

**B.Sc. ELECTRONICS**  
**Semester-I**  
**Paper I- EL 101**  
**Basic Electronics**

**Max. Marks : 40**  
**Internal Assessment : 10**  
**Time : 3 Hrs.**

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Classification of Solids on the basis of energy band diagram, conductors, Insulators, Semiconductors, Types of semi-conductors, current in semi-conductors, ideal diode, V-I Characteristics of ideal diode, PN junction diode, Biasing of PN junction diode, junction capacitance, Current in PN junction diode. Application of PN junction diode as a switch as rectifiers-Half wave rectifier, Full wave rectifier and bridge rectifier, Clamper and clipping circuits, Filter circuits, L,C, L-C, PIE section filters, Zener diode, Multiplier circuits.	12-18
Unit-II	Bipolar Junction Transistor (BJT), Four regions of operation of BJT, Transistor current component, Transistor as an amplifier, BJT in CE, CB, CC configurations, I/P and O/P characteristics, I/P resistance, O/P resistance, Current gain, Voltage gain, Power gain.	12-18
Unit-III	Transistor at low frequencies, Graphical analysis of CE configuration, Transistor hybrid model, conversion formulate for the parameters of the three transistor configuration.	12-18

**Suggested Reading**

1. Electronics for Scientist and Engineers by Vishwanathan, Mehta and Rajaraman (Prentice-Hall, India)
2. Electronics Fundamentals and Applications (5<sup>th</sup> addition) by John, D. Ryder (Prentice-Hall, India)
3. Introduction to Electronics by L.K.Brauson (Prentice-hall, India).
4. Digital Principles and Application by Malvine and Leach (Tata MC Graw hill)
5. Electronic Devices and Circuits by Motershed.
6. Electronic Devices and Circuit-Discrete and Integrated by Y.N. Bapat.
7. Semiconductor Electronics by A.K.Sharma (New Age Internationals Pvt. Ltd., India)
8. Electronics Devices & Circuits by Sanjeev Gupta/V.K.Mehta

**B.Sc. ELECTRONICS**  
**Semester-I**  
**Paper II- EL 102**  
**Network Theory**

**Max. Marks : 40**  
**Internal Assessment : 10**  
**Time : 3 Hrs.**

**NOTE :**

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Ideal voltage source, Open circuit, voltage, Short circuit current, Thevenin's theorem, Norton's Theorems, Super Position Theorem, Reciprocity Theorem, Millman's Theorem, Equivalent network analysis using Kirchoff's laws by Node method and Loop method. Maximum Power Transfer Theorem.	12-18
Unit-II	Sinusoidal Voltage applied across a combination of circuit elements, Low pass filter, High pass filter, Band pass and Band Rejection filters, step impulse and ramp functions, Differentiating and integrating circuits.	12-18
Unit-III	Characterization of two ports, Impedence, Admittance and Hybrid parameters, Transformation of parameters, Dependent sources, Voltage and current amplifier, ideal transformer reciprocity, Impedence Converter.	12-18

**Suggested Reading**

1. Electronics for Scientist and Engineers by Vishwanathan, Mehta and Rajaraman (Prentice-Hall, India)
2. Electronics Fundamentals and Applications (5th addition) by John, D. Ryder (Prentice-Hall, India)
3. Introduction to Electronics by L.K.Brauson (Prentice-hall, India).
4. Digital Principles and Application by Malvine and Leach (Tata MC Graw hill)
5. Electronic Devices and Circuits by Motershed.
6. Electronic Devices and Circuit-Discrete and Integrated by Y.N. Bapat.
7. Semiconductor Electronics by A.K.Sharma (New Age Internationals Pvt. Ltd., India)
8. Electronics Devices & Circuits by Sanjeev Gupta/V.K.Mehta

**B.Sc. ELECTRONICS**  
**Semester-I**  
**Paper III- EL 103**  
**Practical-I**

Max. Marks : 50  
Time : 3 Hrs.

Total No. of Periods: 40-45

Note for Practical papers:-

The practical examination will be of 3 hours.

Distribution of marks:

Experiments 30 marks

Lab. Record 8 marks

Viva-Voce 12 marks

The laboratory record will be assessed by both the external examiners. Distribution of marks of each experiment, Lab record and Viva-voce, oral examination, concerning the experiments in the syllabus are indicated above.

Use of simple (non-programmable) calculator is permissible.

1. Familiarization with CRO, Multi-meter, Bread board etc.
2. Measurement of time period, Voltage and phase shift using CRO
3. Electronic Volt-ohm meter, measurement of peak average and r.m.s. values of given signal, effect of wave form and signal frequency.
4. Junction transistor characteristics for Common Base configuration  $V_e I_e$  and  $V_E I_E$  and to calculate transistor parameters from graph.
5. Junction transistor parameter to measure common Emitter, h-parameter using various circuit arrangements.
6. Transistor amplifier configuration comparison of a Common Base Common Emitter and Common Collector configuration of a given transistor.
7. Transistor bias stabilization, familiarization method for stabilization of transistor.
8. Study of half wave and full wave rectifier, Measurement of ripple factor.
9. Measurement of resistance, Using a multi-meter, Fabrication of potential divider circuit.

**References**

1. Experiments in electronics, by W.H. Events (Prentice-Hall, India)
2. Methods of Experimental Physics Vol.2, Electronic Method (Academic Press).
3. Electronics/Physics Practicals by Vijay Publication

**B.Sc. ELECTRONICS**  
**Semester-II**  
**Paper I- EL 201**  
**Electronic Devices and Circuits-I**

**Max. Marks : 40**  
**Internal Assessment : 10**  
**Time : 3 Hrs.**

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Emitter follower, comparison of transistor amplifier configuration, Linear analysis of CE transistor amplifier configuration, Linear analysis of CE transistor circuit, Miller's Theorem, Cascading transistor amplifier.	12-18
Unit-II	Transistor biasing and thermal stabilization, the operating point, stability, Self bias of emitter bias, stabilization against variations of $I_{CE}$ , $V_{EB}$ & Beta, Bias compensation, Thermal runaway, Thermal stability.	12-18
Unit-III	Junction Field Effect Transistor (JFET), Pinch off voltage, JFET V-I characteristics and transfer characteristics, FET small signal model, Low frequency common source and common drain amplifier, Biasing of FET, FET as voltage variable resistor, MOSFET, depletion and Enhancement mode.	12-18

**Suggested Reading**

1. Electronics for Scientist and Engineers by Vishwanathan, Mehta and Rajaraman (Prentice-Hall, India)
2. Electronics Fundamentals and Applications (5<sup>th</sup> addition) by John, D. Ryder (Prentice-Hall, India)
3. Introduction to Electronics by L.K.Brauson (Prentice-hall, India).
4. Digital Principles and Application by Malvine and Leach (Tata MC Graw hill)
5. Electronic Devices and Circuits by Motershed.
6. Electronic Devices and Circuit-Discrete and Integrated by Y.N. Bapat.
7. Semiconductor Electronics by A.K.Sharma (New Age Internationals Pvt. Ltd., India)
8. Electronics Devices & Circuits by Sanjeev Gupta/V.K.Mehta/D.K.Kaushik
9. Digital Electronics by V.K.Puri/R.P.Jain
10. Electrical Technology by S. Chand

**B.Sc. ELECTRONICS**  
**Semester-II**  
**Paper II- EL 202**  
**Digital Principles and Applications**

**Max. Marks : 40**  
**Internal Assessment : 10**  
**Time : 3 Hrs.**

**NOTE :**

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Binary numbers, Decimal to binary conversion, Binary to Decimal conversion, Binary addition, Subtraction, Multiplication, Division, 1's 2's, 9's, 10's compliments. 2's compliment addition and subtraction, Octal numbers octal to binary conversion, Vice-Versa, Hexa-Decimal number and conversion.	12-18
Unit-II	BCD Code, 8-4-2-1, 2-5-2-1, excess three codes, Cyclic codes, Gray codes. Digital logic, +ve and -ve logic, Basic Logic gates – AND OR NOT gates, Boolean functions Duality Principle.	12-18
Unit-III	Demorgans laws, Laws and theorems of Boolean Algebra, Precedence of Operators, Venn diagram, Truth table, Simplification of Boolean's function by Voolean algebra, K-map and its application (Four variables).	12-18

**Suggested Reading**

1. Electronics for Scientist and Engineers by Vishwanathan, Mehta and Rajaraman (Prentic-Hall, India)
2. Electronics Fundamentals and Applications (5<sup>th</sup> addition) by John, D. Ryder (Prentice-Hall, India)
3. Introduction to Electronics by L.K.Brauson (Prentice-hall, India).
4. Digital Principles and Application by Malvine and Leach (Tata MC Graw hill)
5. Electronic Devices and Circuits by Motershed.
6. Electronic Devices and Circuit-Discrete and Integrated by Y.N. Bapat.
7. Semiconductor Electronics by A.K.Sharma (New Age Internationals Pvt. Ltd., India)
8. Electronics Devices & Circuits by Sanjeev Gupta/V.K.Mehta/D.K.Kaushik
9. Digital Electronics by V.K.Puri/R.P.Jain
10. Electrical Technology by S. Chand

**B.Sc. ELECTRONICS**  
**Semester-II**  
**Paper III- EL 203**  
**Practical-II**

Max. Marks : 50  
Time : 3 Hrs.

Total No. of Periods: 40-45

Note for Practical papers:-

The practical examination will be of 3 hours.

Distribution of marks:

Experiments 30 marks

Lab. Record 8 marks

Viva-Voce 12 marks

The laboratory record will be assessed by both the external examiners. Distribution of marks of each experiment, Lab record and Viva-voce, oral examination, concerning the experiments in the syllabus are indicated above.

Use of simple (non-programmable) calculator is permissible.

1. Draw the characteristics of a PN Junction diode for various voltages.
2. Junction field effect transistor characteristic. T plot V and I characteristics of JFET.
3. To study the effect of R.C. Time constant when various driving voltages (Square,
4. Triangular and rectifier sine wave) are applied across a series of RC Circuits.
5. To study the performance of a diode as clipper and sketch the output wave form using a calibrated oscilloscope.
6. To study the performance of a diode as clamper and sketch the output wave form using a calibrated oscilloscope.
7. To design a basic logic gate and verify its truth table.
8. To design a battery eliminator having the given specifications.
9. To design a low pass RC and high pass RC filter of given specifications.
10. Study of RC circuit as differentiator and trace the o/p at different values of i) frequencies ii) R and C
11. Study of RC circuit as Integrator and trace the o/p at different values of (i) frequencies (ii) R and C.

**References**

1. Experiments in electronics, by W.H. Events (Prentice-Hall, India)
2. Methods of Experimental Physics Vol.2, Electronic Method (Academic Press)
3. Electronics/Physics Practicals by Vijay Publication

**B.Sc. PHYSICS**  
**Semester-I**

**Paper I- PHY 101 : MECHANICS**

Max. Marks : 45  
Internal Assessment : 10  
Time : 3 Hrs.

