

Name of the Department: Metallurgical & Materials Engineering

Name of the School: Engineering & Technology

Session: 2024-2029

Programme Duration: 5yrs

Programme Structure Curriculum & Evaluation & Choice Based Credit System (CBCS)

Programme Name	:	Integrated B. Tech & M. Tech in Metallurgical & Materials Engineering	
Programme Objectives	:	The programme is designed to impart a high-quality education in the core and emerging areas of technical metallurgical Materials Engineering with strong experimental, analytical and computational skills to address materials engineering needs for the emerging area of technological development. The programme is also designed to achieve knowledge acquired through specialization and breadth of knowledge gained through exploration. The programme structure would allow to meet not only today's demands of core sectors but also the needs of various manufacturing sections. It will also inculcate an attitude towards the commitment to engineering ethics, continued learning, and professional development. Additionally, the program structure would also allow a unique opportunity to obtain a departmental or an Interdisciplinary Specialization, or a Minor in demand-driven areas.	
Programme outcomes	:	The program will provide an ability to apply knowledge and address the challenges of design & development, processing, characterization, and evaluation of both conventional & advanced materials. It will also enable the students to predict the various properties of materials, validate structure-property-performance correlation in materials at various length scales, comprehend the process cycle to convert raw material to a final product and scale up the process.	
Eligibility	:	Passed 10+2 or equivalent examination with Physics, Mathematics, Chemistry subjects with a minimum 45% marks or equivalent grade for Unreserved/EWS Category and 40% or equivalent grade for SC/ST/OBC (non-creamy layer)/ PWD.	
Medium of Instruction	:	English	
Programme Duration	:	5 Yrs	
Total Credits	:	161 f(or B.Tech.); 181 (for B.Tech. (Hons.)); 201 (for Integrated M. Tech.)	
Programme Details (Proposed)			
Semester-I (First year)			
Course Code	Course Title	Course Type	Credit
PHY03101	Physics-I	BSC	4
PHY03103	Physics-I Laboratory	BSC	1
MAT03101	Mathematics -I	BSC	4
EEN07101	Basic Electrical Engineering	ESC	4
EEN07103	Engineering Graphics & Design	ESC	3
EEN07105	Basic Electrical Engineering Laboratory	ESC	1
ENG04101	Communication English	HSS	3
HSS04101	Design Thinking	ESC	1
Skill Enhancement Course (SEC) for Non-Engineering Department			
MME05101	Materials Testing	SEC	3

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CENTRAL UNIVERSITY OF JHARKHAND

Semester-II (First year)			
Course Code	Course Title	Course Type	Credit
CHM03102	Chemistry-I	BSC	3
CHM03104	Chemistry Laboratory	BSC	1
MAT03102	Mathematics -II	BSC	4
CSE07102	Programming for Problem Solving	ESC	3
CSE07104	Programming for Problem Solving Laboratory	ESC	1
MME07102	Biology for Engineers	ESC	3
EEN07102	Workshop Manufacturing Practices	ESC	3
NSS10102	NSS	AU	0
ANT041020	Universal Human Values-II: Understanding Harmony and Ethical Human Conduct	HSS	3

Semester-III (Second year)			
Course Code	Course Title	Course Type	Credit
MAT03201	Mathematics III	BSC	4
DCE07201	Engineering Mechanics	ESC	3
DCE07203	Engineering Mechanics Lab	ESC	1
MME01201	Introduction to Metallurgy and Material Sciences	PCC	3
MME01203	Phase Transformations	PCC	4
MME01205	Metallurgical Thermodynamics and Kinetics	PCC	4
MME01207	Metallography Laboratory	PCC	1
MME01209	Metallurgical Thermodynamics and Kinetics Laboratory	PCC	1
DGI10201	Disaster Management	AU	0
Optional (Specialization paper for B. Tech. (Hons))			
MME02201	Synthesis and Properties of Nanomaterials	MSC	3
MME02203	Nanomaterials synthesis lab	MSC	1

