SHIV NADAR UNIVERSITY
CHENNAI

SSN School of Engineering

DEPARTMENT OF MECHANICAL ENGINEERING

Master of Technology
Energy Systems Engineering

CURRICULUM

REGULATIONS 2026

VISION AND MISSION OF THE DEPARTMENT

VISION

To be an eminent centre of excellence in the field of Mechanical Engineering where education, research and innovation synergize to nurture competent professionals to meet global technological and societal challenges.

MISSION

- To provide quality education that equips students with strong fundamentals and practical skills in Mechanical Engineering.
- To foster and disseminate research in various fields of Mechanical Engineering to promote technological advancement.
- To collaborate with industries through research and consultancy to nurture knowledge transfer.
- To cultivate professional ethics, teamwork and social responsibility among students.
- To encourage innovation and entrepreneurship among students to transform ideas into sustainable technologies.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: To excel as Energy/Thermal Engineers in industries and research organizations leading to successful professional career or entrepreneurship.

PEO 2: To pursue higher studies, research, professional development and lifelong learning to keep abreast with current technological advancements.

PEO3: To demonstrate professional standards, ethical practices and commitment to social and environmental responsibilities.

PROGRAM OUTCOMES (POs)

Program outcomes are the skills and knowledge which the students should have acquired at the time of graduation. A program outcome indicates what a student can do from course-wise knowledge acquired during the program. Students who graduate from this program shall exhibit the following:

Students who graduate from this program will be able to

PO1: To independently carry out research /investigation and development work to solve practical problems.

PO2: To write and present a substantial technical report/document.

PO3: To demonstrate a degree of mastery in the areas of energy systems, audit, energy conservation and management, heat transfer, thermal storage, design and simulation of thermal and fluid flow systems.

PO4: To apply ethical principles and environmental guidelines to address societal, environmental, and sustainability related issues.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: Exhibit competence in energy systems, energy audits and energy conservation for efficient energy management in industries

PSO 2: Analyse and apply engineering concepts of thermodynamics, fluid mechanics and heat transfer in design and simulation of thermal and fluid systems.

PEO / PO-PSO Mapping

	PO/PSO					
	PO1	PO2	PO3	PO4	PSO1	PSO2
PEO1	3	3	3	2	3	3
PEO2	3	3	3	2	3	3

Mapping Programme Outcomes with Graduate Attributes

S.No	NBA-GA	ME Energy PO
1	Scholarship of knowledge	3
2	Critical thinking	1
3	Problem solving	3
4	Research skill	1
5	Usage of modern tools	3
6	Collaborative and multidisciplinary research	1
7	Project management and finance	1

8	Communication	2
9	Life-long learning	3
10	Ethical practices and social responsibility	4
11	Independent and reflective learning	1

Washington Accord Knowledge Levels (WK)	**Attributes**
WK1	Natural sciences and social sciences
WK2	Conceptually based mathematics
WK3	Engineering fundamentals
WK4	Engineering specialist knowledge
WK5	Engineering design and operations
WK6	Engineering Practice (Technology)
WK7	Engineering knowledge in society, public safety and sustainable development
WK8	Research based knowledge
WK9	Professional ethics, inclusive behaviour and conduct

Complex Engineering Problems (WP)	**Attributes**
WP1	Depth of knowledge required
WP2	Range of conflicting requirements
WP3	Depth of analysis required
WP4	Familiarity of issues
WP5	Extent of applicable codes
WP6	Extent of stakeholder involvement and conflicting requirements
WP7	Interdependence

Complex Engineering Activities (EA)	Attributes
EA1	Range of resources
EA2	Level of interactions
EA3	Innovation
EA4	Consequences to the society and environment
EA5	Familiarity

Sustainable Development Goals (SDG)	Details	Sustainable Development Goals (SDG)	Details
SDG 1	No poverty	SDG 10	Reducing inequality
SDG 2	Zero hunger	SDG 11	Sustainable cities and communities
SDG 3	Good health and well-being	SDG 12	Responsible consumption and production
SDG 4	Quality education	SDG 13	Climate action
SDG 5	Gender equality	SDG 14	Life below water
SDG 6	Clean water and sanitation	SDG 15	Life on land
SDG 7	Affordable and clean energy	SDG 16	Peace, justice and strong institutions
SDG 8	Decent work and economic growth	SDG 17	Partnerships for the goals
SDG 9	Industry, innovation and infrastructure		

COURSE SUMMARY

The listed courses in the curriculum are broadly classified as per the recommendations from the UGC.

