MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

M.Sc., PHYSICS (CBCS)

(Effective from the Academic year 2012-2013)

STRUCTURE OF THE PROGRAMME & SCHEME OF EXAMINATION

Semester	Title of the paper	Teaching Hours	Credits	Theory/ Practical	Exam hours	Internal Mark	External Mark	Total Marks
I	1. Classical Mechanics and Relativity	6	5	T	3	25	75	100
	2. Mathematical Physics-I	6	5	T	3	25	75	100
	3. Electronic Devices	6	5	T	3	25	75	100
	Elective I 4.a. Renewable energy sources OR 4.b. Optoelectronics and Lasers	6	4	T	3	25	75	100
	Practical 1 - Physics-I	6	3	P	6	40	60	100
II	5. Mathematical Physics-II	6	5	T	3	25	75	100
	6. Electromagnetic Theory	6	5	T	3	25	75	100
	7. Microprocessor and Microcontroller	6	5	T	3	25	75	100
	Elective II 8.a. Nonlinear Dynamics and Chaos OR 8.b.Communication Electronics	6	4	T	3	25	75	100
	Practical 2 - Electronics	6	3	P		40	60	100

Semester	Title of the paper	Teaching Hours	Credits	Theory/ Practical	Exam hours	Internal Mark	External Mark	Total Marks
III	9. Quantum Mechanics-I	6	5	T	3	25	75	100
	10. Solid State Physics	6	5	T	3	25	75	100
	11. Statistical Mechanics	6	5	T	3	25	75	100
	Elective III –Project	6	4	Project	4	40	60	100
	Practical 3 - Physics -II	6	4	P	6	40	60	100
IV	12. Quantum Mechanics-II	6	5	T	3	25	75	100
	13. Molecular Spectroscopy	6	5	T	3	25	75	100
	14. Nuclear and Particle Physics	6	5	T	3	25	75	100
	Elective IV 15.a.Material Science OR 15.b. Physics of Nano Materials	6	4	T	3	25	75	100
	Practical 4 - Computer Programming C++ and Microprocessor	6	4	P	6	40	60	100
	Total for all semester	120	90					

Internal Assessment Mark

Components	**Theory**	**Practical**
The average of the best two tests from three compulsory tests, each of one hour duration	15	
Assignment	4	
Seminar (15-20 minutes)	6	
Experimental work		20
Record		10
Model test		10
Total Mark	25	40

Question Pattern for M.Sc., Physics (Theory)

Duration: 3 hours

Maximum Marks: 75

Part A (10×1=10 Marks)

Two questions from each unit

Part B (5×5=25 Marks)

One question from each unit with internal (either-or) choice.

(The question from one of the units should be a problem (both choices) related to the syllabus from the prescribed text).

Part C (5x8=40 Marks)

One question from each unit with internal (either-or) choice.

(The question from one of the units should be a problem (both choices) relevent to the syllabus from the prescribed text).

Note:

The problems in Part B and Part C should be from different units.

Project work

Components	**Marks**
Project Report (Dissertation)	60
Viva-Voce *	40
Total	100

Group Project with maximum of 4 students. The dissertation topics will be based on special papers or elective papers or topics of current interest. A Departmental committee will distribute the topics.

* The project report evaluation will be done Centrally and Viva-Voce will be conducted by both the External Examiner and the Guide at the end of third semester.

1. CLASSICAL MECHANICS AND RELATIVITY

UNIT I

Variational Principles and Lagrange's equations: System of particles – constraints – D'Alembert's principle - Lagrange's equation – velocity dependence forces – dissipation functions – applications of Lagrange's formulation – Hamilton's principle – calculus of variation – Lagrange's equation from Hamiltons 's principle – Advantages of variational principle formulation.

UNIT II

The two body central force problem: Reduction of two body problems into one body and equivalent one dimensional problems – equation of motion of first integrals – virial theorem – Bertrand's theorem – Kepler's problems – scattering in a central force field – transformation of scattering problems to Laboratory coordinates.

UNIT III

The Kinematics of Rigid body motion: Independent coordinates of a rigid body – matrix transformation – Euler's angle – Coriolis force – Angular momentum and kinetic energy – Euler's equations- torque free motion – cyclic coordinates – principle of least action – Hamilton's equation from variational principle – small oscillations – normal coordinates – Eigen values – linear triatomic molecule - forced vibrations.

UNIT IV

Canonical Transformations : Generating functions – properties – Poisson's brakets – Poisson braket formulation for equations of motion – Hamilton's Jacobi theory – Harmonic oscillator problems – Hamilton's characteristic function – separation of variables – action angle variables.

UNIT V

S**pecial Relativity in Classical Mechanics :** Lorenz transformation – A four dimensional formulation – relativistic elastic scattering – The Lagrangian and Hamiltonian of a relativistic particle – a covarient formulation.

BOOK FOR STUDY:

1. Classical Mechanics - Herbert Goldstein, II Edition, Narosa Publishing House, 2001.

BOOKS FOR REFERENCE

1. Classical Mechanics , B.D. Gupta, Satya Prakash
Kedarnath-Ramnath Pub. Pvt.Ltd., 9th Edition ,1975
2 Classical Mechanics, S. L. Gupta, *V.* Kumar, *H. V.* Sharma.
Edition, 23. Publisher, Pragati Prakashan
3 Classical Mechanics of paricles and bodies , Kiran C. Gupta,
New Age International P Ltd,2008
4. Classical Mechanics , V.B. Batia, Narosa Publications,1997
5. Classical Mechanics , G. Aruldhas, Prentice-Hall of
India, Pvt. Ltd, New Delhi-110001,2008

2. MATHEMATICAL PHYSICS- I

UNIT I

Vector Spaces: Introduction – Gradient of a scalar field – divergence and curl of a vector function – physical significance – Gauss divergence – Stokes and Green's theorem (theorems only) – classification of vector fields-linear vector space – linear independence of vectors and dimensions-basis and expansion theorem-inner product and unitary space- orthonormal sets – Gramm - Schmidt – ortho normalization method – completeness.

UNIT II

Special Functions : Introduction-Legendre and Hermite functions/polynomials–their equations – series solutions – generating functions-recurrence relations – Rodrigue's formula-orthogonal properties – associated Legendre polynomials(introduction only) - beta and gamma functions.

UNIT III

Tensors: Introduction – indicial and summation conventions – scalars, contra variant and covariant vectors – tensor of higher ranks – algebraic operations of tensors-symmetric and antisymmetric tensors – metric tensor – associated tensors – tensor form of gradient, divergence, Laplacian and curl-simple applications of tensors to non-relativistic physics-tensor in dynamics of a particle – tensor in elasticity-tensor in rigid bodies.

UNIT IV

Group Theory: Definition of group – sub group – coset – classes – factor group-homomorphism – isomorphism – direct and semi-direct products – group representation-reducible and irreducible representations – theorems on representation –character of a representation – character table – construction of character table – C_{2v} , C_{3v} and D_3 groups-symmetry group – unitary group, Lie group SU(2) and SU(3) – elements of point group.

