SYLLABUS

M.Sc. Physics

EFFECTIVE FROM JULY - 2011

DEPARTMENT OF PHYSICS

And

ELECTRONICS

DR. RAM MANOHAR LOHIYA AVADH UNIVERSITY

FAIZABAD-224001 (INDIA)

M.SC. PHYSICS

M.Sc. PREVIOUS - SEMESTER I

	Th+S*
• PH 101: Mathematical Physics	70+30
• PH 102: Quantum Mechanics - I	70+30
• PH 103: Semiconductor Devices & Circuits	70+30
• PH 104: Solid State Physics- I	70+30
• PRACTICAL-I: Electronics Devices and Circuit Lab	200
TOTAL MARKS OF FIRST SEMESTER	**600**

M.Sc. PREVIOUS - SEMESTER II

• PH 201: Numerical Analysis And FORTRAN Programming	70+30
• PH 202: Quantum Mechanics -II	70+30
• PH 203: Thermodynamics And Statistical Mechanics	70+30
• PH 204: Solid State Physics-II	70+30
• PRACTICAL-II: General Physics and Computer Programming Lab	200
TOTAL MARKS OF SECOND SEMESTER	**600**

M.Sc. FINAL - SEMESTER III

• PH 301: Nuclear Physics-I	70+30
• PH 302: Classical Electrodynamics	70+30
• PH 303: Integrated and Digital Electronics	70+30
• PH 304: Electronics Communication Principles	70+30
• PRACTICAL-III: Integrated Circuit And Communication Lab	200
TOTAL MARKS OF THIRD SEMESTER	**600**

M.Sc. FINAL - SEMESTER IV

• PH 401: Nuclear Physics-II	70+30
• PH 402: Atomic And Molecular Physics	70+30
• PH 403: Microprocessor And Computer Organization	70+30
• PH 404: Laser And Optical Communication	70+30
• PRACTICAL-IV: Microprocessor and Digital Electronics Lab	100
• PROJECTS/SEMINAR	100
TOTAL MARKS OF FOURTH SEMESTER	**600**
GRAND TOTAL	**2400**

***S -Sessional Marks, Th- Theory Marks**
Distribution of Sessional Marks

• 1. Test-1:	10 Marks
• 2. Test-2:	10 Marks
• 3. Student Response in Class:	5 Marks
• 4. Student Attendance:	5 Marks

M.Sc. Previous – First Semester

PAPER-I: PH 101 MATHEMATICAL PHYSICS

Complex variable: Complex Variable & Complex Functions. Cauchy integral theorem, Cauchy's integral formula, Evaluation of integrals by Contour integral, Residues, Cauchy's residue theorem, Evaluation of integrals by residues methods.

Laplace and fourier transforms: Laplace transforms of various functions, Laplace transform of derivatives and integrals, Convolution Theorem, Laplace transform of certain special functions, Inverse Laplace transforms, Fourier transform, Application of Fourier transforms.

Green function: Green Function, Green Function for one dimensional case, Properties of Green function, Solution of inhomogeneous differential equation using Green Function. Green Function for ∇^2 operator, Solution of three dimensional Helmholtz equation

References:

1. Mathematical Physics by B.S.Rajpoot Pragati Prakashan
2. Mathematical Methods for Engineers: Morganeau and Murphy
3. Mathematical Physics: B. D. Gupta
4. Mathematical Physics: P. P. Gupta
5. Integral Transform: P. P. Gupta

PAPER- II: PH 102: QUANTUM MECHANICS - I

Matrix formulation and theory of angular momentum: Bra and Ket Notation, Matrix form of wave function, Matrix representation of observable, Change of basis. Equation of motion in Matrix form, Schrodinger, Heisenberg and interaction representation. Matrix theory of linear harmonic oscillator and general proof of uncertainty principle in Matrix mechanics. Angular momentum operators, Commutation relation of angular momentum, Ladder operators, Addition of Angular momenta, Clebsch-Gordon Coefficients (j_1=1/2, j_2=1/2 and j_1=1, j_2=1/2), Pauli matrices.

Klein-Gorden and Dirac equation: K.G. equation, Plane wave solution of Dirac equation. Negative energy states and prediction of positron, Spin and Intrinsic magnetic moment of Dirac electron.

Second quantization of fields: Quantization of non-relativistic Schrodinger equation, Second quantization of Klein-Gordon, Dirac and em field (Lorentz guage), The number representation, creation and annihilation operators and simple problems on algebra of annihilation and creation operators, Fock space representations.

