

UNIVERSITY OF MUMBAISyllabus for Approval

Sr. No.	Heading	Particulars
1	Title of the Course	USPH 303 : Applied Physics - I
2	Eligibility for Admission	USPH 403 : Applied Physics - II B.Sc Part I
3	Passing Marks	40%
4	Ordinances / Regulations ( if any)	-
5	No. of Years / Semesters	Two (Semester III, Semester IV)
6	Level	P.G. / U.G. / Diploma / Certificate ( Strike out which is not applicable)
7	Pattern	Yearly / Semester ( Strike out which is not applicable)
8	Status	New / Revised ( Strike out which is not applicable)
9	To be implemented from Academic Year	From Academic Year <u>June 2019</u>

Date:

Signature : W. BamboleName of BOS Chairperson / Dean : Prof. Vaishali Bambole



- 2) Metallic crystal structures, relation between the density of crystal material and lattice constant in a cubic lattice, Directions, Planes, Miller Indices, Important planes in simple cubic structure, separation between lattice planes in a cubic crystal.

SOP : Chapter 4 : II,III,IV,V, VI, VII, XIV,XV, XVI, XVIII, XX, XXII, XXV, XXVI

### **Unit III: Properties of Material**

**15 Lectures**

- 1) Electrical properties: Review of energy band diagram for materials – conductors, semiconductors and insulators, Electrical conductivity in metals, semiconductors and insulators (dielectrics), effect of temperature on conductivity.
- 2) Optical properties: Reflection, refraction, absorption and transmission of electromagnetic radiation in solids.
- 3) Magnetic properties: Origin of magnetism in solids (basic idea), Types of magnetic order (paramagnetism, diamagnetism, antiferromagnetism, ferromagnetism, ferrimagnetism),magnetic hysteresis.
- 4) Applications: Dielectric materials: Piezoelectric, ferroelectric and pyroelectric materials.

### **References:**

1. Electronic Properties of Materials, Rolf E Hummel.
2. Materials Science and Engineering: A First Course by V. Raghavan.

## SEMESTER - IV

### **USPH403: Applied Physics - II**

#### **Learning Outcomes:**

On successful completion of this course, students will be able to:

- i) Understand the concepts of mechanics & properties of matter & to apply them to problems.
- ii) Comprehend the basic concepts of thermodynamics & its applications in physical situation.
- iii) Learn about situations in low temperature.
- iv) Demonstrate tentative problem solving skills in all above areas.

### **Unit 1: Introduction to Geology and Geophysics 15 Lectures**

#### **CHAPTER 1: GEOLOGY**

- 1.1 Introduction to Geology its branches and relationship with other sciences.
- 1.2 Earth and solar system: Meteorites and other extra-terrestrial materials.
- 1.3 Age of Earth and various methods of determination. Planetary evolution of the Earth and its internal structure: Elastic waves and variation of physical and chemical properties in the interior of Earth.
- 1.4 Major tectonic features of the ocean oceanic and continental crust.
- 1.5 Continental drift – geological and geophysical evidence: mechanisms, objections and present status.
- 1.6 Geodynamics of the Indian plate.

#### **CHAPTER 2: GEOPHYSICS**

- 2.1 Introduction to Geophysics
- 2.2 Gravity and magnetic anomalies at Mid-ocean ridges: deep sea trenches, continental shield areas and mountain chains.
- 2.3 Geomagnetism, elements of Earth's magnetism: Internal, external fields and their causes, Palaeomagnetism, Polar wandering paths and reversals, Seafloor spreading and Plate tectonics.
- 2.4 Seismic belts of the Earth: Seismicity and plate movements.
- 2.5 Utility of the different geophysical techniques (discussed above) in exploration for academic as well as for harnessing resources. Geophysical potential fields: Principles of Gravity and Magnetic methods.
- 2.6 Instrumentation, field procedures used in geophysical studies.

#### **Suggested Textbooks and References**

1. Geomagnetism: Solid Earth and Upper Atmosphere Perspectives. Nathani Basavaiah, Springer (2011).
2. Introduction to Applied Geophysics: Exploring the Shallow Subsurface. H.R.