UNIT V

Partial differential equation in Physics: Introduction – Laplace's equation and it's solution (in cartesian coordinates only)-example – separation of variable – one dimensional heat equation (finite and infinite rod) - equation of motion for the vibrating string – D'Alembert's solution – Fourier solution – vibrations of a rectangular and circular membranes – inhomogeneous wave equations – magnetic vector potential.

BOOK FOR STUDY

1. Mathematical Physics, Satya Prakash, Sultan Chand & Sons, New Delhi.

BOOKS FOR REFERENCE

1. Applied Mathematics for Engineers and Physicists, Louis A. Pipes, Lawrence R. Harvill, Mc Graw-Hill Ltd, 1970.
2. Mathematical Methods for Physicists, George Arfken and Hans J. Weber, Edition Academic Press, N. Y.

3. Mathematical Physics, Eugene Butkov, Addison Wesley publishers. 1968.
4. Matrices and Tensors in Physics - A. W. Joshi, 3rd edition, New Age International Publishers Ltd and Wiley Eastern Ltd, New Delhi, 1995
5. Group theory and its application to Physical problems - M. Hamermesh, Addison-Wesley Pub. Co., 1962
6. Vector analysis, Murray R. Spiegel, Schaum's McGraw Hill Professional, 2009
7. Classical groups for Physicists, B. G. Wybourne, John Wiley & Sons, 1974
8. Special functions by E. D. Rainville, The Macmillan Company, New York, 1960.

3. ELECTRONIC DEVICES

UNIT I

Transistors: JFET, BJT, MOSFET and MESFET– Structure – Working – Derivations of the equations for I-V characteristics under different conditions – High Frequency limits

UNIT II

Photonic Devices: Eradicative and non radiative transitions – Optical absorption- Bulk and thin film – Phtotoconductive devices(LDR) – diode photodetectors – solar cell – (open circuit voltage and short circuit current, fill factor) – LED (high frequency limit – effect of surface and indirect combination current, operation of LED) – diode lasers (conditions for population inversion in active region, line confinement factor) – Optical gain and threshold current for lasing – Fabry-Perrot cavity length for lasing and the separation

UNIT III

Memory Devices: Static and Dynamic random access memories SRAM and DRAM – CMOS and NMOS – non-volatile – NMOS – magnetic – optical and ferroelectric memories – charge coupled (CCD)

UNIT IV

Other Electronic Devices : Electro-optic – Magneto-optic and Acousto– Optic effects – Material properties related to get these effects – Important Ferro electric, Liquid Crystal and Polymeric materials of these devices – Piezoelectric – Electrostrictive and Magnetostrictive Effets - Important material exhibiting these properties and their applications in sensors and actuator devices. Acoustic Delay lines – piezoelectric resonators and filters – High frequency piezoelectric devices– Surface acoustic wave devices

UNIT V

Microwave Devices: Tunnel diode – Transfer electron devices (Gunn diode) – Avalanche transit time devices – Impatt diodes – parametric devices.

BOOKS FOR STUDY

1 . Semiconductor Devices- Physics and Technology, S.M. Sze, John *Wiley* & Sons, *1985*
2 . Introduction to Semiconductors Devices, M.S. Tyagi, *John Wiley & Sons, 1991*
3 . Measurment, Instrumention and Experiment Design in Physics and Engineering, M. Sayer and A. Mansingh, Prentice Hall, India, 2000.
4 . Optical Electronics, Ajoy Ghatak and K. Thyagarajan, Cambridge Univ. Press,1989

4. a. RENEWABLE ENERGY SOURCES

UNIT I

Introduction : Primary and Secondary energy– commercial and non – commercial energy – renewable and non– renewable energy resources and their importance – world energy use– reserves of energy resources – energy cycle of earth – Indian energy scenario – Long term energy scenario for India – environmental aspects of utilization.

UNIT II

Solar Energy: Introduction– extra terrestrial solar radiation– radiation at ground level – collectors – solar cells – application of solar energy – Biomass energy – biomass conversion – bio gas production – ethanol production – pyrolysis and gasification – direct combustion – applications.

UNIT III

Wind Energy: Introduction – basic theory – types of turbines – applications
Geothermal energy – Introduction – geothermal resources types – resource base– application for heating and electricity generation– Tidal energy – Introduction – origin of tides – power generation scheme – Wave energy – Introduction – basic theory – wave power devices.

UNIT IV

Other Renewable Energy Sources: Introduction – open and closed OTEC cycles – biophotolysis – ocean currents – Hydropower – introduction – basic concept– site selection – types of turbine – small scale hydropower– Magneto hydrodynamics (MHD), Thermoelectric and Thermionic energy resources – basic principles – power generation – Nuclear energy – basic principle – power generation (basic ideas only).

UNIT V

Chemical Energy Sources: Introduction – Fuel cells-design and principle– classification – types-advantages and disadvantages – applications – Batteries– introduction – theory– different types of batteries arrangements – classification of batteries – advantages of batteries for bulk storage – Hydrogen energy – production– electrolysis – thermochemical methods – solar energy method – hydrogen storage.

BOOK FOR STUDY

1. Non-Conventional Energy Sources, G.D. Rai, Khanna publishers, New Delhi,1984

BOOKS FOR REFERENCE

1. Solar Energies of Thermal Processes, A.Duffie and W.A.Beckmann, John-Wiley,1980.
2. Principle of Solar Engineering, F.Kreith and J.F.Kreider, McGraw-Hill,1978
3. Alternate Energy Sources, T.N. Veziroglu, Vol.5 and 6, McGraw –Hill,1978.
4. Solar Energy -Principles of Thermal Collection and Storage, *S P Sukhatme* and J K Nayak, Tata Mc Graw Hill.Tata, 2008

4.b. OPTOELECTRONICS AND LASERS

UNIT I

Light wave fundamentals: Electromagnetic waves -dispersion – pulse distortion – and information rate – polarisation- resonant cavities at plane boundary – critical angle - reflections

UNIT II

Integrated wave guides: Dielectric slab guide – modes in the symmetric slab guide – modes in the asymmetric slab wave guide – coupling to the wave guide- integrated optical network

UNIT III

Optic fiber wave guides : Step index fiber – graded index fibre – attenuation in fibers – modes in step index fiber – modes in graded index fibre pulse distortion and information rate in optic fibers – construction of optical fibers.

UNIT IV

Lasers : Emission and absorption of radiation- Einstein relations – absorption of radiation-population inversion – threshold conditions – laser losses - line shape functions – population inversion and pumping threshold conditions - Laser modes – Axial modes -Transverse modes-classes of laser - doped insulator laser - semiconductor laser - gas lasers - liquid gas lasers- single mode operation- frequency stabilization - mode locking - active mode-passive mode locking-Q-switching methods

UNIT V

Holography: Wavefront reconstruction – linearity of holographic process – image formation of holographic process – Gabor hologram – limitations – Recording the hologram – minimum reference angle – holography of three dimensions – practical problems in holography – types of holograms- Fresnel - Fraunhofer – transmission- reflection – rainbow multiplex- embossed and thick holograms - application of holography – holography interferometry – holography computer memories.

