	National Institute of Technology Meghalaya An Institute of National Importance	CURRICULUM
Programme	**Bachelor of Technology in Mechanical Engineering**	Year of Regulation: **2018**
Department	**Mechanical Engineering**	Semester: **IV**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
ME216	**Principles of Gas Turbine**	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

Course Objectives	This course has been designed to make the students familiar with the various types of gas turbines, their constructions, working principle and applications. These include the compressor and turbines used for aircraft propulsions, fuels and combustion, jet propulsion engines, followed by the performance of the gas turbines.	Course Outcomes	CO1	Explain the fundamentals of rotating machines; illustrate Brayton cycle and methods to improve its output and efficiency. (Apply)
			CO2	(i) Designate the single and multistage compressors and turbines used for gas turbines. (Understand) and (ii) Solve the problems related to performance and efficiency. (Apply)
			CO3	Explain the types of fuels used and consequent combustion in different combustion chambers. (Understand)
			CO4	(i) Classify various aircraft propulsion cycles. (Understand) and (ii) Solve related problems of the performance of various aircraft propulsion cycles. (Apply)
			CO5	Examine the gas turbine performances using equilibrium matching points (Analyse).

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

SYLLABUS

No.	Content	Hours	COs
I	**Rotodynamic Machines:** Energy transfer in rotodynamic machines, Classifications, Efficiency	**03**	**CO1**
II	**Brayton Cycle:** Ideal cycle with assumptions, Heat exchange cycle, Reheat, Intercooling, Optimum pressure ratio for maximum thermal efficiency, Open cycle arrangements	**06**	**CO1**
III	**Centrifugal and Axial Compressors:** Construction and working, Velocity triangle, Pre-rotation, Slip factor, Surging, Choking, Degree of reaction, Work done factor, Stage performance	**05**	**CO2**
IV	**Turbines:** Axial and radial gas turbines, Maximum utilization factor, Degree of reaction, Staging and overall efficiency, Blade profile, Pitch and chord	**05**	**CO2**
V	**Combustion:** Fuel types and additives, Atomizers, Ignition, Requirements of combustion chamber and classifications, Combustion process, Pressure loss, Pressure loss factor	**06**	**CO3**
VI	**Jet Propulsion:** Classification, Reciprocating or propeller engine, Ramjet, Pulsejet, Turbojet, Turboprop, Turbofan engines, Thrust and thrust equation, Specific thrust, Bypass ratio, Efficiencies	**06**	**CO4**
VII	**Performance:** Off-design performance, Dimensionless groups, Equilibrium matching points	**05**	**CO5**
	Total Hours	**36**	

Essential Readings

1. V. Ganesan, “Gas Turbines”, Tata McGraw Hill, 3rd Edition, 2010.

2. P.G. Hill and C.R. Peterson, “Mechanics and Thermodynamics of Propulsion”, Pearson Education, 2nd Edition, 2014.

Supplementary Readings

1. J.D. Mattingly, “Elements of Gas Turbine Propulsion”, McGraw-Hill, 1st Edition, 2005.

2. H.I.H. Saravanamuttoo, H. Cohen and G.F.C. Rogers, “Gas Turbine Theory”, Pearson Prentice Hall, 5th Edition, 2001.

3. A.H. Lefebvre and D.R. Ballal, “Gas Turbine Combustion: Alternative Fuels and Emissions”, CRC Press, 3rd Edition, 2010.

4. S.M. Yahya, “Turbines, Compressors and Fans”, Tata McGraw Hill, 4th Edition, 2017.