No.BOS/93/6/S-2/11210 Date : 20.10.1993

To,

The Principal,
D.N. Mahavidyalaya,
FAIZPUR.

Sub.:- Permission to change of course Phy.204 Digital Electronics instead of Phy.403.

Sir,

With reference to the subject cited above, I have been directed to inform you that appropriate authorities in B.O.S. have been pleased to allow your College to teach Phy.204 Digital Electronics for the students of M.Sc. Sem.IV, only for the current academic year 1993-94 which please note and late this University to know action taken by you.

Yours faithfully,

Asstt.Registrar.

Copy for information :-

The Asstt.Registrar,
Examination Section (Pre),
North Maharashtra University,
JALGAON.

dbs./-

NORTH MAHARASHTRA UNIVERSITY, JALGAON.

Mathematics : M.A./M.Sc.,
Syllabus from June, 1992.

There will be 20 courses in four Semesters, Out of these 16 courses will be University Courses and the remaining 4 will be departmental courses. The four departmental courses will be distributed equelly between the third and fourth semesters only.

UNIVERSITY COURSES

Semester - I

MT 101 : Advanced Calculus
MT 102 : Topology I
MT 103 : Algebra I
MT 104 : Differential Equations
MT 105 : Classical Mechanics

OR

MT 106 : Computer Programming (Fortran-77)

Semester - II

MT 201 : Measure and Integration
MT 202 : Topology II
MT 203 : Algebra II
MT 204 : Complex Analysis
MT 205 : Mathematical Methods I

or

MT 206 : Programming and Numerical Methods.

Semester - III (Any three)

MT 301 : Functional Analysis
MT 302 : Commutative Algebra
MT 303 : Algebraic Number Theory
MT 304 : Mathematical Methods II
MT 305 : Fluid Mechanics

Semester - IV (Any three)

MT 401 : Algebraic Topology
MT 402 : Algebraic Geometry
MT 403 : Banach Algebra
MT 404 : Solid Mechanics
MT 405 : Environmental Dynamics and Pollution.

DEPARTMENTAL COURSES

(Any two)

Semester-III	Semester-IV
MT 306 : Algebraic Number Theory-1	MT 406 : Algebraic Number Theory,II
MT 307 : Topological Vector Spaces-I	MT 407 : Topological Vector Spaces-II
MT 308 : Operator Theory -I	MT 408 : Operator Theory-II
MT 309 : Applied Functional Analysis	MT 409 : Bio Mechanics.
MT 310 : Graph Theory-I	MT 410 : Graph Theory-II

...2/-

Semester-III	Semester-IV
MT 311 : Geometry - I	MT 411 : Geometry-II
MT 312 : Special Functions-I	MT 412 : Special Functions-II
MT 313 : Computer Science-I	MT 413 : Computer Science-II
MT 314 : Operations Research-I	MT 414 : Operations Research-II
MT 315 : Topics in Algebra-I	MT 415 : Topics in Algebra-II
MT 316 : Mathematical Logic-I	MT 416 : Mathematical Logic-II
MT 317 : Relativity-I (General)	MT 417 : Relativity-II (General)
MT 318 : Quantum Mechanics-I	MT 418 : Quantum Mechanics-II
MT 319 : Harmonic Analysis	MT 419 : Thermo dynamics
MT 320 : Mathematical Coding Theory.	MT 420 : Mathematical Modelling.

University Courses

MT-101 : Advanced Calculus :

Functions of Several variables :

Linear transformations of Euclidean n-space Differentiability of functions of several variables. The Chain rule, Partial and directional derivatives. The grafient, continuously differential functions, Inverse and Implicit function theorem, Jacobians, Derivatives of higher order.

Integration of differential forms.

Integration, Primitive Mappings, Partitions of Unity, Change of variables, differential forms, Basic K.forms and their product,, Change of variable.

Prescribed Book :

1) Walter Rudin : Principles of Mathematical Analysis. (Mc Graw Hill, International Student, 3rd Edition).

Recommended Books :

1) T.M. Apostol - Mathematical Analysis (Revised Edition) (Addison-Wesley).
2) M. Spivak - Calculus of Manifolds (W.A. Banjamin, Inc. New York).
3) Nickerson, Spencer and Steenrod- Advanced Calculus.
4) A.Devinatz- Advanced Calculus (Holl, Rinchardt and Winton).

MT-102 : Topology-I

1) Partially ordered sets, well ordered sets, Axiom of Choice, Zorn's Lemma, Well ordering principle.
2) Metric spaces, Open spheres, Open sets,
3) Sequences of Metric speaces, Cauchy Sequences, Convergence.
4) Completeness, Baire's theorem, Completion of Metric Spaces.
5) Continuity, homeomorphism, Isometry.
6) Compactness, Totally bounded sets, Arzela Ascoli theorem.
7) Contraction principle, Existence theorem for differential equations.
8) Connectedness, finite product of connected speces.

.../-

References :-

i) G.F. Simmons : Introduction to topology & modern analysis, Mc Graw Hill. (Tokio-Japan).

ii) R.R.Munkres Topology, A first course. (Prentice Hall of India, New Delhi) (1984).

iii) J.Dieudonne : Foundations of modern analysis (Revised edition) (Academic Press)

iv) Royden H.L. Real analysis.

- 0 -

MT 103 : Algebra-I :-

Review of groups, subgroups, homomorphisms, Solvable groups, Sylow Theorems.

Rings, ideals, quotient rings, Euclidean domains, Principal ideal domains, Unique factorisation domains.

Extension fields, slitting fields, fundamental theorem of Golois theory, Constructibility by ruler and compass, Solvability by radicals, Structure of finite fields.

Prescribed book :-

1. N.S. Gopalkrishnan, University Algebra, Wiley-Eastern, 1988.

References :-

1) I.N. Herstein, Topics in Algebra, Wiley-Eastern, 1988.
2) N. Jacobson, Basic Algebra, Vol.I, Hindustan Publishing Corporation, 1984.

MT-104 : Differential Equations.

1. Power Series Solution :-

Linear equations and power series. Ordinary points and singular points. Solutions near an ordinary point. Regular singular point. Indicial equation.

Illustrate the method by Bessel and legendre polynomials. State results for other polynomials like laugerre Hermite, Hypergeometric. (Ref.(2)).

2. P.D.E. of first order :-

Origin, Cauchy problem, linear equations of first order, integral surfaces passing through a given curve, surfaces orthogonal to a given system of surfaces. Non-linear p.d.e. of first order. Cauchy's method of characteristics, Compatible systems of first order equations. Charipit's method, special types, solutions satisfying given conditions. Jacobi's' method.

...4/-

3. P.D.E. of Second order :- Origin, applications in physics, characteristic curves of second orderd equations, characteristics of equations in three variables, solutions of linear Hyperbolic, parabolic and elliptic equations of seperation of variables.

Prescribed Books :-

1. Snedden : Elements of Partial differential equations.
2. Simmons : Differential Equations.

Recommended Books :-

1. Arfken : Mathematical Methods for Physics. New York : Academic Press.
2. Cousant & Hilbert : Method of Mathematical Physics Vol.1 & Vol.2, New York, Interscience.

MT-105 Classical Mechanics

D&Alemberts Principle and Lagranges' equations and examples Hamilton's principle, Extension of Hamilton's principle to nonholonomic systems. Orthogonal transformations. The Cayley-Klein parameters and related identities. Finite retations. Rate of change of a vector. Inertia tersorand its eigenvalues. Moment of inertia, Principal axis transformation. The heavy symmetrical top with one point fixed.

Legendre transformations and the Hamiltons equations of motion, Darivation of Hamilton's equations from variational principle. The principle of least action.

The equatious of cannonical transformation. Poisson bracket and other canonical invariants.

