M.Sc. II Semester - IV

4PHY-1: NUCLEAR AND PARTICLE PHYSICS

Unit-I : General Properties of Atomic Nucleus: Nuclear charge, Nuclear Mass,(Atomic Number and Mass Number), Meaning of isotopes, Isobars, Isotones, Isomers, Isodiapheres with examples, Nuclear Radius, Classification of Nuclear radius, (Electrical and Potential Radius)Determination of Nuclear Radius by electron scattering(Hofstadter's Experiment),Mirror Nuclei method, Mass Defect, Binding energy, Variation of Binding energy per nucleon with mass number, Semi empirical Mass Formula, Mass Parabola. Quantum Numbers for individual nucleons(Principal, Orbital, Radial, Spin, Total, Iso-spin, Quantum Numbers) Parity, Quantum Statistics; Nuclear Angular Momentum, Nuclear Magnetic Momentum, Nuclear Magnetic Dipole Moment, Measurements of nuclear magnetic moment by Rabi's method and Block's method, Problems.

Unit-II : Nuclear Forces:

Deuteron, Ground state properties of Deuteron,(Properties of Nuclear Forces, number, Range and depth of potential, excited States of Deuteron),Neutron-Proton scattering at low energies(Scattering length, phase shift, spin dependence, Coherent scattering ,shape independent effective range theory; Proton-Proton scattering at low energies, similarity between n-n and p-p forces ,Meson Theory of Nuclear forces ,spin dependence of Nuclear forces.

Beta Decay and Nuclear Models: Three forms of β decay, continuous nature of β-ray energy spectrum, difficulties encountered in explaining β-ray energy spectrum,. Pauli's Neutrino hypothesis(properties of neutrino and explanation of β-decay using Pauli's Neutrino hypothesis), Assumption of Fermi's theory of β-decay, Fermi-Kurie Plots, Seargents Plots. Detection of Neutrino (Cowan Experiment),non conservation of Parity in β-decay (Wu's experiment). Liquid drop model of Nucleus, Magic numbers, Evidences in support of Magic Numbers, Shell Model.

Unit-III : Neutron Physics, Properties of neutrons, classification of neutrons according to their energy, neutrons sources, neutrons detectors, slowing down of fast neutrons, absorption of neutrons. Reactor Physics : neutrons multiplication, types of reactors, General considerations for reactor design, four factor formula, moderators.

Unit-IV : Nuclear Detectors - Gas filled, solid state and high energy detectors. Wilson cloud chamber, Spark Counter. Particle Accelerators - Need for particle accelerators, classification, wave guide type linear accelerator, focusing in linear accelerators, Betatron, Synchrotron, Synchrotron as a radiation source.

Unit-V : Particle Physics : Classification of elementary particles, types of interactions between elementary particles, symmetry and conservation laws, Basic ideas of CP and CPT invariance, the quark model, Lie algebra, SU(2) and SU(3) multiplets (Meson and Baryon states), the General model.

Reference Books :

(1) Nuclear Physics, Second Edition - Irving Kaplan, Addison-Wesley Publishing - Massachusetts.
(2) Concepts of Nuclear Physics - Bernard L.Cohen, Tata McGraw- Hill Publishing Co. - New Delhi.
(3) Elements of Nuclear Physics - Pandya M.L.
(4) Nuclear Physics : An Introduction - S.B.Patel, Wiley Eastern Limited- New Delhi.
(5) Nuclear Physics : Theory and Experiment : R.R.Roy and B.P.Nigem,New Age International (P) Ltd.-New Delhi.
(6) Nuclear Physics - D.C.Tayal, Himalaya Publishing House, Bombay.
(7) Nuclear Physics - S.N.Ghoshal, S.Chand & Company, New Delhi.
(8) Elementary - Particle Physics - Committee on Elementary Particle Physics Universities Press (India) Ltd., Hyderabad.
(9) The Elements of Nuclear Reactor - Glasstone Samuel, D.Van Nestrand Company- New Jersey.

