

Programme Template

1. Name of the Programme and Code	<i>Master of Technology in Energy & Environment Technologies and Management</i> Interdisciplinary Programme ESN
2. Degree (UG/PG)	PG
3. Minimum Duration of the Programme (Specify for FT and PT, if applicable)	2 years, FT 3 years, PT
4. Maximum Duration of the Programme (Specify for FT and PT, if applicable)	3 years, FT 5 years, PT
5. Capacity (Max. Student Strength) of the Programme	40 (FIA) Total (FT + PT + Sponsored) = (Total No. of faculty) $\times$ 4
6. Number of Regular Faculty Members Involved as Teaching Faculty in the Programme	23 (As of November 06, 2025)
7. Minimum Credit Requirements for the Degree	63

8. Articulate the Program Learning Outcomes (PLO): *Graduates of this program will be able to:*

Abbreviation	Description
PLO1	Apply their advanced knowledge of global energy demand, supply, and security challenges to the energy sector.
PLO2	Identify and implement various facets of energy and environment management.
PLO3	Develop technological solutions for mitigating environmental emissions from the energy sector.
PLO4	Frame policies and regulations for the energy and environment sectors.

9. Map PLOs with Institute Learning Outcomes (ILOs) of the Degree

[Indicate '1' for weak, '2' for good, and '3' for excellent relation. Leave the cell blank to indicate no relation]

	PLO1	PLO2	PLO3	PLO4
ILO1	3	3	2	1
ILO2	1	1	2	3

10. Number of non-project Programme Core Number of
Programme Core Credits

25

11.
Number of Programme Elective Credits

18

12.
Number of Open Credits

6

13.
Number of Project Core Credits

$5 + 3 + 6 = 14$

14. Details of Creative Expression and Ethical Reasoning (CEER) Component in the Programme [Only for UG]

Number of Credits Assigned	
Courses Involved and Credits Accounted <i>[e.g., If one module in AMLXXX with contact hours YY satisfies Z credits, then write AMLXXX (Z credits)]</i>	1. xxx (Z1 credits) 2. xxx (Z2 credits) 3. ...

15. Details of Emerging Trends (ETT) Component in the Programme [Only for UG]		
Number of Credits Assigned		
Courses Involved and Credits Accounted [e.g., If one module in AMLXXX with contact hours YY satisfies Z credits, then write AMLXXX (Z credits)]	1. xxx (Z1 credits) 2. xxx (Z2 credits) 3. ...	
16. Details of Environment and Sustainability (E&S) Component in the Programme [Mandatory for UG]		
Number of Credits Assigned		
Courses Involved and Credits Accounted	ESL7211: Fuel Technology (3 credits) ESL7340: Non-conventional Sources of Energy (3 credits) ESL7127: Energy and Environment (3 credits) ESP7128: Energy & Environment Laboratory (3 credits) ESL7176: Industrial Energy and Environment Analysis (3 credits) and many more in the elective list	
17. Details of Research/Technical Communication Component in the Programme [Only for PG]		
Number of Credits Assigned		
Courses Involved and Credits Accounted	1. ESL7349: Developing Energy Efficiency and Renewable Energy Projects (3 credits) 2. ESD7951: Cornerstone project (Winter) (ESN) (3 credits) 3. ESD7997: Summer Internship (ESN) (3 credits) 4. ESD7999: Minor project (ESN) (3 credits) 5. ESD8901: Major Project Part-I (ESN) (6 credits) 6. ESD8902: Major Project Part-II (ESN) (12 credits)	
18. Details of Professional Ethics Component in the Programme [Only for PG]		
Number of Credits Assigned		

Courses Involved and Credits Accounted	1. ESN7001: Ethics in Science and Engineering (1 credit)
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19. Details of External Connect Component in the Programme [Only for PG]

Number of Credits Assigned	
Courses Involved and Credits Accounted	1. ESD7951: Cornerstone project (ESN) (Winter) (3 credits) 2. ESD7997: Summer Internship (ESN) (3 credits) 3. ESD8901: M. Tech Project Part-1 (ESN) (6 credits) 4. ESD8902: M. Tech Project Part-2 (ESN) (12 credits) For (1) and (2): Both has option to have connect with industry / other AU / other universities in India / outside. However, there will be a mentor from DESE faculty and one will also need to have to make a department presentation in front of an evaluation panel set-up by the department for getting the credits (as will be done for 3 and 4).