Prescribed Book :-

1) H. Goldstein : Classical Mechanics, (Addison Welley) Chapters 1,2,4,5,8,9.

Recommended Books:-

1. Corben and Steble-Classical Mechanics (John Wiley Press).
2. Landon and Lifschitz - Mechanics. (Pergamman Press).
3. Marion: Classical Dynamics (Academic Press).
4. Sudarsan & Mukunda- Classical Mechanics.

OR

MT-106 Computer Programming in Fortran-77.

The flow chart concept, Fortran-77 programming, Integer and real operations, control statements, structured if else-then, if-while statements, Do and Do while loops, Arrays, Input and output operations, Formats, Subroutines and function subprograms., logic and complex operations, Real operations in double precision, construction of some programs, Additional features of Fortran.

Prescribed Book :

1. SCHAUM SERIE : FORTRAN PROGRAMMING.

Reference Book :

1. V.Rajaramanna : Programming Fortran-77.

.....

MT-201: MEASURE & INTEGRATION

Cantor set, Cantor-like sets and Lebesgue function, Lebesgue outer measure. Measurable sets, algebra, Regularity of measure, complete measure, Measurable functions, Borel sets and Measurability.

Integration of non-negative functions of real variables. Fatou's lemma. Lebesgue monotone convergence theorem. The general integral lebesgue dominated convergence theorem. Comparison of Riemann and Lebesgue integrals.

Derivatives. Functions of bounded variation, Positive, negative and total variation, Continuity a.e. and differentiability a.e. of a function of B.V. Properties of the function of B.V. Properties of the derivative of the function of B.V. Absolutely continuous functions Vitali covering theorem, Fundamental theorem of integral calculus Lp spaces. Holders and Minkonski's inequalities Completeness of L_p spaces.

Convergence in measure, Convergence in mean of order p, almost uniform convergence, Egoraff's theorem, Implications among these.

PRESCRIBED BOOKS:

1. DeBarra, G. Measure theory and Integration. Wiley Eastern, New Delhi.

2. Rayden, H.L., Real Analysis, 3rd Edition, Maxwell MC Millan international Edition.

Reference Books:

1. Randdph, J.L. : Basic Real and Abstract Analysis, Academic Press.

2. Berbarion, S.K. : Measure theory and Integration, MC Millan.

---xxx---

MT-202: TOPOLOGY -I

1. Topological spaces, Basis for topology. The order topology, Subspace topology. Closed sets and limit points, continuous functions, Homeomorphism. Product topology. The quotient Topology.

2. Connected spaces: Components and Path components, Local connectedness. Compact spaces, Local compactness, News, One point compactification.

3. The countability axioms. The separation axiom Urysohn lemma, Urysohn Metrization theorem.

4. Tychnoff Theorem, Completely Regular spaces.

PRESCRIBED BOOK:

J.R. Munkres: Topology (A first course)
Prentice Hall of India Ltd.

Reference Books-

1. K.D.Joshi : Introduction to General Topology, (Wiley Estern)
2. Willard : General Topology (Addison Wesley)
3) B.T.Simmon : Fundamentals of Topology (Mc Millen International Edition)

MT -203: Algebra-II

Review of field Extensions, Transcedental extensions, Separability norms and traces, Discriminants, primitive element theorem.

Modules: Sub modules, Homomorphism, Isomorphism Direct sum of modules. Free modules, Rank, Projective modules.

Structure Theorem for finitely generated modules over a PID.

Application to group theory. Tensor product of modules. Localization of rings, Noetherian rings, primary decomposition, Hilbert Basis Theorem.

Prescribed Books:-

N.S.Gopalkrishnan: University Algebra (Wiley Eastern Ltd.)
Commutative Algebra
(Oxonian Press Pvt.Ltd.)

Reference Books

1) I.N.Herstein : Topics in Algebra (IBH)
2) S.Lang : Algebra (Addison Wesley)

---xxx---

MT 204 COMPLEX ANALYSIS

Topology of C, Open, connected subsets, Components of Open sets, Uniform convergence of sequences and series of functions, Wier-strass M-test, power series, radius of convergence.

Analytic functions, exponencial functions, branch of logarithm, Cauchy Riemann equations, hormonic functions Harmonic conjugate.

Path, smooth path, piecewise smooth paths, conformal map, Mobius transofrmation, Symmetry, principle and orientation principle.

Riemann- stieltjes Integral and complex integral. Line integral of a continuous function along rectifiable paths, Fundamental theorem of calculus for line integrals.

Power series, expansion of an analytic function, Fundamental theorem of Algebra, Liouvelle's theorem, Maximum modulus principle, index (winding number) of a curve around a point, Cauchy's theorem and cauchy's integral formula, Morera's theorem.

Homotopic version of Cauchy's theorem and simple connectivity. Logarithmic derivatives of f(z). The open mapping theorem, the argument principle, Meromophic functions, Rouche's theorem.

Singularities, classification of singularities, Poles and essential singularities, singular point, Laurent's series development, Casorati-Weirstrass's theorem, Residues and evaluation of integrals, Schwarz's Lemma.

Prescribed books-

1. J.B.CONWAY: Functions of one complex variable (Springer-verlag Graduate text)

2. Walter Rudin: Real and Complex Analysis (McGraw Hill Book Company, New York)

Reference Books-

1. H. Silverman : Complex variables (Haughton Millan & Co.)
2. J.E.Marsden : Basic Complex Analysis (Freeman & Co.)
3. L.V.Allfors : Complex Anelysis (MC Grew Hill, New York)

---xxx---

MT-205 MATHEMATICAL METHODS-I

1. Linear Boundary Value Problem- Wave Equation, Heat Equation, Laplaces' Equation in Cartesian, Cylindrical and Spherical co-ordinates.

2. Principle of Superposition. Series solutions, separation of variables, Certain types of initial value problems. General solutions of partial differential equations.

3. Orthogonality of functions in the space of piece wise continuous functions on an interval (a,b)

   Generalized fourier series. Approximation in the mean Closed and complete orthonormal sets, Sturn-Liouville Problems. Orthogonality of the eigan functions and their uniqueness.

4. Boundary value problems involving

   (i) the wave equation

   (ii) heat equation

   (iii) Dirichlet problems.

5. Temperature in a long cylinder, Heat transfer at the surface of the cylinder, Vibration of circular membrane.

6. Dirichlet problems in spherical regions, Study Temperatures in a hemisphere.

Prescribed Book-

R.V.Churchill & J.W.Brown,

Fourier Series and Boundary value problems. (Mc Graw Hill International).

Recommended Books-

(1) Mary L.Bose - Methods of Mathematical Physics

(2) N.N.Lebedev - Special functions & their applications. (Prentice Hall)

MT-206 PROGRAMMING AND NUMERICAL METHODS

Characterization of problems that can be solved by computers.

Model of Pascal Machine- Concept of program and data, Input and output introductions.

Types, memory as specialized data storage unit, expressions, their types and properties of arithmatic and logical operators.

Problem reducing through decomposition, sequential decomposition, sequential compositions and conditional composition. Recursion and iteration, Primitive actions: assignment statements, input/output statements.

Programs based on sequential and conditional composition Functional abstraction and procedural abstraction. Among types and iterative programs, character strings, Scalar and Subrange types and case statement, Record types and files.

Organisation of a Computer and its functioning. Role of operating system software. Concept of linking, Paradigms of programming in aid of problem solving.

Introduction to data structures- concept of Stacks, Queues and lists and their implementations, conversion of simple recursive procedures into iterative procedures.

