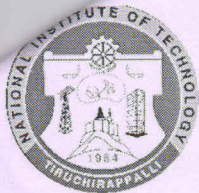


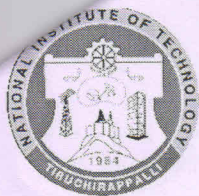
DEPARTMENT OF METALLURGICAL AND MATERIALS
ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	B.Tech Metallurgical and Materials Engineering		
Course Title	Particulate Processing		
Course Code	MTPC25	No. of Credits	3
Course Code of Pre-requisite subject(s)	MTPC23		
Session	January 2019	Section (if, applicable)	NA
Name of Faculty	Ms. P. Anbarasi	Department	MME
Official Email	anbarasi@nitt.edu	Telephone No.	9566121219
Name of Course Coordinator(s) (if, applicable)	NA		
Official E-mail	NA	Telephone No.	NA
Course Type (please tick appropriately)	<input checked="" type="checkbox"/> Core course	<input type="checkbox"/> Elective course	
Syllabus (approved in BoS)			
<p>Introduction – Historical background, important steps in powder metallurgy (P/M) process – Advantage and Limitations of powder metallurgy process and Applications</p> <p>Methods – Production of ceramic powders - powder production by newer methods such as electron beam rotating electrode, rotating electrode process, electron beam rotating disc and the rotating rod process, automation, rapid solidification technique. Characteristics: sampling – chemical composition, particle shape and size analysis, Surface area, packing and flow characteristics, Porosity and density, compressibility, Strength properties. Blending and mixing of metal powders;</p> <p>Compaction of powders, pressure less and pressure compaction techniques - single action and double action compaction, Cold Isostatic compaction, powder rolling, continuous compaction, explosive compaction, Hot temperature compaction – Uni axial hot pressing, Hot extrusion, Spark sintering, Hot isostatic pressing, Injection moulding – Sintering – Types – Theory of sintering – process variables, Effects of sintering – Sintering atmospheres – metallographic technique for sintered products.</p> <p>Post sintering operations – Sizing, coining, repressing and resintering, impregnation, infiltration, Heat treatment, steam treatment, machining, joining, plating and other coatings. Products: Porous parts, sintered carbides, cermets, dispersion strengthened materials, electrical applications, sintered friction materials</p> <p>Atomisation; Mechanical alloying, Metal Injection moulding, Microwave sintering and self propagating high temperature synthesis.</p>			



COURSE OBJECTIVES	
To introduce the importance of non-conventional processing routes for different materials and its importance for advanced materials manufacturing.	
MAPPING OF COs with POs	
Course Outcomes	Programme Outcomes (PO) (Enter Numbers only)
1. Describe the basic mechanism of powder production for variety of materials to meet the demand of the research and industrial needs	1
2. Characterize the various powders (materials) based on the engineering applications	1, 2
3. Differentiate the processing routes for various powders (materials) and associated technology	1, 2, 5
4. Define modern day processing routes and apply them successfully to materials processing	1
5. Apply the powder metallurgy concepts to design new materials for advanced engineering materials	1, 3
6. Apply the concepts of particulate processing to produce non-conventional materials which are difficult to produce other techniques.	1, 10

COURSE PLAN – PART II			
COURSE OVERVIEW			
<ul style="list-style-type: none"> ➤ Introduction, steps in powder metallurgy process, advantages, limitations and applications ➤ Methods of powder production, various powder characteristics ➤ Pressureless and pressure compaction techniques, sintering – types, effects of sintering, sintering atmosphere, metallographic technique for sintered products ➤ Various post sintering operations, application of products ➤ Atomization, mechanical alloying, metal injection moulding, microwave sintering and self propagating high temperature synthesis 			
COURSE TEACHING AND LEARNING ACTIVITIES			(Add more rows)
S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	2 nd to 4 th week, Jan	Introduction, historical background, important steps in P/M process, advantages, limitations and applications of P/M process, ceramic powder production methods	Chalk and Board
2	5 th week Jan to 4 th week Feb	Atomization, mechanical alloying, Metal Injection Moulding, Microwave sintering and self propagating high temperature synthesis, Powder characteristics: sampling – chemical	Chalk and Board



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		composition, particle shape and size analysis, surface area, packing and flow characteristics, porosity and density, compressibility, strength, blending and mixing of metal powders, single action and double action compaction techniques	
3	1 st to 2 nd week March	Cold Isostatic compaction, powder rolling, continuous compaction, explosive compaction, Hot temperature compaction – hot extrusion, spark plasma sintering,	Chalk and Board & Power point
4	3 rd to 4 th week March	HIP, Injection moulding, Sintering – types, atmosphere, effects, metallographic technique for sintered products, various post sintering operations	Chalk and Board & Power point
5	1 st to 3 rd week April	Heat treatment, steam treatment, machining, joining, plating. Products – Porous parts, sintered carbides, cermets, dispersion strengthened materials, electrical applications, sintered friction materials	Chalk and Board

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment – I	3 rd week of February	1 hr	20
2	Assessment – II	3 rd week of March	1 hr	20
3	Assignment	1 st week of April	1 Week	10
CPA	Compensation Assessment*	2 nd week of April	1 hr	20
4	Final Assessment *	May	3 hrs	50

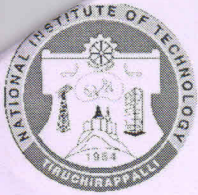
*mandatory; refer to guidelines on page 4

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

Student's feedback

COURSE POLICY (including compensation assessment to be specified)

MODE OF CORRESPONDENCE (email/phone etc): Communication through class representative and E-mail



COMPENSATION ASSESSMENT POLICY: If any students miss the test in genuine ground (production of certificate or letter from the authorized personnel), She/he will be permitted for compensation assessment

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

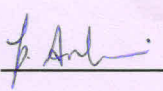
- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

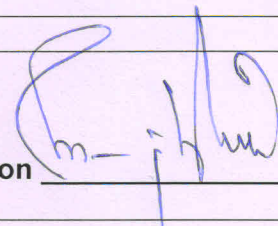
ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION, IF ANY

FOR APPROVAL

Course Faculty 

CC- Chairperson 

HOD 