BOOKS FOR STUDY

1. Fiber Optic Communications, Joseph C. Palais, Prentice Hall Publications. IV Edition (Unit 1-3)
2. Optoelectronics, J. Wilson and J.F.B.Hawkes, Prentice Hall Publications,1989 (Unit 4)
3. Introduction to Fourier Optics, Joseph W.Goodman, McGraw Hill, Person Education II Edition, 1996. (Unit 5)

BOOKS FOR REFERENCE

1. Photonics Optical Electronics in Modern Communications, Amnon Yariv and Pochi Yeh, Oxford University Press, VI Edition, 2006
2. Optical Fibers and Fiber Optic Communication Systems, Subir Kumar Sarkar, S. Chand & Co
3. Introduction to Fiber Optics, *Ajoy Ghatak* and K. *Thyagarajan*, Tata McGraw Hill

5. MATHEMATICAL PHYSICS- II

UNIT I

Matrices: Introduction – special types of matrices – transpose – conjugate –transposed conjugate – symmetric and antisymmetric matrices – Hermitian and skew Hermitian matrices – Determinant – adjoint – orthogonal and unitary matrices – Inverse of a matrix – diagonalization – eigenvalues and eigen vectors of the matrix – characteristic equation of a matrix – Cayley Hamilton theorem (proof and related problems).

UNIT II

Complex variables: Analytical functions – Cauchy –Riemann conditions – line integrals – Cauchy's theorem – Cauchy's integral formula – derivatives of analytic functions-power series – Taylor's theorem – Laurent's theorem – calculus of residues – evaluation of definite integrals – definite integrals of trigonometric functions of $\cos\theta$ and $\sin\theta$ ($_0\int^{2\Pi}$ $F(\cos\theta, \sin\theta)$-type only) – certain improper real integrals ($_{-\infty}\int^{+\infty}$ $f(x)\,dx$-type only).

UNIT III

Special functions-II: Bessel function of first kind – generating function – recurrence relations- $J_n(x)$ as solution of Bessel differential equation – expansion of $J_n(x)$ when n is half and odd integer – integral representation – Laguerre's differential equation and Laguerre polynomials – generating function-Rodrigue's formula – recurrence relations – orthogonal property of Laguerre polynomials – associated Laguerre polynomials (basic ideas only).

UNIT IV

Fourier's and Laplace's integral transforms: Introduction – Fourier transform – properties of Fourier's transform – Fourier transform of a derivative – Fourier sine and cosine transforms of derivatives – Laplace transform (LT) – properties of LT – LT of derivative and integral of a function –LT of periodic function – Inverse LT – properties of inverse LT – application of LT to electrical circuits.

UNIT V

Numerical analysis: Introduction-numerical integration –trapezoidal rule –Simpson's rule – solution of ordinary differential equations of first order –Euler's method –modified Euler's method –Taylor series method –Runge-Kutta method -approximate solution of algebraic and transcendental equations –Newton-Raphson method –method of iteration –Monte-Carlo technique (basic ideas only).

BOOK FOR STUDY

1. Mathematical Physics, Satya Prakash, Sultan Chand & Sons, New Delhi.

BOOKS FOR REFERENCE

1. Applied Mathematics for Engineers and Physicists, Louis A. *Pipes,* Lawrence R. *Harvill, McGraw Hill Ltd, 1970.*
2. Mathematical Methods for Physicists , George *Arfken* and Hans J. *Weber,* VI Edition, Academic Press, N. Y.

3. Mathematical Physics, Eugene Butkov, Addison Wesley publishers. 1968.
4. Matrices and Tensors in Physics, A. W. Joshi, III Edition, *New* Age *International* Publishers Ltd and Wiley Eastern Ltd, *New* Delhi, 1995.
5. Complex variables, Murray Spiegel, Schaum's Outline Series, McGraw-Hill, New York, 1964
6. Complex variables and applications, J.W. Brown and R. V. Churchill- 7th edition. McGraw-Hill, New York, NY, 2004
7. Numerical Methods, E. Balagurusamy, Tata McGraw-Hill Publishing company Ltd, New Delhi.
8. Special functions for Scientists and Engineers, W. W Bell. Dover, New York, 2004

6. ELECTROMAGNETIC THEORY

UNIT I

Electrostatics: Coloumb's law– Gauss' law- Poissons's equation and Laplace's equation – Work done to move a point charge- Energy of a point charge and continuous charge distribution – Methods of images – Electric field in dielectric materials – Induced dipoles and polarizability- connection between polarizability and susceptibility – susceptibility, Permittivity and dielectric constant of linear dielectrics

UNIT II

Magnetostatics: Lorentz force law– Biot-Savart's law and Ampere's law– Magnetic vector potential Multipole . Expansion of the vector potential – Effects of a magnetic field on atomic orbits – Bound current and its physical interpretations – Ampere's law in Magnetised Material – Magnetic energy – Dia, Para, Ferro magnetism – Magnetic Susceptibility and permeability in linear and non linear media

UNIT III

Electrodynamics: Electromagnetic induction – Faradays Law – Maxwell's Equation Differential and integral form – Boundary conditions on field vectors D, E, B and H – Scaler and vector potentials – Gauge transformations – Lorentz and Coulomb Gauge – Poynting vector and poynting theorem – Maxwell's stress tensor – Conservation of momentum

UNIT IV

Electromagnetic waves: The wave equation for E and B – Monochromatic plane waves – energy and momentum in EM waves in linear media – Reflection and Transmission at Normal and Oblique incidence – EM waves in conductors wave guides– TE waves in rectangular wave guides – the coaxial transmission line

UNIT V

Elecromagnetic Radiation: Retarded potential – Lenard - Wiechart potential – Electric dipole radiation – magnetic dipole radiation – power radiated by a point charge – amour formula – Abraham Lorentz formula for the radiation reaction – The physical origin of radiation reaction

BOOK FOR STUDY

1. Introduction to Electrodynamics, David J Griffiths. Prentice Hall of India. II Edition, 1989.

BOOKS FOR REFERENCE

1. Classical Electrodynamics, J.D. Jackson., Wiley Eastern Publication. Second edition, 1975
2. Foundations of electromagnetic theory, J.R. Reitz, E.J. Milford and R.W. Christy.
3. Electromagnetic fields and waves, P. Lorrain and D. Corson. CBS Publishers and distributors, 1986.
4. Electrodynamics, B.P. Laud, *New Age International Pvt. Ltd. 1987.*

7. MICROPROCESSORS AND MICROCONTROLLER

UNIT I

Evolution and Architecture of Microprocessors 8085 & 8086 : Evolution of Microprocessors – Computers and its Classifications– INTEL 8085 microprocessor Pin out configuration – Pins and their functions - Bus system–control and status signals – externally initiated signals including interrupts- architecture – ALU – Flags – registers (general purpose & special purpose registers). INTEL 8086 microprocessor – Pins description, Operating modes, Pin description for Minimum mode and Maximum mode – Operation of 8086 – registers, flags, and interrupts of 8086.