---xxx---

NORTH MAHARASHTRA UNIVERSITY, JALGAON

M.Sc. (PHYSICS)

Semester-wise distribution of Cources = (w.e.f. June 1993)

Sem. :- I

PHY 101 : Methods of Mathematical Physics

PHY 102 : Quantum Mechanics

PHY 103 : Classical Mechanics

PHY 104 : Electronics (Wave-shaping and Circuit design)

PHY 105 : General Laboratory - I

Sem. :- II

PHY 201 : Statistical Mechanics

PHY 202 : Solid State Physics

PHY 203 : Electrodynamics

PHY 204 : Digital Electronics

PHY 205 : General Laboratory - II

Sem. :- III

PHY 301 : Atomic and Molecular Physics

PHY 302 : Numerical methods and Computer Programming

Any one of the following (Course PHY 303) :-

PHY 303 A : Physics of Semiconductor Devices

PHY 303 B : Microwave Electronics

PHY 303 C : Lasers and their applications

PHY 304 : Special Laboratory - I

PHY 305 : Project

Note : At end of the IIIrd Sem. assessment of PHY 305 Project Course for the first half (out of 20 marks) must be submitted to the University office.

Sem. :- IV

PHY 401 : Nuclear Physics

PHY 402 : Microprocessor

Any one of the following (Course PHY 403) :-

PHY 403 A : Radio communication and T.V. system

PHY 403 B : Vacuum technology and thin film physics

PHY 403 C : Solar energy

PHY 404 : Special Laboratory - II

PHY 405 : Project

NORTH MAHARASHTRA UNIVERSITY, JALGAON

PHY-301

M.Sc. (PHYSICS) PHY 301

Atomic and Molecular Physics

(W.e.f. from June, 1993)

1> Atom model for two valence electrons :

ll coupling, ss coupling, LS coupling, Pauli exclusion principle, coupling schemes for two electrons, factors for LS coupling, Lande interval rule, jj coupling branching rule, selection rule, intensity relations. Magnetic moment of the atom, Zeeman effect, intensity rules, calculation of Zeeman pattern, Paschen back effect LS and jj coupling and Paschen back effect, Breits scheme for derivation of spectral terms, Paulis exclusion principle. (10 Periods. 18 mks)

2> Complex spectra :

Displacement law, alteration law of multiplicities, vector model for three more valence electrons, Lande interval rule, inverted terms, Hund's rule.

Zeeman effect and magnetic quantum numbers in complex spectra magnetic energy and Lande g factor, Paschen back effect in complex spectra.

(8 Periods. 12 mks)

3> Hyperfine structure :

Introduction, hyperfine structure and Lande interval rule, nuclear interaction with one valence electron, hyperfine struction of two or more valence electrons, Zeeman effect in hyperfine structure, Back Goudsmit effect in hyperfine structure. (6 Periods. 10 mks)

4> Pure Rotation Spectra :

Rotation of a linear system (classical and quantum mechanical), rigid rotator, rotational energy levels and their populations, interaction of radiation with rotating molecules, rotational spectra of rigid rotators, selection rules for linear molecules, determination of moment of inertia and bond length from rotational spectra, relative intensities of spectral lines, Stark effect in molecular rotational spectra, molecular rotation-nuclear spin coupling.

(7 Periods. 12 mks)

5> Vibrational Spectra :

Vibrations of a single particle, vibrations of two particles connected by a spring (classical), Harmonic oscillator, vibrational energies of diatomic molecules, interaction of radiation with vibrating molecules, vibrational spectra of diatomic molecules, anharmonic oscillator, deduction of molecular properties from vibrational spectra of diatomic molecules. (5 Periods. 8 mks)

6> Rotation-Vibration Spectra :

Diatomic vibrating rotator coupling of rotation and vibration, rotation-vibration spectra, selection rules and transitions for the vibrating rotator, intensities in rotation and vibration spectrum, Parallel and perpendicular bands of Linear molecules, Isotope effect-vibration, rotation. (5 Periods. 8 mks)

7> Electronic Spectra of Diatomic Molecules :

Electronic energy, potential energy curves, stable and unstable molecular states, vibrational structure of electronic transitions, general formula, graphical representation, isotope effect, rotational structure of electronic spectra, the branches of band, band head formation, shading of bands : Fortrat diagram, isotope effect, intensities in electronic bands-vibrational structure-Fanck condon principle, obsorption and emission, Intensity distribution in the rotational structure, $^1\Sigma - ^1\Sigma$ transition.

(7 Periods. 12 mks)

REFERENCES :

1. Atomic Spectra - White
   (For topics 1 to 3)
2. Introduction to Molecular Spectroscopy - C.M.Barrow
   Mc Graw Hill, International Edition
   (For topics 4 to 6)
3. Spectra of diatomic molecules - Hersberg
   (For topic 7)
4. Atomic structure and chemical bond - Manas Chanda
   Mc Graw Hill

**********##########**********

NOTRH MAHARASHTRA UNIVERSITY, JALGAON

M.Sc. (PHYSICS) PHY 303 A

Physics of Semiconductor Devices

(W.e.f. from June, 1993)

1> Introduction to Semicondutors :

Types of semiconductors-Elemental compounds, properties of Silicon, Germanium and Galium arsenide Semiuconductors, Direct indirect semiconductors, charge carriers Mobility and Majority carriers, Excess carriers and life time, Diffusion of carriers and Eisteins relation Intrinsic somiconductors and position of Fermi level, degenerate and non degemerate semiconductors carrier concentration in non degenerate and degenerate cases, current transport internal fielded to non uniform doping. (10 Periods. 20 mks)

2> Measurement of Electrical Parameters of Semiconductors :

Resistivity (Four Probe method) Mobility, carrier-concentration, carried types, by Hall effct Hayne-Shockly experiment for measurement of mobility of minority carries. (6 Periods. 12 mks)

3> Semiconductor Diodes :

Tunnel diode, degenerate semi-conductor, principle of operations, circuit applications.

Varactors diode, capacitance of p- n junction, Princple of operation, equivalent circuit application, rectifierdiodes dependance of current and voltage specifications, switching diodes.

Zener diodes- reverse bias breakdown Avalenche and Zener breakdown, device designfor particular breakdown voltage. (7 Periods. 14 mks)

4> Bipolar Junction Transisters :

Ebers Moll Expressions switching characteristics, transient and A.C. conditions secondary. (4 Periods. 8 mks)

5> Field Effect Transistors :

Metal semiconductor, FET metal Insulator, semiconductor, Ideal MOS capacitor, surface fieldeffect transistors. (4 Periods. 8 mks)

6> Opto Electronic Devices :

Solar cells photodetectors (4 Periods. 8 mks)

7> Power Semicondoctor Devices :

General considerations Thyristers family SCR,diac,Triac,power transistors. (5 Periods . 10 mks)

REFERENCES :

1. Solid state Electronic devices - B.G.Streetman
(Prentice Hall of India) 3 rd Edition.
2. Semiconductors and Electronic devices - div Bar Lov
(Prentice Hall of India) 2 nd Edition.
3. Introduction to Semiconductor devices - Lindmyor & Wringtey
4. Physics of Semiconductor devices - S.M.Sze
(Wyley Eastern, Ltd.)

****

NORTH MAHARASTRA UNIVERSITY , JALGAON

M.Sc(PHYSICS (W.e.f. from June, 1993)

PHY ' 303 B

MICROWAVE ELECTRONICS

1. ELECTROMAGNETIC FILED AND WAVE EQUATIONS:

Intruduction to microwave freqencies. Coparison betweeen Radio and microwave frequency aspects.Electron motion in electric, magnetic and electromagnetic field. Electric and magnetic wave equations. Uniform plane wave. Plane wave propogation in free space poor conductor good conductor.Boundry conditions.Plan wave reflection normal incidence only.Pointing theorem. (10 periods. 20 Marks)

2. MICROWAVE TRANSMISSION LINE AND WAVEGUIDE:

Transmission line equation and their solution-open and terminated transmission lines. Line impedences. Line admittance. reflaction coefficient,transmission coeficient.Standing wave ratio. Smith chart.Single stub matching double stube matching.

