RBU

RAMDEOBABA UNIVERSITY, NAGPUR

Formerly Shri Ramdeobaba College of Engineering & Management (RCOEM) Est. 1984

RAMDEOBABA UNIVERSITY, NAGPUR–440013

(Formerly, Shri Ramdeobaba College of Engineering and Management, Nagpur 440013)

School of Electrical and Electronics Engineering

Department of Electrical Engineering

Teaching and Evaluation Scheme and Syllabi

(as per National Education Policy-2020)

Multidisciplinary Minor (MDM) Courses offered by Electrical Department

Renewable Energy and E-Mobility

(With effect from Academic Year 2024-25)

Ramdeobaba University, Nagpur
School of Electrical and Electronics Engineering
Department of Electrical Engineering

Session 2025-26
Multidisciplinary Minor (MDM) Courses offered by Electrical Department
"Renewable Energy and E-Mobility"

Sem	Course Code	Course Name	L	P	C	Continuous Assessment	End Semester/ Internal evaluation	Total	Duration of End Semester (Hrs)
III	24EE07TH0309	Introductions to Renewable Energy Sources	3	0	3	50	50	100	3
IV	24EE07TH0409	EV Architecture and Components	3	0	3	50	50	100	3
V	24EE07TH0509	Energy Storage Systems in E-Mobility	3	0	3	50	50	100	3
VI	24EE07TH0609	Autonomous Vehicle	3	0	3	50	50	100	3
		TOTAL	**12**	**00**	**12**				

Ramdeobaba University, Nagpur
School of Electrical and Electronics Engineering
Department of Electrical Engineering

Semester III	
Course Code: 24EE07TH0309	**Course:** Introductions to Renewable Energy Sources
L: 3 Hrs, **P**:0Hrs per Week	**Total Credits:** 03
Compulsory/Elective: Elective	**Course Type:** MDM

Course Outcomes:

After completion of the course, students will be able to

CO1	Understand the necessity and importance of renewable energy sources.
CO2	Discuss the working principle of solar photovoltaic system and its topologies.
CO3	Discuss the operation of wind energy generation.
CO4	Explain the renewable energy sources like Hydel, Tidal, Biomass, Geothermal, Wave, and Ocean.

Syllabus

Module I: Global and National Energy Scenario (04 Hours)

Over view of conventional & renewable energy sources, need, potential & development of renewable energy sources, Global and Indian Energy scenario, Energy for sustainable development, Global climate change, carbon credits and carbon footprint calculation.

Module II: Solar Energy (06 Hours)

Global and Indian solar energy potential, Types of solar energy: Thermal and Photovoltaic, Basic principles of solar radiation, Solar constant, solar spectrum, Extraterrestrial and terrestrial radiation, Solar time, solar angle, sun-path diagrams, Tilt angle, tracking systems, Solar radiation data and modeling

Module III : Solar PV Fundaments (08 Hours)

Introduction to photovoltaic solar cell, characteristics and its connections, Concept of Maximum Power Point tracking, Different PV topologies.

Module III: Wind Energy (06 Hours)

Wind Energy Conversion, Potential, Nature of the wind, Types of wind turbines, Wind-Electric Generation.

Ramdeobaba University, Nagpur
School of Electrical and Electronics Engineering
Department of Electrical Engineering

Module IV: Other Renewable Sources (08 Hours) Introduction to hydel-power generation, tidal energy, biomass energy, geothermal energy, Other renewable Energy Sources

Text Books:	
1	Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH,New Delhi, 3rd Edition.
2	Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis - second edition, 2013.
3	Non-Conventional Energy Sources /G.D. Rai, Khanna Publishers

Reference Books:	
1	Renewable Energy- Edited by Godfrey Boyle, Oxford University Press, 3rd Edition, 2013.
2	Handbook of Renewable Technology, Ahmed and Zobaa, Ramesh C Bansal, World scientific, Singapore.
3	Renewable Energy Technologies, Ramesh & Kumar /Narosa
4	Renewable Energy Technologies, A practical guide for beginners, Chetang Singh Solanki, PHI.
5	Non-conventional Energy Source, B.H. Khan, TMH, 2nd Edition.

Ramdeobaba University, Nagpur
School of Electrical and Electronics Engineering
Department of Electrical Engineering

Semester IV	
Course Code: 24EE07TH0409	**Course:** EV Architecture and Components
L: 3 Hrs, **P**:0Hrs per Week	**Total Credits:** 03
Compulsory/Elective: Elective	**Course Type:** MDM

Course Outcomes: After completion of the course, students will be able to	
CO1	Understand the evolution and comparison of Electric Vehicles (EVs)
CO2	Describe the various internal combustion engines.
CO3	Analyze vehicle dynamics and performance parameters
CO4	Explain the basic concepts of hybrid and electric traction and analyze various drive train topologies. They will also evaluate power flow control strategies for efficient energy management and performance optimization in hybrid vehicles.

Syllabus

Module I: Environmental Impact and History of Modern Transportation (05 Hours)
Air Pollution, Global Warming, Petroleum Resources, Overview of Electric Vehicles (EVs), Comparison with Internal Combustion Engine (ICE) vehicles, EV Market

Module II: Vehicle Dynamics and Control (07 Hours)
Fundamentals of vehicle dynamics: Tractive effort, gradeability, and driving cycles, Energy consumption and efficiency analysis, Performance parameters (range, acceleration, top speed).

Module III: Hybrid Drive-trains (06 Hours)
Basic concept of hybrid traction, introduction to various hybrid drive train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Module IV: Electric Vehicle (EV) Drive-trains (06 Hours)
Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

Modules V: Electric Vehicle Components
Overview of electric motor types, Introduction to Energy Storage Systems, Auxiliary and Support Systems

Text Books:	
1	Modern Electric, Hybrid Electric, and Fuel Cell Vehicles - Fundamentals, Theory, and Design: M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, CRC Press, 2004.
2	Electric and Hybrid Vehicles Design Fundamentals by Iqbal Husain, CRC Press

Reference Books:	
1	Electric and Hybrid Vehicles: T. Denton, Routledge, 2016