4PHY-2 : OPAMP THEORY AND ITS APPLICATIONS

Unit-I : Differential amplifier - circuit configurations, Four types, DC analysis- AC analysis – Detail study of dual input balanced output differential amplifier -, inverting and noninverting inputs CMRR- constant current bias level translator.

Unit-II : Block diagram of a typical Op-Amp -Analysis Open loop configuration inverting and non-inverting amplifiers. Opamp with negative feedback - voltage series feed back - effect of feed back on closed loop gain input persistence output resistance bandwidth and output offset voltage - voltage follower.

Unit-III : Practical op-amp Op-Amp parameter definition and illustration, input offset voltage - input bias current – input offset current offset voltage, CMRR, frequency response. DC and AC amplifier; summing, scaling and averaging amplifiers, instrumentation amplifier, integrator and differentiator

Unit-IV : Oscillators principles - Oscillator types - frequency stability - response - The phase shift oscillator. Wein bridge oscillator, LC - tunable oscillators - Multivibrators - Monostable and Astable – comparators. PLL circuit and its applications. OPAMP as butter worth filter (low pass, high pass and band pass only).

Unit-V : Analogue computation, active filters, comparators, logarithmic and anti-logarithmic amplifiers, sample and hold amplifiers, waveform generators, Square and triangular wave generators, pulse generator. Applications of Linear ICs OPAMP as instrumentation amplifier, Digital to Analogue converter : ladder and weighted register type. Analogue to Digital converter : Counter type and successive approximation type

Reference Books :

1. OPAmps and Linear Integrated Circuits- Gaikwad R. A. : Prentice – Hall of India Pvt. Ltd.
2. Electronic Devices and Circuits , Vol. II – Godse A. P. and Bakshi U. A., Technical Publications, Pune .

List of Experiments:

It is necessary to perform atleast seven experiments from the list given below. The experiments based on theory course are desirable.

1. Application of OPAMP as inverting, non-inverting and summing amplifier.
2. Applications of OPAMP as differentiator and integrator.
3. OPAMP as square and triangular waveform generator.
4. OPAMP as instrumentation amplifier for measurement of temperature.
5. Study of ADC and DAC.
6. Study of PLL and its applications.
7. OPAMP as Butterworth filter low pass, high pass and band pass circuit.
8. ADC using ICsDAC using opamp and WRM, R-2-R Ladder
9. Design consideration of ADC/DAC Using Opamp and other ICs
10. Digital Clock using Counters, Frequency meters.

4PHY-3(i) : MICROPROCESSOR PROGRAMMING AND INTERFACING

Unit-I : 8085 Microprocessor: Basic 8085 microprocessor architecture and its functional blocks, 8085 microprocessor clock signals, address, data and control buses, instruction cycles, machine cycles, and timing states, Basic instruction set, instruction timing diagrams.

Unit-II : Programming of 8085 microprocessor: HLL, LLL and ALP Writing assembly language programs, looping, counting and indexing operations, stacks and subroutines, conditional call and return instructions, debugging programs.

Unit-III : 8085 Interfacing: Bus interfacing concepts, timing for the execution of input and output(I/O) instructions, I/O address decoding, memory and I/O interfacing memory mapped I/O interfacing of matrix input keyboard and output display, Serial I/O lines of 8085 and the implementation asynchronous serial data communication using SOD and SID lines,

Unit-IV : Programmable Interface and peripheral devices: PPI IC 8255A programmable peripheral interface Block Diagram, Control words, Modes of Operations and applications, 8251 SIO, USART block diagram functions. 8279 programmable keyboard/display interface controller.

Unit-V : 8253/8254 programmable interval timer, Interrupt structure of 8085: RST(restart) instructions, vectored interrupt, interrupt process and timing diagram of interrupt instruction execution, 8259 A interrupt controller, principles block transfer(direct memory access) techniques 8257direct memory access controller.

