	National Institute of Technology Meghalaya An Institute of National Importance	CURRICULUM

Programme	**Bachelor of Technology in Mechanical Engineering**	Year of Regulation	**2018**
Department	**Mechanical l Engineering**	Semester	**IV**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
ME 206	Applied Thermodynamics	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

Course Objectives	To develop the student's ability to apply the first and thesecond laws of thermodynamics for the exergy and anergy analysis of the basic energy conversion systems.	Course Outcomes	**CO1**	Able to perform the exergy analysis and irreversibility of thermodynamic system.
			CO2	Able to perform the thermal analysis of vapour power cycle
			CO3	Able to perform the thermal analysis of gas power cycle
	To develop the student's ability to apply the principles of thermodynamics for the thermal analysis of the basic energy conversion systems: power generation, refrigeration, air-conditioning, and combustion.		**CO4**	Able to perform analysis of refrigeration cycles using various working fluids.
			CO5	Able to apply psychrometrics for analysis of different air conditioning process.
			CO6	Able to apply the first and second laws to combustion processes

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**
2	CO2	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**0**	**0**
3	CO3	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**0**	**0**
4	CO4	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**0**	**0**
5	CO5	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**3**	**0**	**0**
6	CO6	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**

SYLLABUS

No.	Content	Hours	CO
I	**Availability, Irreversibility:** Introduction, Available and non-available energy of a source and finite body, Relation between increase in unavailable energy and and entropy generation. Maximum work, maximum useful work for a control system and control volume, irreversibility, second law efficiency (effectiveness).	**05**	**CO1**
II	**Vapour Power Cycles:** Simple steam power Plant, Carnot vapours power cycle and its drawbacks. Description and thermodynamic analysis simple Rankine cycle with T-s diagram, different losses in Rankine cycle and thermodynamic analysis of actual Rankine cycle.Comparison of Carnot and Rankine cycle. Methods to improve Rankine cycle performance. Reheat cycle and its thermodynamic analysis, Regeneration, Practical regenerative Rankine cycles, open and closed feed water heaters. Reheat- regenerative cycle. Co-generation cycle and its thermodynamic analysis, Binary Vapour cycles, Combined power cycles	**08**	**CO2**
III	**Gas Power Cycles :** Air standard cycles; Otto, Diesel, Dual cycles, P-v and T-s diagrams, description and thermodynamic analysis, efficiencies and mean effective pressures. Comparison of Otto and Diesel cycles. Gas turbine (Brayton) cycle; description and analysis. Regenerative gas turbine cycle. Inter-cooling and reheating in gas turbine cycles. **Jet propulsion:** Introduction to the principles of jet propulsion, turbojet, turboprop, Ramjet and turbofan engines and their processes . Principles of rocket propulsion.	**06**	**CO3**
IV	**Refrigeration:** Mechanical refrigeration and types, units of refrigeration, air refrigeration system, details and principle of operation, applications of air refrigeration, vapour compression refrigeration systems, calculation of COP, effect of superheating and sub cooling, desired properties of refrigerants and common refrigerants, vapour absorption system, mechanical details, working principle, use of p-h charts for calculations	**06**	**CO4**
V	**Psychometrics and Air-conditioning :** Properties of Atmospheric air, Psychometric properties(dry bulb, wet bulb and dew point temperature, specific & relative humidity) of Air, Enthalpy of moist air, Psychometric Chart, Psychrometric and Air-conditioning Processes; Heating, Cooling, Dehumidification and Humidification, Evaporative Cooling. Adiabatic mixing of two moist air streams**.**	**06**	**CO5**
VI	**Chemical Reactions:** Fuels and Combustion, Theoretical and Actual Combustion Processes, Enthalpy of Formation and Enthalpy of Combustion, First-Law Analysis of Reacting Systems (Steady-Flow Systems, Closed Systems), Adiabatic Flame Temperature, EntropyChange of Reacting Systems, Second-Law Analysis of Reacting Systems	**05**	**CO6**
	Total Hours	**36**	

Essential Readings

1. Y. Cengel and M. Boles, "Thermodynamics- An Engineering Approach", McGraw Hill Education; Eighth Edition, 2017

2. R. E. Sonntag and C. Borgnakke, "Introduction to Engineering Thermodynamics", John Wiley & Sons, Second Edition, 2006.

Supplementary Readings

1. Moran, Shapiro, Boettner and Bailey "Principles of Engineering Thermodynamics", Wiley, Eighth Edition, 2015.

2. T.D.Eastop & A.McConkey, "Applied Thermodynamics for Engineering Technologists", Burnt Mill, Harlow, Longman Higher Education, Fifth Edition,1993

Property Tables/ Databook

1. K K Ramalingam "Steam Tables & Mollier Diagram (SI units)" SciTech publications (India) Pvt.Ltd.(2013)

2. C.P. Kothandarman, "Refrigerant Tables and Charts including Air Conditioning Data" New Age International; Fifth edition (2018)