Sl. No	Broad Category of Course	Minimum Credit Requirement
1	Department Core Course (DC)	10
2	Major Core Course (MC)	30
3	Multidisciplinary Course (MD)	10
4	Open Elective (OE)	2
5	Project Dissertation (PD)	20
6	Research Internship (RI)	4
5	Skill Enhancement Course (SEC)	4
Total		**80**

The semester wise credit breakup of the Curriculum based on the above credit breakup proposed by the UGC is as follows:

Semester\Category	DC	MC	MD	OE	PD	RI	SEC	TOTAL
I	7	8	4	2	-	-	2	**23**
II	3	14	3	-	-	-	2	**22**
III	-	8	3	-	8	4	-	**23**
IV	-	-	-	-	12	-	-	**12**
Total	10	30	10	2	20	4	4	**80**

SEMESTER I

S. No.	COURSE CODE	COURSE TITLE	COURSE CATEGORY	CONTACT PERIODS	Teaching and Learning Scheme (per semester)					
					L	T	P	TW& SL	TH	C
1		Advanced Numerical Techniques for Energy Engineers	MD	4	45	30	0	45	120	4
2		Thermodynamic Analysis of Energy Systems	DC	5	45	0	30	45	120	4
3		Applied Fluid Mechanics and Heat Transfer	DC	3	45	0	0	45	90	3
4		Advanced Power Plant Engineering	MC	5	45	0	30	45	120	4
5		Elective 1	MC	5	45	0	30	45	120	4
6		Research Methodology / IPR/Operations Research	OE	2	30	0	0	30	60	2
PRACTICALS										
7		Applied Heat Transfer and Fluid Mechanics Laboratory	SEC	3	0	15	45	20	80	2
TOTAL				**27**	**255**	**45**	**135**	**275**	**710**	**23**

SEMESTER II

S. No.	COURSE CODE	COURSE TITLE	COURSE CATEGORY	CONTACT PERIODS	Teaching and Learning Scheme (per semester)					
					L	T	P	TW& SL	TH	C
1		Data Analytics and AI in Energy Systems	MD	4	30	0	30	30	90	3
2		Measurement and Control for Energy Systems	DC	3	45	0	0	45	90	3
3		Green Energy Technology	MC	5	45	0	30	45	120	4
4		Solar Energy Technologies	MC	5	45	0	30	45	120	4
5		Elective 2	MC	3	45	0	0	45	90	3
6		Elective 3	MC	3	45	0	0	45	90	3
PRACTICALS										
7		Computational Fluid Dynamics Laboratory	SEC	3	0	15	45	20	80	2

TOTAL			**26**	**255**	**15**	**135**	**275**	**680**	**22**

SEMESTER III

S. No.	COURSE CODE	COURSE TITLE	COURSE CATEGORY	CONTACT PERIODS	Teaching and Learning Scheme (per semester)					
					L	T	P	TW& SL	TH	C
1		Multi-disciplinary Open Elective	MD	3	45	0	0	45	90	3
2		Elective 4	MC	5	45	0	30	45	120	4
3		Elective 5	MC	5	45	0	30	45	120	4
PRACTICALS										
4		Project/Dissertation Phase I	PD	16	0	0	120	180	300	8
5		Research Internship	RI		0	0	0	320	320	4
TOTAL				**29**	**135**	**0**	**180**	**635**	**950**	**23**

SEMESTER IV

S. No.	COURSE CODE	COURSE TITLE	COURSE CATEGORY	CONTACT PERIODS	Teaching and Learning Scheme (per semester)					
					L	T	P	TW& SL	TH	C
PRACTICALS										
1		Project/Dissertation Phase II	PD	24	0	0	180	270	450	12
TOTAL				**24**	**0**	**0**	**180**	**270**	**450**	**12**

