Written by Administrator	
Sunday, 01 November 2009	10:06 -

# **MATERIAL SCIENCE & METALLURGY**

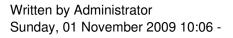
Sub Code			
: 06 ME 32 A/			
	06 ME 42A		
IA Marks			
: 25			
Hrs/week			
: 04			
Exam Hours			

Sunday, 01 November 2009 10:06 -
: 03
Total Lecture Hrs
: 52
Exam Marks
: 100
PART – A
UNIT 1:

Structure of crystalline solids: Fundamental concepts of unit cell space lattice, Bravaias space lattices, unit cells for cubic structure & HCP, study of stacking of layers of atoms in cubic structure & HCP, calculations of radius, Coordination Number and Atomic Packing Factor for different cubic structures. Crystal imperfections-point, line, surface & volume defects. Diffusion, Diffusion Mechanism, Fick's laws of diffusion.

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7 Hours
UNIT 2:
Concepts of stress & strain, tensile properties, true stress & strain, Hardness, Rockwell, Vickess & Brinell Hardness testing. Plastic deformation, slip & twinning.
6 Hours
UNIT 3:
Fracture: types, stages in cup & cone fracture, Griffith's criterion. Fatigue: fatigue tests, S-N curves, Factors affecting fatigue life and protection methods. Creep: The creep curves, Mechanisms of creep. Creep-resistant materials.
7 Hours



## **UNIT 4:**

Solid solutions, Types, Rules of governing the formation of solids solutions. Phase diagrams: Basic terms, phase rule, cooling curves, construction of phase diagrams, interpretation of equilibriums diagrams, Types of phase diagrams. Lever rule.

### 6 Hours

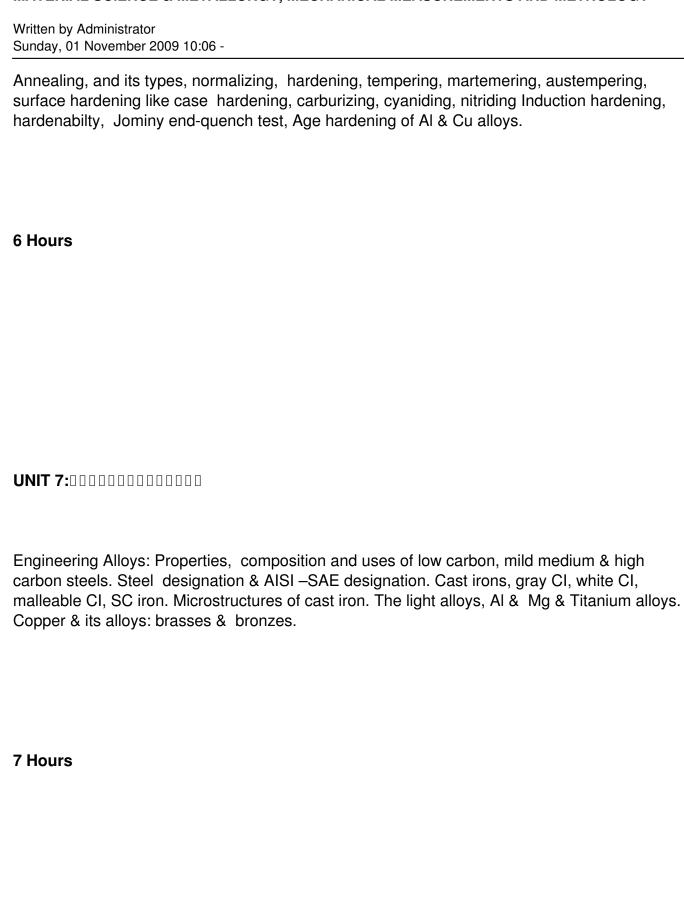
PART - B

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Iron carbon equilibrium Diagram, phases in the Fe–C system, Invariant reactions, critical temperatures, Microstructure of slowly cooled steels, effect of alloying elements on the Fe-C diagram, ferrite & Austenite stabilizers. The TTT diagram, drawing of TTT diagram, TTT diagram for hypo-& hyper-eutectoid steels, effect of alloying elements, CCT diagram.

7 Hours

**UNIT 6:** 



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Corrosion & Its Prevention: Galvanic Cell, The Electrode Potentials, Polarization, Passivation, General methods of Corrosion Prevention, Cathodic Protection, Coatings, Corrosion Prevention by Alloying, Stress Corrosion Cracking.