Text Books:

1. Microprocessor, Architecture, Programming and Application with 8085-Gaonkar, John Wiley Eastern , Ltd, Publication
2. Microprocessors and interfacing-Douglas V Hall, Tata Mc-Graw Hill publication

Reference Books:

1. Microcomputer Systems: The 8086/8088 family-Yu-Chen Lin, Glen A Gibson, Prentice Hall of India Publication

2. The 8086 Microprocessor : programming and interfacing the PCKenneth J Ayala, Penram publication
3. The 8086 family: John Uffenbeck, Prentice Hall of India publication.

OR

4PHY-3(ii) : CONDENSED MATTER PHYSICS-II

Unit-I : Imperfections in Crystal: Mechanisms of plastic deformation in solid, Dislocations, stress & strain field of screw dislocation, elastic energy of dislocations, Slip, Cross slip, climb, Dislocation Multiplications, stress needed to operate Frank Read Source.
Unit-II : Dislocation reaction, Partial Dislocations and stacking faults in close packed structures, Thompson Tetrahedron. Experimental methods of observing dislocation and stacking fault.
Unit-III : Interacting electron gas, Hartee & Hartee-Fock approximation, Correlation energy, Screening, dielectric function, Thomas-Fermi and Lindhard Theory, Frequency dependent Lindhard screening, Screening of Hartee-Fock approximation. Introduction of Fermi Liquid Theory.
Unit-IV : Point Defects: Types of point defects, concentration of point defects, description of point defect within the frame work of band model, diffusion and ionic conduction, recombination process of imperfection, optical transitions at imperfections.
Unit-V : Lattice disorders: Types of lattice disorders, localized states, Anderson model, and density of states: Impurity band semiconductor, amorphous semiconductors, transport in disordered lattice, hopping probability, fixed and variable range hopping, conductivity in impurity bands and in amorphous semiconductors.

References:
1. Introduction to Dislocations, Derek Hull and D J Bacon, Butterworth- Heinemann.
2. Introduction to Solid-State Theory, Otfried Madelung, Springer.
3. Solid State Physics, N W Ashcroft and N D Mermin (Cenage Learning India Pvt Ltd, 2009).
4. Introduction to Solid State Physics, C. Kittel (John-Wiley, 8th Ed. 2005).

OR

4PHY-3 (iii) : DIGITAL COMMUNICATION

UNIT-I : Digital Communications: Pulse-Modulation Systems : Sampling theorem-Low-Pass and Band-pass signals, PAM, Channel BW for a PAM signal. Natural sampling. Flat-top sampling. Signal recovery through Holding, Quantization of signals, Differential PCM, Delta Modulation, Adaptive Delta modulation, CVSD,
UNIT-II : Digital Modulation Techniques : BPSK, DPSK, QPSK, FSK. Introduction to PSK, QASK, BFSK, and MSK. Mathematical Representation of Noise : Sources of noise. Frequency domain representation of noise, Effect of filtering on the probability Density of Gaussian noise, spectral component of noise , Effect of a filter on the power spectral

density of noise. Superposition of noises. Mixing involving noise. Linear filtering, Noise Bandwidth, Quadrature Components of noise. Power spectral density of nc(t), ns(t) and their time derivatives.

UNIT-III : Data Transmission : Baseband signal receiver, probability of error. Optimum filter. White noise. Matched filter and probability of error. Coherent reception, Correlation, PSK, FSK, Non-coherent detection of FSK, Differential PSK, QPSK, Calculation of error probability for BPSK, BFSK, and QPSK.

Unit-IV : Noise in pulse-code and Delta-modulation systems : PCM transmission, Calculation of Quantization noise, outputsignal power. Effect of thermal noise, output signal-to-noise ratio in PCM, DM, Quantization noise in DM, output signal power, DM output - signal - to quantization - noise ratio, Effect of thermal noise in Delta modulation, output signalto- noise ratio in DM.

UNIT-V : Mobile Radio and Satellites : Time Division multiple Access (TDMA), Frequency Division Multiple Access (FDMA), ALOHA, Slotted ALOHA, Carrier Sense Multiple access (CSMA), Poisson distribution protocols.