**NOTE :**

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Mechanics of single and system of particles, conservation of laws of linear momentum, angular momentum and mechanical energy, Centre of mass and equation of motion, constrained motion, degrees of freedom.	22
Unit-II	Generalised coordinates, displacement, velocity, acceleration, momentum, force and potential. Hamilton's variational principle, Lagrange's equation of motion from Hamilton's Principle. Linear Harmonic oscillator, simple pendulum, Atwood's machine.	23
Unit-III	Rotation of Rigid body, noment of inertia, torque, angular momentum, kinetic energy of rotation. Theorems of perpendicular and parallel axes with proof. Moment of inertia of solid sphere, hollow sphere, spherical shell, solid cylinder, hollow cylinder and solid bar of rectangular cross-section. Acceleration of a body rolling down on an inclined plane.	22

**References**

1. Classical Mechanics by V.K.Jain (Ane 2009)
2. Classical Mechanics by H. Goldstein (2nd Edition)
3. Berkeley Physics Course, Vol. I, Mechanics by E.M. Purchell

## B.Sc. PHYSICS

### Paper II- PHY 102 : ELECTRICITY AND MAGNETISM

Max. Marks : 45

Internal Assessment : 10

Time : 3 Hrs.

#### NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	<b>Mathematical Background</b> : Scalars and Vectors, dot and cross product, Triple vector product, Scalar and Vector fields, Differentiation of a vector, Gradient of a scalar and its physical significance, Integration of a vector (line, surface and volume integral and their physical significance), Gauss's divergence theorem and Stocks theorem. <b>Electrostatic Field</b> : Derivation of field E from potential as gradient, derivation of Laplace and Poisson equations. Electric flux, Gauss's Law and its application to spherical shell, uniformly charged infinite plane and uniformity charged straight wire, mechanical force of charged surface, Energy per unit volume.	15-20
Unit-II	<b>Magnetostatics</b> : Magnetic Induction, magnetic flux, solenoidal nature of Vector field of induction. Properties of B (i) $\cdot B = 0$ (ii) $\times B = J$ . Electronic theory of dia and para magnetism (Langevin's theory). Domain theory of ferromagnetism. Cycle of Magnetisation - Hysteresis (Energy dissipation, Hysteresis loss and importance of Hysteresis curve).	10-13
Unit-III	<b>Electromagnetic Theory</b> : Maxwell equation and their derivations, Displacement Current. Vector and scalar potentials, boundary conditions at interface between two different media, Propagation of electromagnetic wave (Basic idea, no derivation). Poynting vector and Poynting theorem.	10-12

#### References :

1. Electricity and Magnetism by Reitz and Milford (Prentice Hall of India)
2. Electricity and Magnetism by A.S. Mahajan and A.A. Rangwala (Tata McGraw Hill).



**B.Sc. PHYSICS**  
**Paper III Phy- 103**  
**PRACTICALS**

Max. Marks : 40  
Time : 3 Hrs.

**SPECIAL NOTES**

2. Do any eight experiments .
3. The students are required to calculate the error involved in a particular experiment (percentage error).

**NOTE**

**1. Distribution of Marks :**

Experiment : = 20 marks  
Viva Voce : = 10 marks  
Lab Record : = 10 marks  
Total = 40 marks

For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure :-

1. Each student has to perform a minimum number of experiments prescribed in the syllabus.
2. After the completion of a practical the teacher concerned will check the note-book and conduct the viva-voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/she has understood. According to his/her performance marks will be recorded in their practical note book. These marks will constitute the lab record.
3. To complete the final marks for lab. record a separate register for each class of B.Sc will be maintained. The Student will be assigned a separate page on the register. On this page the marks obtained by the student in different practicals will be recorded. While taking the final average the total marks obtained will be divided by the total no. of required practicals, instead of the number of practicals performed by the student. This record will be signed by the concerned teacher.
4. The lab. record register will be presented to the external practical examiners for lab. record marks. The external examiners will verify the record randomly.

**B.Sc. PHYSICS**  
**Paper III- PHY 103**  
**PRACTICALS**

Max. Marks : 40  
Time : 3 Hours

1. Moment of Inertia of a fly-wheel
2. M.I. of an irregular body using a torsion pendulum.
3. Surface Tension by Jeager's method.
4. Young's modulus by bending of beam.
5. Modulus of rigidity by Maxwell's needle.
6. Elastic constants by Searle's method.
7. Viscosity of water by its flow through a uniform capillary tube.
8. Thermal conductivity of a good conductor by Searle's method.
9. Mechanical equivalent of Heat by Callendao and Barne's method.
10. 'g' by Bar pendulum.

**B.Sc. PHYSICS**  
**SCHEME OF EXAMINATION**  
**Semester-II**  
**Paper I- PHY 201 : PROPERTIES OF MATTER, KINETIC THEORY AND RELATIVITY**

Max. Marks : 45  
Internal Assessment : 10  
Time : 3 Hrs.

**NOTE :**

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	<b>Properties of Matter (Elasticity) :</b> Elasticity, Hooke's law, Elastic constants and their relations, Poisson's ratio, torsion of cylinder and twisting couple. Bending of beam (bending moment and its magnitude) cantilevers, Centrally loaded beam.	22
Unit-II	<b>Kinetic Theory of Gases :</b> Assumptions of Kinetic Theory of gases, Law of equipartition of energy and its applications for specific heats of gases. Maxwell distribution of speeds and velocities (derivation required), Experimental verification of Maxwell's Law of speed distribution : most probable speed, average and r.m.s. speed, mean free path. Transport of energy and momentum, diffusion of gases. Brownian motion (qualitative), Real gases, Van der Waal's equation.	23
Unit-III	<b>Theory of Relativity :</b> Reference systems, inertial frames, Gallilean invariance and Conservation laws, Newtonian relativity principle, Michelson - Morley experiment : Search for ether. Lorentz transformations length contraction, time dilation, velocity addition theorem, variation of mass with velocity and mass energy equivalence.	22

**References**

1. Properties of Matter by D.S. Mathur.
2. Heat and Thermodynamics (Vth Edition) by Mark W. Zemansky.
3. Berkeley Physics Course, Vol.-I Mechanics by E.M. Purchell.

## B.Sc. PHYSICS

### Paper II- PHY 202 : ELECTRO MAGNETIC INDUCTION AND ELECTRONIC DEVICES

Max. Marks : 45  
Internal Assessment : 10  
Time : 3 Hrs.

#### NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	<b>Electromagnetic Induction</b> : Growth and decay of current in a circuit with (a) Capacitance and resistance (b) resistance and inductance (c) Capacitance and inductance (d) Capacitance resistance and inductance. AC circuit analysis using complex variables with (a) capacitance and resistance, (b) resistance and inductance (c) capacitance and inductance (d) capacitance, inductance and resistance Series and parallel resonant circuit. Quality factor (Sharpness of resonance).	22
Unit-II	<b>Diode Rectifiers</b> : P-N junction half wave and full wave rectifier. Types of filter circuits (L and - with theory). Zener diode as voltage regulator, simple regulated power supply. <b>Transistors</b> : Junction Transistors, Bipolar transistors, working of NPN and PNP transistors, Transistor connections (C-B, C-E, C -C mode), constants of transistor. Transistor characteristic curves (excluding h parameter analysis), advantage of C-B configuration. C.R. O. (Principle, construction and working in detail).	23
Unit-III	Transistor Amplifiers : Transistor biasing, methods of Transistor biasing and stabilization. D.C.load line. Common -base and common-emitter transistor biasing. Common-base, common-emitter amplifiers. Classification of amplifiers. Resistance-capacitance (R-C) coupled amplifier (two stage; concept of band width, no derivation). Feed-back in amplifiers, advantage of negative feedback Emitter follower. Oscillators : Oscillators, Principle of scillation, Classification of Oscillator. Condition for self sustained oscillation : Barkhausen Criterion for oscillations. Tuned collector common emitter oscillator. Hartley oscillator. Colpitt's oscillator.	22

#### References :

1. Electricity and Magnetism by Reitz and Milford (Prentice Hall of India)
2. Electricity and Magnetism by A.S. Mahajan and A.A. Rangwala (Tata McGraw Hill).
3. Basic Electronics and Linear circuits by N.N. Bhargava, D.C. Kulshreshtha and S.C. Gupta (TITI, CHD).
4. Solid State Electronics by J.P. Agarwal, Amit Agarwal (Pragati Prakashan, Meerut).
5. Electronic Fundamentals and Applications by J.D. Ryder (Prentice Hall India).

**B.Sc. PHYSICS**  
**Paper III Phy- 203**  
**PRACTICALS**

Max. Marks : 40

Time : 3 Hrs.

**SPECIAL NOTES**

1. Do any eight experiments .
2. The students are required to calculate the error involved in a particular experiment (percentage error).

**NOTE**

**1. Distribution of Marks :**

Experiment : = 20 marks

Viva Voce : = 10 marks

Lab Record : = 10 marks

Total = 40 marks

For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure :-

1. Each student has to perform a minimum number of experiments prescribed in the syllabus.
2. After the completion of a practical the teacher concerned will check the note-book and conduct the viva-voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/she has understood. According to his/her performance marks will be recorded in their practical note book. These marks will constitute the lab record.
3. To complete the final marks for lab. record a separate register for each class of B.Sc will be maintained. The Student will be assigned a separate page on the register. On this page the marks obtained by the student in different practicals will be recorded. While taking the final average the total marks obtained will be divided by the total no. of required practicals, instead of the number of practicals performed by the student. This record will be signed by the concerned teacher.
4. The lab. record register will be presented to the external practical examiners for lab. record marks. The external examiners will verify the record randomly.

**B.Sc. PHYSICS**  
**Paper III- PHY 203**  
**PRACTICALS**

Max. Marks : 40  
Time : 3 Hours

1. E.C.E. of hydrogen using an Ammeter.
2. Calibration of thermocouple by potentiometer.
3. Low resistance by Carey Foster's Bridge with calibration.
4. Determination of impedance of an A.C. circuit and its verification.
5. Frequency of A.C. mains and capacity by electrical vibrator.
6. Frequency of A.C. mains by sonometer using an electromagnet.
7. Measurement of angle dip by earth inductor.
8. High resistance by substitution method.
9. Inductance (L) by Anderson Bridge (A.C. method)
10. To draw forward and reverse bias characteristics of a semiconductor diode.
11. Zener Diode voltage regulation characteristics.
12. Verification of Inverse square law by photo-cell.
13. To study the characteristics of a solar cell.

## NEW SCHEME

### Scheme of Examination of B.Sc. 1<sup>st</sup> Semester Mathematics (w.e.f. 2012-2013)

Paper: 12BSM 111

Max. Marks:

$7 \times 4 = 28$
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$2 \times 6 = 12$
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<b>Total = 40</b>
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**Time: 3 Hours**

**Note:** The question paper will consist of **five** sections. Each of the first four sections(**I-IV**) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Symmetric, Skew symmetric, Hermitian and skew Hermitian matrices. Elementary Operations on matrices. Rank of a matrices. Inverse of a matrix. Linear dependence and independence of rows and columns of matrices. Row rank and column rank of a matrix. Eigenvalues, eigenvectors and the characteristic equation of a matrix. Minimal polynomial of a matrix. Cayley Hamilton theorem and its use in finding the inverse of a matrix.	22
Unit-II	Applications of matrices to a system of linear (both homogeneous and non-homogeneous) equations. Theorems on consistency of a system of linear equations. Unitary and Orthogonal Matrices, Bilinear and Quadratic forms.	23
Unit-III	Relations between the roots and coefficients of general polynomial equation in one variable. Solutions of polynomial equations having conditions on roots. Common roots and multiple roots. Transformation of equations.	22
Unit-IV	Nature of the roots of an equation Descarte's rule of signs. Solutions of cubic equations (Cardon's method). Biquadratic equations and their solutions.	