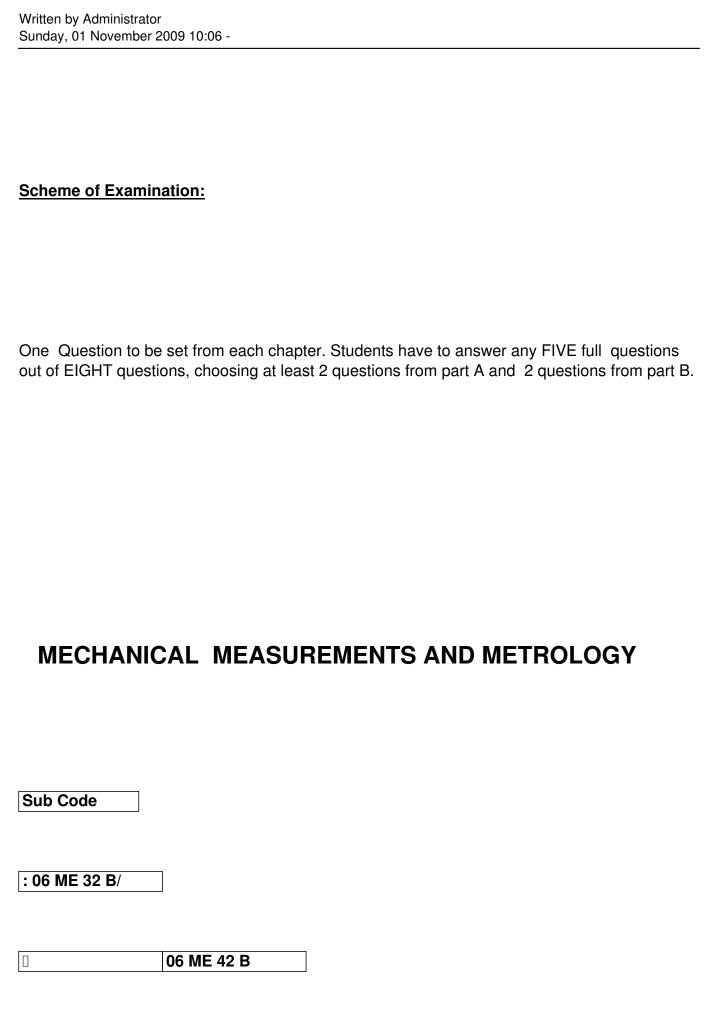
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## **Text Books:**

- 1. "Materials Science & Engineering- An Introduction", William D.Callister Jr. Wiley India Pvt. Ltd. 6 th Edition, 2006, New Delhi.
- 2. "Essentials of Materials For Science And Engineering", <u>Donald R. Askeland</u>, Pradeep P.Phule Thomson-Engineering, 2006.

## **Reference Books:**

- 1. "Introduction to Material Science for Engineering", 6<sup>th</sup> edition James F. Shackel ford. Pearson, Prentice Hall, New Jersy, 2006.
- 2. "Physical Metallurgy, Principles & Practices", V Raghavan.PHI 2<sup>nd</sup> Edition 2006, New Delhi.
- 3. **"Foundation of Material Science and Engineering",** Smith, 3<sup>rd</sup> Edition McGraw Hill, 1997.



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IA Marks
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PART – A

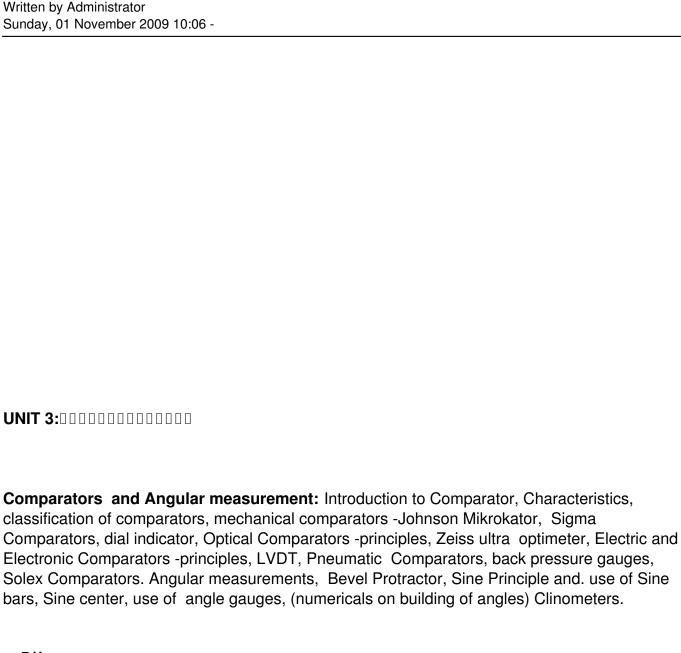
Written by Administrator Sunday, 01 November 2009 10:06 -

**Standards of measurement:** Definition and Objectives of metrology, Standards of length - International prototype meter, Imperial standard yard, Wave length standard, subdivision of standards, line and end standard, comparison, transfer from line standard to end standard, calibration of end bars (Numerical), Slip gauges, Wringing phenomena, Indian Standards (M-81, M-112), Numerical problems on building of slip gauges.

6 Hours

System of limits, Fits, Tolerances and gauging: Definition of tolerance, Specification in assembly, Principle of inter changeability and selective assembly limits of size, Indian standards, concept of limits of size and tolerances, compound tolerances, accumulation of tolerances, definition of fits, types of fits and their designation (IS 919 -1963), geometrical tolerance, positional - tolerances, hole basis system, shaft basis of system, classification of gauges, brief concept of design of gauges (Taylor's principles), Wear allowance on gauges, Types of gauges -plain plug gauge, ring Gauge, snap gauge, limit gauge and gauge materials.