REFERENCES: -

1. Quantum Mechanics by L. I. Schiff
2. Quantum Mechanics by Pauling & Wilson
3. Quantum Mechanics by B. K. Agrawal
4. Quantum Mechanics by Merzbacher
5. Quantum Mechanics by Ghatak & Lokanathan

PAPER III: PH 103: SEMICONDUCTOR DEVICES & CIRCUITS

Bipolar Junction Transistors: Transistor action, configurations and characteristics, current gains, h-parameters and analysis of transistor amplifier using h-parameter, inter conversions in different configuration, thermal instability and bias stabilization, cascaded transistors.

Multistage Amplifiers: BJT at high frequencies, frequency response of RC coupled amplifiers and transformer coupled amplifier.

Power Amplifiers: Classification of amplifiers, transformer coupled class- A power amplifier, efficiency and crossover distortion, class- B push pull amplifier, single tuned and double tuned amplifier.

Classification of feedback amplifiers, effect of negative feedback, stability and response of feedback amplifiers,

Oscillators: General theory of operation, Phase Shift, Wien's Bridge, Hartley, Collpit and Crystal Oscillators.

References:

1. Electronic Devices & Circuits: Mottershed
2. Electronic Devices & Circuits: Milliman and Halkias
3. Solid state Electronic devices: B. G. Streetman
4. Functional Electronics: Ramnan

PAPER- IV: PH 104: SOLID STATE PHYSICS- I

Optical Properties and Imperfection in Solids: Basic Theories and models of luminescence, phosphorescence, thermoluminescence, electroluminescence and photo-conductivity.

Point Defects: Schottky defects and Frenkel defects. Colour centers: Trapped electron (F) Center, Trapped hole (V) Center. Exciton: Frenkel Exciton and Mott – Wannier Exciton.

Lattice Vibration: Normal modes of monoatomic and diatomic chains, Optical and Acoustic modes, Quantization of Lattice Vibrations.

Free Electron Theory of Metals: Free electron model, some features of electrical conductivity of metals, Density of states, free electron gas at 0K, Electron heat capacity, Lorentz modifications to Drude model, Sommer field theory of electrical conduction and Hall Effect.

Energy Bands: The Bloch theorem, The Kroning-Penney Model (Energy bands in general periodic potential).Motion of electron in one dimension. Insulator, Semiconductor & Metals. Tight binding approximations, Brillioun zones.

References:

1. Solid state Physics by A-J.Dekkar (McMillan and Co., London)
2. Introduction to Solid State Physics by C.Kittel (Wiley Eastern, New Delhi)
3. Elementary Solid State Physics: Principle and Application by Omar Ali (Addison Wesley, London).
4. Solid State Physics by R.Kubo and T.Nagamiya (McGraw Hill, New York).
5. Electrons and Phonons by J.M.Ziman (Oxford University Press, London).
6. Solid State Theory by W.A. Harrison (McGraw Hill, New York).

M.Sc. Previous – Second Semester

PAPER-I: PH 201: NUMERICAL ANALYSIS AND FORTRAN PROGRAMMING

Introduction To Computer Languages: FORTRAN Language and Programming: flow charts, FORTRAN constants and variables, Arithmetic expressions, Input-Output Statements, Simple programs, Control statement, Looping, Arrays, elementary FORMAT specification, Logical expressions, Functions and subroutines..

Numerical Methods I: Computer Arithmetic, Iterative methods for finding roots of a Polynomial, Interpolation techniques, Linear regression and polynomial curve fitting.

Numerical Methods II: Simultaneous equations solving, Matrix manipulation, Eigen values computations, Numerical Integration and Differentiation, Solution of Differential equations.

References:

1. Numerical Analysis by Balguruswamy.
2. Numerical Analysis by Harper.
3. Text book of Numerical Analysis by H.S. Sharma, G.C. Sharma and S.S. Choudhary (Ratna Prakashan Mandir, Agra).

PAPER-II:PH 202: QUANTUM MECHANICS -II

Approximation methods: Time independent perturbation theory for nondegenerate case. Application to anharmonic oscillator problem and normal Helium atom. Perturbation theory for degenerate case and its application to Zeeman effect, Variation method and its application to He atom and one dimensional harmonic oscillator of unit mass. The time dependent perturbation theory, Transition probability, Fermi-Golden rule, Application to semiclassical theory of radiation, Selection rules, WKB method, Application to potential barrier penetration problem (alpha decay).