UNIT II

Instruction Set of 8085 and Assembly Language Programming: Software – Assembly Language – Assembler, Assembler directives– Instruction set of 8085 : Data transfer instructions, Arithmetic instructions, Logical instructions, Branching instructions, Machine control instructions Processor cycles – Instruction & machine cycle, Timing diagram & instruction format–Timing diagram for memory read machine cycle & executing an instruction– addressing modes of 8085A – Assembly language programming using 8085A– Sequence, branching and loop programming – Subroutines and ISR.

UNIT III

Peripheral Interfacing Devices and Techniques: Address space – partitioning, interfacing – memory and I/O interfacing – I/O ports: non programmable I/O port INTEL 8212, Programmable Peripheral Interface (PPI) INTEL 8255, Programmable Interval (Counter) Timer (PIT) INTEL 8253. – Data transfers: types of parallel and serial data transfer schemes – Direct Memory Access (DMA) controller INTEL 8257– 8085A interrupt system: software & hardware interrupts – interfacing, working and programming of PIC 8259 with 8085.

UNIT IV

Programming of 8086 and Microcontroller 8051 : 8086 Instructions – Data transfer and arithmetic instructions, addressing modes of Intel 8086. INTEL8051:Architecture – hardware features, registers, I/O ports, external memory, counter and timers, serial I/O, interrupts. 8051 Programming: Instruction set, addressing modes, data transfer, logical, arithmetic operations, jump/call instructions, interrupt handler.

UNIT V

Microprocessor System Design and Applications: Delays – Generation of square waves of pulses – Interfacing of 7- Segment LED display – Formation of codes for alphanumeric characters – Sensors and transducers in physical instruments – Temperature measurements and control – Frequency and resistance measurements – Digital clock – DC motor speed control – Traffic control system.

BOOKS FOR STUDY

1. Microprocessor Architecture, Programming and Applications with 8085, Ramesh S. Gaonkar, III Edition, Penram International Publishing,1997

2. Fundamentals of Microprocessor and Microcomputers, B. Ram,V Edition, Dhanpat Rai publications (P) Ltd. New Delhi, 2003.
3. The 8051 Microcontroller – Architecture, Programming & Applications, Kenneth J. Ayala, II Edition., Penram International, India, 1996.

BOOKS FOR REFERENCE

1. Microprocessor and its Applications, Nagoor Kani, RBA Publications I Edition, Chennai, 2004.
2. Microprocessors and Interfacing- Programming and Hardware, Douglas.V. Hall, II Edition., McGraw Hill, India, 1999.
3. The 8051 microcontroller and embedded systems, Mohammed Ali Mazidi, Janice Gillispie Mazidi,Pearson education, India, 2001.

8. a. NONLINEAR DYNAMICS AND CHAOS

UNIT I

Nonlinearity, Linear and Nonlinear oscillators: Dynamical systems-linear and nonlinear forces – mathematical implications of nonlinearity – working definition of nonlinearity – effects of nonlinearity-linear oscillators and predictability– damped and driven nonlinear oscillators – dissipative and conservative systems-autonomous and nonautonomous systems.

UNIT II

Equilibrium points, Bifurcations and Chaos: Equilibrium points – general criteria for stability– classification-some simple bifurcations-saddle node, pitch fork, transcritical and Hopf bifurcations-discrete dynamical systems – logistic map – equilibrium points and their stability – period doubling phenomenon – chaos – continuous dynamical systems – Duffing oscillator – bifurcation scenario – period doubling and intermittency routes to chaos.

UNIT III

Chaos in nonlinear electronic circuits: Linear and nonlinear circuit elements–nonlinear circuits – Chua's diode-autonomous case – bifurcations and chaos – chaotic dynamics of MLC circuit – analogue circuit simulation – some other useful nonlinear circuits – RL diode circuit-Hunt's nonlinear oscillator– P-N junction diode oscillator–Colpitt's oscillator.

UNIT IV

Fractals : Self similarity – Properties and examples of fractals – fractal dimension-construction and properties of some fractals-middle one third cantor set-Koch curve-Sierpinski triangle – Julia set –Mandelbrot set – construction – similarity and differences-applications of fractal.

UNIT V

Solitons: Linear waves-linear nondispersive wave propagation – linear dispersive wave propagation – nonlinear dispersive systems– Korteweg de Varies equation – solitary and cnoidal waves – Scott Russel phenomenon and KdV equation – properties and types of solitons – applications of solitons.

BOOK FOR STUDY

1. Nonlinear dynamics, Integrability, Chaos, Patterns, M. Lakshmanan and S. Rajasekar, Springer, Berlin, 2003.

BOOKS FOR REFERENCE

1. Chaos in nonlinear oscillator, controlling and synchronization, M. Lakshmanan and K. Murali, (World Scientific, Singapore, 1997).
2. Deterministic chaos, H. G. Schuster, (Verlag, Weinheim, 1998).
3. Nonlinear oscillations, dynamical systems and bifurcations of vector fields, J. Guckenheimer and P. Holmes, Springer, New York, 1983.
4. Nonlinear waves in one dimensional dispersive systems, P. L. Bhatnagar, Oxford Univ. press, Bombay, 1979.

8.b. COMMUNICATION ELECTRONICS

UNIT I

Amplitude modulation: Modulation index for AM – Frequency spectrum for AM – Average power – AM receiver – AM transmitter- Single side band principles – Frequency Modulation – Frequency spectrum – Average power – FM transmitter – Phase modulation – Pulse amplitude modulation – Pulse Code modulation – Pulse Frequency modulation – Pulse Time modulation

UNIT II

Synchronization: Asynchronous Transmission – Probability of bit Error in baseband transmission- Matched Filter – Optimum Terminal Filters – Bit time recovery – Digital carrier systems – Carrier recovery circuits – Differential Phase shift Keying (DPSK) - Hard and soft decision decoders.

UNIT III

Propagation of waves: Ground waves – Sky wave propagation – the ionosphere – space wave troposphere scatter propagation – extra terrestrial communications

UNIT IV

Optical Communication : Transmission in fiber – Losses in fibers- Dispersion – Light sources for Fiber optics – photodetectors - Connectors and splices – Fiber optic communication link

UNIT V

Keplers' Laws : Keplers' I, II and III law – Orbits – Geostationary orbits – Power systems – altitude Control – Satellite station Keeping – Antenna look angles – Limits of visibility – Transponders - Uplink and down link power budget calculation – Digital carrier Transmission – Multiple access methods.

