CONDENSED MATTER PHYSICS-II
PHY401

UNIT-I

Super Conductivity: Concept of super conducting state, Persistent current, Critical temperature, Meissner effect, thermodynamics of the super conducting transitions, London equation and penetration depth, Coherence length, Type I and Type II superconductors, B.S.C. theory of superconductivity. AC and DC Josephson effects, Josephson Tunneling.

UNIT-II

Magnetism: Weiss theory of ferromagnetic Heisenberg model and molecular field theory, Domain and Bloch wall energy, Spin waves and mangnons,curie weiss law for susceptibility, Ferri and anti-ferromagnetic.

UNIT-III

Imperfection in crystals :Imperfection in atomic packing , point defects , interstitial Schottky and Frenkel defects, lattice vacancies colour centers, F centers ,F' centers, coagulation of F centers, production of colour centers and V centers, explanation of experimental facts , line defects, edge and screw dislocation, mechanism of plastic deformation , elastic energy of dislocation, slip and plastic deformation, shear strength of single crystal, burgers vector stress fields around dislocation.

UNIT-IV

Thin Film: Study of surface topography by multiple beam interferometer, conditions for accurate determination of step height and film thickness (Fizeau fringes), Electrical conductivity of thin films, expression for electrical conductivity of thin films, Hall-coefficient quantum size effect in thin film.

UNIT-V

Nano Structure: Definition and properties of Nano structured material, different method of preparation of Nano materials; plasma enhanced chemical vapour deposition, electro deposition. Structure of single wall carbon Nano tubes (classification, chiral vector Cn, Translational vector T. Symmetry vector R, Unit cell, Brillouin Zone) Electronic, mechanical, thermal and phonon properties.

Suggested Readings:

1. Kittel: Solid State physics
2. Huang: Theoretical solid state physics
3. Thomes: Multiple electron microscopy
4. Chopra: Physics of thin films
5. Heavens: Thin films

LASER PHYSICS

PHY402

UNIT-I

Basic principles of Laser Introduction to Laser,Spontaneous and Stimulated emission. Einstein coefficients. Idea of light amplification. Population inversion, laser pumping schemes for two and three level system with threshold condition for laser oscillation.

UNIT-II

Properties of Laser Beams and Resonators: Properties of Laser-Temporal coherence, spatial coherence, directionality and monochromatic of laser beam, resonators, vibrational mode of resonators, laser amplification, open resonator.

UNIT-III

Types of lasers: Solid state lasers i.e. Ruby Laser, ND-Yag Laser, Semiconductor laser, Gas laser i.e. Carbon dioxide Laser, Basic idea about liquid laser, Dye laser and chemical laser i.e. HCL and HF lasers.

UNIT-IV

Application of lasers: Holography and principle, theory of holograms, reconstruction of Image, characteristics of Holographs, Application of lasers in chemistry and optics laser in Industry i.e. laser Belding, Hole drilling, laser cutting, application of lasers in Medicine.

UNIT-V

Basic idea about non-linear optics: Harmonic generation, second and third harmonic generation, phase matching, optical mixing, parametric generation of light, self-focusing of light.

Suggested Readings:

1. Laser: Syelto
2. Optical electronics: Yarive
3. Nonlinear optics: B.B. Loud
4. Molecular spectroscopy: King
5. Laser spectroscopy and instrumentation Demtroder
6. Laser spectroscopy Demtroder

COMPUTER PROGRAMMING AND INFORMATICS

PHY403A

UNIT-I

Conceptual framework of computer languages (Algorithm, Flowchart), Need of structured programming, Top-down, bottom-up and modular programming design. Introduction to C languages –basic structure of C program. Character set, keyword and identifiers, data type declaration. Various operators like arithmetic, relational, logical, assignment, conditional, increment and decrement operators. Evaluation of expression and operator precedence.

UNIT-II

Input and output statement, control statement (If, If-else, If nested if-else statements, switch, while, Do….while and for statements) Simple C programs like search of prime number between given range of numbers, finding the smallest and largest of three numbers, sum of algebraic series, factorial of given number, roots of a quadratic equation, binary to decimal and decimal to binary conversion etc.

UNIT-III

Functions: need of functions, calling the function by value and by reference, category of functions: no argument no return, argument but not return, argument with return. Recursion. One and two dimensional arrays. String and string handling functions like sprint (), strcpy (), sscanf (), strcmp() etc . Simple programs using user define functions, arrays and string functions.

UNIT-IV

Network: Terminals- Dumb terminals, smart terminals, intelligent terminals.

Types of network:

- According to range: LAN, MAN, WAN, CLIENT SERVER.
- According to topologies: BUS, RING, STAR, and Mesh Network.

Internet: History of Internet, Service Provider (ISP) , introduction to type of internet account- shell/Ac, TCP/IP A/C. Types of connectivity- Dialup, Leased lines, Satellite. IP Address-Class A, Class B, Class C, Domain Name address. URL- absolute and relative.

UNIT-V

Web enabled technology (Email and HTML): Web Browser: Internet Explorer, Netscape Navigator, Station and Dynamic web page. Introduction to HTML Tags:

- <HTML> , <TITLE> ,<HEAD> ,<BODY>
- <P> ,
 , <ALIGN> , <I>, <B> , <DIV> , <PRE> , and their attributes.
- <IMG>, <a>, and their attributes.
- Ordered and Unordered list tages.
- Tabes and associated tags and its properties.