#### 7 Hours



7 Hours

**UNIT 4:**000000000000000

Interferometer and Screw thread gear measurement: Interferometer Principle of interferometery, autocollimator. Optical flats. Terminology of screw threads, measurement of major diameter, minor diameter pitch, angle and effective diameter of screw threads by 2-wire and 3-wire methods, Best size wire. Toolmakers microscope, gear terminology, use of gear tooth Vernier caliper and gear tooth micrometer

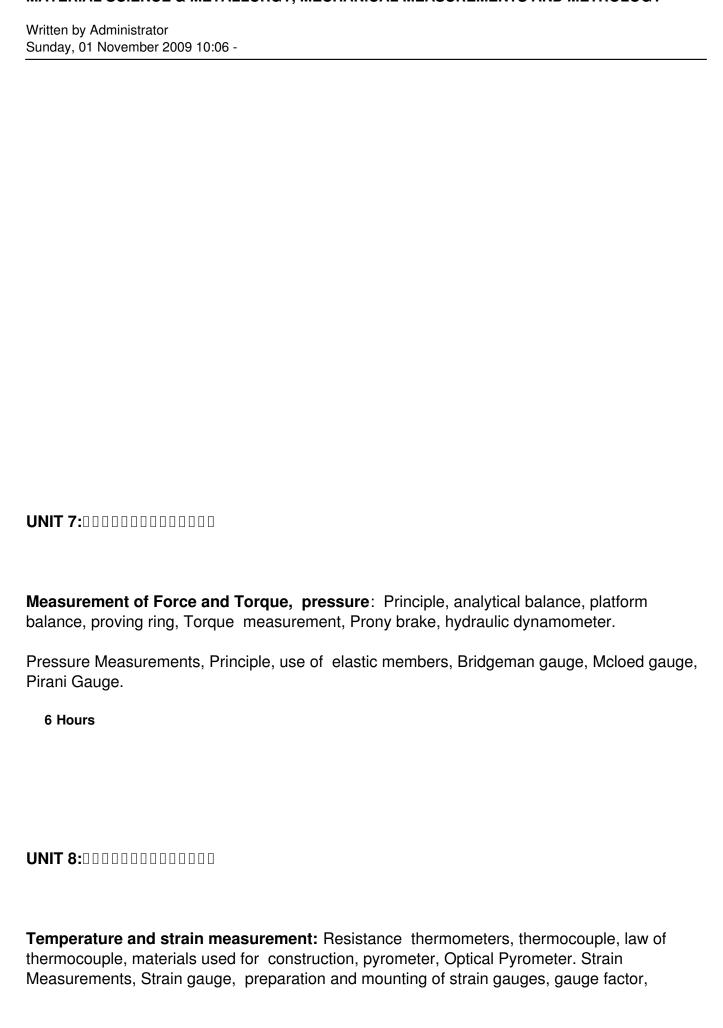
MATERIAL SCIENCE & METALLURGY, MECHANICAL MEASUREMENTS AND METROLOGY Written by Administrator Sunday, 01 November 2009 10:06 -6 Hours PART - B UNIT 5: nnnnnnnnnnnnn Measurements and Measurement systems: Definition, Significance of measurement, generalized measurement system, definitions and concept of accuracy, precision, calibration, threshold, sensitivity, hystersis, repeatability, linearity, loading effect, system response-times delay. Errors in Measurements, Classification of Errors. Transducers, Transfer efficiency, Primary and Secondary transducers, electrical, Mechanical, electronic transducers, advantages of each type transducers. 7 Hours **UNIT 6:** 

Intermediate modifying and terminating devices: Mechanical systems, inherent problems,

Electrical intermediate modifying devices, input circuitry, ballast, ballast circuit, electronic amplifiers and telemetry. Terminating devices, Mechanical, Cathode Ray Oscilloscope,

Oscillographs, X-Y Plotters.

6 Hours



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methods of strain measurement
7 Hours
Text Books:
1. " <b>Mechanical measurements</b> " by Beckwith Marangoni and Lienhard, Pearson Education, 6 th Ed., 2006
2. "Engineering Metrology" by R.K.Jain, Khanna Publishers, 1994.
Reference Books:
1. "Engineering Metrology" by I.C.Gupta, Dhanpat Rai Publications, Delhi

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2.	"Mechanical measurements" by R.K.Jain
3.	"Industrial Instrumentation" Alsutko, Jerry. D.Faulk, Thompson Asia Pvt. Ltd.2002
4. Hill B	"Measurement Systems Applications and Design" by Ernest O, Doblin, McGRAW ook Co.
Sche	me of Examination:
	Question to be set from each chapter. Students have to answer any FIVE full questions fEIGHT questions, choosing at least 2 questions from part A and 2 questions from part B.