20. List of prescribed courses in all baskets (BS, GE, DC/PC, DE/PE, ...)

Basic Sciences (BS)	General Engineering (GE)	Departmental/Programme Core (DC/PC)			Departmental/Programme Elective (DE/PE)		
		ESD7951	Cornerstone Project (ESN) (Winter)	0-0-10	ESD7999	Minor Project (ESN)	0-0-6
		ESD7997	Summer Internship (ESN)	0-0-6	ESD8902	Major Project Part – II (ESN)	0-0-24
		ESD8901	Major Project Part – I (ESN)	0-0-12	ESL7060	Heat Transfer	3-0-0
		ESL7127	Energy and Environment	3-0-0	ESL7114	Power Plant Engineering	3-0-0
		ESL7176	Industrial Energy and Environment Analysis	3-0-0	ESL7130	Direct Energy Conversion	3-0-0
		ESL7184	Cogeneration and Energy Efficiency	3-0-0	ESL7134	Nuclear Energy	3-0-0

		ESL7211	Fuel Technology	3-0-0	ESL7135	Hazardous Waste Management	3-0-0
		ESL7340	Non-conventional Sources of Energy	3-0-0	ESL7143	Optimal Design of Energy Systems	3-0-0
		ESL7415	Electrical Energy Management	3-0-0	ESL7154	Nanomaterials for Energy Applications	3-0-0
		ESL7774	Quantitative Methods for Energy Management and Planning	3-0-0	ESL7166	Environmental Regulations	3-0-0
		ESN7001	Ethics in Science and Engineering	1-0-0	ESL7170	Fusion Energy	3-0-0
		ESN7004	Basic Thermal Engineering	1-0-0	ESL7171	Instrumentation and Control in Energy Systems	3-0-0
		ESN7412	Basic Electrical Engineering	1-0-0	ESL7175	Liquid Sprays for Energy Sector and Industrial Applications	3-0-0
		ESN7899	Teaching practicum /Research practicum	0-0-8	ESL7178	Industrial Waste Management and Recycling	3-0-0
		ESP7128	Energy & Environment Laboratory	0-0-6	ESL7181	Alternative Fuels for Aircraft and Rocket Propulsion	3-0-0
					ESL7280	Zero Emission Vehicles	3-0-0
					ESL7282	Emission Control in Internal Combustion Engines	3-0-0
					ESL7333	Organic Waste to Energy Conversion Technology	3-0-0
					ESL7346	Hydrogen Energy	3-0-0
					ESL7349	Developing Energy Efficiency and Renewable Energy Projects	3-0-0
					ESL7351	Renewable Energy Resource	3-0-0

						Assessment and AI/ML tools Forecasting		
					ESL7352	Emerging Materials for Next Generation Photovoltaic Applications	3-0-0	
					ESL7355	Solar Photovoltaic Devices and Systems	3-0-0	
					ESL7368	Wind and Small Hydro Energy Systems	3-0-0	
					ESL7390	Atomistic Simulations for Energy Applications	2-0-2	
					ESL7421	Pulse Width Modulation Techniques and AC Motor Drives	3-0-0	
					ESL7438	Power System Planning and Operation	3-0-0	
					ESL7451	Electricity Policy, Regulations and Markets	3-0-0	
					ESL7496	Operation and Control of Electrical Energy Systems	3-0-0	
					ESL7497	Operation of Electrical Energy Systems with Large Scale Integration of Renewable Energy Sources.	3-0-2	
					ESL7498	Distributed and Decentralized Energy Systems	3-0-0	
					ESL7544	Plasmas for Energy and Environment	3-0-0	
					ESL7660	Electrochemical Science and Engineering for Energy Applications	3-0-0	

					ESL7672	Energy Storage	3-0-0
					ESL7673	Battery Storage	3-0-0
					ESL7679	Li-ion Batteries: Technology and Thermal Management	3-0-0
					ESL7724	Energy Audit	3-0-0
					ESL7742	Economics and Financing of Renewable Energy Systems	3-0-0
					ESL7745	Environmental Audit and Impact Assessment	3-0-0
					ESL7750	Economics and Planning Energy Systems	3-0-0
					ESL7752	Carbon Accounting, Reporting and Markets	3-0-0
					ESL7756	Energy Policy and Planning	3-0-0
					ESL7758	Carbon Capture and Storage	3-0-0
					ESL7764	Environmental Economics	3-0-0
					ESL8104	Pollution Control in Power Plants	3-0-0
					ESL8171	Advanced Fusion Energy	3-0-0
					ESL8275	Alternative Fuels for Transportation	3-0-0
					ESL8455	Solar Photovoltaic Power Generation	3-0-0
					ESS8901	Independent Study (ESN)	0-3-0
					ESV8191	Special Topics on Emerging Trends in Energy and Environmental Technologies	1-0-0