TEXT AND REFERENCE BOOKS :

1. Barry B.Brey, "The Intel microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, pentium and pentium pro-processor architecture, programming, and interfacing", 4th Edition, PHI, 1999.
2. Dougles V.Hall, "Microprocessors and interfacing, programming and Hardware", 2nd Edition, McGraw Hill, international edition, 1992.
3. Muhammad Ali Maxidi and Janice Gillispie Mazidi, "The 80x86 IBM PC and Compatible computers (Volume I & II), 2nd Edition, Prentice Hall international, 1998.
4. Taub and Schilling, principles of communication system, 2nd edition, TMH, 1994, Simon Hykin communication system, Third Edition, John Wiley and Sons, INC,1994.

4PHY-4(i): ADVANCED MICROPROCESSOR AND MICROCONTROLLER

Unit-I : 8086 Microprocessors: Architecture and organization of 8086microprocessors family, bus interface unit, 8086 hardware pin signals, timing diagram of 8086 family microprocessors, simplified read/ write bus cycles, 8086 minimum and maximum modes of operation, 8086memory addressing, address decoding, memory system design of 8086 family, timing considerations for memory interfacing, input/output port addressing and decoding, introduction to 8087 floating point coprocessor and its connection to host 8086.

Unit-II : 8086 assemble language programming:Addressing modes, 8086 instruction formats and instruction set, data transfer, arithmetic, bit manipulation, string, program execution transfer and program control instructions, machine codes of 8086 instructions, assemble language syntax, assembler directives, initialization instructions, simple sequential and looping programs in assemble language, debugging assembly language programs.

Unit-III : The 8051 Architecture : 8051 microcontroller, Hardware – oscillator, clock, program counter, data pointer, A and B CPU registers, Flags and the program status

word (PSW) , Internal memory, Internal RAM , the stack and stack pointer, special function register (SFR), internal ROM. I/O pins, ports and circuits External memory, counters and Timers serial data input/output, Interrupts.
Unit-IV : 8051 Assembly Language Programming Introduction , structure of assembly language, assembling and running on 8051 program, Data transfer types , addressing modes, PUSH and POP operations, Arithmatic, Logic , JUMP, LOOP, CALL instructions, time delay, I/O programming, serial port programming.
Unit-V : Applications : Interfacing of LCD, Keyboard, ADC, DAC and Sensor interfacing. Microcontroller Application Development Tools : Use of Kell software 8051 development tool.

Reference Books :
1. The 8051 Microcontroller and embedded system using assembly and C - Mazidi, Mazidi Mckinlay
2. The 8051 Microcontroller – Ayala - third edition.
3. Microcontroller – Architecture, Programing, Interfacing and system design – Rajkamal 4 8051 Microcontroller – Mckenzie.
4. Microprocessors & Interfacing – Programming & hardware By D. V. Hall (TMH)
5. The 8088 AND 8086 microprocessors By Walter A. Trebel & Avtar Singh (PHI)
6. 8086 Microprocessor By Uffenbeck (PHI)
7. The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium Pro Processor Architecture, programming and interfacing. By Barry B. Brey (PHI)
8. The 8051 Microcontroller: Architecture, programming and applications By Kenneth J. Ayala (Penram International)
9. The 8051 Microcontroller and Embedded Systems By Mazidi & Mazidi (PHI)

4PHY-4(ii) NANO SCIENCE AND NANOTECHNOLOGY

Unit-I : Free electron theory and its features, Idea of band structures, Insulators, semiconductors and conductors, Reciprocal space, Energy bands and gaps of semiconductors, Effective masses, Fermi surfaces,
Localized particles, The Bloch theorem, band structure in three dimensions. Electron transport in
semiconductors in 3D (bulk), 2D (thin film) and low dimensional systems.
Unit-II : Different methods for preparation of Nanostructured materials, Bottom up and top down process, sol-gel, electrodeposition, chemical bath deposition, thermal evaporation methods, ball milling, pulsed laser deposition, chill block melting and gas quantizationmethod.
Unit-III : Different methods for measuring the properties of Nanomaterials, Structure determination: Atomic structures, crystallography and powder diffraction method, determination of particle size from XRD peaks. Microscopy: Transmission electron microscopy, Field ion microscopy, scanning microscopy.