Scattering theory: Scattering Cross-section, quantum mechanical description, Expansion of plane wave in spherical harmonics (Partial wave analysis), scattering by spherically symmetric potentials, Born approximation, Validity of Born's approximation, Scattering from three-dimensional square well and screened coulomb potential.

Identical particles: Indistinguishability of identical particles and exchange energy, Permutation Symmetry and Symmetrization postulates, Self- consistent field approximation (Hartee method), Slater determinant, Hartee-Fock method, Application of two electron systems e.g. hydrogen molecule and He atom(excited).

REFERENCES: -

1. Quantum Mechanics by L. I. Schiff
2. Quantum Mechanics by Pauling & Wilson
3. Quantum Mechanics by B. K. Agrawal
4. Quantum Mechanics by Merzbacher
5. Quantum Mechanics by Ghatak & Lokanathan

PAPER-III: PH 203 THERMODYNAMICS AND STATISTICAL MECHANICS

Thermodynamics: Entropy and probability; Thermodynamic potentials - Helmholtz, Gibbs, Enthalpy and Internal energy; Equilibrium conditions for an isolated system; Third law of thermodynamics.

Thermodynamics of first and second order phase transistion, Clausius-Clapeyron and Ehrenfest's equations; Chemical potential and phase equilibria.

Ideal gas in microcanonical, Canonical and Grand canonical ensembles, Gibbs paradox and its resolution, Sackur-Tetrode relation.

Formulation of quantum statistics: Quantum ensemble theory, Statistics of various ensembles, Density matrix and partition function, Application to a linear harmonic oscillator and a free particle in a box.

Bose & Fermi Systems: Bose & Fermi distribution functions, Quantum theory of ideal gas, Bose-Einstein condensation, Derivation of Planck's formula, Thermionic and Photoelectric emission.

Phase transition & Brownian motion: First and second order phase transition, (Order parameters and Landau theory of Phase equilibrium), Fluctuations and Thermodynamic Properties, Brownian motion (Langevin Theory)

References:

1. A Treatise on Heat by M.N.Saha and B.N.Srivastava (Indian Press Limited, Allahabad)
2. Thermodynamics for Chemistis by S.Glasstone (John Wiley, New York)
3. Thermal Physics by C.Kittel (John Wiley, New York 1969)
4. Statistical Mechanics by B. K. Agarwal and Melvin Eisner (Wiley Est. Ltd., Delhi)
5. Statistical Mechanics and Properties of Matter by E.S.R. Gopal (Macmillan Ltd., Delhi)
6. Introduction to Statistical Mechanics by B. B.Laud (Macmillan Ltd., Delhi)
7. Fundamentals of Statistical Mechanics by-F. Rief
8. Statistical Mechanics by- R. K. Patharia
9. Statistical Mechanics by- K. Huang

PAPER-IV: PH 204: SOLID STATE PHYSICS-II

Magnetic Properties of Materials: Para-magnetism, Langevin theory of paramagnetism, Weiss Theory , Quantum theory of Paramagnetism, Ferromagnetism, Spontaneous magnetization, Quantum theory of Ferromagnetism, Weiss molecular field, Ferromagnetic domain & domain theory, Curie – Weiss law, Antiferro and Ferrimagnetism, Ferrites.

Dielectrics and Related Properties: Dielectrics and Gauss theorem, Dielectric constant and polarizability: Electronic Polarization, Ionic Polarization and Orientations Polarization, Langevin theory of Polarization in Polar Dielectrics, Internal fields in Liquids and Solids, Clausius Mosotti relation, Lorentz – Lorentz formula, Ferroelectricity, Dielectrics in Alternating field & Dielectric Loss.

Super Conductivity: Basic Phenomenology and mechanism, Effect of magnetic field, Meissner effect, Thermal properties and energy gap, Isotope effect, Type I and Type II Superconductor, Superconductors in AC fields, Thermodynamics of Superconductors, BCS Theory, BCS Pairing mechanism, Josephson Effect.

References:

1. Solid state Physics by A-J.Dekkar (McMillan and Co., London)
2. Introduction to Solid State Physics by C.Kittel (Wiley Eastern, New Delhi)
3. Elementary Solid State Physics: Principle and Application by Omar Ali (Addison Wesley, London).
4. Solid State Physics by S.O Pillai
5. Solid State Physics by R.Kubo and T.Nagamiya (McGraw Hill, New York).
6. Solid State Theory by W.A. Harrison (McGraw Hill, New York).