					Programme Electives (From Other Departments) [subject to confirmation from respective departments]		
					CHL7415	Petroleum Production Engineering	3-0-0
					CHL7407	Hydrogen, Electrolyser, and Fuel Cell Technology	3-0-0
					CHL7412	Environmental Engineering and Waste Management	3-0-0
					CHL7411	Air Pollution Control Engineering	3-0-0
					CHL7416	Petroleum Refinery Engineering	3-0-0
					CVL7705	Air Pollution and Climate	3-0-0
					CVL7704	Solid Waste Engineering and Management	3-0-0
					CVL8707	Environmental Impact Assessment	3-0-0
					CVL7709	Emerging Technologies for Environmental Management	3-0-0
					CVL8710	Thermal Techniques for Waste Management	3-0-0
					CVL8204	Life Cycle Analysis & Design for Environment	3-0-0
					CVL7542	Transportation Economics	3-0-0
					ELL7603	Elements of Smart and Sustainable Power Systems	3-0-0
					MEL7424	Combustion	3-0-0
					PYL7127	Energy Materials and Devices	3-0-0

21. Nominal Semester-wise Academic Plan [An example is provided below]

Proposed Semester wise Course Distribution: ESN (FT)

SEMESTER	Courses (Number, abbreviated title, L-T-P, Credits)							Lecture Courses	Contact h/week				Credits
									L	T	P	Total	
I	ESL7127 Energy and Environment (3-0-0) 3	ESL7211 Fuel Technology (3-0-0) 3	ESL7340 Non- Conventional Sources of Energy (3-0-0) 3	ESL7774 Quantitative Methods for Energy Management and Planning (3-0-0) 3	ESN7001 Ethics in Science and Engineering (1-0-0) 1	ESN7004 Basic Thermal Engineering / ESN7412 Basic Electrical Engineering (1-0-0) 0	ESN7899 Teaching practicum /Research practicum (0-0-8) 0	6	14	0	8	22	13
WINTER	ESD 7951 Cornerstone Project (ESN) (Winter) (0-0-10) 5 [2 credits to be completed within winter break]							0	0	0	4	4	2
II	ESL7176 Industrial Energy and Environment Analysis (3-0-0) 3	ESL7184 Cogeneration and Energy Efficiency (3-0-0) 3	ESL7415 Electrical Energy Management Systems (3-0-0) 3	ESP7128 Environment Laboratory (0-0-6) 3	PE-1 (3-0-0) 3	ESD7951 Cornerstone Project (ESN) (Winter) (0-0-10) 5 [remaining 3 credits to be completed within 2nd semester]	ESN7899 Teaching practicum /Research practicum (0-0-8) 0	4	12	0	20	32	18
SUMMER	ESD 7997 Summer Internship (ESN) (0-0-6) 3 / ESD7999 Minor Project (ESN) (0-0-6) 3							0	0	0	6	6	3
III	ESD8901 Major Project Part-I (ESN) (0-0-12) 6	PE-2 (3-0-0) 3		OE-1 (3-0-0) 3		OE-2 (3-0-0) 3	ESN7899 Teaching practicum /Research practicum (0-0-8) 0	3	9	0	20	29	15
IV	ESD8902 Major Project Part-II (ESN) (0-0-24) 12							0	0	0	24	24	12
	PE-3 (3-0-0) 3	PE-4 (3-0-0) 3	PE-5 (3-0-0) 3	PE-6 (3-0-0) 3		ESN7899 Teaching practicum /Research practicum (0-0-8) 0	4	12	0	0	12		
Total													63

Proposed Semester wise Course Distribution: ESN (PT)