Creation of simple forms using text, Password, text area, radio, submit, Reset and Hidden.

Brief idea about HTTP. Search engine, its working, types of working, types of search engines: sub directories Meta search engines, search function-AND and OR .Population search engines.

Suggested Readings:

1. Let us C — Yashwant Kanetkar
2. Programming with C — Balaguruswami
3. Internet and Web page — V.K. Jain

‘O’ level module M1.2

4. Internet and Web page design — Dr P.D

Murarka ‘O’ level module M1.2

DIGITAL ELECTRONIC & MICROPROCESSORS

PHY404B

UNIT-I

OP-AMP: Differential amplifier circuit configurations: dual input balanced output dual input, single input unbalanced output (AC analysis) only, block diagram of a typical op amp analysis, schematic symbol of an op-amp.

UNIT-II

OP-AMP Parameters: Ideal op-amp, Op-amp parameters, input offset voltage, input offset current, input bias current, CMRR, SVRR , large signal voltage gain , Slew rate , Gain band width product , output resistance , supply currents power consumption , inverting and non- inverting inputs.

UNIT-III

Application of OP-AMP: Inverting and non-inverting amplifier , summing , scaling and averaging amplifier , integrator and differentiator , Oscillator Principles : oscillator types , frequency , stability response , the phase shift oscillator ,Wein – bridge oscillator , L-C tunable oscillator , square wave generator.

UNIT-IV

Microprocessors and Micro Computers: Microprocessor and Architecture : Intel 8086 , Microprocessor architecture modes of memory addressing , 8086/8088 Hardware specification : Pin-outs and pin functions, clock generator (8284A) , Bus buffering and latching , Bus timing , Ready and wait state , Minimum mode versus maximum mode.

UNIT-V

Programing the Microprocessors: Addressing modes: Data addressing modes, program memory addressing modes, stack memory- addressing modes. Instruction set: data movement instruction, Arithmetic and login instructions, program control instruction. Programming example: Simple assembly language programs table handling direct table addressing, searching a table sorting a table pseudo ops.

Suggested Readings:

1. Digital principles and application — AP Melvino & DP Leech

2.OP- Amps & Linear Integrated circuits — R.A.Gaykwad

3.Microprocessor Architecture, Programming & Applications with 8085/8086 — R.S. Gaonker

4.Microprocessor & Digital Systeam — D.V. Hall

5.Electronics — D.S. Mathur

NANOTECHNOLOGY
PHY 403C

UNIT -I

Low dimensional materials. Application in electronics, communication, medicine etc. Electron states in a potential well, spherically symmetric potential, Coulomb potential and periodic potential. Tunneling through a potential barrier. Excitons, biexcitons, dark excitons.

UNIT – II

Clusters. Fullerens, semiconductor and metal clusters, cluster stability. Nanotubes. Electron states in nanoparticles, effective mass approximation, weak confinement, strong confinement, size dependent oscillator strength.

UNIT – III

Synthesis of nanomaterials (bottom up approach) by physical techniques. Introduction to vacuum techniques (pumps, gauges, materials). Physical vapour deposition, electron beam evaporation, sputters deposition, laser ablation, ion beam mixing, and plasma deposition.

UNIT - IV

(Synthesis of nanomaterials by chemical, biological and hybrid routes). Concepts of colloids,LaMer diagram, L.B films, Miceller route, self-assembly, biosynthesis, electrophoresis, immobilization in glass, zeolites, polymers.

UNIT – V

Analysis Techniques. UV-VIS-IR spectroscopy, Luminescence techniques, X-ray, electron and neutron Diffraction, Small Angle X-ray and Neutron Scattering, photon correlation spectroscopy, Extended X-ray , Absorption Fine Structure (EXAFS), X-ray Photoelectron Spectroscopy, Auger Electron Spectroscopy.

Suggested Readings:

1. Physics of Low Dimensional Structures — J. H. Davis, (Cambridge Press), 1998.
2. Semiconductor Quantum Dots — L. Banjaj and S. W. Koch.
3. Low Dimensional Semiconductors — M. J. Kelly, Clarendon, 1955.
4. Characterization of Materials — J. B. Wachtman and Z.
6. Experimental Physics, Modern Methods — R. A. Dunlop.

SUBJECT: PHYSICS

List of Experiments for M.Sc. (IV SEM)

Lab A: General

1. Newton's Ring experiment.
2. Characteristics of laser.
3. Wavelength of Light using laser.
4. Study of Elastic constants.
5. Oscillators Wein bridge/Hartley.
6. To study hall effect and to determine hall coefficient
7. To determine the beam divergence of a laser beam.

Lab B: Electronics

1. Communication Electronics:

    a. Pulse amplitude modulation/demodulation.
    b. Pulse position modulation/demodulation.
    c. Pulse width modulation/demodulation.
    d. FSK modulation/demodulation using timer.

2. Digital Electronics:

    a. To study the wave form of Operational Amplifier (741).
    b. To study the wave form Differential Amplifier.

3. To study Microprocessor-8085/8086

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