	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	**VIII**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
ME 416	**MANUFACTURING OF COMPOSITE MATERIALS**	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

Course Objectives		Course Outcomes		
	To develop the student's ability to understand the need of composite materials.		CO1	Able to compare the properties between the different classes of composite materials. (Understanding)
	To develop the student's ability to know the primary processing of PMCs, MMCs and CMCs.		CO2	Able to explain the different methods associated with manufacturing of polymer matrix composites. (Understanding)
	To develop the student's ability to know the secondary processing of PMCs, MMCs and CMCs.		CO3	Able to explain the different methods associated with manufacturing of metal matrix composites. (Understanding)
			CO4	Able to explain the different methods associated with manufacturing of ceramic matrix composites. (Understanding)
			CO5	Able to apply the understanding of machining and joining behaviour of different class of composite materials for making complex shape products. (Applying)

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**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2	CO2	**3**	**2**	**0**	**2**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**3**	**2**	**0**
3	CO3	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**2**	**0**
4	CO4	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**2**	**0**
5	CO5	**3**	**2**	**0**	**2**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**

SYLLABUS

No.	Content	Hours	COs
I	**Introduction** Need of composites, constituents of composites, classification based on matrix and fibers, types of reinforcements, matrix materials, interfaces and interphases, Polymer Matrix Composites (PMCs), Metal Matrix Composites (MMCs), Ceramic Matrix Composites (CMCs), mechanical properties of composites, advantages and limitations of composites, and applications of composites.	**06**	**CO1**
II	**Polymer Matrix Composites** Comparison of different types of polymer composites, processing of PMCs: Wet lay-up process, spray-up process, prepreg lay-up process, filament winding, pultrusion, resin transfer molding, injection molding, compression molding, sheet molding compound, and autoclave processing. Joining of PMCs: adhesive bonding and mechanical joining. Machining of PMCs: requirements for machining, challenges during machining of PMCs, chip formation, cutting tools, and types of machining operations.	**10**	**CO2** **CO5**
III	**Metal Matrix Composites** Processing of MMCs: Liquid state processes, solid state processes and in-situ processes. Secondary processing of MMCs, machinability aspects of MMCs, traditional machining processes for MMCs.	**10**	**CO3** **CO5**
IV	**Ceramic Matrix Composites** Processing of CMCs: Hot pressing, cold pressing and sintering, infiltration, direct oxidation, reaction bonding processes, sol-gel, in-situ chemical reaction techniques, self-propagating high-temperature synthesis, polymer infiltration and pyrolysis, and electrophoretic deposition, machinability aspects of MMCs.	**10**	**CO4** **CO5**
	Total Hours	**36**	

Essential Readings

1. K. K. Chawla, "Composite Materials: Science and Engineering", Springer, 2012.
2. K. Mazumdar, "Composites Manufacturing: Materials, Product, and Process Engineering", CRC Press, 2002.

Supplementary Readings

1. V. V. Vasiliev and E. V. Morozov, "Mechanics and Analysis Composite Materials", Elsevier, 2001.
2. F. L. Matthews and R. D. Rawlings, "Composite Materials: Engineering and Science", Woodhead Publishing, 1999.
3. D. Hull, "An Introduction to Composite Materials", Cambridge University Press, 1996.