SEMESTER	Courses (Number, abbreviated title, L-T-P, Credits)				Lecture Courses	Contact h/week				Credits
						L	T	P	Total	
I	ESL7211 Fuel Technology (3-0-0) 3	ESL7340 Non-Conventional Sources of Energy (3-0-0) 3	ESL7774 Quantitative Methods for Energy Management and Planning (3-0-0) 3	ESN7004 Basic Thermal Engineering / ESN7412 Basic Electrical Engineering (1-0-0) 0	4	10	0	0	10	9
II	ESL7176 Industrial Energy and Environment Analysis (3-0-0) 3	ESL7184 Cogeneration and Energy Efficiency (3-0-0) 3	ESL7415 Electrical Energy Management Systems (3-0-0) 3		3	9	0	0	9	9
III	ESL7127 Energy and Environment (3-0-0) 3	ESN7001 Ethics in Science and Engineering (1-0-0) 1	PE-1 (3-0-0) 3		3	7	0	0	7	7
WINTER	ESD 7951 Cornerstone Project (ESN) (Winter) (0-0-) (0-0-10) 5 [2 credits to be completed within winter break]				0	0	0	4	4	2
IV	ESP7128 Environment Laboratory (0-0-6) 3	PE-2 (3-0-0) 3	OE-1 (3-0-0) 3	ESD7951 Cornerstone Project (ESN) (Winter) (0-0-10) 5 [remaining 3 credits to be completed within 4 th semester]	2	6	0	12	18	12
SUMMER	ESD 7997 Summer Internship (ESN) / ESD7999 Minor Project (ESN) (0-0-6) 3				0	0	0	6	6	3
V	ESD8901 Major Project Part-I (0-0-12) 6			OE-2 (3-0-0) 3	1	3	0	12	15	9
VI	ESD8902 Major Project Part-II (0-0-24) 12				0	0	0	24	24	12
	PE-3 (3-0-0) 3	PE-4 (3-0-0) 3	PE-5 (3-0-0) 3	PE-6 (3-0-0) 3	4	12	0	0	12	
Total										63

22. Average Contact Hours per Faculty *per Week*, for this Programme

~ 2 h approx.

23. Average Credit Students per Faculty per Semester, for

52 credits approx.

this Programme	
24. If the program is a revision of an existing program, please list the major changes made.	✓ Inclusion of ethics course. ✓ Introduction to summer internships. ✓ Inclusion of cornerstone projects. ✓ Based on the basket of programme elective courses taken by the students, the department will certify the specialization in the respective domain.
25. Please elaborate on,	
a) how flexibility for the students has increased?	✓ Wider options for program elective courses. ✓ Expanded knowledge of open elective courses.
b) how engagement and interaction with the student have increased?	✓ Increased practical and laboratory contact hours compared to lecture hours.
c) how hands-on learning is emphasized in the program?	✓ The Corner-stone project has been allotted the maximum number of credits and it is expected to allow students to try to make some prototypes relevant to the energy sector towards the end of the tenure of the project. ✓ Higher credits dedicated to in Summer and Winter internships

The overall credits structure for M. Tech. in Energy and Environment Technologies & Management (Programme Code: ESN)