M.Sc. Final – Third Semester

PAPER I: PH 301: NUCLEAR PHYSICS-I

Nuclear Forces: Binding Energy, Saturation of nuclear force, Central and Non-central force, Spin dependent and exchange force, Von Weizsacker mass formula, Meson-theory of nuclear force, Mass parabola, Deuteron problem, Quadrupole moment of Deuteron, Scattering length, Determination of phase shift, Coherent scattering of slow neutrons, shape independent effective range theory, proton-proton scattering, Neutron-proton scattering at low energies.

Nuclear Models: Liquid drop model, Theory of fission, Bohr –Wheeler theory of fission, Experimental evidence of shell effects, Shell model, Independent particle model, Harmonic oscillator model, Spin orbit-interaction and explanation of magic number, Schmidt limits, Collective model, Vibrational states, Rotational states.

Particle Accelerators: Linear accelerators, Cyclotron and Betatron.

References: -

1. Nuclear Physics By- D. C. Tayal
2. Nuclear Physics By- Evans
3. Nuclear Physics By- Roy and Nigam

PAPER II: PH 302: CLASSICAL ELECTRODYNAMICS

Four Dimensional Formulation: Four vectors, Intervals, Contravariant, Covariant, Metric, Pseudo and dual tensors, Lorentz transformation equations in 4d (not derivation)

Dynamics of Charge Particle In EM Fields: Lagrangian of a free particle, Velocity, Momentum, Electromagnetic potential in 4d space, Motion of a charge particle in a constant uniform electric field, Magnetic field and EM field, EM field tensor, Lorentz transformation of the field, Invariants of the field.

Fundamental Equations Of Electrodynamics : Covariant form of first and second pair of Maxwell field equation, Lagrangian of the em field, current four- vector, equation of continuity, Energy- momentum tensor of em field particles, Particles and em field.

Radiation From A Moving Charge: Solution of inhomogeneous wave equation, Invariant of Green's functions, Lienard- Wiechart potentials and fields from a moving point charge, Larmour's formula and its relativistic generalization, Angular distribution of radiation emitted by an accelerated charge particle.

REFERENCES

1-The classical theory of fields by L. D. Landan and E. M. Lifshitz.
2- Introduction to the classical electrodynamics by J. D. Jackson
3- Introduction to the Quantum Field theory by F. Mandal

PAPER III: PH 303: INTIGRATED AND DIGITAL ELECTRONICS

Operational Amplifiers: Introduction to Operational amplifier, Basic parameters, Inverting and Non-inverting amplifier, Applicability of Op-Amp in Analog computation: Solution of simultaneous and differential equation, Op-Amp as voltage follower, Adder, Subtractor, Integrator, Differentiator, logarithmic amplifier, Antilog amplifier, Analog multiplier & Divider circuit, RMS circuit.

Active filters(low pass & high pass of 1^{st} & 2^{nd} order), Comparator, Mutivibrator, Schmitt trigger, Sample and hold circuit, triangular wave generator, Voltage Controlled Oscillator, Phase locked loop(PLL) and its Application, A/D and D/A converter circits, 555 Timer..

Arithmetic Logic Operations And Circuits: Binary addition & substraction, Half adder, Full adder, Half Subtractor, Full Subtractor, Controlled Inverter and Adder-Subtracter, Data processing circuits: Multiplexers, Demultiplexers, Encoder and Decoder (1 of 16 Decoder, BCD Decoder and LED Decoder).

Flip-flop: R-S, D, T, J-K and J-K Master slave flip-flops. Asynchronous, Synchronous and Mod counters. Serial, parallel shift registers and counters.

References:

1. Integrated Electronics by – Millman & Halkias
2. OPAMP and Linear Integrated Circuits By- R.A.Gayakwad
3. Linear Integrated Circuits By- Choudhary and Jain
4. Op. Amp and Linear Integrated circuit by Coughlin and Driscoll.
5. Digital Principle & Application By-Malvino Leach
6. Modern Digital Electronics By- R.P.Jain
7. Digital Electronics By Floyd
8. Digital Electronics By Goathmann
9. Digital Electronics By Tocci

PAPER IV: PH 304: **ELECTRONICS COMMUNICATION PRINCIPLES**

Analog Communication : Introduction to signals (Unit Impulse function), Fourier transform & its properties, Amplitude modulation, modulation index, spectrum of AM signal, AM modulator and demodulator (balanced modulator, square law demodulator) Modulation (DSBSC, SSB), frequency & phase modulation, relationship between phase and frequency modulation, spectrum of FM signal, generation and detection of FM signal, comparison of FM &AM signal