#### **Books Recommended :**

1. H.S. Hall and S.R. Knight : Higher Algebra, H.M. Publications 1994.
2. Shanti Narayan : A Text Books of Matrices.
3. Chandrika Prasad : Text Book on Algebra and Theory of Equations. Pothishala Private Ltd., Allahabad.

## Calculus

**Paper: 12BSM 112**

**Max. Marks:**

<b>7 x 4 = 28</b>
<b>2 x 6 = 12</b>
<b>Total = 40</b>

**Time: 3 Hours Note:**

The question paper will consist of **five** sections. Each of the first four sections (**I-IV**) will contain two questions (each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Definition of the limit of a function. Basic properties of limits, Continuous functions and classification of discontinuities. Differentiability. Successive differentiation. Leibnitz theorem. Maclaurin and Taylor series expansion	
Unit-II	Asymptotes in Cartesian coordinates, intersection of curve and its asymptotes, asymptotes in polar coordinates. Curvature, radius of curvature for Cartesian curves, parametric curves, polar curves. Newton's method. Radius of curvature for pedal curves. Tangential polar equations. Centre of curvature. Circle of curvature. Chord of curvature, evolutes. Tests for concavity and convexity. Points of inflexion. Multiple points. Cusps, nodes & conjugate points. Type of cusps.	
Unit-III	Tracing of curves in Cartesian, parametric and polar co-ordinates. Reduction formulae. Rectification, intrinsic equations of curve.	
Unit-IV	Quadrature (area) Sectorial area. Area bounded by closed curves. Volumes and surfaces of solids of revolution. Theorems of Pappu's and Guilden.	

**Books Recommended :**

4. Differential and Integral Calculus : Shanti Narayan.
5. Murray R. Spiegel : Theory and Problems of Advanced Calculus. Schaun's Outline series. Schaum Publishing Co., New York.
6. N. Piskunov : Differential and integral Calculus. Peace Publishers, Moscow.
7. Gorakh Prasad : Differential Calculus. Pothishasla Pvt. Ltd., Allahabad.
8. Gorakh Prasad : Integral Calculus. Pothishala Pvt. Ltd., Allahabad.



## Solid Geometry

**Paper: 12BSM 113**

**Max. Marks:**

<b>7 x 4 = 28</b>
<b>2 x 6 = 12</b>
<b>Total = 40</b>

**Time: 3 Hours**

**Note:** The question paper will consist of **five** sections. Each of the first four sections (**I-IV**) will contain two questions (each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 2 marks) without any internal choice covering the entire syllabus and shall be

Unit	Contents	No. of Periods
Unit-I	General equation of second degree. Tracing of conics. Tangent at any point to the conic, chord of contact, pole of line to the conic, director circle of conic. System of conics. Confocal conics. Polar equation of a conic, tangent and normal to the conic.	
Unit-II	Sphere: Plane section of a sphere. Sphere through a given circle. Intersection of two spheres, radical plane of two spheres. Co-oxal system of spheres Cones. Right circular cone, enveloping cone and reciprocal cone. Cylinder: Right circular cylinder and enveloping cylinder.	
Unit-III	Central Conicoids: Equation of tangent plane. Director sphere. Normal to the conicoids. Polar plane of a point. Enveloping cone of a coinoid. Enveloping cylinder of a coinoid.	
Unit-IV	Paraboloids: Circular section, Plane sections of conicoids. Generating lines. Confocal conicoid. Reduction of second degree equations.	

### **Books Recommended**

1. R.J.T. Bill, Elementary Treatise on Coordinary Geometry of Three Dimensions, MacMillan India Ltd. 1994.
4. P.K. Jain and Khalil Ahmad : A Textbook of Analytical Geometry of Three Dimensions, Wiley Eastern Ltd. 1999.

## NEW SCHEME

### Scheme of Examination of B.Sc 2<sup>nd</sup> Semester Mathematics (w.e.f. 2012-2013)

### Number Theory and Trigonometry

Paper: 12BSM 121

Max. Marks:

$7 \times 4 = 28$
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$2 \times 6 = 12$
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<b>Total = 40</b>
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**Time: 3 Hours**

**Note:** The question paper will consist of **five** sections. Each of the first four sections(**I-IV**) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions(each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Divisibility, G.C.D.(greatest common divisors), L.C.M.(least common multiple) Primes, Fundamental Theorem of Arithmetic. Linear Congruences, Fermat's theorem. Wilson's theorem and its converse. Linear Diophantine equations in two variables	
Unit-II	Complete residue system and reduced residue system modulo m. Euler's $\phi$ function Euler's generalization of Fermat's theorem. Chinese Remainder Theorem. Quadratic residues. Legendre symbols. Lemma of Gauss; Gauss reciprocity law. Greatest integer function $[x]$ . The number of divisors and the sum of divisors of a natural number n (The functions $d(n)$ and $\sigma(n)$ ). Moebius function and Moebius inversion formula.	
Unit-III	De Moivre's Theorem and its Applications. Expansion of trigonometrical functions. Direct circular and hyperbolic functions and their properties.	
Unit-IV	Inverse circular and hyperbolic functions and their properties. Logarithm of a complex quantity. Gregory's series. Summation of Trigonometry series.	

#### Books Recommended :

4. S.L. Loney : Plane Trigonometry Part – II, Macmillan and Company, London.
5. R.S. Verma and K.S. Sukla : Text Book on Trigonometry, Pothishala Pvt. Ltd. Allahabad.
6. Ivan Ninen and H.S. Zuckerman. An Introduction to the Theory of Numbers.

**NEW SCHEME****Scheme of Examination of B.Sc 2<sup>nd</sup> Semester Mathematics  
(w.e.f. 2012-2013)****Ordinary Differential Equations****Paper: 12BSM 122****Max. Marks:**

<b>7 x 4 = 28</b>
<b>2 x 6 = 12</b>
<b>Total = 40</b>

**Time: 3 Hours**

**Note:** The question paper will consist of **five** sections. Each of the first four sections(**I-IV**) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions(each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Geometrical meaning of a differential equation. Exact differential equations, integrating factors. First order higher degree equations solvable for x,y,p Lagrange's equations, Clairaut's equations. Equation reducible to Clairaut's form. Singular solutions.	
Unit-II	Orthogonal trajectories: in Cartesian coordinates and polar coordinates. Self orthogonal family of curves.. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations. Equations reducible to homogeneous linear ordinary differential equations.	
Unit-III	Linear differential equations of second order: Reduction to normal form. Transformation of the equation by changing the dependent variable/ the independent variable. Solution by operators of non-homogeneous linear differential equations. Reduction of order of a differential equation. Method of variations of parameters. Method of undetermined coefficients.	
Unit-IV	Ordinary simultaneous differential equations. Solution of simultaneous differential equations involving operators x (d/dx) or t (d/dt) etc. Simultaneous equation of the form $dx/P = dy/Q = dz/R$ . Total differential equations. Condition for $Pdx + Qdy + Rdz = 0$ to be exact. General method of solving $Pdx + Qdy + Rdz = 0$ by taking one variable constant. Method of auxiliary equations.	

**Books Recommended :**

1. D.A. Murray : Introductory Course in Differential Equations. Orient Longaman (India) . 1967
2. A.R.Forsyth : A Treatise on Differential Equations, Machmillan and Co. Ltd. London
3. E.A. Codington : Introduction to Differential Equations.
4. S.L.Ross: Differential Equations, John Wiley & Sons
5. B.Rai & D.P. Chaudhary : Ordinary Differential Equations; Narosa, Publishing House Pvt. Ltd.

**NEW SCHEME**  
**Scheme of Examination of B.Sc 2<sup>nd</sup> Semester Mathematics**  
**(w.e.f. 2012-2013)**  
**Vector Calculus**

**Paper: 12BSM 123**

**Max. Marks:**

<b>7 x 4 = 28</b>
<b>2 x 6 = 12</b>
<b>Total = 40</b>

**Time: 3 Hours**

**Note:** The question paper will consist of **five** sections. Each of the first four sections(**I-IV**) will contain two questions (each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 2 marks) without any internal choice covering the entire syllabus and shall be

Unit	Contents	No. of Periods
Unit-I	Scalar and vector product of three vectors, product of four vectors. Reciprocal vectors. Vector differentiation. Scalar Valued point functions, vector valued point functions, derivative along a curve, directional derivatives.	
Unit-II	Gradient of a scalar point function, geometrical interpretation of grad $\phi$ , character of gradient as a point function. Divergence and curl of vector point function, characters of Div $f$ and Curl $f$ as point function, examples. Gradient, divergence and curl of sums and product and their related vector identities. Laplacian operator.	
Unit-III	Orthogonal curvilinear coordinates Conditions for orthogonality fundamental triad of mutually orthogonal unit vectors. Gradient, Divergence, Curl and Laplacian operators in terms of orthogonal curvilinear coordinates, Cylindrical co-ordinates and Spherical co-ordinates.	
Unit-IV	Vector integration; Line integral, Surface integral, Volume integral. Theorems of Gauss, Green & Stokes and problems based on these theorems.	

**Books Recommended:**

1. Murrary R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing Company, New York.
2. Murrary R. Spiegel : Vector Analysis, Schaum Publisghing Company, New York.
3. N. Saran and S.N. NIgam. Introduction to Vector Analysis, Pothishala Pvt. Ltd., Allahabad.

Shanti Narayna : A Text Book of Vector Calculus. S. Chand & Co., New Delhi.

**B.Sc. ELECTRONICS**  
**Semester-III**  
**Paper I- EL 301**  
**Electronic Devices and Circuits-II**

**Max. Marks : 40**  
**Internal Assessment : 10**

**Time : 3 Hrs.**

**NOTE :**1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.

2. 20% numerical problems are to be set.

3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Classification of IC's (mono-lithic and Thin Film Imonolithic Fabrication techniques; crystal growth diffusion, epitaxy, Photolithography, metallization isolation, crossovers (detailed discussions). Monolithic devices BJT (npn. pnp), JFET MOSFET, Diodes Resistors, Capacitors (simple idea only)	12-18
Unit-II	Differential amplifier, Differential gain, Common mode gain, CMRR, ideal operational amplifier, Feed back in Op-Amp in inverting and non-inverting configuration, Buffer, summer, input bias current input offset voltage. Error introduced by offset voltage, integrating and Differentiating circuits using OPAMP, difference, Multiplication, division, Threshold discrimination.	12-18
Unit-III	Principle of voltage regulation, shunt regulators Zener diode Shunt regulator, BJT shunt regulator Series Voltages regulator, feed back regulator, Power Supply regulation, using OPAMP, Load regulation Stability, Zener diode regulator, short circuit protection, current regulation, using op.amp. regulators (IC 723 and three terminal regulators)	12-18

**Suggested Reading**

1. Electronics for Scientist and Engineers by Vishwanathan, Mehta and Rajaraman (Prentice-Hall, India)
2. Electronics Fundamentals and Applications (5<sup>th</sup> addition) by John, D. Ryder (Prentice-Hall, India)
3. Introduction to Electronics by L.K.Brauson (Prentice-hall, India).
4. Digital Principles and Application by Malvine and Leach (Tata MC Graw hill)
5. Electronic Devices and Circuits by Motershed.
6. Electronic Devices and Circuit-Discrete and Integrated by Y.N. Bapat.
7. Semiconductor Electronics by A.K.Sharma (New Age Internationals Pvt. Ltd., India)
8. Electronics Devices & Circuits by Sanjeev Gupta/V.K.Mehta/D.K.Kaushik
9. Digital Electronics by V.K.Puri/R.P.Jain
10. Electrical Technology by S. Chand

**B.Sc. ELECTRONICS**  
**Semester-III**  
**Paper II- EL 302**  
**Electronic Devices and Circuits-II**

**Max. Marks : 40**

**Internal Assessment : 10**

**Time : 3 Hrs.**

**NOTE :** 1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.

2. 20% numerical problems are to be set.

