

DEPARTMENT OF INSTRUMENTATION AND CONTROL ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN

COURSE OUTLINE			
Course Code & Name	ICPC12 MATERIAL SCIENCE		
Programme & Semester	B.Tech & III	No. of Credits	3
Department	ICE	Faculty	Dr. P.Venkatachalam
Pre - requisites Course Code	Not required		
Course Coordinator(s) (if, applicable)	----		
Course Teacher E-mail	venkatp@nitt.edu	Telephone No.	8220931481
Course Type	Core Course		
COURSE OVERVIEW			
<p>This course covers all aspects of materials science for those who have no previous exposure to this subject from crystal structure to the basics in selection of materials for instrumentation applications.</p> <p>Sufficient Importance is given in course to Phase diagrams, microstructure and properties of materials. Standard mechanical testing procedures for materials. Material response to different service environments and remedies has been also covered.</p>			
COURSE OBJECTIVES			
To develop an understanding of the basic principles of Material Science and apply those principles to engineering applications.			
COURSE OUTCOMES (CO)			
Course Outcomes		Aligned Programme Outcomes (PO)	
1. Understand the geometry and crystallography of crystalline materials using Bravais lattices and Miller Indices.		1, 12	

2. Differentiate the basic crystal structures (BCC, FCC, and HCP), recognize other crystal structures.
3. Interpretation of phase diagram and iron-carbon system.
4. Define various mechanical properties and the associated testing methods.
5. Define electrical, magnetic and optical properties of materials.
6. Select suitable materials for specific instrumentation devices.

COURSE TEACHING AND LEARNING ACTIVITIES

Sl.No.	Week	Topic	Mode of Delivery
1.	1 st week	Introduction to crystal structure of materials, density computations, polymorphism and allotropy.	Chalk & Talk ,PPT
2.	2 nd week	Miller indices for crystallographic planes and directions, Isotropy and anisotropy with respect to material properties.	Chalk & Talk ,PPT
3.	3 rd week	X-ray diffraction for determination of crystal structure. Defects in solids: point, line and planar defects and their effect on properties of materials.	Chalk & Talk ,PPT
4.	4 th week	Phase diagrams, Gibbs phase rule, the iron-carbon system.	Chalk & Talk ,PPT
5.	5 th week	Development of micro structure-equilibrium and non-equilibrium cooling. Time- temperature-transformation curves and their applications.	Chalk & Talk ,PPT
6.	6 th week	Mechanical properties of materials, stress-strain relationship, fatigue and creep.	Chalk & Talk ,PPT
7.	7 th week	strengthening mechanisms and fracture, Thermal properties	Chalk & Talk ,PPT

8.	8 th week	Electrical properties of materials: electron energy band structures for solid materials .	Chalk & Talk ,PPT
9.	9 th week	Intrinsic and extrinsic semiconductors, the temperature variation of conductivity and carrier concentration.	Chalk & Talk ,PPT
10.	10 th week & 11 th week	Electrical properties and magnetic properties of materials and application.	Chalk & Talk ,PPT
12.	12 th week & 13 th week	Environmental effect on materials, Zone refining for purification of materials.	Chalk & Talk ,PPT
14.	14 th week	Synthesis and growth of Group-III-V compounds and their applications. Selection of specific materials required for instrumentation devices	Chalk & Talk ,PPT

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment I (Written Test)	7 th Week	1 Hr	20%
2	Assessment II (Written Test)	12 th Week	1 Hr	20%
3	Retest	15 th Week	1 Hr	20%
4	Assignments III	3 rd to 14 th Week	-	20%
5	Assessment IV (End Semester)	16 th Week	3 Hrs	40%

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

Text Books:

1. Callister W.D., *Materials Science and Engineering: An introduction*, 6th Edition, John Wiley & Sons Inc., New York 2002
2. Raghavan V. *Materials Science and Engineering – A first course*, 5th Edition, Prentice Hall, New Delhi, 1998
3. Van Vlack, LH, *Elements of Materials Science and Engineering*, 6th Edition, Addison – Wesley Singapore, 1989

Reference Books:

1. Askeland D.R. *The Science and Engineering of Materials*, 2nd Edition, Chapman and Hall, London, 1989

COURSE EXIT SURVEY

An exit survey will be taken from the student at the end of the semester through a questionnaire on coverage of syllabus, usefulness of course-plan, teaching efficiency, etc.

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

1. Examination

- a) Students who have missed the Assessment I and II or both can register only once for retest which shall be conducted after the completion of the Assessment II and before the end semester examination.
- b) Syllabus for reassessment exam shall comprise of the syllabus of both first and second assessments. Weightage of marks for the reassessment would be 20 %
- c) Students should submit two assignments on selected topics related to this course. Weightage of marks for the assignments will be 14 % (7% for each assignment).
- d) A Quiz will be conducted on assignment topic to evaluate the academic honesty of the student in preparing the assignments. Weightage of marks for the quiz will be 6% (3% for each assignment)
- e) The pass mark and grading will be assigned as per institute norms.

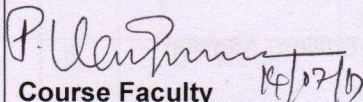
2. Attendance

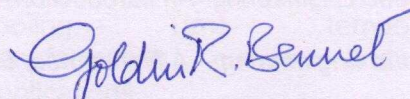
Minimum attendance required for result declaration is 75%.

ADDITIONAL COURSE INFORMATION

Students can make a call or email to venkatp@nitt.edu at any stage of the course duration in case he/she finds difficulty in understanding the concepts.

FOR SENATE'S CONSIDERATION


Course Faculty
Dr. P. Venkatachalam


14.7.2017
CC-Chairperson/ICE
Prof. G.R. Bennet


HOD/MME
Dr. S. P. Kumaresh Babu