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Semester -IV (Second year)			
Course Code	Course Title	Course Type	Credit
MME01202	Mechanical behavior of Materials	PCC	3
MME01204	Transport Phenomena	PCC	3
MME01206	Physical Metallurgy & Heat Treatment of Materials	PCC	3
MME01208	Mineral Processing	PCC	3
MME01210	Iron and Steel Making Technology	PCC	3
MME01212	Mechanical Metallurgy Laboratory	PCC	1
MME01214	Heat Treatment of Materials Laboratory	PCC	1
MME01216	Mineral Processing Laboratory	PCC	1
MME09202	Fundamentals of Materials Science & Engineering##	OEC**	3
Optional (Specialization paper for B. Tech. (Hons))			
MME02202	Quantum Mechanics for Nanostructures	MSC	3
Sem-IV: Open Elective offered by other Departments**			
CSE09202	Introduction to Data Structure**	OEC	3
DCE09202	Project Management Techniques**	OEC	3
EEN09202	Basics of Renewable Energy Resources**	OEC	3

Note:

- 1) ** DMME students will take any one course offered from another departments & ## for other Department students
- 2) Mandatory Industrial Training/Internship of 30-45 days in summer vacation

Semester-V (Third year)			
Course Code	Course Title	Course Type	Credit
MME01301	Materials Characterization Techniques	PCC	3
MME01303	Corrosion and Degradation of Materials	PCC	3
MME01305	Principle of Extractive Metallurgy	PCC	3
MME01307	Foundry Technology	PCC	3
MME01309	Materials Characterization Laboratory	PCC	1
MME01311	Materials Degradation Laboratory	PCC	1
MME09301	Fundamentals of Nanoscience & Technology##	OEC**	3
DCE07301	Engineering Economics	ESC	3
Optional (Specialization paper for B. Tech. (Hons))			
MME02301	Sensor Materials and Technology	MSC	4
Sem-V: Open Elective offered by other Departments**			
CSE09301	AI foundations & Applications	OEC	3
DCE09301	Remote sensing & GIS in Engineering	OEC	3
EEN09301	Basics of Solar Energy Engineering	OEC	3

Note:

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झारखण्ड केन्द्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF JHARKHAND

Semester-VI (Third year)			
Course Code	Course Title	Course Type	Credit
MME01302	Physics of Materials	PCC	4
MME01304	Fuel, Furnace and Refractories	PCC	3
MME01306	Computational Materials Engineering	PCC	3
MME01308	Manufacturing Process	PCC	3
MME01310	Alloys & Steel	PCC	3
MME01312	Computational Materials Laboratory	PCC	1
MME09302	Fundamentals of Materials Characterization Techniques##	OEC**	3
Optional (Specialization paper for B. Tech. (Hons))			
MME02302	Nanoelectronics	MSC	3
Sem-VI: Open Elective offered by other Departments**			
CSE09302	Introduction to Machine Learning	OEC	3
DCE09302	Watershed Management	OEC	3
EEN09302	Basics of Fuel Cell & Hydrogen energy	OEC	3

Note:

- 1) **DMME students will take any one course offered from other departments & ## for other Department students
- 2) Mandatory Industrial Training/Internship of 30-45 days in summer vacation

Semester-VII (Fourth year)			
Course Code	Course Title	Course Type	Credit
MME01401	Powder Metallurgy	PCC	3
MME01403	Metal Joining Processes	PCC	3
MME08401	Programme Elective-1	PEC	3
MME08403	Programme Elective-2	PEC	3
MME08405	Programme Elective-3	PEC	3
MME05401	Engineering Project-1	Project	5
MME05403	Summer Internship	Project	1
Optional (Specialization paper for B. Tech. (Hons)) Nanophotonics			
MME02401	Nanophotonics	MSC	3