Unit-IV : Size dependent properties, quantum size effect, quantum dot, quantum wire and quantum well. Mechanical and electrical properties of nano-structured materials, single electron tunneling, infrared detectors, quantum dot lasers. Super Conductivity at Nano Scale. Hopping conduction, Polaron conduction.
Unit-V : Carbon nanostructures, nature of carbon bond, carbon clusters: C60, Structure of C60 carbon anotubes,
Applications of carbon nanotubes: computers, fuel cells, chemical sensors, catalysis, Single electron transistor (no derivation), Molecular machine, applications of nanomaterials in energy, medicine and environment.

Reference Books:
1. Introduction to Nanotechnology – C. P. Poole, John Wiley and Sons
2. Nanotechnology Appin. Lab BPB publication New Delhi
3. Nanomaterials – A. K. Bandyopodhyay , New Age Publication
4. Physics of semiconductor nanostructures K. P. Jain Narosa Publication
5. Nanotechnology, Rakesh Rathi, S Chand & Company, New Delhi
6. Introduction to Nanoscience & Nanotechnology by K. K. Chattopadhyay and A. N.Banerjee, Publisher: PHI Learning and Private Limited.

4PHY-4 (iv) Photonics-2: Optical fibre and applications

Unit-I : Optical fibers: Classification, total internal reflections, Goos Hanchen shifts, Analysis of optical wave guidesray and wave optics, characteristic equation of step index fiber, modes and their cut-off frequencies, single and multimode fibers, linearly polarized modes, power distribution
Unit-II : Graded index fiber, propagation constant, leaky modes, power profiles, dispersions, impulse response, types of couplings, Birefringent effects, polarization maintaining fibers, Fabrication techniques, Photonic crystal fiber.
Unit-III : Optical Communications: Optical transmitters, Optical receivers, system design and performance, coherent and multi channel light wave systems, optical amplifiers, dispersion compensation, Optical signal processing.
Unit-IV : Optical devices: Optical modulators, Optical Transducers, Optical switches, All optical logic gates, Photonic circuits, Optically integrated devices, Optical sensors.
Unit-V : Optoelectronic devices: Wide bandgap semiconductors, light emitting diodes (LED's), Diode lasers, fiber lasers, Wave division multiplexing network optical devices, Advances in waveguides and waveguide devices, Plasmonic waveguides.

Reference:
1) Ajoy Ghatak and K Thyagarajan, "Introduction to fiber optics," Cambridge University Press (1999).
2) G P Agarwal, "Fiber-Optic Communication systems (second edition),"
3) Pallab Bhattacharya, "Semiconductor Optoelectronic devices," Prentice Hall (1996).
4) Shun Lien Chuang, "Physics of Optoelectronic Devices," Wiley Series in Pure and Applied Optics, John Wiley & Sons Ltd. (1995).

5) S. O Kasap, "Optoelectronics and Photonics: Principles and Practices," Pearson Education (2001).
6) Various Research Journal Papers on Optical and optoelectronic devices.

4PHY-5:

(A) Compulsary lab experiments:

OPAMP-List of Experiments:

11. Application of OPAMP as inverting, non-inverting and summing amplifier.
12. Applications of OPAMP as differentiator and integrator.
13. OPAMP as square and triangular waveform generator.
14. OPAMP as instrumentation amplifier for measurement of temperature.
15. Study of ADC and DAC.
16. Study of PLL and its applications.
17. OPAMP as Butterworth filter low pass, high pass and band pass circuit.
18. ADC using ICsDAC using opamp and WRM, R-2-R Ladder
19. Design consideration of ADC/DAC Using Opamp and other ICs
20. Digital Clock using Counters, Frequency meters.