3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Saturated and non-saturated logics, Resistor, Transistor Logic (RTL), Diode transistor logic (DTL), Transistor transistor logic (TTL), Emitter coupled logic, (EGL), integrated Injunction logic (IIL), Complimentary Metal Oxide Semi-conductor (CMOS), Logic, current sinking and sourcing, logic circuit Parameters- Propagation delay, number of levels, Fan in, Fan out, Loading Noise margin, Combination circuit design procedure analog to digital converter, realization of Boolean expression with NAND/NOR gate, Design of a railway track switching system.	12-18
Unit-II	Half adder, Full adder, a parallel binary adder 8-4-2-1 adder or excess 3 adder, half subtractor, full subtractor, 2's compliment adder/subtractor, multiplexer and their use in combinational logic design, Demultiplexer, Decoder and their use in combinational design, Parity generator/Checker, Coade convertor.	12-18
Unit-III	Basics of sequential circuits, Asynchronous & synchronomous sequential circuits, flip-flops, R-S, J-K-M, asterslave JK, T&D type flip-flops, Counters binary counter, Ripple counter and synchronous counter, Up and down counters.	12-18

**Suggested Reading**

1. Electronics for Scientist and Engineers by Vishwanathan, Mehta and Rajaraman (Prentic-Hall, India)
2. Electronics Fundamentals and Applications (5<sup>th</sup> addition) by John, D. Ryder (Prentice-Hall, India)
3. Introduction to Electronics by L.K.Brauson (Prentice-hall, India).
4. Digital Principles and Application by Malvine and Leach (Tata MC Graw hill)
5. Electronic Devices and Circuits by Motershed.
6. Electronic Devices and Circuit-Discrete and Integrated by Y.N. Bapat.
7. Semiconductor Electronics by A.K.Sharma (New Age Internationals Pvt. Ltd., India)
8. Electronics Devices & Circuits by Sanjeev Gupta/V.K.Mehta/D.K.Kaushik
9. Digital Electronics by V.K.Puri/R.P.Jain

**B.Sc. ELECTRONICS**  
**Semester-III**  
**Paper III- EL 303**  
**Practical-II**

Max. Marks : 50  
Time : 3 Hrs.

**Total No. of Periods: 40-45**

**Note for Practical papers:-**

**The practical examination will be of 3 hours.**

**Distribution of marks:**

**Experiments 30 marks**

**Lab. Record 8 marks**

**Viva-Voce 12 marks**

The laboratory record will be assessed by both the external examiners. Distribution of marks of each experiment, Lab record and Viva-voce, oral examination, concerning the experiments in the syllabus are indicated above.

Use of simple (non-programmable) calculator is permissible.

1. To study & design Hartley oscillator & measure its frequency.
2. To study & design colpits oscillator & measure its frequency for two values of inductance & with ferrite core.
3. To study and design of phase shift oscillator and measure its frequency.
4. To study the condition for sustained oscillation for Wein bridge oscillator.
5. Operational amplifier
  1. Unity gain buffer
  2. Inverting amplifier
  3. Non-inverting amplifier
6. Operational Amplifier
  1. Summing amplifier
  2. difference amplifier.
7. Measurement of offset voltage and bias currents & CMRR of an operational amplifier
8. Integrating & differentiating circuits using Op-amp.
9. To study the 555 IC timer and its application as monostable and astable multivibrator.
10. To study the working of Schmitt trigger using operational amplifier.

**B.Sc. PHYSICS**  
**SCHEME OF EXAMINATION**  
**Semester III**

**Paper I- PHY 301 : Computer Programming, Thermodynamics**

Max. Marks : 45  
Internal Assessment : 10  
Time : 3 Hrs.

**NOTE :**

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Computer Programming : Computer organisation, Binary representation, Algorithm development, flow charts and their interpretation. Fortran Preliminaries; Integer and floating point arithmetic expression, built in functions executable and non -executable statements, input and output	22
Unit-II	Thermodynamics-I : Second law of thermodynamics, Carnot theorem, Absolute scale of temperature, Absolute Zero, Entropy, show that $dQ/T=O$ , T-S diagram Nernst heat law, Joule's free expansion, Joule Thomson (Porous plug) experiment. Joule - Thomson effect. Liquefaction of gases. Air pollution due to internal combustion Engine.	23
Unit-III	Thermodynamics-II : Derivation of Clausius - Claperyron latent heat equation. Phase diagram and triple point of a substance. Development of Maxwell thermodynamical relations. Application of Maxwell relations in the derivation of relations between entropy, specific heats and thermodynamic variables. Thermodynamic functions : Internal energy (U), Helmholtz function (F), Enthalpy (H), Gibbs function (G) and the relations between them.	22

**References :**

1. Rajaraman, Fortran Programming.
2. Schaum Series, Fortran 77.
3. Ram Kumar, Programming with Fortran - 77.
4. S. Lokanathan and R.S., Gambir, Statistical and Thermal Physics (An Introduction), Prentice Hall of India, Pvt., Ltd. (1991, New Delhi).
5. J.K. Sharma and K.K. Sarkar, Thermodynamics and statistical Physics, Himalaya Publishing House (1991, Bombay.)
6. M.W. Zemansky and R. Dittman, Heat and Thermodynamics, McGraw Hill, New York (1981).



**B.Sc. ELECTRONICS**  
**Semester-IV**  
**Paper I- EL 401**  
**Amplifier and Oscillator Circuits**

**Max. Marks : 40**

**Internal Assessment : 10**

**Time : 3 Hrs.**

**NOTE :**1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.

2. 20% numerical problems are to be set.

3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Feedback-positive and negative feedback, Effect of negative feedback on gain, Non-linear distortion, input resistance, Frequency response, Voltage series and shunt feedback, Current series feedback. Active filters using op.amp (Lowpass and highpass Band pass and Band reject).	12-18
Unit-II	Principle of oscillations, condition for sustained oscillation, RF Oscillators, Hartley, Colpitt, Crystal Oscillator (Principle of working and frequency oscillation), AF Oscillators" Wein Bridge, Phase shift Oscillators.	12-18
Unit-III	Multivibrator (Astable, Bistable, Monostable, Schmitt Trigger, Unijunction transistor, (UJT), Silicon controller, Rectifier (SCR), Triac, Diac Silicon Controller Switch (SCS), Controller rectification, pulse control of SCR Phase Control of SCR, SCR Controller circuits, UJT Sawtooth wave generator, Triangular waveform generator.	12-18

**Suggested Reading**

1. Electronics for Scientist and Engineers by Vishwanathan, Mehta and Rajaraman (Prentice-Hall, India)
2. Electronics Fundamentals and Applications (5th addition) by John, D. Ryder (Prentice-Hall, India)
3. Introduction to Electronics by L.K.Brauson (Prentice-hall, India).
4. Digital Principles and Application by Malvine and Leach (Tata MC Graw hill)
5. Electronic Devices and Circuits by Motershed.
6. Electronic Devices and Circuit-Discrete and Integrated by Y.N. Bapat.
7. Semiconductor Electronics by A.K.Sharma (New Age Internationals Pvt. Ltd., India)
8. Electronics Devices & Circuits by Sanjeev Gupta/V.K.Mehta/D.K.Kaushik
9. Digital Electronics by V.K.Puri/R.P.Jain
10. Electrical Technology by S. Chand

**B.Sc. ELECTRONICS**  
**Semester-IV**  
**Paper II- EL 402**  
**Electronic Devices and Circuits-III**

**Max. Marks : 40**

**Internal Assessment : 10**

**Time : 3 Hrs.**

**NOTE :** 1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.

2. 20% numerical problems are to be set.

3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Memories, memory organization and its parameters. Read only Memories (ROM), Random Access Memory (RAM), Application of ROM, Static Random access memories (SRAM), Dynamic Ram, Digital to Analog conversion (D/A) Binary weight, ladder type, Serial, BCD D/A conversion, Analog to digital conversion A/D, Single slope & dual slope and their parameters.	12-18
Unit-II	Transducers classification, Strain gauge displacement, Temperature measurement Resistance Thermometer, Thermocouple and Thermister, Photomultiplier tubes, photovoltaic cells Photoemissive cells, Light Emitting Diode (LED) construction and working.	12-18
Unit-III	Electronic Multimeter, Basic circuit, Characteristics of Electronic instruments, accuracy, precision sensitivity, Resolution and different types of errors Cathode ray oscilloscope, Block diagram, Cathode ray tube (CRT), Electrostatic deflection, Post deflection, acceleration, Horizontal and vertical deflection system, Digital storage oscilloscope Block diagram and explain in briefly.	12-18

**Suggested Reading**

1. Electronics for Scientist and Engineers by Vishwanathan, Mehta and Rajaraman (Prentic-Hall, India)
2. Electronics Fundamentals and Applications (5<sup>th</sup> addition) by John, D. Ryder (Prentice-Hall, India)
3. Introduction to Electronics by L.K.Brauson (Prentice-hall, India).
4. Digital Principles and Application by Malvine and Leach (Tata MC Graw hill)
5. Electronic Devices and Circuits by Motershed.
6. Electronic Devices and Circuit-Discrete and Integrated by Y.N. Bapat.
7. Semiconductor Electronics by A.K.Sharma (New Age Internationals Pvt. Ltd., India)
8. Electronics Devices & Circuits by Sanjeev Gupta/V.K.Mehta/D.K.Kaushik
9. Digital Electronics by V.K.Puri/R.P.Jain
10. Electrical Technology by S. Chand

**B.Sc. ELECTRONICS**  
**Semester-IV**  
**Paper III- EL 403**  
**Practical-II**

Max. Marks : 50  
Time : 3 Hrs.

**Total No. of Periods: 40-45**

**Note for Practical papers:-**

**The practical examination will be of**

**3 hours.**

**Distribution of marks:**

**Experiments 30 marks**

**Lab. Record**

**8 marks**

**Viva-Voce**

**12 marks**

The laboratory record will be assessed by both the external examiners. Distribution of marks of each experiment, Lab record and Viva-voce, oral examination, concerning the experiments in the syllabus are indicated above.

Use of simple (non-programmable) calculator is permissible.