BOOKS FOR STUDY

1. Electronic Communication, Dennis Roddy and John Coolen, IV Edition, Pearson Education
2. Electronic Communication, George Kennedy and Bernard Davis, IV Edition Mc Graw Hill Publishing company Limited
3. Fiber Optic Communications, Joseph C Palais, McGraw Hill Publishing company Limited

9. QUANTUM MECHANICS - I

UNIT I

The Schrodinger wave equation: Development of the wave equation- Travelling harmonic waves - The one dimensional wave equation - Interpretation of the wave function - normalization-Probability current density- Expectation values- Ehrenfest's theorem Energy Eigen functions - One dimensional square well potential.

UNIT II

Eigen functions and Eigen values: Interpretative postulates and energy Eigen functions - motion of a free wave packet in one dimension. Discrete Eigen valves (bound states)- Linear Harmonic oscillator - Spherically Symmetric potential in three dimension.

UNIT III

Continuous Eigen values: One dimensional square potential barrier - Scattering coefficients - collisions in three dimensions - scattering cross section - asymmetric behaviour - scattering by spherically symmetric potentials - scattering by a perfectly rigid sphere - scattering by a square well potential.

UNIT IV

Matrix formulation of Quantum Mechanics : Transformation theory - Transformation of Hamiltonian with W - Transformation of Hamiltonian with U, Transformation of Hamiltonian with V - Dirac's bra and ket notation - Equations of Motion - matrix theory of the linear Harmonic Oscillator.

UNIT V

Symmetry in Quantum mechanics : Rotation, angular momentum and unitary groups - Proper rotation group – infinitesimal rotations – spin of vector particle – Commutation relation for the generators – Choice of representation - Angular momentum matrices - Combination of angular momentum states and tensor operation – Clebsch Gordan coefficients.

BOOK OF STUDY

1. Quantum Mechanics, L.I. Schiff, III Edition, McGraw Hill, 1968
   (Sections: 6, 7, 8, 9,10,12,13,14,17,18,19,23,24,25,27,28)

BOOKS OF REFERENCE

1. Quantum Mechanics, Eugen Merzbacher III Edition, John Wiley, 2004
2. Modern Quantum Mechanics, J.J. Sakurai, Addison-Wesley, 1994
3. Quantum Mechanics, P.J.E.Peebles, Prentice – Hall of India, 2001.
4. Introductory Quantum Mechanics, Richard L.Liboff, IV Edition,
   Pearson Education, 2003.

10. SOLID STATE PHYSICS

UNIT I

Reciprocal Lattice and Energy Bands : Diffraction of waves by crystals - Bragg's law– scattered wave amplitude – reciprocal lattice vectors – Brillouin zones– Fourier analysis of the basis – Quasi crystals – Nearly free electron model –Bloch function – Kronig Penny model – wave equation of electron in a Periodic potential – Number of orbitals in a band.

UNIT II

Phonons and Crystals Vibrations : Vibration of crystals with mono atomic basis – Two atoms per primitive basis - Quantisation of elastic waves – Phonon momentum – inelastic scattering by phonons – Phonon heat capacity – Density of states in one and three dimensions – Debye model for density of states – Einstein model of the density of states – Thermal conductivity –Thermal resistivity of phonon gas – Umklapp process.

UNIT III

Free Electron Fermi Gas and Fermi Surfaces : Energy levels in one dimension – Effect of temperature on the Fermi Dirac distribution – Free electron gas in three dimension – heat capacity of the electron gas – Electrical conductivity and ohm's law – motion in magnetic fields – Fermi surface – construction – calculation of energy bands – Wigner Seitz method – De Haas-van Alphen effect – extremal orbits.

UNIT IV

Dia, Para and Ferromagnetism : Langevin's diamagnetic equation – Quantum theory of diamagnetism and paramagnetism – Hund's rule – Paramagnetic susceptibility of conduction electrons –Ferromagnetic order – magnons – Ferrimagnetic order – Antiferromagnetic order – Ferromagnetic domains.

UNIT V

Surface and Interface Physics: Lattice vacancies – Diffusion -Colour centres – Shear strength of single crystals – slip – dislocations – Burgers vectors – Low angle grain boundaries – Dislocation densities – Strength of alloys – surface crystallography – surface electronic structure – magneto resistance in a two dimensional channel – PN junctions – rectification – solar cells and photo voltaic detectors – Schottky barrier.

BOOK OF STUDY

1. Introduction to Solid State Physics, Charles Kittel, VII Edition, John Wiley & Sons, New York, 1996. (Chapters: 2,4,5,6,7,9,14,15,18,19,20)

BOOKS OF REFERENCE

1. Elementary Solid State Physics, M. Ali Omar, Pearson Education, 1999.

2. Introductory Solid State Physics, H. P. Myres, II Edition, Taylor and Francis Ltd, London 1989.

11. STATISTICAL MECHANICS

UNIT I

Introduction : Objectives of Statistical Mechanics – macrostates, microstates, phase space and ensembles – Ergodic hypothesis – postulate of equal a priori probability and equality of ensemble average and time average - Boltzmann's postulate of entropy – Counting the number of microstates in phase space – Entropy of ideal gas: Sackur – Tetrode equation and Gibbs' paradox – Liouville Theorem.

UNIT II

Canonical Ensemble : System in contact with a heat reservoir – expression of entropy, canonical partition function – Helmholtz free energy, fluctuation of internal energy – Grand Canonical ensemble – System in contact with a particle reservoir – chemical potential – grand canonical partition function and grand potential – fluctuation of particle number – Chemical potential of ideal gas.

UNIT III

Quantum Statistical Mechanics : Mean field theory and Vander Wall's equation of state, Density matrix – Quantum Liouville theorem – Density matrices f or microcanonical, canonical and grand canonical systems – Simple examples of density matrices – one electron in a magnetic field – particle in a box.

UNIT IV

Identical Particles : Bose Einstein and Fermi Dirac distributions – Equation of state – Bose condensation – Equation of state of ideal Fermi gas – Fermi gas at finite time – Ising model – Partition function for one dimensional case – Chemical equilibrium and Saha ionisation formula.

UNIT V

Phase Transitions : first order and continuous – critical components and scaling relations – Calculation of exponents from mean field theory and Landau's theory – upper critical dimension.

BOOK OF STUDY

1. Statistical Mechanics, Satya Prakash, Kedar Nath Ram Nath Publication, Delhi, 2009

BOOKS OF REFERENCE

1. Fundamentals of Statistical and thermal Physics, F.Reif, McGraw-Hill, International Edition, 1985
2. Statistical Mechanics, R.K.Pathira, Bufferworgh Heinemann, II Edition
3. Statistical Mechanics, K.Huang, John Willey & Sons, II Edition
4. Statistical and Thermal Physics, Loknathan and Gambhir, Prentice-Hall of India Pvt.Lt.2007

12. QUANTUM MECHANICS- II

UNIT I

Approximation Methods for bound states : Stationary Perturbation theory – Non degenerate case – degenerate case – Zeeman effect without electron spin – first order Stark effect in hydrogen – Variation method – Ground state of helium – Vander Waals interaction – perturbation calculation – variation calculation.