Respective laboratory specialization:

(B) Microprocessors Lab

List of Experiments : (Any Five)

Experiment :Problem 1

(A) 4 single byte numbers are stored at consecutive memory location starting at "X" write and implement a program which will transfer first two numbers in BC pair and the other two in DE pair respectively.

"[a] Using LDA instruction.
"[b] Using LHLD instruction.
"[c] Using register-indirect instruction.
"[d] Compare these programs in the context of memory requirements.

(B) 4 single byte numbers are stored in registers B,C,D & E respectively. Write and implement the programme which will transfer the contents of the registers B,C,D,E to the memory block starts at X successively, respectively.

"[a] Using STA instruction.
"[b] Using SHLD instruction.
"[c] Using register indirect instruction.
"[d] Compare these programs in the context of memory requirements.

(C) Two double byte nos. are stored at two memory location starts at X & Y resply. Write and implement the program which exchanges the information between X & Y resp.[i.e. X—Y & X+1—Y+1]

"[a] Using direct instructions {LDA}
"[b] Using register indirect instruction.
"[c] Using LHLD & XCHG instruction.
"[d] Compare these programs in the context of memory requirements.

(D) 4 single byte nos. are stored consecutively in memory starting at "X". Write and implement a programs
"[a] Using register indirect instruction, without loop.
"[b] Using forming loop i.e. branch control group instruction.
"[c] Compare the program in the context of memory requirements

Experiment Problem 2:
"(A) The 4 numbers are N1=F7, N2=6A, N3=32, N4=1C. Write a programme which will perform following arithmatic. store the result in some memory location [N1-N2] + [N3-N4].
"[a] Using immediate instruction.
"[b] Using register indirect instruction [assume in this case nos. are stored consecutively in memory starting at "X")
"[c] Optimise the programme."
(B) Two 5-byte nos. are stored at "X" & "Y" memory blocks. Write a programme to substract the lower number from the higher number and stores a result in memory block starts at "Z"
"[a] Using register indirect instruction without loop.
"[b] Using loop [i.e. branch control group instruction]
"[c] Optimise the programme.
(C) Two double byte decimal nos. are stored at memory locations X & Y resply. Write a programme which will obtain product of these two nos. in decimal equivalent and stores a result at Z.

Experiment Problem 3
(A) Write a programme which will display "HELP" in freely running fashion.
(B) Write a programme for Hexadecimal counter which will count the nos. from 00 to 40 and stops after. Implement a delay of 1 sec. and display the counts in data field.
(C) Write a programme which will produce blinking display alternately of following words." "Hallow" & "Welcome"

Experiment Problem-4
(A) Write programme for Hexadecimal counter which will count nos. from 0 to 21 and stops after. Implement a delay of 1.5 sec. and display the counts in data field of display.
(B) Write a programme which will display your name, father's name & surname. "Come in Lab." alternatly. Implement a delay of 2 sec.

Experiment Problem-5
(A) Write a programme which will add 3 double-byte numbers and stores the result in HL pair (the possible final carry).
(1) Using ADC instructions.
(2) Using DAD instructions.
(3) Compare the programmes in the context memory requirements.

(B) Write a programme to count number of logical '1'in following hexa decimal numbers. And to count the numbers which involve less than 5 logical 1's C7, B8, A3, 74, 32, 17, D2, E8, 7E, 29, 3C.
"(C) Two double byte decimal nos. are stored consecutively in memory which starts at "X". Write a programme to add these nos. and stores the result in decimal form at the next memory locations.
"" [1] Using register indirect without loop.
"" [2] Using loop i.e. branch control group instruction.
"" [3] Optimise the programme.

Experiment Problem-6
(A) Write a programme for the following type of dis-play. WORD :- ANURADHA
" [1] Charactor will come from one side slowly in the display field.
"" [2] Stay for longer time and
"" [3] Go away from other side slowly,
(B) Five single byte nos. are stored at memory starts at X. Write programme
(i) which will find the largest of these nos. & store it at (X+5) location
(ii) Which will find the smallest of these nos. & stores it at (X+6) location.