1. To study and design DTL NAND gate using discrete components and verify its truth table.
2. To study and design TTL NAND gate using discrete components and verify its truth table.
3. To study half Adder/full adder, and verify its truth table.
4. To study and verify the truth table of JK, D&T type flip-flops.
5. BCD Decade counter, verify its truth table.
6. Study ripple Binary counter and verify its truth table.
7. Solid State Rectifier, Study of Characteristic under forward and reverse bias conditions.
8. To study the operation of transistorized Monostable multivibrator circuit and measure its delay time.
9. To study the operation of transistorized Astable multivibrator circuit and measure its frequency.

Projects topics are:

1. Electronic Multimeter using IC
2. Solid State Power controller using thyristor.
3. Function generator using IC
4. Time base generator
5. Regulated power supply using ICs.
6. Event Counter.
7. Transistor tester (NPN, PNP)
8. Electronic Timer with Alarm
9. Design of an under/over voltage cut off circuit
10. Transformer less o/p amplifier stage.

References:

1. Experiments in electronics by W.H. Events (Prentice Hall India)
2. Method of experimental Physics Vol.2 Electronic Method (Acad Press)
3. Experimental in electronics by Ravi Taj Dudeja.

**B.Sc. PHYSICS**  
**Paper-II PHY 302**  
**Optics – I**

Max. Marks : 45  
Internal Assessment : 10  
Time : 3 Hrs.

**NOTE :**

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Fourier Analysis and Fourier Transforms : Speed of transverse waves on a uniform string. Speed of longitudinal waves in a fluid, superposition of waves (physical idea), Fourier Analysis of complex waves and its application for the solution of triangular and rectangular waves, half and full wave rectifier out puts. Fourier transforms and its properties. Application of fourier transform to following function. (I) $f(x) = e^{-x^2/2}$ (II) $f(x) = \begin{cases} 1 &  x  < a \\ 0 &  x  > a \end{cases}$	22
Unit-II	Geometrical Optics : Matrix methods in paraxial optics, effects of translation and refraction, derivation of thin lens and thick lens formulae, unit plane, nodal planes, system of thin lenses, Chromatic, spherical coma, astigmatism and distortion aberrations and their remedies. Physical Optics	23
Unit-III	Interference : Interference by Division of Wavefront : Fresnel's Biprism and its applications to determination of wave length of sodium light and thickness of a mica sheet, Lloyd's mirror, phase change on reflection.	22

**References**

1. Mathematical Physics by B.S. Rajput and Yog Prakash Pragati Prakashan.
2. Theory and Problems of Laplace Transforms by Murrari R. Spiegel, McGraw Hill Book Company.
3. Optics by Ajay Ghatak, Tata McGraw Hill 1977.
4. Introduction of Optics by Frank L. Pedrotti and Leno S. Pedrotti, Prentice Hall 1987.

## B.Sc. PHYSICS

### Paper-III Phy- 303 Practicals

Max. Marks : 40  
Time : 3 Hrs.

#### Special Notes

1. Do any eight experiments.
2. The students are required to Calculate the error involved in a particular experiment (Percentage error).

Note:-

1. The practical examination will be held in two sessions of 3 hours.
2. Distribution of Marks :

Experiments :	=	20 Marks
Viva-Voce :	=	10 Marks
Lab. Record :	=	10 marks
Total		40 Marks

For Giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure.

1. After the completion of a practical the teacher concerned will check the note-book and conduct the viva-voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/she has understood. According to his/her performance marks will be recorded on their practical note book. These marks will contribute the lab Record.

2. To complete the final marks for lab. Record a separate register for each class of B.Sc. will be maintained. The students will be assigned a separate page on this register. On this page the marks obtained by the student in different practicals will be recorded. While taking the final average the total marks obtained will be divided by the total no. of required practicals, instead of the number of practicals performed by the student. This record will be signed by the concerned teacher.

3. The Lab. Record register will be presented to the external practical examiners for lab. Record marks. The external examiner will verify the record randomly.

**B.Sc. PHYSICS**  
**Paper III- PHY 303**  
**PRACTICALS**

Max. Marks : 40  
Time : 3 Hours

1. To measure the (a) area of a window (b) height of an inaccessible object.
2. Refractive index and dispersive power of a prism material by spectrometer.
3. To draw a graph between wave length and minimum deviation for various lines from a Mercury discharge source.
4. Determination of wave length of Na light and the number of lines per centimeter using a diffraction grating.
5. Wave length by Newton's Rings.
6. Resolving power of a telescope.
7. Comparison of Illuminating Powers by a Photometer.
8. Measurement of (a) Specific rotation (b) concentration of sugar solution using polarimeter.
9. Ordinary and extra ordinary refractive indices for calcite or quartz.
10. To find the equivalent focal length of a lens system by nodal slide assembly.

**B.Sc. PHYSICS**  
**Semester IV**

**Paper I- PHY 401 : Statistical Mechanics**

Max. Marks : 45  
Internal Assessment : 10  
Time : 3 Hrs.

**NOTE :**

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five questions in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Probability, some probability considerations, combinations possessing maximum probability, combinations possessing minimum probability, distribution of molecules in two boxes. Case with weightage (general). Phase space, microstates and macrostates, statistical fluctuations constraints and accessible States Thermodynamical probability.	22
Unit-II	Postulates of Statistical Physics. Division of Phase space into cells, Condition of equilibrium between two system in thermal contact. $\beta$ - Parameter. Entropy and Probability, Boltzman's distribution law. Evaluation of A and $\beta$ . Bose-Einstein statistics, Application of B.E. Statistics to Plancks's radiation law, B.E. gas.	23
Unit-III	Fermi-Dirac statistics, M.B. Law as limiting case of B.E. Degeneracy and B.E., Condensation. F.D. Gas, electron gas in metals. Zero point energy. Specific heat of metals and its solution.	22

References

1. B.B. Laud, "Introduction to Statistical Mechanics" (Macmillan 1981).
2. F. Reif, "Statistical Physics" (McGraw Hill 1988).
3. K. Huang, "Statistical Physics" (Wiley Eastern 1988).

**B.Sc. PHYSICS**  
**Paper-II PHY 402**  
**Optics – II**

Max. Marks : 45  
Internal Assessment : 10  
Time : 3 Hrs.

**NOTE :**

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Interference by Division of Amplitude :Colour of thin, films, wedge shaped film, Newton's rings. Interferometers: Michelson's interferometer and its application to (I) Standardisation of a meter (II) determination of wave length. Fresnel's Diffraction : Fresnel's half period zones, zone plate, diffraction at a straight edge, rectangular slit and circular aperture.	22
Unit-II	Fraunhofer diffraction : One slit diffraction, Two slit diffraction N-slit diffraction, Plane transmission grating spectrum, Dispersive power of a grating , Limit of resolution, Rayleigh's criterion, resolving power of telescope and a grating.	23
Unit-III	Polarization :Polarisation and Double Refraction : Polarisation by reflection, Polarisation by scattering, Malus law, Phenomenon of double refraction, Huygen's wave theory of double refraction (Normal and oblique incidence), Analysis of Polarised light : Nicol prism, Quarter wave plate and half wave plate, production and detection of (i) Plane polarized light (ii) Circularly polarized light and (iii)Elliptically polarized light, Optical activity, Fresnel's theory of rotation, Specific rotation, Polarimeters (half shade and Biquartz).	22

**References**

1. Optics by Ajay Ghatak, Tata McGraw Hill 1977.
2. Introduction of Optics by Frank L. Pedrotti and Leno S. Pedrotti, Prentice Hall 1987.



**B.Sc. PHYSICS**  
**Paper-III Phy- 403**  
**Practicals**

Max. Marks : 40  
Time : 3 Hrs.

**Special Notes**

1. Do any eight experiments.
2. The students are required to Calculate the error involved in a particular experiment (Percentage error).

Note:-

1. The practical examination will be held in two sessions of 3 hours.

2. Distribution of Marks :

Experiments : = 20 Marks

Viva-Voce : = 10 Marks

Lab. Record : = 10 marks

Total 40 Marks

For Giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure.

1. After the completion of a practical the teacher concerned will check the note-book and conduct the viva-voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/she has understood. According to his/her performance marks will be recorded on their practical note book. These marks will contribute the lab Record.

2. To complete the final marks for lab. Record a separate register for each class of B.Sc. will be maintained. The students will be assigned a separate page on this register. On this page the marks obtained by the student in different practicals will be recorded. While taking the final average the total marks obtained will be divided by the total no. of required practicals, instead of the number of practicals performed by the student. This record will be signed by the concerned teacher.

3. The Lab. Record register will be presented to the external practical examiners for lab. Record marks. The external examiner will verify the record randomly.

**B.Sc. PHYSICS**  
**Paper III- PHY 403**  
**PRACTICALS**

Max. Marks : 40

Time : 3 Hours

Note:- This course will contain two parts (i) Electronics and (ii) Computer experiments. Students have to perform a minimum of four experiments from each part.

**(i) Electronics**

1. To draw common base and common emitter characteristics of a transistor and calculate transistor and calculate transistor characteristics parameters.
2. To study the ripple factor in a.d.c. power supply.
3. To draw frequency response curve of transistorised R.C. coupled amplifier.
4. To find out the frequency of a tuning fork by Melde's experiment.
5. Study of series and parallel resonance circuits.
6. Electronic Voltmeter measurement of peak, average & R.M.S. value of signal.
7. Study of voltage doubler and tripler circuits.

**(ii) Computer Experiments**

1. To print out all natural (even/odd) number between given limits using computer.
2. To find maximum, minimum and range of a given set of numbers using computer.
3. To evaluate sum of finite series. For example,  $S = \dots$
4. Find the roots of a quadratic equation.
5. To find integration of a definite integral by trapezoidal rule.
6. To find the area of a triangle, sphere and cylinder.
7. Given value for a,b,c and d and a set of values for the variable x evaluate the function defined by

$$F(x) = ax^2 + bx + c \text{ if } x < d \quad F(x) = 0 \text{ if } x = d$$

$$F(x) = ax^2 + bx - c \text{ if } x > d$$

For each value of x, and print the value of x and (fx). Write a program for an arbitrary number of x values.

## NEW SCHEME

Scheme of Examination of B.Sc. 3<sup>rd</sup> Semester Mathematics (w.e.f. 2013-2014)

### Advanced Calculus

Paper: 12BSM 231

**Max. Marks:**

$7 \times 4 = 28$
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$2 \times 6 = 12$
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<b>Total = 40</b>
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**Time: 3 Hours Note:**

The question paper will consist of **five** sections. Each of the first four sections (**I-IV**) will contain two questions (each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Continuity, Sequential Continuity, properties of continuous functions, Uniform continuity, chain rule of differentiability. Mean value theorems; Rolle's Theorem and Lagrange's mean value theorem and their geometrical interpretations. Taylor's Theorem with various forms of remainders, Darboux intermediate value theorem for derivatives, Indeterminate forms.	
Unit-II	Limit and continuity of real valued functions of two variables. Partial differentiation. Total Differentials; Composite functions & implicit functions. Change of variables. Homogenous functions & Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables.	
Unit-III	Differentiability of real valued functions of two variables. Schwarz and Young's theorem. Implicit function theorem. Maxima, Minima and saddle points of two variables. Lagrange's method of multipliers.	
Unit-IV	Curves: Tangents, Principal normals, Binormals, Serret-Frenet formulae. Locus of the centre of curvature, Spherical curvature, Locus of centre of Spherical curvature, Involute, evolutes, Bertrand Curves. Surfaces: Tangent planes, one parameter family of surfaces, Envelopes.	