Programme Core (PC): ESN				Programme Electives (PE)/Open Electives (OE): ESN			
ESD7951	Cornerstone Project (ESN) (Winter)	0-0-10	5	ESL7742	Economics and Financing of Renewable Energy Systems	3-0-0	3
ESD7997	Summer Internship (ESN)	0-0-6	3	ESL7745	Environmental Audit and Impact Assessment	3-0-0	3
ESD8901	Major Project Part – I (ESN)	0-0-12	6	ESL7750	Economics and Planning Energy Systems	3-0-0	3
ESL7127	Energy and Environment	3-0-0	3	ESL7752	Carbon Accounting, Reporting and Markets	3-0-0	3
ESL7176	Industrial Energy and Environment Analysis	3-0-0	3	ESL7756	Energy Policy and Planning	3-0-0	3
ESL7184	Cogeneration and Energy Efficiency	3-0-0	3	ESL7758	Carbon Capture and Storage	3-0-0	3
ESL7211	Fuel Technology	3-0-0	3	ESL7764	Environmental Economics	3-0-0	3
ESL7340	Non-conventional Sources of Energy	3-0-0	3	ESL8104	Pollution Control in Power Plants	3-0-0	3
ESL7415	Electrical Energy Management	3-0-0	3	ESL8171	Advanced Fusion Energy	3-0-0	3
ESL7774	Quantitative Methods for Energy Management and Planning	3-0-0	3	ESL8275	Alternative Fuels for Transportation	3-0-0	3
ESP7128	Energy & Environment Laboratory	0-0-6	3				
Total PC (excluding audit courses)				ESL8455	Solar Photovoltaic Power Generation	3-0-0	3
38				ESS8901	Independent Study (ESN)	0-3-0	3
Compulsory Audit Courses (CA): ESN							
ESN7001	Ethics in Science and Engineering	1-0-0	1	ESV8191	Special Topics on Emerging Trends in Energy and Environmental Technologies	3-0-0	3
ESN7004	Basic Thermal Engineering	1-0-0	0				
ESN7412	Basic Electrical Engineering	1-0-0	0				
ESN7899	Teaching practicum /Research practicum	0-0-8	0				
Total PC (including audit courses)							
39							
Programme Electives (PE) / Open Electives (OE): ESN				Programme Electives (other Departments) [subject to confirmation from respective departments]			
ESD7999	Minor Project (ESN)	0-0-6	3	CHL7415	Petroleum Production Engineering	3-0-0	3
ESD8902	Major Project Part – II (ESN)	0-0-24	12	CHL7407	Hydrogen Energy and Fuel Cell Technology	3-0-0	3
ESL7060	Heat Transfer	3-0-0	3	CHL7412	Environmental Engineering and Waste Management	3-0-0	3
ESL7114	Power Plant Engineering	3-0-0	3	CHL7411	Air Pollution Control Engineering	3-0-0	3
ESL7134	Nuclear Energy	3-0-0	3	CHL7416	Petroleum Refinery Engineering	3-0-0	3
ESL7135	Hazardous Waste Management	3-0-0	3	CVL7705	Air Pollution and Climate	3-0-0	3
ESL7143	Optimal Design of Energy Systems	3-0-0	3	CVL7704	Solid Waste Engineering	3-0-0	3
ESL7154	Nanomaterials for Energy Applications	3-0-0	3	CVL8707	Environmental Impact Assessment	3-0-0	3
ESL7166	Environmental Regulations	3-0-0	3	CVL7709	Emerging Technologies for Environmental Management	3-0-0	3
ESL7170	Fusion Energy	3-0-0	3	CVL8710	Thermal Techniques for Waste Management	3-0-0	3
ESL7171	Instrumentation and Control in Energy Systems	3-0-0	3	CVL8204	Life Cycle Analysis & Design for Environment	3-0-0	3
ESL7175	Liquid Sprays for Energy Sector and Industrial Applications	3-0-0	3	CVL7542	Transportation Economics	3-0-0	3
ESL7178	Industrial Waste Management and Recycling	3-0-0	3	ELL7603	Elements of Smart and Sustainable Power Systems	3-0-0	3
ESL7181	Alternative Fuels for Aircraft and Rocket Propulsion	3-0-0	3	MEL7424	Combustion	3-0-0	3
ESL7280	Zero Emission Vehicles	3-0-0	3	PYL7127	Energy Materials and Devices	3-0-0	3
ESL7282	Emission Control in Internal Combustion Engines	3-0-0	3				
ESL7333	Organic Waste to Energy Conversion Technology	3-0-0	3				
ESL7346	Hydrogen Energy	3-0-0	3				
ESL7349	Developing Energy Efficiency and Renewable Energy Projects	3-0-0	3				
ESL7351	Renewable Energy Resource Assessment and AI/ML tools Forecasting	3-0-0	3				
ESL7352	Emerging Materials for Next Generation Photovoltaic Applications	3-0-0	3				
ESL7355	Solar Photovoltaic Devices and Systems	3-0-0	3				
ESL7368	Wind and Small Hydro Energy Systems	3-0-0	3				
ESL7421	Pulse Width Modulation Techniques and AC Motor Drives	3-0-0	3				
ESL7438	Power System Planning and Operation	3-0-0	3				
ESL7451	Electricity Policy, Regulations and Markets	3-0-0	3				
ESL7496	Smart Grid Operations	3-0-0	3				
ESL7497	Operation of Electrical Energy Systems with Large Scale Integration of Renewable Energy Sources.	3-0-2	4				
ESL7498	Distributed and Decentralized Energy Systems	3-0-0	3				
ESL7544	Plasmas for Energy and Environment	3-0-0	3				
ESL7672	Energy Storage	3-0-0	3				
ESL7673	Battery Storage	3-0-0	3				
ESL7679	Li-ion Batteries: Technology and Thermal Management	3-0-0	3				
ESL7724	Energy Audit	3-0-0	3				

Category	PC	PE	OE	Total
Credits	39	18	6	63