Wave duides:-Rectangular,circular,Rectangular waveguides solutions of wave equation in rectangular co-ordinates TE and TM modes in rectangular waveguide power transmission. Power losses and excitation modes in rectangular waveguid. (10 periods. 20 marks)

3.MICROWAVE COMPONENTS:

Rectangular cavity resonator circular cavity resonator of cavity resonator re-ontract caities. E-flame (Series tee) H-plane (Shunt fee), magic tee (Hubrid tee) wave guide corners bends and twists Direectional conplers, two hole difectional couplers, Mocrowave circulars isolators. Hybrid couplers. (8 periods. 16 marks)

4.MICROWAVE GENERATORS:

Klystrons, Velocity modulation, bumching process, output power and beam loading efficienty of klysteren.

Reflax Klystron Velocity modulation. Power output efficiency electonic admittance.

Travelling wave Tube:Construction operation.

5. MICROWAVE Semiconductor Devices.-

Microwave transistors:Principle, operation microwave charecteristics, current gain cutoff frequency, power gain

Varactor diode: Principle, opearation use of varector diode for frequency multiplication.

microwave Tunnel diode. principle of operation, microwave field effect Transistors. FETS,JFSTS,MESFETS principle of operation microwave charactoristics,drain current out off frequency.

(6 period. 12 marks)

REFERENCE BOKKS:

1. Foundation of microwave engineering - Collin R. E.
2. Introduction to microwaves - Atwater
3. Introduction to microwave - Wheeler
4. Microwave semiconductor devices and their circuit application. - Watson
5. Microwave circuits and elements - M.L.Sisodia
6. Electromagnetic fields and waves - Jorden
7. Microwave - K.C.Gupta.
8. Electronic communication - Sangeeva Gupta

****

NORTH MAHARASHTRA UNIVERSITY, JALGAON

M.Sc(PHYSICS)

PHY 303 C (W.e.f. from June, 1993)

Laser and Their Application

1. Charecteristics of Laser light. Light waves, monochromaticity, Directionality, Brightness, Interference, the laser speekly pattern, Coherence, polarization.

2. Basic Laser Principle : The Active medium, the automatic basis fpr laser action Laser pumping, creating a population inversion Optical Feedback the Laser resonator.

3. The Laser output and its modification. Absorption and emission lineshape,Brocadenning lasermodes Optical resonance, pump rate, gain oscillations, power output , gain saturation. Selection of laser emission linesintracavity elements. Q-switching and mode locking.

4. Laser exposition(Type of Laser)

Gas lasers, Doped-Insulator Lasers, Semiconductor lasers, Dye lasers, extending the range. Design features and operating charecteristics.

5. Application of Laser:-(Brief review) Holography, civil engineering, medicine and surgery, High power laser application A power primer, material processing , laser Fusion.

REFERENCE BOOKS:-

1. An Introduction to lasers and their applications D C O shea, W-Russell and W.T. Rhodes(1977) Addision-Wesley Pyble.Col.
2. Laser Application to optics and sepectroscopy. Vol. 1, II.S.F. Jaco Bs. M. Sargent at. al. (1973).
3. Laser Application- Ed. Monte Ross, Vol. III (1977). By Academic press.

****

NORTH MAHARASHTRA UNIVERSITY, JALGAON

M.Sc. (Physics) PHY 304

List of experiments (W.e.f from June, 1993)

Special Lab.- I

Note :- At least SIX experiments from each group

Group A:

i) Wave shaping circuits.
ii) Instrumentation amplifier.
iii) PAM, PWM, PPM using IC - 555.
iv) S M P S of 5 Volt and 1 Amp.
v) Inductance Simulation.
vi) Phase detection using PLL.
vii) Optocoupler using IC -741,LED and Phototransistor.
viii) DC to DC Converter.
ix) Programmable UJT Oscillator.
x) Study of filters.(band reject and Notch filter)
xi) To study the performance of microwave components.
xii) To study horn antenna characteristics.
xiii) Susceptibility of MnSO-4 by using Guoy's method.
xiv) To study Fraunhoffer diffraction by He-Ne laser.
xv) To determine the pumping speed of rotary pump.
xvi) Study of phase diagrams by direct cooling curves.
xvii) Study of dielectric behaviour of BaTiO-3 sample.

Group B:

i) Shift register IC - 7495.
ii) UP/DOWN counter IC - 74192.
iii) Digital multiplexing (F-1 and F-2 generated by timer IC-555.)
iv) Conversion of temperature to digital signal using temperature transducer (AD 590) and 8-bit ADC.
v) Half and Full substractor.
vi) 1 : 10 line multiplexing.
vii) Study of J-K master slave flip-flop.
viii) Design, build and test a code converter circuit.
ix) To study the parity generation (odd and even) and parity checking using proper circuit.
x) To study core-loss in transformer.
xi) To study Klystron characteristics.
xii) Thin film deposition by evaporation method.
xiii) Measurement of thickness of thin film.
xiv) study of power distribution within laser beam and determine the laser beam quality.
xv) Study of flat-plate collector.
xvi) Measurements of Ultrasonic velocity in liquids.
xvii) Study of the dispersion relation for the monoatomic lattice and diatomic lattice.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

M.Sc. (PHYSICS) PHY 401

Nuclear Physics

(W.e.f. from June, 1993)

1> Nuclear Structure :

Nuclear masses and binding energies,Defination of seperation energy, Basic principles of mass spectroscopy, Neir's and Robert's mass spectroscopes, Bainbridge's and Jordon's mass spectroscopes.

Size of the nucleus, determination of radius by electron scattering method and by Coloumb energy difference method.

Nucleaur angular momentum and magnetic dipole moments, Electric quadrupole moment (classical derivation only),Quadrupole interaction energy.

(10 Periods. 20 mks)

2> The Nuclear Two -Body Problem :

The Deuteron, ground state of the deuteron (Simple theory).

Nucleon-Nucleon Scattering : Phase shift analysis,scattering length, effective range,Coherent scattering by hydrogen molecule (Ortho and para hydrogen) Born approximation.

(10 Periods. 20 Mks)

3> Nuclear Reactors :

Brief revision of fission chain reation, General reactor design, Nuclear reactor types,research reactor (Heterogeneous) Power reactor (Fast breeder reactor), reactors in India (Apsara,Cirus,Purnima)

(6 Periods. 12 Mks)

4> Nuclear Particle Accelarators :

The Principle of phase stability, synchro-cyclotron, Microtron, electron-synchrotron or Bevatron.

(5 Periods. 10 Mks)

5> Elementary Particals :

Classification on the basis of type of interaction,quantum numbers, Isospin,strangeness,parity,Decay of elementry particles.Conservation laws and symmentry properties of elementry particles,Quark model.

(5 Periods, 10 mks)

6> Cosmic Rays :

Origin of cosmic Rays, primary and secondary radiations,cosmic ray showers, Geomagnetic effects,absorption of cosmic rays.

(4 Periods, 8 Mks)

REFERENCES :

1) Atomic Nucleus - R.D.Evans.
2) Nuclear Physics - D.G.Tayal.
3) An Introduction to Nuclear Physics - Bhide,Joshi.
4) Concepts of Nuclear Physics - B.L.Cohen.
5) Basic Nuclear Physics - B.N.Srivastava.
6) Introduction to Nuclear Physics - Herald Enge.
7) Introduction to Nuclear Physics - David Halliday.
8) Elements of Nuclear Physics - M.L.Pandya and Yadav.
9) Nuclear Physics - Irving Kaplan.
10) Nuclear Physics - Alex E.S.Green.