Digital Communication: Sampling and Nyquist sampling theorem, Pulse code modulation, Channel Capacity, Pulse amplitude modulation, Pulse width modulation, pulse position modulation, Quanization of signals and quantization error, companding. Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK)

REFERENCES:

1. Principles of communication- Taub & Schilling
2. Communication System- S.Haykins
3. Satellite Communication- D.C. Ararwal
4. Communication Principles- Kennedy

M.Sc. Final – Fourth Semester

PAPER I: PH 401: NUCLEAR PHYSICS-II

Nuclear Decay: Gamma's theory of Alpha decay, Fermi theory of Beta-decay, Neutrino hypothesis, Violation of parity conservation in β-decay, Gamma radiation (multipole transitions), Internal conversion, Internal pair creation, Nuclear isomerism.

Nuclear Reactions: Kind of nuclear reactions, Kinematics of nuclear reaction, Cross-section of a nuclear reaction, Partial wave Analysis of reaction cross-section, Compound nucleus, Direct & Compound reactions and Continuum theory of nuclear reaction.

Fission reaction, Chain reaction, General aspects of nuclear reactor design, Indian Reactors. Fusion Reaction.

Particle Physics: Types of interaction between elementary particles their strength and general classification, Invariance and Conservation laws, Associated production and strangeness, Lifetime, Spin and Parity of pions, Basic idea of quark's structure of elementary particles.

References: -

1. Nuclear Physics By- D. C. Tayal
2. Nuclear Physics By- Evans
3. Nuclear Physics By- Roy and Nigam

PAPER-II: PH 402: ATOMIC AND MOLECULAR PHYSICS

Atomic Spectra: Spectra of one and many electron atoms, LS and jj coupling, Spin orbit interaction, Fine structure, Zeeman, Paschan Back and Stark effects, Electric dipole transitions and selection rules, X-ray spectra (Characteristic of X- rays, Moseley's Law),

Molecular Spectroscopy: Rotation and Vibration Spectra, IR and Raman spectra of rigid rotator and harmonic oscillator, IR and Raman spectra of non-rigid rotator, anharmonic oscillator and vibrating rotator, Intensities in rotation - vibration spectra, Isotope effects in rotation and vibration spectra.

Electronic Spectra: Electronic energy and total energy, vibration structure of electronic transitions, progressions and sequences, rotational structure of electronic bands, band head formation and band origin. Intensity distribution in vibrational structure, Frank-Condon principle and its quantum mechanical formulation, intensity alternation in rotational lines, Basics of NMR and ESR.

References:

1. Molecular Spectra and Molecular Structure by G. Herzberg (Dover Publication, London).
2. Quantum Theory of Molecules and Solids Vol.-I by J. C. Slater (Mc-Graw Hill, New York).
3. Valence by C. A. Coulson.

PAPER III: PH 403: **MICROPROCESSOR AND COMPUTER ORGANIZATION**

Microprocessor, Architecture And Programming: Introduction to microprocessors, Architecture of 8085 µp, System components, Control signal of 8085, System timing diagram, Memory R/W cycle. Instruction set of 8085, addressing modes, Elementary programming concept of 8085µp

Data Transfer Schemes & Memory Interfacing: Data transfer scheme in microprocessors, Memory mapped I/O and I/O mapped I/O scheme, Synchronous, Asynchronous and interrupted driven schemes, Hardware and software interrupts of 8085, Concepts of memory and I/O interfacing, Interfacing a DMA controller Memory system of a computer, Primary and secondary storage devices, addressing techniques in semiconductor memories, Working principle of floppy and hard disks..

Interfacing Supports & Controllers: Basic interface supports, PPI-8255A, PIC-8259, USART-8251, Key board/ Display controller, Floppy disk controller, Printer controller.

References:

1. Microprocessor by Goyankar
2. Microprocessor & Interfacing by Rafiquazzama (PHI)
3. Microprocessor & Interfacing by Douglas V Hall (TMH)
4. Microprocessor & Microcomputer by B. Ram
5. Computer Fundamentals by PK Jain (BPO)
6. Computer Fundamentals by B. Ram

PAPER IV: PH 404: **LASER AND OPTICAL COMMUNICATION**

Laser: Interaction of radiation with matter, Einstein coefficients, Light amplification; Populationinversion; pumping processes; rate equation for three and four level systems; Semi-classical theory of lasers, Cavity modes, polarization of cavity media, first order theory. Quality factor of cavity and ultimate line width laser. Directionality and mono chromaticity of laser and coherence properties. Principles of Ruby, He-Ne, CO_2 Dye and Semi-conductor Lasers.