Semester-VIII (Fourth year)			
Course Code	Course Title	Course Type	Credit
MME08402	Programme Elective-4	PEC	3
MME08404	Programme Elective-5	PEC	3
MME05402	Engineering Project -2	Project	10
Optional (Specialization paper for B. Tech. (Hons))			
MME02402	Modern Microscopic Techniques	MSC	3

झारखण्ड केन्द्रीय विश्वविद्यालय

CENTRAL UNIVERSITY OF JHARKHAND

Semester-IX (Five Year]			
Course Code	Course Title	Course Type	Credit
MME08501	Programme Elective-6	PEC	3
MME08503	Programme Elective-7	PEC	3
MME01505	Research Methodology & IPR	PCC	2
MME05501	Dissertation -1	Project	12

Semester-X (Five Year]			
Course Code	Course Title	Course Type	Credit
MME05502	Dissertation -2	Project	20

Note:

1. **DMME students will take any one course offered by other departments
2. ##for other Department students
3. Mandatory Industrial Training/Internship of 30-45 days in summer vacation after Semesters IV & VI.
4. The variations in the semester course & credits may take place depending upon the availability of the course/credit on the SWAYAM/NPTEL/MOOCs platform.
5. In the case of semester-long project work in an industry/research organization, the semester-IX courses may be offered in online mode from the SWAYAM/NPTEL/MOOCs Platform.

Programme Elective Course (PEC)			
Course Code	Course Title	Course Type	Credit
Semester-VII			
MME08401	Composite Materials	PEC	3
MME08403	Welding Technology	PEC	3
MME08405	AI in Materials Engineering	PEC	3
MME08407	Materials forming technology	PEC	3
MME08409	Steel making & ferrous Alloys	PEC	3
MME08411	Ceramics and Glass Materials	PEC	3
MME08413	Semiconductor Technology	PEC	3
MME08415	Surface Engineering	PEC	3
MME08417	Polymeric Materials and Processing	PEC	3
MME08419	Electronic and Magnetic Materials	PEC	3
MME08421	Non-Ferrous Extractive metallurgy	PEC	3
MME08423	Metal casting & solidification	PEC	3
Semester-VIII			
MME08402	Renewable Energy Materials	PEC	3
MME08404	Ferroalloys Technology	PEC	3
MME08406	Nanomaterials & Applications	PEC	3
MME08408	Recycling and sustainable Technology	PEC	3
MME08410	Additive Manufacturing Technologies	PEC	3
MME08412	Electron Microscopy	PEC	3
MME08414	Industry 4.0: Applications in Metallurgical and Materials Engineering	PEC	3
MME08416	Non-Destructive testing	PEC	3

झारखण्ड केन्द्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF JHARKHAND

MME08418	Texture Analysis	PEC	3
MME08420	Light Metals & Alloys	PEC	3
Semester-IX			
MME08501	Fracture Mechanics and Failure Analysis	PEC	3
MME08503	X-Ray Diffraction Technique	PEC	3
MME08505	Design and selection of materials	PEC	3
MME08507	Energy storage materials	PEC	3
MME08509	Biomaterials	PEC	3
MME08511	High Temperature Materials	PEC	3
MME08513	Deformation Theory of Metals	PEC	3

Semester-wise credit summary of Course Type for various programmes

Sl. No.	Course Type	Number of Courses	Credits	Number of Courses	Credits
1.	Basic Science Course (BSC)	7	21	7	21
2.	Engineering Science Course (ESC)	11	26	11	26
3.	Humanities Courses (HSS)	2	6	2	6
4.	Programme Core Course (PCC)	27	68	28	70
5.	Programme Elective Course (PEC)	5	15	7	21
6.	Open Elective Course (OEC)	3	9	3	9
7.	Audit Course (AU)	3	0	3	0
8.	Project/Internship	3	16	5	48
		Credits	161		201
9.	Department/Minor specialization Course (MSC)*	7	20		
		Credits	181		
Credit for B. Tech: 161; for B.Tech. (Hons): 181; for M.Tech: 201					

Gajendra Prasad Singh

Signature of the Head of Department

Date:28.01.2024