****

NORTH MAHARASHTRA UNIVERSITY, JALGAON

M.Sc. (PHYSICS) PHY 402

Microprocessor

(W.e.f. from June, 1993)

1> Introduction to Microcomputor :

Memories, Microprocessor (C.P.U.), I/O devices, (2 Lectures)

2> Memory devices :

A) Biportar, Unipolar memeries, Random access memory (RAM) Read only momory (ROM,PROM,EPROM.)

B) Study ofmemory chips : 2174,2716 (6 Lectures)

3> Architecture of 8085 :

Detail block diagram with pin configuration (3 Lectures)

4> Instruction set of 8085 :

A) i) Instruction types

ii) Classification of instruction

iii) Addressing modes

iv) Instruction set of 8085.

B) Programming- simple programs use of subroutine (12 Lectures)

5> Interfacing memory and I/O devices :

Introduction

i) Address space partitioning, address deceding

ii) Momory Interfacing

iii) Lata transfer schemes.....

a) Programmed date transfer,

Synchronous transfer, Asynchronoces transfer, Interrupt driven data transfer, Intrurrupts in 8085.

b) Direct memory access data transfer: DMA transfer in an 8085 bassed system (5 Lectures)

6> Study of interfacing devices :

i) Programmatice peripheral interface (Ic 8255)

ii) Programmable interval timer (IC 8253) with programming.

iii) Keyboard ontroller and display controller (IC 8279)

(7 Lectures)

7> Inturrupts :

Need of Inturrupts; study of hardware and software Inturrupts, study of Inturrups controller (IC 8259) (2 Lectures)

8> Introduction to 8086, 80386 and 80286 in brief (2- Lectures)

REFERENCES :

1) Microprocessor Fundamentals (Schaum's series)
- Roger L. Kokhein (M.G.H.)

2) Introduction to Microprocesser Softwar, hardware, programming by
- L.A.Leventhal (M.G.H.)

3) 8080/8085 Assembly language programming
- L.A.Leventhal (M.G.H.)

4) Microprocessor Architecture .Programming and application
- Ramesh Goankar (WEL Bombay.)

5) MC5 85 Users manual Inter Corp. USA.

6) Introduction to microprocesser (3 rd Ed.) - A.PMathur (TMG)

7) Introduction to micorprocessor (Vol. 1 & 2) - Adam Osborn (MGH)

8) Data manual for Microprocessor family Intel Corpusa

9) Introduction to micorprocessor - Khambate

10) Microprocessor and its applications - B.Ram

NOTRH MAHARASHTRA UNIVERSITY,JALGAON

M.Sc. (PHYSICS) PHY 403 (A)

Radio communication and T.V.

(W.e.f. from June, 1993)

1> Modulationn and transmilters :

Theory of amplitude, frequency and phase modulation, AM and FM modulation system, vestigial side band filters and modulation pulse modulation,block diagram of transmitter and its function, T.V.scanning synchronization of pulses, vision signal mixing , composite video signal,T.V.camera tubes, vidiocon image orthicon,m plubicon, use of frequency multipliers and duplixer, nesative polavity in T.V. transmission, information content capacity

2> Detection and Reception :

Demodulation of FM,Block diagram of T.V. recevier, tuner and mixer stage, IF amplifier, detection and video amplifier, sunc pulse seperation deflection-circuits.

3> Propagation :

Nomenclature of upper atomsphere, ionorphere grounds and space wave propagation,tropospheric and ionospheric propagation, effect of ertth's curvature,fading,duct propagations, reflection in ionosphere, MUP, critical frequencies of differen layers.

4> Antenna :

Characteristics of antenna system, wire aerials, arrays, Yagi with design,Rhobatic aerial, loop aerials pattern multiplication.

5> T.V.Communication System :

Micowave links,satellite communication.

REFERENCES:

1. Electronics(fundamentals and applications) - Ryder
   * 4 th Edition *
2. Antenna Engineering - Kraiss
3. Basic Television - Anil maini
4. Basic Television - Grob
5. Antennas - Prasad
6. Electronics and Radio Engineering - Terman

**********##########**********

NORTH MAHARASTRA UNIVERSITY, JALGAON

M.Sc(PHYSICS) (W.e.f. from June, 1993)

PHY 403 B

Vaccum Technology and Thin Film Physics

1. Various ranges of vaccum, conductance,impodance,speed,pump-down time and thin relations. (2 periods)

2. Pumps and Gauges for H.V. and U.H.V. : Rotary Diffisuion, Getter pumps,Evapouration, sputtenation Molecular drug,Cryogonic and orgitron pump. (6 periods)

3. Method of producing thin films: Different methods chemicals CVD, Vaccum evaporation and sputtering. Parameters governing thin films different types of sources, Working of Hig-vaccume:systems, Theory of Cosine law of omission.

4. Thickness measurenments: Optical interferences techniques, Multiple beam interforometry, Tolcksky technique,Gravimatric method. (5 periods)

5. Monitoring of film thickness: Quarts crystal monitor, optiical thickness monitor. (3 periods)

6. Nucleation: Thermal accomodation coefficients, capilarity model, sperical cap and disc. Atimatic model and Comparison, varios states of growth.

7. Mechanical properties:Adhesion and its measuremets with various methods, stress measurements with various methods. (4 periods)

8. Electrical properties:- Boltzman equation, Fuch-Sondhemir theory, TCR and its variation, Resustance variation of very thin films, Hall effect. (5 periods)

9. Optical properties, Reflaction,Refraction,Fresnels coefficients, Complex refractive index, Ellipsometry Reflecting and antireflecting films. (5 periods)

REFERENCE BOOK:-

1. Hand Book of Thin film technology :- Maissel and Glang.

2. Vaccum Deposition of Thin Films :- L. Holand.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

M.Sc. (SOLID STATE PHYSICS)

Semester-wise distribution of Cources - (W.e.f. June 1993)

Sem. :- I

PHY 101 : Methods of Mathematical Physics

PHY 102 : Quantum Mechanics

PHY 103 : Classical Mechanics

PHY 104 : Electronics (Wave-shaping and Circuit design)

PHY 105 : General Laboratory - I

Sem. :- II

PHY 201 : Statistical Mechanics

PHY 202 : Solid State Physics

PHY 203 : Electrodynamics

PHY 204 : Digital Electronics

PHY 205 : General Laboratory - II

Sem. :- III

PHY 301 : Atomic and Molecular Physics

PHY 302 : Solid state physics - I

Any one of the following (Course PHY 303) :-

PHY 303 A : Physics of Semiconductor Devices

PHY 303 B : Microwave Electronics

PHY 303 C : Vacuum tech. and thin film physics

PHY 304 : Special Laboratory - I

PHY 305 : Project

Note : At end of the IIIrd Sem. assessment of PHY 305 Project Course for the first half (out of 20 marks) must be submitted to the University office.

Sem. :- IV

PHY 401 : Nuclear Physics

PHY 402 : Solid state physics - II

Any one of the following (Course PHY 403) :-

PHY 403 A : Crystal growth and their characterization

PHY 403 B : Microprocessor

PHY 403 C : Numerical methods and Computer Programming

PHY 404 : Special Laboratory II

PHY 405 : Project

****

NORTH MAHARASHTRA UNIVERSITY, JALGAON

PHY-301

M.Sc. (PHYSICS) PHY 301

Atomic and Molecular Physics

(W.e.f. from June, 1993)

1> Atom model for two valence electrons :

ll coupling, ss coupling, LS coupling, Pauli exclusion principle, coupling schemes for two electrons, factors for LS coupling, Lande interval rule, jj coupling branching rule, selection rule, intensity relations. Magnetic moment of the atom, Zeeman effect, intensity rules, calculation of Zeeman pattern, Paschen back effect LS and jj coupling and Paschen back effect, Breits scheme for derivation of spectral terms, Paulis exclusion principle. (10 Periods. 18 mks)

2> Complex spectra :

Displacement law, alteration law of multiplicities, vector model for three more valence electrons, Lande interval rule, inverted terms, Hund's rule.