- Burger, A.F. Sheehan and C.H. Jones. W.W. Norton, New York (2006).
3. Earth Science. E.J. Tarbuck, F.K. Lutgens and D. Tasa, Prentice & Hall (2005).
4. Mantle Plumes and Their Record in Earth History. K.C. Condie, Cambridge University Press, Cambridge, UK (2001)
5. The Magnetic Field of the Earth: Paleomagnetism, the Core, and the Deep Mantle. R.T. Merrill, M.W. McElhinny and P.L. McFadden, International Geophysical Series 63, Academic Press (1996).
6. Applied Geophysics (Paperback). W.M. Telford, L.P. Geldart and R.E. Sheriff, Cambridge University Press, Cambridge (1990).

**Unit: II - Microprocessors**

**15 lectures**

**1) Building Concept of Microprocessor**

Introduction, Study of Memory, Input Device , Output Device , Input/output Device Central Processing Unit.

**Chapter 3 : 3.1 , 3.2 , 3.3 (3.3.1 , 3.3.2 , 3.3.3) , 3.4. , 3.5 , 3.6 , 3.7**

**2) 8085 Microprocessor**

Introduction , Features of Inter 8085 , Pin Diagram of 8085 , 8085 CPU Architecture , Arithmetic and Logical Group (ALU , Accumulator , Temporary Register , Flag Register (PSW)) , Register Group (Temporary Registers (W and Z) , General purpose registers , Special Purpose registers) , Interrupt Control , Serial I/O Control Group , Instruction Register , Decoder and Control Group (Instruction Register , Instruction Decoder , Timing and Control)

**Chapter 4 : 4.1 ,4.2 , 4.3. , 4.4 , 4.5 (4.5.1 , 4.5.2 , 4.5.3 , 4.5.4) , 4.6 (4.6.1 , 4.6.2 , 4.6.3) ,4.7 , 4.8 , 4.9 (4.9.1 , 4.9.2 , 4.9.3)**

**3) 8085 Instruction Set**

Introduction , Flowchart , Classification of Instruction Set (Data Transfer Group , Arithmetic Group , Logical Group , Branching Group , Stack and Machine Control Group) , Notations used in Instructions and Opcode , Data Transfer Group , Program Examples for Data Transfer Group , Arithmetic Operation Group , Branch Group , Logical Group , Addressing Modes , 8085 Programmers Model.

**Chapter 6 : 6.1 , 6.2 , 6.3 6.4 , 6.5 , 6.6 , 6.7 , 6.8 (6.8.1 , 6.8.2 , 6.8.3 , 6.8.8 , 6.8.9 , 6.8.10 , 6.8.11 (A part Block Transfer) , 6.9 (6.9.1 upto 6.9.19) , 6.12 , 6.13**

Reference Book: V.J. Vibhute & P.B. Borole, Fifth Revised Edition

**Unit: III-Radio communication**

**15 lectures**

**1) Basics of Communication:** Block diagram of communication system, types of communication system: simplex, duplex, analog and digital communication, Electromagnetic spectrum, base band and broad band communication. Noise concept and types, signal to noise ratio, noise figure, noise temperature.

**2) Amplitude Modulation:** Need of modulation, concept of modulation, AM waveform, mathematical expression of AM, concept of sideband, demodulation principles. AM Receiver: TRF and super heterodyne receiver.

**3) Frequency Modulation:** Definition, mathematical representation, frequency spectrum, bandwidth and modulation index.

**4) Concept of ASK, PSK, FSK, PAM, PWM, PPM, PCM.**

**Suggested Books:**

1. Communication Electronics: Principles and applications by Louis E Frenzel 3rd edition TMH Publications.
2. Electronics Communication Systems by Kennedy
3. Telecommunication Switching Systems and Network by Vishwanathan and Thiagarajan, PHI publication.
4. Electronics Communication Systems by Denis Roddy and John Coolen, PHI publication.