AMITY UNIVERSITY
UTTAR PRADESH

FORMAT FOR COURSE CURRICULUM

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
2	0	0	0	2

Course Title: Material Science **Course Code:** **Credit Units:2**

Course Objectives: Materials Science deals with the structure and properties of all materials, which have engineering applications. Material Engineering is essential for designing, producing, examining and testing materials as diverse as metallic engineering alloys, semiconductors and superconductors, ceramics, plastics and composites. This course will help students understand the properties and behavior of different types of materials and their applications.

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Pre-requisites: Basic Basic Concepts of Physics, General Chemistry and Mathematics (Differential Equations, Integration and Calculus).

Student Learning Outcomes:
On completion of the course the student will be able to:

1. Demonstrate knowledge of fundamental concepts of material science.
2. Identify various components of mathematics, and perform basic operations and apply safety procedures.
3. Design and analyze problems relating to Material science.

Course Contents/Syllabus:

	Weightage (%)
Module-I:	**20%**
1. Introduction : Historical perspective, importance of materials. **2.** Fundamentals Of crystal Structure, Crystal lattice: BCC, FCC and HCP, Concept of unit cell, space lattice, **3.** Atomic packing factor and Density Miller indices. **4.** Xray crystallography techniques. Crystallography and Imperfections::- Defects & Dislocations , **5.** Mechanism of Plastic Deformation : by twinning and by slip.	
Module-II:	**30%**

Mechanical properties and Testing : Stress strain diagram, Ductile & brittle material, Stress vs strength. Toughness, Hardness, Fracture, Fatigue and Creep.. Testing such as Strength testing, Hardness testing, Impact Testing Non-destructive testing (NDT).	
Module-III:	**30%**
1. Iron-carbon equilibrium diagram. Ferrous materials :. Various types of carbon steels, alloy steels and cast irons, its properties and uses 2. Heat Treatment : Various types of heat treatment such as Annealing, Normalizing, Quenching, Tempering and Case hardening. Time Temperature Transformation (TTT) diagrams Non-Ferrous metals and alloys : Non-ferrrous metals such as Cu, Al, Zn, Cr, Ni etc. and its applications. Various type Brass, Bronze,. Other advanced materials/alloys	
Module-IV:	**20%**
1. Electric properties : Energy band concept of conductor, insulator and semi-conductor 2. Intrinsic & extrinsic semi-conductors. P-n junction and transistors. Basic devices and its application. Super conductivity and its applications 3. Ceramics : Structure types and properties and applications of ceramics 4. Plastics : Various types of polymers/plastics and its applications. Future of plastics •	

Pedagogy for Course Delivery:

The course pedagogy will include lectures, numerical practice, case studies, seminars and presentations.

Lab/ Practicals details, if applicable: N/A

List of Experiments: N/A

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Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	Total
100%	N/A	100%

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment					End Term Examination
Components (Drop down)					
Weightage (%)	10%	10%	5%	5%	70%

Lab/ Practical/ Studio Assessment: N/A

	Continuous Assessment/Internal Assessment				End Term Examination		
Components (Drop down							
Weightage (%)							

Text & References:

Text:

- William Smith, Javad Hashemi and Ravi Prakash, "Materials Science and Engineering", McGraw Hill, 2013.
- V. Raghavan, "Material Science & Engineering", Prentice Hall India Ltd., 2001.
- S.K. Hazra Chaudhuri, "Material Science & Processes", Indian Book Publishers, Calcutta, 1983.
- R.B. Gupta, "Material Science Processes", Satya Prakashan, New Delhi, 2000.

References:

- Buduisky et al, "Engineering Materials & Properties", Prentice Hall India, New Delhi, 2004.
- Shackelford, J.F. and Muralidhara, M.K., Introduction to Material Science for Engineers (6/e), Pearson Education, 2007