Zeeman effect and magnetic quantum numbers in complex spectra magnetic energy and Lande g factor, Paschen back effect in complex spectra.

(8 Periods. 12 mks)

3> Hyperfine structure :

Introduction, hyperfine structure and Lande interval rule, nuclear interaction with one valence electron, hyperfine struction of two or more valence electrons, Zeeman effect in hyperfine structure, Back Goudsmit effect in hyperfine structure. (6 Periods. 10 mks)

4> Pure Rotation Spectra :

Rotation of a linear system (classical and quantum mechanical), rigid rotator, rotational energy levels and their populations, interaction of radiation with rotating molecules, rotational spectra of rigid rotators, selection rules for linear molecules, determination of moment of inertia and bond length from rotational spectra, relative intensities of spectral lines, Stark effect in molecular rotational spectra, molecular rotation-nuclear spin coupling.

(7 Periods. 12 mks)

6> X-ray, electron and Neutron diffraction in crystals :

Emission of X-rays, absorption of X-rays, The geometry of diffraction, The intensity of the diffractedbeam, X-ray diffraction methods, The uses of X-ray diffraction techniques, Electronic diffraction neutron diffraction, Zeolities. ...5 Periods

REFERENCES :

1. Introduction to solids - L.V.Azaroff
2. Solid state physics - A.J.Dekker
3. Introduction to solid state physics - C.Kittle
4. The physics of Engineering solids - T.S.Hutchison, D.C.Baird
5. Dislocation - Hull
6. X-ray diffraction procedures (Accde. Press)

**********##########**********

NOTRH MAHARASHTRA UNIVERSITY, JALGAON

M.Sc. (PHYSICS) PHY 303 A

Physics of Semiconductor Devices

(W.e.f. from June, 1993)

1> Introduction to Semicondutors :

Types of semiconductors-Elemental compounds, properties of Silicon, Germanium and Galium arsenide Semiuconductors, Direct indirect semiconductors, charge carriers Mobility and Majority carriers, Excess carriers and life time, Diffusion of carriers and Eisteins relation Intrinsic somiconductors and position of Fermi level, degenerate and non degemerate semiconductors carrier concentration in non degenerate and degenerate cases, current transport internal fielded to non uniform doping. (10 Periods. 20 mks)

2> Measurement of Electrical Parameters of Semiconductors :

Resistivity (Four Probe method) Mobility, carrier-concentration, carried types, by Hall effct Hayne-Shockly experiment for measurement of mobility of minority carries. (6 Periods. 12 mks)

3> Semiconductor Diodes :

Tunnel diode, degenerate semi-conductor, principle of operations, circuit applications.

Varactors diode, capacitance of p- n junction, Princple of operation, equivalent circuit application, rectifierdiodes dependance of current and voltage specifications, switching diodes.

Zener diodes- reverse bias breakdown Avalenche and Zener breakdown, device designfor particular breakdown voltage. (7 Periods. 14 mks)

4> Bipolar Junction Transisters :

Ebers Moll Expressions switching characteristics, transient and A.C.conditions secondary. (4 Periods. 8 mks)

5> Field Effect Transistors :

Metal semiconductor, FET metal Insulator, semiconductor, Ideal MOS capacitor, surface fieldeffect transistors. (4 Periods. 8 mks)

6> Opto Electronic Devices :

Solar cells photodetectors (4 Periods. 8 mks)

7> Power Semicondoctor Devices :

General considerations Thyristers family SCR,diac,Triac,power transistors. (5 Periods . 10 mks)

REFERENCES :

1. Solid state Electronic devices - B.G.Streetman
(Prentice Hall of India) 3 rd Edition.
2. Semiconductors and Electronic devices - div Bar Lov
(Prentice Hall of India) 2 nd Edition.
3. Introduction to Semiconductor devices - Lindmyor & Wringtey
4. Physics of Semiconductor devices - S.M.Sze
(Wyley Eastern, Ltd.)

**********##########**********

NORTH MAHARASTRA UNIVERSITY , JALGAON

M.Sc(PHYSICS (W.e.f. from June, 1993)

PHY ' ' 303 B

MICROWAVE ELECTRONICS

1. ELECTROMAGNETIC FILED AND WAVE EQUATIONS:

Intruduction to microwave freqencies. Coparison betweeen Radio and microwave frequency aspects.Electron motion in electric, magnetic and electromagnetic field. Electric and magnetic wave equations. Uniform plane wave. Plane wave propogation in free space poor conductor good conductor.Boundry conditions.Plan wave reflection normal incidence only.Pointing theorem. (10 periods. 20 Marks)

2. MICROWAVE TRANSMISSION LINE AND WAVEGUIDE:

Transmission line equation and their solution-open and terminated transmission lines. Line impedences. Line admittance. reflaction coefficient,transmission coeficient.Standing wave ratio. Smith chart.Single stub matching double stube matching.

Wave duides:-Rectangular,circular,Rectangular waveguides solutions of wave equation in rectangular co-ordinates TE and TM modes in rectangular waveguide power transmission. Power losses and excitation modes in rectangular waveguid. (10 periods. 20 marks)

3.MICROWAVE COMPONENTS:

Rectangular cavity resonator circular cavity resonator of cavity resonator re-ontract caities. E-flame (Series tee) H-plane (Shunt fee), magic tee (Hubrid tee) wave guide corners bends and twists Direectional conplers, two hole difectional couplers, Mocrowave circulars isolators. Hybrid couplers. (8 periods. 16 marks)

4.MICROWAVE GENERATORS:

Klystrons, Velocity modulation, bumching process, output power and beam loading efficienty of klysteren.

Reflax Klystron Velocity modulation. Power output efficiency electonic admittance.

Travelling wave Tube:Construction operation.

5. MICROWAVE Semiconductor Devices:-

Microwave transistors:Principle, operation microwave charecteristics, current gain cutoff frequency, power gain

Varactor diode: Principle, opearation use of varector diode for frequency multiplication.

microwave Tunnel diode, principle of operation, microwave field effect Transistors. FETS,JFSTS,MESFETS principle of operation microwave charactoristics,drain current out off frequency.

(2 period. 12 marks)

REFERENCE BOKKS:

1. Foundation of microwave engineering - Collin R. E.
2. Introduction to microwaves - Atwater
3. Introduction to microwave - Wheeler
4. Microwave semiconductor devices and their circuit application. - Watson
5. Microwave circuits and elements - M.L.Sisodia
6. Electromagnetic fields and waves - Jorden
7. Microwave - K.C.Gupta.
8. Electronic communication - Sangeeva Gupta

**********##########**********

NORTH MAHARASTRA UNIVERSITY, JALGAON

M.Sc(PHYSICS) (W.e.f. from June, 1993)

PHY 303 (C)

Vaccum Technology and Thin Film Physics

1. Various ranges of vaccum, conductance,impodance,speed,pump-down time and thin relations. (2 periods)

2. Pumps and Gauges for H.V. and U.H.V. : Rotary Diffisuion, Getter pumps,Evapouration, sputtenation Molecular drug,Cryogonic and orgitron pump. (6 periods)

3. Method of producing thin films: Different methods chemicals CVD, Vaccum evaporation and sputtering. Parameters governing thin films different types of sources, Working of Hig-vaccume systems, Theory of Cosine law of omission.

4. Thickness measurenments: Optical interferences techniques, Multiple beam interforometry, Tolcksky technique,Gravimatric method. (5 periods)

5. Monitoring of film thickness: Quarts crystal monitor, optiical thickness monitor. (3 periods)

6. Nucleation: Thermal accomodation coefficients, capilarity model, sperical cap and disc. Atimatic model and Comparison, varios states of growth.

