Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER Arrear EXAMINATIONS, April/May 2024

Materials Science and Engineering
V[th] Semester
ML5502&Characterisation of Materials
(Regulation 2019)

Time : 3hrs Max.Marks : 100

CO1	To educate students on various techniques of structural characterization of materials.
CO2	To enable student to interpret microstructure, crystal structure and surface structure of materials.
CO3	To import knowledge on X-Ray diffraction techniques and analysis
CO4	To import knowledge on different electron microscopy techniques used for characterization
CO5	To import knowledge on techniques of elemental chemical composition and structure of surface.

BL – Bloom's Taxonomy Levels
(L1- Remembering, L2- Understanding, L3- Applying, L4- Analyzing, L5- Evaluating, L6- Creating)

PART- A (10x2=20Marks)
(Answer all Questions)

Q.No	Questions	Marks	CO	BL
1	Distinguish between resolution and magnification. Comment on empty magnification.	2	1	L2
2	Why depth of field is important in SEM?	2	1	L2
3	What is constructive and destructive interferences?	2	2	L4
4	What is the difference between characteristic and continuous X-ray spectrum?	2	2	L4
5	How does the instrumental line broadening be rectified in XRD?	2	3	L4
6	What is Bragg's equation and explain the terms?	2	3	L5
7	Analyze the various signals during electron – matter interaction?	2	4	L2
8	Write the sample preparation techniques for metallurgical microscope analysis.	2	4	L4
9	Write the Principle of Quadrapole mass spectrometer?	2	5	L4
10	What is the basic principle of LEED?	2	5	L2

PART- B(5x 13=65Marks)
(Restrict to a maximum of 2 subdivisions)

Q.No	Questions	Marks	CO	BL
11 (a)	Explain in detail about construction and principle of Working of Metallurgical microscope.	13	1	L2
	OR			
11 (b)	What is meant by aberration? Discuss various aberrations and its correction method.	13	1	L3

12 (a)	What are the different diffraction methods in XRD? Explain any one of the X-ray diffraction Technique in detail?	**13**	2	L2
	OR			
12 (b)	Explain absorption edges?	**13**	2	L3
13 (a)	The lattice parameter of an FCC metal is 0.4nm. Evaluate the 2Θ values for the first five peaks of diffraction pattern obtained with Cu radiation (λ= 0.154 nm).	**13**	3	L5
	OR			
13 (b)	Find out the crystal structure for the following 2Θ positions: 38.46, 55.54, 69.58, 82.46, 94.94, 107.64 and 121.36.	**13**	3	L3
14 (a)	Differentiate between SEM and TEM with ray diagrams and explain in detail?	**13**	4	L4
	OR			
14 (b)	How residual stresses are measured using X Ray diffraction in the welded metals?	**13**	4	L2
15 (a)	Analyze the use of suitable tool for exactly identifying the nano sizes precipitates and its composition.	**13**	5	L5
	OR			
15 (b)	Explain the Energy-Dispersive X-ray Spectroscopy technique with a sample energy vs intensity plot.	**13**	5	L2

PART- C(1x 15=15Marks)

(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16.	Write the principle and construction of scanning electron microscope. Discuss the electron beam interaction with the material and the various signals/modes of image formation.	**15**	1	L2