UNIT II

The WKB Approximation : Classical limit – Tunnelling through a barrier – Time dependent perturbation theory – Transition probability – adiabatic approximation – sudden approximation – disturbance of an oscillator.

UNIT III

Identical Particles and Spin : Identical particles – Symmetric and anti symmetric wave functions – Construction from unsymmetrized functions – distinguishability of identical particles – The exclusion principle – Connection with statistical mechanics – Collisions of identical particles – Spin angular momentum – electron spin functions.

UNIT IV

Semiclassical Treatment of Radiation : Absorption and induced emission – Maxwell's equations – Transition probability – Electric dipole transitions – Forbidden transition – Spontaneous emission – asymptotic form – angular momentum – Planck distribution formula.

UNIT V

Relativistic Wave Equations : Schrodinger's Relativistic Equations – Electromagnetic potentials – Energy levels in a Coulomb field – Dirac's Relativistic Equation – Free particle solutions – Charge and current densities – Electromagnetic potentials – Spin and angular momentum – Negative energy states.

BOOK OF STUDY

1. Schiff, Quantum Mechanics, III Edition, Mc Graw Hill, 1968
   (Sections: 31,32,34,35,40,41,44,45,51,52,53)

BOOKS FOR REFERENCE

1. Quantum Mechanics, Eugen Merzbacher III edition, John Wiley, 2004
2. Advanced Quantum mechanics – J. Sakurai
3. Quantum Physics III edition S. Gasiorowicz, II edition, John Wiley, 1996
4. J.L. Powell and B. Crasemann, Quantum Mecahanics
5. P.M. Mathews and K.Venkatesan, A text book of Quantum Mechanics

13. MOLECULAR SPECTROSCOPY

UNIT I

Microwave Spectroscopy : Classification of molecules – Rotational spectra of rigid diatomic molecule – Isotope effect in rotational spectra – intensity of rotational lines – non rigid rotator – linear poly atomic molecules– symmetric molecules– asymmetric molecules – Microwave spectrometer – information derived from rotational spectra.

UNIT II

Infrared Spectroscopy : Vibrational energy of a diatomic molecule – selection rules - vibrating diatomic molecule – diatomic vibrating rotator-asymmetry of vibration– vibration band– rotational vibrational spectra of polyatomic molecules– linear molecules– symmetric top molecules– information derived from vibrational spectra.

UNIT III

Raman Spectroscopy : Theory of Raman scattering – classical theory– quantum theory – rotational Raman spectra – Linear molecules – symmetric top molecules – vibrational Raman spectra– Raman spectrometer– Hyper Raman effect– classical treatment of hyper Raman effect– stimulated Raman effect– Inverse Raman scattering– CARS– PARS– multi photon process.

UNIT IV

Electronic Spectroscopy : Vibrational coarse structure – vibrational analysis of band system - Deslandres table – progression and sequences – Franck Condon principle-rotational fine structure of electronic vibrational spectra– The Fortrat parabola– dissociation – predissociation – photoelectron spectroscopy – principle– instrumentation.

UNIT V

NMR, ESR, NQR, NMR **–** Magnetic properties of nuclei – resonance condition – relaxation process – Bloch equations – chemical shift – NMR instrumentation. ESR **–** Principle– ESR spectrometer – Hyperfine structure – ESR spectrum of Hydrogen atom – ESR spectra of free radicals in solution. NQR **–** The Quadrupole nucleus – principle – transitions for axially symmetric systems – transitions for non axially symmetric systems – NQR instrumentation.

BOOK OF STUDY

1. Molecular Structure and Spectroscopy, G. Aruldhas, II Edition, Prentice-Hall of India, Pvt. Ltd, New Delhi-110001, 2007.

BOOKS FOR REFERENCE

1. Fundamentals of Molecular Spectroscopy, Colin N. Banwell and Elaine M. McCash, IV Ed., Tata McGraw Hill publishing company Ltd., New Delhi, 2004
2. Spectroscopy, G. R. Chatwal and S. K. Anand, Himalaya publishing house, New Delhi, 2002.

14. NUCLEAR AND PARTICLE PHYSICS

UNIT I

Nuclear Models : Liquid Drop Model – Weizsacker's Mass formula – Mass Parabola – Nuclear stability –Bohr-Wheeler theory of Nuclear Fission –Magic numbers – Evidence for magic numbers – Shell model – Spin orbit coupling mode –angular momentum and parity of nuclear ground states – Magnetic moment and Schmitt lines – Collective model of Bohr.

UNIT II

Nuclear Decay: Gamow's theory of alpha decay – Fermi theory of beta decay–Beta Spectrum – Fermi and Gamow – Teller selection rules – Neutrino hypothesis – Parity violation – Multipole radiation – Selection rules – Internal conversion – Nuclear isomerism – Disintegration energy Calculation for alpha, beta and gamma decay.

UNIT III

Nuclear forces: Ground state of Deuteron– Excited state of Deuteron – Magnetic moment and quadruple moment of Deuteron–Non central Tensor Forces–Meson theory of nuclear forces– n-p scattering at low energies–scattering length– phase shift analysis – spin dependence – shape independent effective range theory of n-p scattering – p-p scattering at low energies

UNIT IV

Nuclear Interaction and Nuclear Reactors: Types of nuclear reactions – Nuclear reaction kinematics – Compound nuclear theory – Reciprocity theorem – Resonance Scattering – Breit-Wigner one level formula – Classification of Neutrons – Neutron Sources – Neutron Diffusion – Neutron current density – leakage – Fermi age Equation – Four factor formula – Critical size of a reactor – reactor buckling – Classification of Nuclear reactor based on fuel and moderator – thermal, Power, research, breeder and PHWR- Reactors .

UNIT V

Elementary Particles : Classification of elementary particles – Particle interactions – Symmetry and conservation laws – Leptons and Hadrons – C.P.T theorem – Quark Model – Gellmann-Okubo mass formula – SU (3) multiplet – Meson Octet-Baryon Octet and baryon decouplet – Bosons.

BOOKS FOR STUDY

1. Nuclear Physics, D. C Tayal, Himalaya Publications.

2. Elements of Nuclear Physics, M. C. Pandia and R. P. S Yadav Kedarnath.

BOOKS FOR REFERENCE

1. Concepts of Nuclear Physics, Bernard L Cohen, Tata Mc Graw-Hill

2. Nuclear Physics an Introduction, S. B. Patel, Wiley Eastern Ltd.

3. Nuclear Physics, R. R Roy and B. P. Nigam. New Age International Ltd.

15. a. MATERIAL SCIENCE

UNIT I

Crystalline Materials: Introduction – Crystal symmetry – simple crystal structures – Polymorphism and Allotropy – Crystal directions-crystal imperfections – Structure determination by X-ray diffraction – Bragg's law-production of X-rays – determination of lattice parameters (Bragg's X-ray spectrometer method) – The Laue method– The powder method – The rotating crystal method.