7. Mechanical properties:Adhesion and its measuremets with various methods, stress measurements with various methods. (4 periods)

8. Electrical properties:- Boltzman equation, Fuch-Sondhemir theory, TCR and its variation, Resustance variation of very thin films, Hall effect. (5 periods)

9. Optical properties, Reflaction,Refraction,Fresnels coefficients, Complex refractive index, Ellipsometry Reflecting and antireflecting films. (5 periods)

REFERENCE BOOK:-

1. Hand Book of Thin film technology :- Maissel and Glang.

2. Vaccum Deposition of Thin Films :- L. Holand.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

M.Sc.(Solid state physics)

List of experiments PHY 3Ø4

Spl. Lab.-1 (W.e.f. From June, 1993)

(15 Experiments :- 3 Hours duration each)

X-rays :

Analyse an X-ray power photograph for a substance having crystal lattice.

i> SC ,ii> BCC and iii> FCC and determine the (hkl) indices of reflections recorded. Hence determine lattice constant and volume of unit cell.

Microwave :

1> Study of different microwave components :

Slotted section probe, tunable crystal detector, Klystron tube, attenuators, frequency meters, directional couplers, circulators and horn antenna.

2> Detection of relationship between frequency f, wavelength in free space and wavelength in a wave guide by using a microwave bench.

3> Measurement of dielectric constant of various solids and liquids at room temperature by using a microwave bench.

Crystal defects :

1> Study of defects in calcite crystals by chemical etching technique and density of dislocation by using an optical microscope.

2> To study ionic conductivity of solids at various temperatures (Alkali halides), using two probe method.

Magnetic Resonance :

Study of electron spin resonance in combined static and r.f.magnetic fields of a paramagnetic material.

Nuclear Radiations :

1> To determine "Plateau range", "Plateau slope" and "Variation in counts with distance" for a given G.M.Counter.

2> To study absorption of beta rays in aluminium, measurement of range.

Alloys :

1> To construct equlibrium phase diagram of a series of Lead-Antimony alloy system of varying composition and to measure the eutoctic temperature by preparing Pb-Sb alloys.

2> To prepare a series of Nickel-Copper alloys and to measure the curie temperature of the alloys for different percentages of nickel content.

Thermo Gravimetric Analysis (TGA) :

Thero gravimetric analysis (TGA) of $NiSO_4$, $6H_2O$ crystals.

Absorption Phenomenon :

To study absorption in Zeolites.

****

NORTH MAHARASHTRA UNIVERSITY, JALGAON

M.Sc. (PHYSICS) PHY 401

Nuclear Physics

(W.e.f. from June, 1993)

1> Nuclear Structure :

Nuclear masses and binding energies,Defination of seperation energy, Basic principles of mass spectroscopy, Neir's and Robert's mass spectroscopes, Bainbridge's and Jordon's mass spectroscopes.

Size of the nucleus, determination of radius by electron scattering method and by Coloumb energy difference method.

Nucleaur angular momentum and magnetic dipole moments, Electric quadrupole moment (classical derivation only),Quadrupole interaction energy. (10 Periods, 20 mks)

2> The Nuclear Two -Body Problem :

The Deuteron, ground state of the deuteron (Simple theory).

Nucleon-Nucleon Scattering : Phase shift analysis,scattering length, effective range,Coherent scattering by hydrogen molecule (Ortho and para hydrogen) Born approximation. (10 Periods, 20 Mks)

3> Nuclear Reactors :

Brief revision of fission chain reation, General reactor design, Nuclear reactor types,research reactor (Heterogeneous) Power reactor (Fast breeder reactor), reactors in India (Apsara,Cirus,Purnima)

(6 Periods, 12 Mks)

4> Nuclear Particle Accelarators :

The Principle of phase stability, synchro-cyclotron, Microtron, electron-synchrotron or Bevatron. (5 Periods, 10 Mks)

5> Elementary Particals :

Classification on the basis of type of interaction,quantum numbers, Isospin,strangeness,parity,Decay of elementry particles.Conservation laws and symmentry properties of elementry particles,Quark model.

(5 Periods. 10 mks)

6> Cosmic Rays :

Origin of cosmic Rays, primary and secondary radiations,cosmic ray showers, Geomagnetic effects,absorption of cosmic rays.

(4 Periods. 8 Mks)

REFERENCES :

1) Atomic Nucleus - R.D.Evans.
2) Nuclear Physics - D.G.Tayal.
3) An Introduction to Nuclear Physics - Bhide,Joshi.
4) Concepts of Nuclear Physics - B.L.Cohen.
5) Basic Nuclear Physics - B.N.Srivastava.
6) Introduction to Nuclear Physics - Herald Enge.
7) Introduction to Nuclear Physics - David Halliday.
8) Elements of Nuclear Physics - M.L.Pandya and Yadav.
9) Nuclear Physics - Irving Kaplan.
10) Nuclear Physics - Alex E.S.Green.

****

NORTH MAHARASHTRA UNIVERSITY, JALGAON

M.Sc. (Solid state physics and Crystal growth)

PHY 402 Solid State Physics - II

(W.e.f. from June, 1993)

1> Properties of semiconductors :

Band theory : Energy bands, Intrinsic semiconductors, Extrinsic semiconductors conductivity. Electron and holes; The temperature dependence of minority carriers and Hall effect.

Optical properties : Absorption spectrum, photoconductivity, photovoltaic effect, junction properties.

Metal : Metal junctions, metal semiconductor junction, MIS structure, P-N junction, Transistors. ...10 Periods

2> Structure of semiconductor :

The elements : Dimond structure, Graphite structure, complex structure, intermetallic compounds. General properties : III-V compounds, II-VI compounds, Silicon carbide. Sulfides : Wurtzite and halite types, Binary sulfides, Complex sulfides Oxides, Binary Oxides, Complex Oxides. ...10 Periods

3> Luminescence :

Excitation and emission, Decay mechanisms, Thallium-activited alkali halides, The sulfide phosphors, Types of luminescence. ...5 Periods

4> Ferrimagnetism :

Introduction, The structure of ferrites, The saturation magnetization, Elements of Neel's theory. ...3 Periods

5> Principle of LASER and MASER action :

The nature of spontaneous and stimulated emission, The master cavity, Pumping in the optical MASER, The two level, Three level and Four level optical MASER, The ruby optical MASER, The semiconductor optical MASER, The solid state detector, Ruby LASER, Applications of LASER in medicine

and crystallography.

Mossbeaur effect : Instrumentation,Relativity and Mossbeaur effect, Atomic motion and chemical application. Introduction Recoilles resonance-absorption. ...6 Periods

6> **Radiation damage in solids** :

Damage by neutron radiation, Irradiation by heavy charged particles, Irradiation by fast electrons,Irradiation by Gammarays. ...3 Periods

7> **Photoconductivity** :

Historical survey, photoconducting materials,Electronic transitions in photoconductors, Absorption and excitation, Trapping and capture, Recombination, Life time, photoconductivity,capture cross-section, simple model of a photoconductor, Excitation, absorption, excitation across the gap trapping and it's effects.

REFERENCES :

1. Introduction to solids - L.V.Azaroff
2. Solid state physics - A.J.Dekker
3. Introduction to solid state physics - C.Kittle
4. The physics of Engineering solids - T.S.Hutchison,D.C.Baird
5. Solid state physics - R.L.Singhal
6. Fundamentals of solid state physics - Saxena, Gupta
7. Dislocation - Hull and Read
8. Mossbeaur effect - G.K.Wertheim
9. Crystal growth and characterization - R.Ueda, J.B.Mullin
10. Semiconductor physics - Shieger
11. Essentials for solar cell - N.P. Singh (New Delhi)
12. Semiconductor physics - T.S.Moss
13. Introduction to Mossbear effect - V.G.Bhide
14. Semiconductor physics - S.M.Zea

****

NORTH MAHARASHTRA UNIVERSITY, JALGAON

M.Sc. (Solid state physics and Crystal growth)

Growth of crystal and their characterization

PHY 403 A (W.e.f. from June, 1993)

1> Importance of growing single crystals and their uses :

Thermodynamic principles and crystal growth equilibria. Theory of crystal growth, revision, nucleation from solution, melt and vapour.

