DEPARTMENT OF __METALLURGICAL AND MATERIALS ENGINNERING__

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	**M Tech. (Materials Science and Engineering/ Welding Engineering/ Industrial Metallurgy]**		
Course Title	**MT 611 PHYSICAL METALLURGY**		
Course Code	**MT 611**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)	**Nil**		
Session	**July 2019**	**Section (if, applicable)**	**NA**
Name of Faculty	**Dr. N. Ramesh Babu**	**Department**	**MME**
Email	**rameshrohith@gmail.com** **nrb@nitt.edu**	**Telephone No.**	**2503464** **9444932221**
Name of Course Coordinator(s) (if, applicable)	**NA**		
E-mail		**Telephone No.**	
Course Type	☐ **Elective course**		

Syllabus (approved in BoS)

Introduction to engineering materials. Atomic structure and inter atomic bonding, theoretical concept of crystalline materials – types of packing, voids and packing factors for each of the packings, concept of alloy design using lattice positions and interstitial voids. Planes and directions and imperfections in solids. Polymorphism and allotropy.

Diffusion, Solidification, Nucleation and growth-dealing homogeneous and heterogeneous nucleation and growth in solids, dendritic growth in pure metals, constitutional super cooling and dendritic growth in alloys.

Phase diagrams – solid solution –types, Hume-Rothery rules. Phase diagrams – Binary- types – Lever rule. Solidification of different types of solid solutions – Iron-Carbon diagram – Effect of alloying element on Iron-carbon diagram. Ternary phase diagrams- Understanding of isotherms and isopleths.

Heat treatment of ferrous alloys; Annealing, Normalising, TTT and CCT diagrams, Hardening – hardenability measurements, tempering. Thermo-mechanical treatments. Heat treatment furnaces – atmospheres – quenching media – case hardening techniques.

Basic concept of dislocations their types and its interactions. Dislocations and strengthening mechanisms strengthening by grain-size reduction, solid solution strengthening, strain hardening, dispersion hardening and other recent modes of hardening.

COURSE OBJECTIVES

To develop an understanding of the basis of physical metallurgy and correlate structure of materials with their properties for engineering applications..

COURSE OUTCOMES (CO)

Course Outcomes	**Aligned Programme Outcomes (PO)**
Upon completion of this course, the students will be able to: 1. Describe the basic crystal structures (BCC, FCC, and HCP), recognize other crystal structures, and their relationship with the properties [1] 2. Define and differentiate engineering materials on the basis of structure and properties for engineering applications [1, 3, 5] 3. Select proper processing technologies for synthesizing and fabricating different materials [1,3,5,6] 4. Analyse the microstructure of metallic materials using phase diagrams and modify the microstructure and properties using different heat treatments.[1,2,3,6,9]	1. Materials Science and Engineering post graduates are attaining knowledge of materials and their science & Engineering 2. Materials Science and Engineering post graduates are talented to formulate and analyse the engineering data. 3. Materials Science and Engineering post graduates can recognize classify and solve engineering problem. 4. Materials Science and Engineering post graduates are capable of exploring the resources to collect the required data, analyse and solve critical problems. 5. Materials Science and Engineering post graduates have skills in locating and applying modern tools to resolve the complex engineering problems 6. Materials Science and Engineering post graduates are competent to work in research, industrial sectors and with multi-faceted team 7. Materials Science and Engineering post graduates have the capacity to design, plan and execute complex processes adhering to environmental considerations and cost effectiveness. 8. Materials Science and Engineering post graduates are capable to communicate effectively to engineering community and explain well to the society. 9. Materials Science and Enggeering post graduates have motivation for enduring education to maintain competency. 10. Materials Science and Engineering post graduates have gained knowledge to adhere to the ethical considerations and play a key role in sustainable development. 11. Materials Science and Engineering post graduates are capable to asses both persons and problems & take decisions independently

COURSE PLAN – PART II

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1.	I-III	Structure and bonding, imperfections, planes and directions	Classroom teaching + Guest Lectures + Exposure to the facilities available at NITT/Research Labs/Industry
2.	IV-VI	Nucleation and growth	
3.	VII-IX	Phase diagrams	
4.	X-XII	Heat treatment	
5.	XIII-XIV	Dislocations and strengthening mechanisms	

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	One Assignment	X- XIV week	-----	10
2	One Seminar and writeup	XIII- XIV week	30 min	15
3	One cycle test	Around IX week	1.5 h	25
4	**Compensation Assessment***			
	Re-test	XII week	1.5 h	25 (If any
	Guest Lectures (2 lectures subjected to Institute approvals)	After VIII week	1 h each	student misses 1st cycle test for medical reasons)
	Attendance	---------	---------	Nil
5	**Final Assessment *** End semester exam based on classroom teaching	Around XV	3 h	50

***mandatory; refer to guidelines on page 4**
Minimum 75% attendance required for writing the semester examination as per institute norms

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

The feedback from students will be assessed based on the questionnaire prepared by the institute and expected attainment to be 75%.

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

The students are expected to attend all the classes except for medical reasons. Minimum attendance of 75% is required for writing the semester examination.

Apart from technical content and presentation, plagiarism will be checked for the assignments

MODE OF CORRESPONDENCE (email/ phone etc)

The Course Coordinator is available for consultation at any time.

Students can also contact me at any time through phone or by e-mail.

The phone number and email id will be given to the students at the beginning of the course

COMPENSATION ASSESSMENT POLICY

Retest will be conducted for the portion of the course completed.

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

The Course Coordinator is available for consultation at any time.

Students can also contact me at any time through phone or by e-mail.
The phone number and email id will be given to the students at the beginning of the course

FOR APPROVAL

N. Ramesh Babu
Course Faculty _____

NRB
CC-Chairperson _____

HOD _____ 08-08-19

Guidelines:

a) The number of assessments for a course shall range from 4 to 6.

b) Every course shall have a final assessment on the entire syllabus with at least 30% weightage.

c) **One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.**

d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or class average/2 whichever is greater.		Peak/3 or class average/2 whichever is lower		40%

e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.

f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.

g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.