**Books Recommended:**

2. C.E. Weatherburn : Differential Geometry of three dimensions, Radhe Publishing House, Calcutta
3. Gabriel Klaumber : Mathematical analysis, Mrcel Dekkar, Inc., New York, 1975
4. R.R. Goldberg : Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970
5. Gorakh Prasad : Differential Calculus, Pothishala Pvt. Ltd., Allahabad
6. S.C. Malik : Mathematical Analysis, Wiley Eastern Ltd., Allahabad.
7. Shanti Narayan : A Course in Mathematical Analysis, S.Chand and company, New Delhi
8. Murray, R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing co., New York

## Partial Differential Equations

Paper: 12BSM 232

**Max. Marks:**

**7 x 4 = 28**

**2 x 6 = 12**

**Total = 40**

**Time: 3 Hours**

**Note:** The question paper will consist of **five** sections. Each of the first four sections(**I-IV**) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions(each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Partial differential equations: Formation, order and degree, Linear and Non-Linear Partial differential equations of the first order: Complete solution, singular solution, General solution, Solution of Lagrange's linear equations, Charpit's general method of solution. Compatible systems of first order equations, Jacobi's method.	
Unit-II	Linear partial differential equations of second and higher orders, Linear and non-linear homogenous and non-homogenous equations with constant co-efficients, Partial differential equation with variable co-efficients reducible to equations with constant coefficients, their complimentary functions and particular Integrals, Equations reducible to linear equations with constant co-efficients.	
Unit-III	Classification of linear partial differential equations of second order, Hyperbolic, parabolic and elliptic types, Reduction of second order linear partial differential equations to Canonical (Normal) forms and their solutions, Solution of linear hyperbolic equations, Monge's method for partial differential equations of second order.	
Unit-IV	Cauchy's problem for second order partial differential equations, Characteristic equations and characteristic curves of second order partial differential equation, Method of separation of variables: Solution of Laplace's equation, Wave equation (one and two dimensions), Diffusion (Heat) equation (one and two dimension) in Cartesian Co-ordinate system.	

**Books Recommended:**

5. D.A.Murray: Introductory Course on Differential Equations, Orient Longman, (India), 1967
6. Erwin Kreyszing : Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
7. A.R. Forsyth : A Treatise on Differential Equations, Macmillan and Co. Ltd.
8. Ian N.Sneddon : Elements of Partial Differential Equations, McGraw Hill Book Company, 1988
9. Frank Ayres : Theory and Problems of Differential Equations, McGraw Hill Book Company, 1972
10. J.N. Sharma & Kehar Singh : Partial Differential Equations

**Statics****Paper: 12BSM 233****Max. Marks:**

$7 \times 4 = 28$

$2 \times 6 = 12$

$Total = 40$

**Time: 3 Hours**

**Note:** The question paper will consist of **five** sections. Each of the first four sections(**I-IV**) will contain two questions (each carrying 7 marks.) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Composition and resolution of forces. Parallel forces. Moments and Couples.	
Unit-II	Analytical conditions of equilibrium of coplanar forces. Friction. Centre of Gravity.	
Unit-III	Virtual work. Forces in three dimensions. Poinsots central axis.	
Unit-IV	Wrenches. Null lines and planes. Stable and unstable equilibrium.	

**Books Recommended:**

11. S.L. Loney : Statics, Macmillan Company, London

12. R.S. Verma : A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad

## NEW SCHEME

### Scheme of Examination of B.Sc 4<sup>th</sup> Semester Mathematics

(w.e.f. 2013-2014)

## Sequences and Series

**Paper: 12BSM 241**

**Max. Marks:**

<b>7 x 4 = 28</b>
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<b>2 x 6 = 12</b>
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<b>Total = 40</b>
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**Time: 3 Hours**

**Note:** The question paper will consist of **five** sections. Each of the first four sections(**I-IV**) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions(each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Boundedness of the set of real numbers; least upper bound, greatest lower bound of a set, neighborhoods, interior points, isolated points, limit points, open sets, closed set, interior of a set, closure of a set in real numbers and their properties. Bolzano-Weiestrass theorem, Open covers, Compact sets and Heine-Borel Theorem.	
Unit-II	Sequence: Real Sequences and their convergence, Theorem on limits of sequence, Bounded and monotonic sequences, Cauchy's sequence, Cauchy general principle of convergence, Subsequences, Subsequential limits. Infinite series: Convergence and divergence of Infinite Series, Comparison Tests of positive terms Infinite series, Cauchy's general principle of Convergence of series, Convergence and divergence of geometric series, Hyper Harmonic series or p-series.	
Unit-III	Infinite series: D-Alembert's ratio test, Raabe's test, Logarithmic test, de Morgan and Bertrand's test, Cauchy's Nth root test, Gauss Test, Cauchy's integral test, Cauchy's condensation test.	
Unit-IV	Alternating series, Leibnitz's test, absolute and conditional convergence, Arbitrary series: abel's lemma, Abel's test, Dirichlet's test, Insertion and removal of parenthesis, re-arrangement of terms in a series, Dirichlet's theorem, Riemann's Re-arrangement theorem, Pringsheim's theorem (statement only), Multiplication of series, Cauchy product of series, (definitions and examples only) Convergence and absolute convergence of infinite products.	

### **Books Recommended:**

4. R.R. Goldberg : Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970
5. S.C. Malik : Mathematical Analysis, Wiley Eastern Ltd., Allahabad.
6. Shanti Narayan : A Course in Mathematical Analysis, S.Chand and company, New Delhi
7. Murray, R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing co., New York
8. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
9. Earl D. Rainville, Infinite Series, The Macmillan Co., New York
- 10.

## Special Functions and Integral Transforms

Paper: 12BSM 242

· **Max. Marks:**

<b>7 x 4 = 28</b>
<b>2 x 6 = 12</b>
<b>Total = 40</b>

**Time: 3 Hours**

**Note:** The question paper will consist of **five** sections. Each of the first four sections(**I-IV**) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions(each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Series solution of differential equations – Power series method, Definitions of Beta and Gamma functions. Bessel equation and its solution: Bessel functions and their properties-Convergence, recurrence, Relations and generating functions, Orthogonality of Bessel functions	
Unit-II	Legendre and Hermite differentials equations and their solutions: Legendre and Hermite functions and their properties-Recurrence Relations and generating functions. Orthogonality of Legendre and Hermite polynomials. Rodrigues' Formula for Legendre & Hermite Polynomials, Laplace Integral Representation of Legendre polynomial.	
Unit-III	Laplace Transforms – Existence theorem for Laplace transforms, Linearity of the Laplace transforms, Shifting theorems, Laplace transforms of derivatives and integrals, Differentiation and integration of Laplace transforms, Convolution theorem, Inverse Laplace transforms, convolution theorem, Inverse Laplace transforms of derivatives and integrals, solution of ordinary differential equations using Laplace transform.	
Unit-IV	Fourier transforms: Linearity property, Shifting, Modulation, Convolution Theorem, Fourier Transform of Derivatives, Relations between Fourier transform and Laplace transform, Parseval's identity for Fourier transforms, solution of differential Equations using Fourier Transforms.	

**Books Recommended:**

4. Erwin Kreyszing : Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
5. A.R. Forsyth : A Treatise on Differential Equations, Macmillan and Co. Ltd.
6. I.N. Sneddon : Special Functions on mathematics, Physics & Chemistry.
7. W.W. Bell : Special Functions for Scientists & Engineers.
8. I.N. Sneddon: the use of integral transform, McGraw Hill, 1972
9. Murray R. Spiegel: Laplace transform, Schaum's Series.

**Programming in C**  
**and Numerical**  
**Methods**

**Max. Marks:**

$5.5 \times 2 = 11$
$5 \times 2 = 10$
$1.5 \times 6 = 9$

**Total =30                      Time: 3 Hours**

**Note:-** The question paper will consist of **five** sections. Each of the first two sections (**I-II**) will contain two questions (each carrying 5.5 marks). Each of the **IIIrd** and **IVth** sections will contain two questions (each carrying 5 marks). The students shall be asked to attempt **one** question from each section (**I-IV**). **Section-V** will contain **six** short answer type questions ( each carrying 1.5 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Programmer's model of a computer, Algorithms, Flow charts, Data types, Operators and expressions, Input / outputs functions.	
Unit-II	Decisions control structure: Decision statements, Logical and conditional statements, Implementation of Loops, Switch Statement & Case control structures. Functions, Preprocessors and Arrays.	
Unit-III	Strings: Character Data Type, Standard String handling Functions, Arithmetic Operations on Characters. Structures: Definition, using Structures, use of Structures in Arrays and Arrays in Structures. Pointers: Pointers Data type, Pointers and Arrays, Pointers and Functions. Solution of Algebraic and Transcendental equations: Bisection method, Regula-Falsi method, Secant method, Newton-Raphson's method. Newton's iterative method for finding $n$ th root of a number, Order of convergence of above methods	
Unit-IV	Simultaneous linear algebraic equations: Gauss-elimination method, Gauss-Jordan method, Triangularization method (LU decomposition method). Crout's method, Cholesky Decomposition method. Iterative method, Jacobi's method, Gauss-Seidal's method, Relaxation method.	

**Books Recommended:**

4. B.W. Kernighan and D.M. Ritchie : The C Programming Language, 2<sup>nd</sup> Edition
5. V. Rajaraman : Programming in C, Prentice Hall of India, 1994
6. Byron S. Gottfried : Theory and Problems of Programming with C, Tata McGraw-Hill Publishing Co. Ltd., 1998
7. M.K. Jain, S.R.K. Lyengar, R.K. Jain : Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
8. M.K. Jain, S.R.K. Lyengar, R.K. Jain : Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
9. Computer Oriented Numerical Methods, Prentice Hall of India Pvt. Ltd.



**Part-B (Practical)**

**Max. Marks: 20**

**Time: 3 Hours**

There will be a separate practical paper which will consist simple programs in C and the implementation of Numerical Methods, studied in the paper 12BSM 243 (Part-A).