Experiment Problem-7
(A) 4 single byte numbers are stored at "X" consecutively & 4 other single byte numbers are stored at Y. Write a program to exchange these information between memory blocks X & Y.
[1] Using register indirect instruction.
[2] Using LHLD, SHLD & XTHL instruction.
[3] Compare the programs in the context of memory
(B) Two single byte nos. 0A & 25 are stored at memory location X and X=1. Write a programme which will obtain the product of these nos. Find total time required for the execution of this program.
(C) Write a programme which will arrange the following numbers in (i) ascending order (ii) descending order. A3, B6, F9 (The numbers are stored at memory starting at 'X'). Finally the arranged numbers must occupy the same memory locations.

Experiment Problem-8 Application of 8085 microprocessor.
(A) Study of DAC Card. Generation of waveforms of definite frequency.
(1) Generate the square wave
(2) Generate the triangular wave
(3) Generate the ramp wave
(4) Measure the freq. of each wave by using CRO
(B) Study of 8255 in mode 0 operation.
(1) Construct the display panel for three characters.
(2) Write and execute the programme for three digit decimal counter.
(C) Study of 8255 in mode 0 operation

(1) Construct the display panel for 3 characters.
(2) Write and execute the programme for free running display of your name.

Experiment Problem-9: Application of 8085 microprocessor.
(A) Study of 8253 timer at mode 0, mode 1 & mode 2 operation.
(B) STUDY of 8253 timer at mode 3, mode 4 & mode 5 operation.
(C) 8085 microprocessor based on experiments viz. ADDITION, SUBSTRACTION, MULTIPLICATION, DIVISION, etc. may be performed.

(B) CONDENSED MATTER PHYSICS-II

Laboratory Experiments:
It is necessary to perform atleast seven experiments from the list given below.
The experiments based on theory course are desirable.
1. Determination of Lattice parameters using powder photograph / graph.
2. To study lattice dynamics of monoatomic and diatomic molecules.
3. Measurement of Hall coefficient of given semiconductor.
4. Study of Crystal structure by Laue's Pattern.
5. To study variation of ionic conductivity of a given sample with temperature.
6. Determination of Electrical Conductivity of a given material by Four Probe Method.
7. Measurement of photoconductivity of a sample.
8. Study of dislocation motion.
9. Measurement of dislocation density by etch-pit method.
10. Deposition of nanometer size thin films and determination of its thickness.
11. Determination of Poisson's ratio of glass by Cornu's method.

(B) Digital Communication

Laboratory Course: The experiments from serial no. 1 to 5 are compulsory & perform any two experiments from others. It is expected that the teacher may perform open ended experiments.
1. Pulse Amplitude Modulation / Demodulation
2. Pulse position / Pulse width Modulation / Demodulation.
3. FSK Modulation Demodulation using Timer / PLL
5. PLL circuits and applications.
6. Fibre Optics communication.
7. Study of Transmission line.
8. Characteristics of Yagi Antenna
9. Design of digital filters using MATLAB. Setting up of new experiments on the following :
10. Mobile communication via satellites.
11. Cellular communications
12. Bandwith consideration in INTERNET.
13. IS DN
14. Wide Area Net work

4PHY-5 (iv) Lab on Photonics-1

A student should perform at least seven experiments from the following list. In the examination he will be asked to perform one experiment only.

1) To set up fiber optic voice communication system.
2) To determine numerical aperture of given optical fiber.
3) Determination of bending loss in multi mode fibers.
4) Magneto optic effect: To determine the angle of rotation as a function of mean flux density using different wavelengths of light and to calculate the corresponding Verdet's constant in each case.
5) Acousto optic effects: Study of density and elasticity in various liquids.
6) To study Pockel's effect.
7) To study Sculpting of plastic optical fiber tip.
8) To fabricate all optical fiber beam splitter.
9) Study of Second Harmonic Generation in crystals.
10) Pulsed laser deposition of thin films. (Demo)
11) Microlithography using High power Nd:YAG laser. **(Demo)**

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