OPTICAL COMMUNICATION: Introduction to optical communication, Fundamentals of optical fiber, Step index, graded index fiber – Ray transmission, (single mode and multi-mode fiber). Optical Source (LED hetrojunction, LASER Diode), Optical Receiver (Principle of photo diode, Avalanche Photodiode, Comparison of photodiode)

References:

1. Lasers and Non-Linear Optics by B. B. Laud (Wiley East. Ltd., New Delhi)
2. Laser and holographic Data processing by N.G. Bosov (Mir Publisher, Moscow)
3. Principles of communication- Taub & Schilling
4. Communication System- S.Haykins
5. Satellite Communication- D.C. Ararwal
6. Communication Principles- Kennedy
7. Microwave Devices- Liao
8. Optical fiber communication- Keiser &Senior

Ordinance relating to newly adopted semester system in M.Sc. course in Physics & Electronics, Faculty of Science

Ordinances

A candidate who has passed B. Sc. with Physics and or Electronics as a subject up to IIIrd year and Mathematics as a subject at least up to second year and having minimum 50% marks in aggregate from a recognized university is eligible for admission.

Admission will be made on merit of entrance test/merit of qualifying exam.

The courses of M.Sc. Physics/Electronics degree shall consist of two academic sessions and each session shall consist of two semesters.

A candidate enrolled for M.Sc. Physics/Electronics course shall be admitted to semester examination after completing a regular course of study for at least 14 weeks in each semester.

A candidate successful at all four M.Sc. Physics/Electronics semester examinations as specified in the regulation will be awarded M.Sc. degree in Physics(Electronics) /Electronics.

Regulations

1- The examination for semester system in M.Sc. course in Physics /Electronics shall be by means of theory papers and practicals as specified in the examination scheme which consist of

(a) Four theory papers, practical examination in each of the first, second and third semesters.

(b) Four theory papers, practical examination, seminars and project viva in fourth semester.

2- The name of the candidates successful in the semester system in M.Sc. course in Physics/Electronics examination shall be arranged in the following classes.

(a) First class to those who secure 60% or more marks in aggregate.

(b) Second class to those who secure 45% or more marks in aggregate.

3- The pass marks in each semester shall be

(a) 30% marks in each theory papers subject to 40% marks in the total of theory.

(b) 40% marks in practical examinations/seminar/project.

Ordinance Relating to Second Examination in newly adopted semester system in M.Sc. course in Physics & Electronics, Faculty of Science

1- A candidate taking the main examination of newly adopted semester system in M.Sc. course in Physics & Electronics Ist, IInd, IIIrd & IVth semester will be eligible to appear in the second examination to be clubbed with respective main examination of next consecutive year.

2- An examinee shall be allowed in the second examinations only under the following circumstances

(a) It the examinee has scored not less than 30% marks in each theory paper and not less than 40% marks in total of theory but has failed in practical on has been unable to appear in practical examination the examinee may appear in second examination in practical, No improvement is allowed in practical examination.

(b) If, in an academic session, an examinee has scored not less than 40% marks in total of all theory and in practical in each semester and has scored not less than 40% marks in aggregate in each semester but has failed to score 30% or more marks in only one or two theory papers, the examinee may appear in second examination in any two of these theory papers only in one academic session.

(c) If an examinee has secured the pass marks or more in any main semester examination but desires to improve his marks, the examinee may appear in second examination in only one theory paper of his/her choice.

(d) Provided further that a candidate shall not be allowed to appear in more than two theory papers in second examinations in an academic session.

3- A candidate for any of the second examination listed above shall apply not less than 15 days before the latest for the commencement of the respective examination to be held in next consecutive year/batch.

4- The candidate has to surrender his/her original marks sheet relating to the corresponding semester examination to the controller of examination. He/She shall be eligible to take second examination only when the original mark sheet has been surrendered.

5- A candidate opting for the second examination shall be entitled to appear in the respective main examination of next consecutive year only.

6- The students who have failed are not eligible to appear in the second examination of the semester may appear as ex-student in the main examination in next session.

7- The number of attempts in examination will be subject to university ordinance and regulation.