AGGARWAL COLLEGE BALLABGARH

**B.Sc. ELECTRONICS**  
**Semester-V**  
**Paper I- EL 501**  
**Computer Fundamental-I**

**Max.**  
**Marks : 40**  
**Internal Assessment : 10**  
**Time : 3 Hrs.**

**NOTE :**

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Random-Access Memories, Linear-Select Memory Organization, Decoders, Dimensions of Memory Access, Connecting Memory Chips to a Computer Bus, Random Access Semiconductor Memories, Static Random-Access Memories, Dynamic Random-Access Memories, Read Only Memories, Magnetic Disk Memories, Flexible-Disk Memories, Flexible-Disk Storage Systems- The Floppy Disk, Magnetic Tape, Tape Cassettes and Cartridges, Magnetic Bubble and CCD Memories.	12-18
Unit-II	Simple as possible Computer (SAP-I), Architecture Instruction Set, Programming SAP-I, Fetch cycle Execution cycle, SAP-2 Architecture, Memory reference instruction, Register instructions, JUMP & Call instructions Logic instructions.	12-18
Unit-III	SAP-3 Programming model, MOV & MVT, arithmetic instructions, increments, Decrements, and rotates, Logic instructions, Arithmetic and Logic immediate jumps instruction, Extended register instructions, indirect instructions set of 8005 timing diagrams.	12-18

**Suggested Reading**

1. Television Systems by Gulati
2. Digital Computer Electronocs by Malvino/B.Ram
3. Computer Architecture by Morris Mano
4. Any book from Authentic Writer related to concerned topics

**B.Sc. ELECTRONICS**  
**Semester-V**  
**Paper II- EL 502**  
**Communication Electronics-I**

**Max. Marks : 40**

**Internal Assessment : 10**

**Time : 3 Hrs.**

**NOTE :**

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Modulation and Demodulation: Principles of modulation, Amplitude modulation, percent modulation, Upper and lower side Frequencies, Upper and Lower side bands, mathematical analysis of a modulated, carrier wave, power relations in an AM wave, simple idea about different forms of amplitude modulation, Basic circuit for generation and detection of AM/FM signals.	12-18
Unit-II	Basic television aspect ratio, vertical resolution, Kellfactor, Horizontal resolution and video band width, interlaced scanning composite video signal, video modulation and vestigial side hand transmissions, Television camera tubes, The image orthicon, The Videocon, frequency band and resolution.	12-18
Unit-III	Monochrome Television transmitter, Television receiver, Receiver Sweep circuit and their synchronization, colour Television, Fundamental concepts of a three colours systems, colour television transmitter, colour television receiver.	12-18

**Suggested Reading**

1. Television Systems by Gulati
2. Digital Computer Electronocs by Malvino/B.Ram
3. Computer Architecture by Morris Mano
4. Any book from Authentic Writer related to concerned topics

**B.Sc. ELECTRONICS**  
**Semester-V**  
**Paper III- EL 503**  
**Practical-V**

Max. Marks : 50  
Time : 3 Hrs.

**Total No. of Periods: 40-45**

**Note for Practical papers:-**

**The practical examination will be of**

**3 hours.**

**Distribution of marks:**

**Experiments 30 marks**

**Lab. Record**

**8 marks**

**Viva-Voce**

**12 marks**

The laboratory record will be assessed by both the external examiners. Distribution of marks of each experiment, Lab record and Viva-voce, oral examination, concerning the experiments in the syllabus are indicated above.

Use of simple (non-programmable) calculator is permissible.

**Note :** five experiments are to be performed by each student

**i** Familiarization with microprocessor kit.

**ii** Study the instruction set of 8085 on microprocessor kit.

**lii** Programme writing with simple arithmetic operation.

**iv** To study the operation of decade counter/7 segment decoder.

**v** To identify and study the main parts of a monochrome TV receiver.

**vi** Computer Programming in FORTRAN language (using the statements) READ, WRITE,

IF THEN ELSE, DO TO DO LOOPS.

**vii** Computer Programming in FORTRAN Language (using arrays and subscribed variables).

**viii** Study the operation of J-K, Flip Z Flop, D & T flip flops.

**ix** To Study the operation of Shift resister.

**x** To design the D to A converters (Ladder type) and study the operation of A to D convertor.

**xi** Circuit simulation using PSPICE

**B.Sc. ELECTRONICS**  
**Semester-VI**  
**Paper I- EL 601**  
**Computer Fundamental-II**

**Max. Marks : 40**

**Internal Assessment : 10**

**Time : 3 Hrs.**

**NOTE :**

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Input-Output Statements, Simple Computer programmes, Control statements.	12-18
Unit-II	Format specifications function and subroutines, Fortran programme example, Additional Fortran 77, Features, Simulation of circuits using P SPICE	12-18
Unit-III	Interconnecting System Components, Interfacing-Buses, Bus Formats and Operation, Isolated and Memory-Mapped Input-Output, Interfacing a Keyboard, Program Control of Keyboard Interface, Interfacing a Printer, Interrupts in Input-Output Systems, A Standard Bus Interface.	12-18

**Suggested Reading**

1. Television Systems by Gulati
2. Digital Computer Electronics by Malvino/B.Ram
3. Computer Architecture by Morris Mano
4. Any book from Authentic Writer related to concerned topics

**B.Sc. ELECTRONICS**  
**Semester-VI**  
**Paper II- EL 602**  
**Communication Electronics-II**

**Max.**  
**Marks : 40**  
**Internal Assessment : 10**  
**Time : 3 Hrs.**

**NOTE :**

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Television antennas, horizontal dipole, folded dipole, Yagi antenna, Colour Television camera, the Luminance and colour difference signals, shadow mask colour picture tube, PAL-D colour television system, block diagram of PAL-D encoder, block diagram of PAL- D television receiver.	12-18
Unit-II	Detailed Design Principle of following: (i) Digital Frequency meter (ii) Super heterodyne receiver (iii) Time base generator for C. R. O. (iv) Stabilized power supply usual output 0-15 Volt, 1 Amp. Using IC regulators (v) Digital voltmeter (vi) Digital Clock (vii) Stereo amplifier	12-18
Unit-III	Volt Meter (VTVM), Signal Generator, Free Space Radar Range Equation, Basic Pulsed Radar System, Indicator, Applications of Radar.	12-18

**Suggested Reading**

1. Television Systems by Gulati
2. Digital Computer Electronics by Malvino/B.Ram
3. Computer Architecture by Morris Mano
4. Any book from Authentic Writer related to concerned topics

**B.Sc. ELECTRONICS**  
**Semester-VI**  
**Paper III- EL 603**  
**Practical-VI**

Max. Marks : 50  
Time : 3 Hrs.

**Total No. of Periods: 40-45**

**Note for Practical papers:-**

**The practical examination will be of**

**3 hours.**

**Distribution of marks:**

**Experiments 30 marks**

**Lab. Record**

**8 marks**

**Viva-Voce**

**12 marks**

The Project Report will be assessed by the external examiner. Distribution of marks of each experiment, project report and Viva-voce oral examination, concerning the experiments in the syllabus are indicated above. Use of simple (non-programmable) calculator is permissible. One project to be based on one of the following topics:

- i. Digital Frequency meter.
- ii. Digital Volt meter.
- iii. Digital Clock
- iv. Stereo Amplifier.
- v. Super heterodyne receiver.
- vi. Inverter with given specifications
- vii. Stabilized power supply
- viii. Digitally adjustable tier.
- ix. Temperature Controller

**B.Sc. PHYSICS**  
**SCHEME OF EXAMINATION**  
**Semester -V**

**Paper I- PHY 501 : SOLID STATE PHYSICS**

Max. Marks : 45  
Internal Assessment : 10  
Time : 3 Hrs.

**NOTE :**

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Crystalline and gallyssy forms, liquid crystals. Crystal structure, periodicity, lattice and basis, crystal translational vectors and axes. Unit cell and primitive cell, Winger Seitz primitive Cell, symmetry operations for a two dimensional crystal, Bravais tattices in two and three dimensions.	22
Unit-II	crystal planes and Miller indices, Interplanner spacing, Crystal structures of Zinc sulphide, Sodium Chloride and diamond, X-ray diffraction, Bragg's Law and experimental x-ray diffraction methods, K-space.	23
Unit-III	Reciprocal lattice and its physical significance, reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c and f.c.c. Specific heat : Specific heat of solids, Einstein's theory of specific heat, Debye model of specific heat of solids.	22

**References**

1. Introduction to solid state Physics (5<sup>th</sup> Ed.) by kittel, Wiley eastern Limited



**B.Sc. PHYSICS**  
**Paper I- PHY 502 : QUANTUM MECHANICS**

Max. Marks : 45  
Internal Assessment : 10  
Time : 3 Hrs.

NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Failure of (Classical) E.M. Theory. quantum theory of radiatio (old quantum theory), Photon, photoelectric effect and Einsteins photoelectric equation compton effect (theory and result). Inadequancy of old quantum theory, de-Broglie hypothesis. Davisson and Germer experiment. G.P. Thomson experiment. Phase velocity group velocity, Heisenberg's uncertainty principle. Time-energy and angular momentum, position uncertainty Uncertainty principle from de-Broglie wave, (wave-partice duality). Gamma Ray Maciroscope, Electron diffraction from a slit.	15-20
Unit-II	Derivation of time dependent Schrodinger wave equation, eigen values, eigen functions, wave functions and its significance. Normalization of wave function, concept of observable and operator. Solution of Schrodinger equation for harmomic oscillator ground states and excited states.	10-13
Unit-III	Application of Schrodinger equation in the solution of the following one-dimensional problems : Free particle in one dimensional box (solution of schrodinger wave equation, eigen function, eigen values, quantization of energy and momentum, nodes and antinodes, zero point energy). i) One-dimensional potential barrie $E > V_0$ (Reflection and Transmission coefficient). ii) One-dimensional potential barrier, $E > V_0$ (Reflection Coefficient, penetration of leakage coefficient, penetration depth).	10-12

**References :**

1. Quantum Mechanics by L.I. Schiff, McGraw Hill Book Company, Inc.
2. Quantum Mechanics by B. Crasemand and J.D. Powel (Addison Wesley).
3. Quantum Mechanics by A.P. Messiah.

**B.Sc. PHYSICS**  
**Paper -III Phy- 503**  
**(Practicals)**

**Max. Marks : 40**  
**Time : 3 Hrs.**

**Special Notes**

1. Do 6 experiments from section (i) & 4 experiments from Section (ii).
2. The students are required to calculate the error involved in a particular experiment (percentage error).
3. Use of simple non-programmable scientific calculator is allowed.

**Note :**

1. The practical examinations will be

Experiments	=20 marks
Viva-Voce	=10 marks
Lab Record	= 10 marks

-----  
Total = 40 marks  
-----

For giving marks under Lab. Record each college maintain practical assessment record by using the following procedure.

- I. Each student has to perform a minimum number of experiments prescribed in the syllabus.
- II. After the completion of a practical the teacher concerned will check the note-book and conduct the Viva-voce of each student to find out how much concept related to the theoretical and experimental part of the experiment he/she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.
- III. To complete the final marks for lab. Record a separate register for each class of B.Sc. will be maintained. The student will be assigned a separate page on this register. On this page the marks obtained by the student in different practicals will be recorded. While taking the final average the total marks obtained will be divided by the total number of required practicals instead of the number of practicals performed by the student. This record will be signed by the concerned teacher.
- IV. The lab. Record register will be presented to the external practical examiner for lab. Record marks. The external examiner will verify the record randomly.

## B.Sc. PHYSICS

### Paper III- PHY 503 PRACTICALS

Max. Marks : 40

Time : 3 Hours

This course will consist of two parts :

i) Solid State Electronics

ii) Computer Experiments

Student have to perform a minimum of four experiments from each

part. **i) Solid State Electronics**

1.  $e/m$  by Thomson method.
2. Transistor as voltage Amplifier in C-B Configuration.
3. Transistor as voltage Amplifier in C-B Configuration.
4. Study of B-H Curve by C.R.O.
5. Study of Hartley Oscillator (Calibration of Gang Condenser).
6. To study Hall effect.
7. Measurement of Energy Gap of Four Probe Method.
8. a) To Draw the Plateau of G.M. Counter.  
b) To Determine the Mass Attention Coefficient by G.M.Counter.