ELECTIVE 1

Basket 1: Energy Conversion Systems

S. No.	COURSE CODE	COURSE TITLE	COURSE CATEGORY	CONTACT PERIODS	Teaching and Learning Scheme (per semester)					
					L	T	P	TW& SL	TH	C
1		Steam Generator Technology	MC	5	45	0	30	45	120	4
2		Wind Energy Technologies	MC	5	45	0	30	45	120	4
3		Bio Energy Conversion Techniques	MC	5	45	0	30	45	120	4
4		Electric Drive Systems and Energy Conversion	MC	5	45	0	30	45	120	4
5		Renewable Energy Systems	MC	5	45	0	30	45	120	4

ELECTIVE 2

Basket 2: Applied Energy Systems

S. No.	COURSE CODE	COURSE TITLE	COURSE CATEGORY	CONTACT PERIODS	Teaching and Learning Scheme (per semester)					
					L	T	P	TW& SL	TH	C
1		Electric and Hybrid Electric Vehicles	MC	3	45	0	0	45	90	3
2		Photo Voltaic Technologies	MC	3	45	0	0	45	90	3
3		Fluidized Bed Systems	MC	3	45	0	0	45	90	3
4		Electrical Drives and Controls	MC	3	45	0	0	45	90	3
5		Hydrogen and Fuel Cell Technologies	MC	3	45	0	0	45	90	3

ELECTIVE 3

Basket 3: Energy Conservation and Storage

S. No.	COURSE CODE	COURSE TITLE	COURSE CATEGORY	CONTACT PERIODS	Teaching and Learning Scheme (per semester)					
					L	T	P	TW& SL	TH	C
1		Energy Conservation in Electrical Systems	MC	3	45	0	0	45	90	3
2		Energy Conservation in Industrial Utilities	MC	3	45	0	0	45	90	3
3		Energy Efficient Buildings	MC	3	45	0	0	45	90	3
4		Advanced Energy Storage Technologies	MC	3	45	0	0	45	90	3
5		Advanced Energy Materials	MC	3	45	0	0	45	90	3

ELECTIVE 4

Basket 4: Energy System Design and Utilization

S. No.	COURSE CODE	COURSE TITLE	COURSE CATEGORY	CONTACT PERIODS	Teaching and Learning Scheme (per semester)					
					L	T	P	TW& SL	TH	C
1		Design and Analysis of Turbomachines	MC	5	45	0	30	45	120	4
2		Computational Fluid Dynamics	MC	5	45	0	30	45	120	4
3		Design of Heat Exchangers	MC	5	45	0	30	45	120	4
4		Heating, Ventilating and Air Conditioning Systems	MC	5	45	0	30	45	120	4
5		Power Generation, Transmission and Utilization	MC	5	45	0	30	45	120	4

ELECTIVE 5

Basket 5: Energy Management and Environment

S. No.	COURSE CODE	COURSE TITLE	COURSE CATEGORY	CONTACT PERIODS	Teaching and Learning Scheme (per semester)					
					L	T	P	TW& SL	TH	C
1		Project Management in Energy Systems	MC	5	45	0	30	45	120	4
2		Environmental Engineering and Pollution Control	MC	5	45	0	30	45	120	4
3		Biomass Waste Management and Energy Recovery	MC	5	45	0	30	45	120	4
4		Alternate Fuels & Emission Control for IC Engines	MC	5	45	0	30	45	120	4
5		Principles of Energy conservation and Auditing	MC	5	45	0	30	45	120	4

MULTI-DISCIPLINARY OPEN ELECTIVE

S. No.	COURSE CODE	COURSE TITLE	COURSE CATEGORY	CONTACT PERIODS	Teaching and Learning Scheme (per semester)					
					L	T	P	TW& SL	TH	C
1		Business Analytics	MD	3	45	0	0	45	90	3
2		Industrial Safety	MD	3	45	0	0	45	90	3
3		Operations Research	MD	3	45	0	0	45	90	3
4		Cost Management of Engineering Projects	MD	3	45	0	0	45	90	3
5		Composite Materials	MD	3	45	0	0	45	90	3
6		Waste to Energy	MD	3	45	0	0	45	90	3

Note: Students from M.Tech. Energy Systems Engineering must not opt for this Open Elective.

L - Lecture, **T** - Tutorial, **P** - Practical, TW & SL – Term Work & Self Learning, TH – Total Hours and **C** – Credits