UNIT II

Conducting Materials: Introduction – The classical free electron theory – Wiedemann- Franz law – The quantum free electron theory – Fermi distribution function – density of energy states – electrons in a periodic potential – conductors – High resistivity materials –superconductivity– General features – Effects of magnetic field – The Meissner effect – Thermal properties – London equation – Penetration depth – BCS theory – Josephson effect.

UNIT III

Semiconducting Materials : Introduction – Elemental intrinsic semiconductors – Carrier concentration in intrinsic semiconductor – Electrical conductivity – Extrinsic semiconductor – Carrier concentration in N- type and P-type semiconductors – Variation of carrier concentration with temperature. Direct and indirect band gap semiconductors-semiconductor materials – Hall effect - applications.

UNIT IV

Dielectric Materials : Fundamental definitions - Measurement of relative dielectric constant - Various polarization process - Electronic polarization - Ionic polarization - Orientational polarization – Space - charge polarization – frequency effect on polarization – Dielectric loss - Internal field - Lorentz method - Clausius-Mossoti relation - dielectric break down – required qualities of good insulating materials - classification – applications.

UNIT V

Optical and Nano Materials : Luminescence – photoluminescence – Cathode-luminescence - Electroluminescence – injection luminescence – P-N-Junction theory – P-N-Junction as a light source - Light emitting diode - LED materials - construction – Liquid crystal display - characteristics - action – photo detectors - photo detective materials – Nanophase materials- Synthesis- variation of physical properties with geometry.

BOOK FOR STUDY

1. Material Science, P. K. Palanisamy, II Edition, Scitech Publications (India) Pvt. Ltd, Chennai, 2007. (Chapters: 1,2,3,4,5,6)

BOOKS FOR REFERENCE

1. Material Science and Engineering, V. Raghavan, IV Edition, Prentice Hall of India, Pvt. Ltd, New Delhi – 110001, 2001
2. Material Science, Dr. M. Arumugam, Anuradha agencies, Vidayalkaruppur, Kumbakonam - 612 605.

15. b. PHYSICS OF NANO MATERIALS

UNIT I

Nanostructures & Structural Characterization : History – background – nanoscale in one dimension, two dimensions, three dimensions – Synthesis of oxide nanoparticles (Sol-gel processing), metallic nanoparticles: semiconductor nanoparticles, fabrication of core – shell nanostructures – aerosol synthesis – gas phase synthesis of nanoparticles – Structural characterization – X-ray diffraction – STM, Atomic force microscopy, properties of nano materials.

UNIT II

Carbon Nanotubes : Carbon allotropes – types of carbon nanotubes – graphene sheet to single walled carbon nanotubes – electronic structure of carbon nanotubes – synthesis of carbon nanotubes: electric arc discharge method – laser method – electrolysis – pyrolysis of hydrocarbons – Fluidised bed CVD method – solar production of CNT – purification methods – properties – filling of CNT – fullerene – purification – properties – application of CNT

UNIT III

Quantum Heterostructures: Introduction – heterostructure – growth of heterostructure: molecular beam epitaxy – metal organic chemical vapour deposition – heterojunction band alignment – quantum well – superlattice – low dimensional system -– doped heterostructures: modulation doping – quantum wells in heterostructures – effective mass theory in heterostructures – application of effective mass theory in quantum wells in heterostructures – optical confinement – application of heterostructures

UNIT IV

Quantum wires & Quantum dots: Introduction – size effects - preparation of quantum nanostructures – Fermi gas and density of states – calculation of density of states – infrared detector – quantum well lasers – quantum cascade laser – nanowires – production, structure and uses of nanowires – quantum dots: fabrication techniques – electronic properties - application of quantum dots: information storage – infrared photodetector - laser

UNIT V

Magneto Electronics and Applications of Nano Technology:

Magnetism in nanocrystals – Nanocrystalline soft magnetic materials – Columb blockade – single electron transistor – quantum cellular automata – fabrication – Spintronics – giant magnetoresistance – Quantum Hall effect – Quantum spin Hall effect – fractional quantum Hall effect – application of nanotechnology – medical application of molecular nanotechnology

BOOKS FOR STUDY

1. The Physics of low Dimensional Semiconductors - An introduction, John H. Davis, Cambridge University Press, 2006.
2. Optical Properties of Semiconductor Quantum Dots, U. Woggon Springer Verlog
3. Nanophysics edited by Dr. Sr. Gerardin Jayam

BOOKS FOR REFERENCE

1. Transport in Semiconductor nanostructure, D. Ferry and S. Goodnick, Cambridge University Press, 1997.
2. Nanotechnology in Carbon Materials, M. S. Dresselhaus and R. Salio
3. Advanced Magnetic nanostructures, K. P. Awasthi, Cyber Tech Publications,2008
4. Introduction to Nanotechnology , Charles P. Poole Jr, Frank.J.Owens, Wiley India Pvt. Ltd, 2008.

PRACTICALS

Practical 1 - Physics I

Any 10 Experiments

1. Susceptibility – Quinke's Method
2. Cauchy's constant by least square fit (Experimental method)
3. Hyperbolic fringes – Determination of elastic constants
4. Michelson's interferometer
5. Anderson Bridge – determination capacitance
6. Ultrasonic interferometer- ratio of compressibility in 2 liquids
7. Force constant calculation from vibration spectrum
8. Young's double slit experiment (1) using standard kit (2) lab made double slit
9. Ultrasonic diffraction – velocity determination in single liquid
10. Solar absorption spectrum
11. Variation of diameter of a very thin thread (hair, very thin plastic thread, etc) as function of load using Laser source
12. Mutual inductance – coupling coefficient as a function of distance and angle
13. Identification of X- ray lines using given XRD spectrum
14. Basic Characteristics parameters of optical fibre

Practical 2 - Electronics

Any 10 Experiments

1. Voltage regulator using transistors.
2. Schmidt trigger design using transistors.
3. Triangular Wave, Ramp generators using IC 741.
4. Active filters- low pass, high pass and band pass filters using IC 741.
5. Counters mod 2 to 10.
6. UJT characteristics and relaxation oscillator.
7. Phase shifter using Op- amp IC 741 and phase shift measurement.
8. AD converters and DA converters using IC 741.
9. SCR characteristics and power control .
10. The Constant current source - floating load and grounded load using Op amp and Transistor.
11. FET characteristics and voltage amplifier.
12. Code converters (Binary to Gray , Gray to Binary , Binary to Excess 3, Excess 3 to Binary).
13. Solution of simultaneous equations using IC 741

Practical 3 - Physics II

Any 10 Experiments

1. Susceptibility- Guoy's Method
2. Elliptical fringe - determination of elastic constants
3. Biprism - determination of wavelength
4. Band gap - thermister
5. Hall effect
6. Resistivity -four probe method
7. Equipotential surface – different shapes
8. Diffraction – ultrasonic compressibility of liquid, ratio of velocities.
9. Temperature variation of forward bias diode voltage for Ge and Si
10. Comparison of illumination – Using photo transistor (two lamps, various distances)
11. Dielectric constant- LCR circuit
12. BH curve tracing and Hysteresis loss
13. Resistivity – two probe method
14. Calibration of Hall probe into Gauss meter using a search coil

BOOK FOR REFERENCE for Practical 1 & 3

Advanced Practical Physics, B.L.Worsnop, H.T.Flint

Practical 4 - Programming

Any twelve Programmes with a minimum of five from each Group I &II

Group I : Writing ALP and testing with trainer kits of Intel 8085/8086/8051 (Write Algorithm and Draw flow charts)

1. Block Move, addition, subtraction, multiplication, logical operations (8085/8086).
2. Rearranging the Numbers – ascending, descending , maxima, minima and searching a character of an array (8085/8086).
3. Counters using seven segment LED Display (8085/8086).
4. Simple Series Generation – Fibonacci, Tribonaccietc (8085/8086).
5. Display of any character / rolling display (8085/8086).
6. Analogue to Digital convertor and Digital to Analogue convertor(ADC and DAC)
7. Waveform Generation(Square, Sine, Triangular) (8085/8086).