2> Solution growth :

Growth from water solution, growth by Gel method, growth by Flux, Hydrothermal growth, growth from flux, growth by electrodeposition.

3> Growth from melt :

Czcharalski crystal pulling techniques, Bridgmann-Stockbarget technique, Zone melting method, Detailed study of growth and silicon and germanium single crystals.

4> Vapour growth :

The various methods of vapour growth. (Viz. CVD, Epitaxial growth etc.) and growth kinetics.

5> Introduction to liquid crystals, their classification, properties, uses and limitations of each type.

6> Characterization of crystals :

a. Identify classical gravimetric and volumetric analysis.

b. Major constituents.

c. Minor constituents.

d. Mapping (Electrical and dielectric properties).

e. X-ray power diffraction techniques.

f. Election microscopic techniques (TEM, SEM).

g. Etching studies (Chemical etching thermal and hydrothermal etching).

h. Characterization of crystal surfaces by optical microscopy.

REFERENCES :

1. Crystal growth and characterization - R.Ueda, J.B.Mulling
2. Crystal growth theory and techniques - Ed. C.H.L.Goodman
3. Short course on solid state phy. Vol. - Vol.I Ed.F.C.Auluk
4. Art and science of growing crystals - J.J.Gillman
5. Fundamentals of crystal growth - Dr. Franz A.Rosenberg
6. Dislocations - Hull and Read

**********##########**********

NORTH MAHARASHTRA UNIVERSITY,JALGAON

M.Sc. (PHYSICS) PHY 403 (B)

Microprocessor

(W.e.f. from June, 1993)

1> Introduction to Microcomputor :

Memories, Microprocessor (C.P.U.), I/O devices, (2 Lectures)

2> Memory devices :

A) Biportar, Unipolar memeries, Random access memory (RAM) Read only momory (ROM,PROM,EPROM.)

B) Study ofmemory chips : 2174,2716 (6 Lectures)

3> Architecture of 8085 :

Detail block diagram with pin configuration (3 Lectures)

4> Instruction set of 8085 :

A) i) Instruction types

ii) Classification of instruction

iii) Addressing modes

iv) Instruction set of 8085.

B) Programming- simple programs use of subroutine (12 Lectures)

5> Interfacing memory and I/O devices :

Introduction

i) Address space partitioning, address deceding

ii) Momory Interfacing

iii) Lata transfer schemes.....

a) Programmed date transfer,

Synchronous transfer, Asynchronoces transfer, Interrupt driven data transfer, Intrurrupts in 8085.

b) Direct memory access data transfer: DMA transfer in an 8085 bassed system (5 Lectures)

6> Study of interfacing devices :

i) Programmatice peripheral interface (Ic 8255)

ii) Programmable interval timer (IC 8253) with programming.

iii) Keyboard ontroller and display controller (IC 8279)

(7 Lectures)

7> Inturrupts :

Need of Inturrupts; study of hardware and software Inturrupts, study of Inturrups controller (IC 8259) (2 Lectures)

8> Introduction to 8086, 80386 and 80286 in brief (2- Lectures)

REFERENCES :

1) Microprocessor Fundamentals (Schaum's series)
- Roger L. Kokhein (M.G.H.)

2) Introduction to Microprocesser Softwar, hardware, programming by
- L.A.Leventhal (M.G.H.)

3) 8080/8085 Assembly language programming
- L.A.Leventhal (M.G.H.)

4) Microprocessor Architecture .Programming and application
- Ramesh Goankar (WEL Bombay.)

5) MC5 85 Users manual Inter Corp. USA.

6) Introduction to microprocesser
(3 rd Ed.) - A.PMathur (TMG)

7) Introduction to micorprocessor
(Vol. 1 & 2) - Adam Osborn (MGH)

8) Data manual for Microprocessor family Intel Corpusa

9) Introduction to micorprocessor - Khambate

10) Microprocessor and its applications - B.Ram

NORTH MAHARASTRA UNIVERSITY, JALGAON

M.Sc(PHYSICS) (W.e.f. from June, 1993)

PHY 403 (C)

NUMERICAL METHODS AND COMPUTER PROGRAMMING

1.COMPUTER PROGRAMMING:

A) FORTRAN-77: Charector set , Constants,Variables. Expressions (Arithmatics, Relational and Logical), Assignment statements, Input statement, output statement,control statements(GO TO, If, DO Loops)

(12 periods)

B) Subprogramme : -FUNCTION, SUBROUTINE Subprogram, Common statemet equivalanic statemt. (7 periods)

2.NUMERICAL METHODS IN FORTRAN:

In the following topic on numerical methods,students are expected to be able to write programs, subprogrsms or programs segments as well as perform numerical calculations using electronics calculators and mathematical tables.

a)Inerative methods for solution of Algebric equations-
Derivation of formula for successive Bisection, Newton Rapson method Regula false and their comparison. (6 periods)

b) Integration - Traperoidal, simpson 1/3, Simpson 3/8 Rules DErivation and Applications.

c) Interpolation:-Linear interpolation, Langrages Interpolation.

(4 periods)

d) Solution of Simulataneous equation - Guass Elimination method pivoting all conditioned equations in Guass-Seidal Iterative method.

(5 periods)

REFERENCE BOOK:

1.Programming with FORTRAN - Lipsehutz (Seaum series,MC Graw Hill pub)

2. Computer Programming in FORTRAN-77 :- Davis

3. Computer programming in FORTRAN-77 : Ramkumar

4. Computer programming in FORTRAN-77 : V. Rajaraman

5. Computer oriented numerical methos : V. Rajaraman

6. Introductory methods of Numerical Analysis : S.S. Sastry.

****

NORTH MAHARASHTRA UNIVERSITY, JALGAON

M.Sc.(Solid state physics)

List of experiments (W.e.f. from June, 1993)

Spl. Lab - 2 PHY 404

(15 Experiments :- 3 Hours duration each)

Magnetism :

1> To study variation of capacitance and power factor with temperature in ferroelectric sample.(Barrium titanate)

2> To study variation of dc channel resistance of a field effect transistor (BFW 10) with external magnetic field.

3> To determine the paramagnetic molar susceptibility and hence magnetic moment and number of unpaired electronics in pottassium ferricyanide $K_3Fe(CN)_6$ by Guoy method.

4> To study variation of suceptibility of a magnetic slat with temperature.

5> To study Faraday effect and to determine Vardet's constant of a magnetic material.

Electrical properties :

1> To determine electrical conductivity of a semiconducting material.

2> To determine energy gap of a semiconducting speciman.

3> To determine energy gap in the band structure of Indian Antimonide from the given IR spectrum.

4> To study characteristics of NTC and PTC materials by varying their temperature and to determine temperature co-efficient of resistance.

Thin films :

1> To prepare cadmium sulphide photosensitive thinfilm by chemical bath deposition technique.

2> To determine step hight on mica-cleavage by multiple beam interferometry.

3> To prepare thin films of semiconducting materials by flash evaporation technique and to measure resistivity by two probe/ four probe method.

4> To prepare thin films of photosensitive materials by solution growth technique and to study their photoconductivity.

Hall measurement : (For semiconductors)

To measure Hall co-efficient, the number of charge carriers per unit volume and the carrier mobility in P type and N-type semiconducting samples and compare the results.

Superconductors :

To study theorotical aspects and preparation of superconductors.

Low temperature :

Effect of change in temperature down to liquid nitrogen temperature upon the break down potential of a voltage reference diode.

**********##########**********