy of	3	2	2	1	2	3	2	-	2	3	2	3

		control for energy processes												
	EST 605.2	Design procedure for an advanced control system	2	3	-	3	2	2	3	1	2	3	3	3
	EST 605.3	Application of optimization techniques involving advanced control system and energy conservation control	2	3	3	-	1	3	2	1	3	2	3	3
	EST 605.4	A survey of optimization techniques	3	2	2	1	2	3	2	-	2	3	2	3
	EST 605.5	Review of experimental search methods, pattern search method and optimization techniques for energy management solutions	2	3	-	3	2	2	3	1	2	3	3	3
	EST 605.6	Understanding general philosophy of selecting a computer system, specification generated by user and quotation generated by supplier, Software specification	2	3	3	-	1	3	2	1	3	2	3	3

	EST 605.7	Systems engineering services from manufacturers. Energy management in production agriculture/agro- industry systems	3	2	2	3	2	3	3	-	2	3	3	3
--	--------------	---------------------------------------------------------------------------------------------------------------------------------------------	---	---	---	---	---	---	---	---	---	---	---	---