No.	Title		
1.	Subject	Matter & Material Science	
2.	Subject Code	KE 018	
3.	Status	Major	
4.	Credit Hours	Four (4) [(3L + 1T) x 14 weeks + 12 hours Lab]	
5.	Semester and Year	Semester 2	
6.	Pre-requisite	-	
7.	Mode of Delivery	Lectures, tutorials and laboratory	
8.	Assessment	Assignments 10% Lab work/test 20% Class Test 10% Final Examination 60%	
9.	Objectives	To introduce basic concepts of materials in a qualitative aspects.	
10.	Learning Outcomes	Upon the completion of the unit, the students will be able to: 1. Understand the properties of materials and their applications. 2. Grasp the terms and terminology used in material science. 3. Appreciate the concepts of corrosions, its control and preventions.	
11.	Details of subject	Contents	Hours
		Chapter 1: Atomic structure Electron, proton, neutron, electron states, quantum numbers. Atomic number, atomic mass number, isotopes, Avogadro's number. Pauli exclusion principle and periodic table.	9L 3T
		Chapter 2: Molecules and Bonding Binding energy, ionic bonding, covalent bonding, valence crystals, electro negativity. Bond energy, metallic bonding, intermolecular forces, dipole moment, vander waals forces and metallic boding. Dipole – dipole forces. Dipole – induced effect and hydrogen bond.	6L 2T
		Chapter 3: Mechanical Properties Stress. Strain. Young Modulus of elasticity E. Shear stress. Shear strain. Modulus of compressibility k, hardness, brittleness and toughness.	6L 2T
		Chapter 4: Corrosion Electrode potentials, electrochemical series, mechanism of corrosion. Galvanic corrosion, oxygen absorption mechanism, concentration cell, polarization phenomena and stress corrosion.	6L 2T
		Chapter 4: Corrosion Control & Prevention Design, inhibitors, increasing corrosion resistance of metal and alloys, cathodic protections, metallic coating, chemical conversion coating, and ceramic protective coating.	3L 1T

		Chapter 5: Radioactivity Atoms, isotopes, radioactivity, fusion and fission processes, and decay. Decay equations, half-life, decay products, and properties.	6L 2T
		Chapter 6: Defects & imperfection in solids. Formation of point defect vacancies. Interstitials and impurity defects.	6L 2T
		Total	L = 42 hrs T = 14 hrs P = 12 hrs 68 hours
12.	Main Reference	1. Smith, W. F. (1996*). Principle of Materials Science and Engineering*. McGraw-Hill Inc.	
13.	Additional Reference	1. Jastrezebski, Z. D. (1987). *The Nature and Properties of Engineering Materials* (3rd ed.). John Wiley & Sons. 2. Anderson, J. C., Leaver, K. D., Alexander, J. M., & Rawlings, R. D. (1975). *Materials Science* (2nd ed.). UK: Thomas Nelson & Sons Ltd.	
14.	Practical/Lab Classes	Students are required to conduct the following practical laboratory experiements, each of 2 hours duration: 1. Using spheres, e.g. table tennis balls to construct Bravais lattices. E.g. Simple cubic, body-centre cubic, face-centre cubic and hexagonal closed-packed, etc. Hence determine the number of atoms in one unit cell, coordination number and packing factor. 2. Experiment to show rate of corrosion. 3. Experiment on Hooke's Law using spring.	