Group II : C++ Programming exercises with Computers (Write Algorithm and Draw flow charts)

8. Curve fitting to straight line and data interpolation (Cauchy's constant).
9. Currents in Wheatstone's bridge – solution of simultaneous equations – Gauss elimination.
10. Solution of radioactive decay problem (or any Physics problem). Use Runge-Kutta or Euler's methods
11. Evaluation of area under the curve – Simpson's rule and Monte–Carlo method.
12. Eigen values and eigenvectors of symmetry matrices.
13. Matrix multiplication (application – rotation matrices).
14. Newton's Law of cooling (or any Physics problem) using Numerical differentiation.
15. Solution of transcendental or polynomial equations by the Newton Raphson method

Note : For the Practical Examination the questions will be either from C++ or Microprocessor

PROJECT

FORMAT FOR PREPARATION OF PROJECT REPORT FOR M.Sc. Physics

1. ARRANGEMENT OF CONTENTS:

The sequence in which the project report material should be arranged and bound should be as follows:

Cover Page & Title Page
Bonafide Certificate
Abstract
Table of Contents
List of Tables
List of Figures
List of Symbols, Abbreviations and Nomenclature
Chapters
Appendices
References

2. PAGE DIMENSION AND BINDING SPECIFICATIONS:

The dimension of the project report should be in A4 size. The project report should be bound using flexible cover of the thick white art paper. The cover should be **printed in black letters** and the text for printing should be identical.

Total number of Pages should not exceed 70.

3. PREPARATION FORMAT:

Cover Page & Title Page – A specimen copy of the Cover page & Title page of the project report are given in **Appendix 1.**

Bonafide Certificate – The Bonafide Certificate shall be in double line spacing using Font Style Times New Roman and Font Size 14**.**

The Certificate shall carry the supervisor's signature and shall be followed by the supervisor's name, academic designation (not any other responsibilities of administrative nature), department and full address of the institution where the supervisor has guided the student. The term **'SUPERVISOR'** must be typed in capital letters between the supervisor's name and academic designation.

Preface – Preface should be one page synopsis of the project report typed double line spacing, Font Style Times New Roman and Font Size 14.

Table of Contents – The table of contents should list all material following it as well as any material which precedes it. The title page and Bonafide Certificate will not find a place among the items listed in the Table of Contents but the page numbers of which are in lower case Roman letters. One and a half spacing should be adopted for typing the matter under this head.

List of Tables – The list should use exactly the same captions as they appear above the tables in the text. One and a half spacing should be adopted for typing the matter under this head. The tables shall be introduced in the appropriate places in the text.

List of Figures – The list should use exactly the same captions as they appear below the figures in the text. One and a half spacing should be adopted for typing the matter under this head. The figures shall be introduced in the appropriate places in the text.

List of Symbols, Abbreviations and Nomenclature – One and a half spacing should be adopted or typing the matter under this head. Standard symbols, abbreviations etc. should be used.

Chapters – The Chapters may be broadly divided into 5 parts

1. Introduction to Project
2. Literature Survey
3. Methods and methodology/Working / Experimental Techniques
4. Result Analysis
5. Conclusion

1 . The main text will be divided into several chapters and each chapter may be further divided into several divisions and sub-divisions.

2. Each chapter should be given an appropriate title.

3. Tables and figures in a chapter should be placed in the immediate vicinity of the reference where they are cited.

4. Footnotes should be used sparingly. They should be typed single space and placed directly underneath in the very same page, which refers to the material they annotate.

Appendices – Appendices are provided to give supplementary information, which is included in the main text may serve as a distraction and cloud the central theme.

1. Appendices should be numbered using numerals, e.g. Appendix 1, Appendix 2, etc.
2. Appendices, Tables and References appearing in appendices should be numbered and referred to at appropriate places just as in the case of chapters.

3. Appendices shall carry the title of the work reported and the same title shall be made in the contents page also.

List of References –The listing of references should be typed 4 spaces below the heading "REFERENCES" in alphabetical order in single spacing left – justified. The reference material should be listed in the alphabetical order of the first author. The name of the author/authors should be immediately followed by the year and other details.
A typical illustrative list given below relates to the citation example quoted above.

REFERENCES

1. Ariponnammal, S. and Natarajan, S. (1994) 'Transport Phonomena of Sm Sel – X Asx', Pramana – Journal of Physics Vol.42, No.1, pp.421-425.
2. Barnard, R.W. and Kellogg, C. (1980) 'Applications of Convolution Operators to Problems in Univalent Function Theory', Michigan Mach, J., Vol.27, pp.81–94.
3. Shin, K.G. and Mckay, N.D. (1984) 'Open Loop Minimum Time Control of Mechanical Manipulations and its Applications', Proc.Amer.Contr.Conf., San Diego, CA, pp. 1231-1236.

Table and figures - By the word Table, is meant tabulated numerical data in the body of the project report as well as in the appendices. All other non-verbal materials used in the body of the project work and appendices such as charts, graphs, maps, photographs and diagrams may be designated as figures.

4. TYPING INSTRUCTIONS:

The impression on the typed copies should be black in colour.

One and a half spacing should be used for typing the general text. The general text shall be typed in the Font style 'Times New Roman' and Font size 14.

APPENDIX 1

(A typical Specimen of Cover Page & Title Page)

<Font Style Times New Roman – Bold>

TITLE OF PROJECT REPORT

<Font Size 18><1.5 line spacing>

A PROJECT REPORT

<Font Size 14>

Submitted by

<Font Size 14><Italic>

NAME OF THE CANDIDATE(S)

<Font Size 16>

in partial fulfilment for the award of the degree

of

<Font Size 14><1.5 line spacing><Italic>

NAME OF THE DEGREE

<Font Size 16>

IN

BRANCH OF STUDY

<Font Size 14>

NAME OF THE COLLEGE

<Font Size 14>

MANONMANIAM SUNDARARANAR UNIVERSITY
TIRUNELVELI- 627 012

<Font Size 16><1.5 line spacing>

MONTH & YEAR

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