**ii) Computer Experiment :**

1. Program of compute product of two matrices A and B of different dimensions. This is an exercise to illustrate the use of subscripted variable and implied Do loops.
2. Evaluate the definite integral  $\int_1^h f(x)dx$ . through Simpson's one. third rule.
3. Use of the least-square curve fitting to fit a straight line to a given set of data.
4. Consider an array X with subscripted variables  $x_i$ ;  $i = 1, 2, \dots, N$ .  
It is desired to find the average and the standard deviation using the formulas.
5. Compute the sum of an infinite series upto three significant figures. For example, compute.  
for different x using Do loops. Calculate factorials through function subprogram.
6. Let there be N(Say=100) students in a class. Arrange their marks in descending or ascending orders.
7. Write a Fortran Program which evaluates v and y as function of x varying between and increments of using the relation.

## B.Sc. PHYSICS

### SCHEME OF EXAMINATION Semester -VI

#### Paper I- PHY 601 : ATOMIC MOLECULAR AND LASER PHYSICS

Max. Marks : 45  
Internal Assessment : 10  
Time : 3 Hrs.

#### NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed

Unit	Contents	No. of Periods
Unit-I	Vector atom model, quantum numbers associated with vector atom model, penetrating and non-penetrating orbits (qualitative description), spectral lines in different series of alkali spectra, spin orbit interaction and doublet term separation LS or Russell-Saunders Coupling jj coupling (expressions for interaction energies for LS and jj coupling required).	22
Unit-II	Zeeman effect (normal and anomalous) Zeeman pattern of $D_1$ and $D_2$ lines of Na-atom, Paschen, Back effect of a single valence electron system. Weak field Stark effect of Hydrogen atom. Discrete set of electronic energies of molecules. Quantisation of vibrational and rotational energies Raman effect (Quantitative description) Stokes and anti Stokes lines.	23
Unit-III	Main features of a laser : Directionality, high intensity, high degree of coherence, spatial and temporal coherence, Einstein's coefficients and possibility of amplification, momentum transfer, life time of a level, kinetics of optical absorption. Threshold condition for laser emission, Laser pumping, He-Ne laser and RUBY laser (Principle, Construction and Working). Applications of laser in the field of medicine and industry.	22

#### References

1. Introduction to Atomic and Molecular Spectroscopy by V.K.Jain, Narosa (2007)
2. Introduction to Atomic Spectra by H.B. White.
3. Atomic spectra by G. Herzberg.
4. Molecular Spectra and Molecular Structure by G. Herzberg.
5. Fundamentals of molecular spectroscopy by Colin N. Banwell and Elaine M. Mc-Cash.
6. Lasers, Theory and Application (2nd Ed.) by Thagrajan and Ajay Ghatak.
7. Laser and Nonlinear Optics by B.B. Laud (2nd Ed.)
8. Introduction to Optics by Frank L. Pedrotti and Lens S. Pedrotti, Prentice Hall, 1987.

## B.Sc. PHYSICS

### Paper II- PHY 602 : NUCLEAR PHYSICS

Max. Marks : 45

Internal Assessment : 10

Time : 3 Hrs.

#### NOTE :

1. The syllabus is divided into 3 units. Eight questions will be set up. At least two questions will be set from each unit and the student will have to attempt at least one question from each unit. A student has to attempt five question in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

Unit	Contents	No. of Periods
Unit-I	Nuclear mass and binding energy, systematics nuclear binding energy, nuclear stability, Nuclear size, spin, parity, statistics magnetic dipole moment, quadrupole moment (shape concept), Determination of mass by Bain-Bridge, Bain-Bride and Jordan mass spectrograph, Determination of charge by Mosley law Determination of size of nuclei by Rutherford Back Scattering.	22
Unit-II	Interaction of heavy charged particles (Alpha particles), alpha disintegration and its theory Energy loss of heavy charged particle (idea of Bethe formula, no derivation), Energetics of alpha -decay, Range and straggling of alpha particles. Geiger-Nuttal law. Introduction of light charged particle (Beta-particle), Origin of continuous beta -spectrum (neutrino hypothesis) types of beta and energetics of beta decay, Energy loss of beta-particles (ionization), Range of electrons, absorption of beta-particles. Interaction of Gamma Ray, Nature of gamma rays, Energetics of gamma rays, passage of Gamma radiations through matter (photoelectric, compton and pair production effect) electron position annihilation. Absorption of Gamma rays (Mass attenuation coefficient) and its application.	23
Unit-III	Nuclear reactions, Elastic scattering, Inelastic scattering, Nuclear disintegration, photoneuclear reaction, Radiative capture, Direct reaction, heavy ion reactions and spallation Reactions, conservation laws. Q-value and reaction threshold. Nuclear Reactors General aspects of Reactor design. Nuclear fission and fusion reactors (Principles, construction, working and use) Linear accelerator, Tandem accelerator, Cyclotron and Betatron accelerators. Ionization chamber, proportional counter, G.M. counter detailed study, scintillation counter and semiconductor detector.	22

#### references :

1. Atomic and nuclear Physics, Vol. II by S.N. Ghoshal.
2. Nuclear Physics by D.C. Tayal, Umesh Prakashan, 125, Goblind Dev Khurja (UP).
3. Concept of Modern physics by arther Besier, Tata McGraw Hill Publications.
4. Nuclear Physics by W.E. Burcham.
5. Nuclear Radiation Detectors by S.S. Kapoor
6. Experimental Nuclear Physics by M. Singru.

**B.Sc. PHYSICS**  
**Paper -III Phy- 603**  
**(Practicals)**

**Max. Marks : 40**

**Time : 3 Hrs.**

**Special Notes**

1. Do 8 experiments.
2. The students are required to calculate the error involved in a particular experiment (percentage error).
3. Use of simple non-programmable scientific calculator is allowed.

**Note :**

1. The practical examinations will be	
Experiments	=20 marks
Viva-Voce	=10 marks
Lab Record	= 10 marks
-----	
Total	= 40 marks
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For giving marks under Lab. Record each college maintain practical assessment record by using the following procedure.

- I. Each student has to perform a minimum number of experiments prescribed in the syllabus.
- II. After the completion of a practical the teacher concerned will check the note-book and conduct the Viva-voce of each student to find out how much concept related to the theoretical and experimental part of the experimental part of the experiment he/she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.
- III. To complete the final marks for lab. Record a separate register for each class of B.Sc. will be maintained. The student will be assigned a separate page on this register. On this page the marks obtained by the student in different practicals will be recorded. While taking the final average the total marks obtained will be divided by the total no of required practicals instead of the number of practicals performed by the student. This record will be signed by the concerned teacher.
- IV. The lab. Record register will be presented to the external practical examiner for lab. Record marks. The external examiner will verify the record randomly.

**B.Sc. PHYSICS**  
**Paper III- PHY 603**  
**PRACTICALS**

Max. Marks : 40

Time : 3 Hours

Wave length of Sodium light by fresnel's biprism. Velocity of ultrasonic waves by grating formation in CC14. Diameter of Lycopodium powder particles by Carona rings. To study double slit interference by He-Ne laser. Diameter of a thin wire by diffraction method (using He-Ne Laser). Young's modulus by Newton's rings method. Resolving power of a prism. Thickness of a thin plate using air wedge. Resolving Power of plane transmission grating. Rydberg constant by Hydrogen gas spectrum.

## NEW SCHEME

### Scheme of Examination of B.Sc. 5<sup>th</sup> Semester Mathematics

(w.e.f. 2014-2015)

### Real Analysis

**Paper: 12BSM 351**

**Max. Marks:**

$7 \times 4 = 28$
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$2 \times 6 = 12$
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<b>Total = 40</b>
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**Time: 3 Hours**

**Note:** The question paper will consist of **five** sections. Each of the first four sections(**I-IV**) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions(each carrying 2 marks ) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Riemann integral, Integrability of continuous and monotonic functions, The Fundamental theorem of integral calculus. Mean value theorems of integral calculus.	
Unit-II	Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests, Frullani's integral, Integral as a function of a parameter. Continuity, Differentiability and integrability of an integral of a function of a parameter.	
Unit-III	Definition and examples of metric spaces, neighborhoods, limit points, interior points, open and closed sets, closure and interior, boundary points, subspace of a metric space, equivalent metrics, Cauchy sequences, completeness, Cantor's intersection theorem, Baire's category theorem, contraction Principle	
Unit-IV	Continuous functions, uniform continuity, compactness for metric spaces, sequential compactness, Bolzano-Weierstrass property, total boundedness, finite intersection property, continuity in relation with compactness, connectedness , components, continuity in relation with connectedness.	

**Books Recommended:**

6. P.K. Jain and Khalil Ahmad: Metric Spaces, 2<sup>nd</sup> Ed., Narosa, 2004
7. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
8. R.R. Goldberg : Real analysis, Oxford & IBH publishing Co., New Delhi, 1970
9. D. Somasundaram and B. Choudhary : A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997
10. Shanti Narayan : A Course of Mathematical Analysis, S. Chand & Co., New Delhi
11. E.T. Copson, Metric Spaces, Cambridge University Press, 1968.
12. G.F. Simmons : Introduction to Topology and Modern Analysis, McGraw Hill, 1963.

## Groups and Rings

**Paper: 12BSM 352**

**Max. Marks:**

$7 \times 4 = 28$
$2 \times 6 = 12$
<b>Total = 40</b>

**Time: 3 Hours**

**Note:** The question paper will consist of **five** sections. Each of the first four sections (**I-IV**) will contain two questions (each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Definition of a group with example and simple properties of groups, Subgroups and Subgroup criteria, Generation of groups, cyclic groups, Cosets, Left and right cosets, Index of a sub-group Coset decomposition, Lagrange's theorem and its consequences, Normal subgroups, Quotient groups,	
Unit-II	Homomorphisms, isomorphisms, automorphisms and inner automorphisms of a group. Automorphisms of cyclic groups, Permutations groups. Even and odd permutations. Alternating groups, Cayley's theorem, Center of a group and derived group of a group.	
Unit-III	Introduction to rings, subrings, integral domains and fields, Characteristics of a ring. Ring homomorphisms, ideals (prime, maximal and Quotient rings, Field of quotients of an integral domain.	
Unit-IV	Euclidean rings, Polynomial rings, Polynomials over the rational field, The Eisenstein's criterion, Polynomial rings over commutative rings, Unique factorization domain, $R$ unique factorization domain implies so is $R[X_1, X_2, \dots, X_n]$	

**Books Recommended:**

3. I.N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
4. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal : Basic Abstract Algebra (2<sup>nd</sup> edition).
5. Vivek Sahai and Vikas Bist : Algebra, Narosa Publishing House.
6. I.S. Luther and I.B.S. Passi : Algebra, Vol.-II, Narosa Publishing House.
7. J.B. Gallian: Abstract Algebra, Narosa Publishing House.



## Dynamics

**Paper: 12BSM 353**

**Max. Marks:**

$7 \times 4 = 28$
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$2 \times 6 = 12$
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<b>Total = 40</b>
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**Time: 3 Hours**

**Note:** The question paper will consist of **five** sections. Each of the first four sections (**I-IV**) will contain two questions (each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Velocity and acceleration along radial, transverse, tangential and normal directions. Relative velocity and acceleration. Simple harmonic motion. Elastic strings.	
Unit-II	Mass, Momentum and Force. Newton's laws of motion. Work, Power and Energy. Definitions of Conservative forces and Impulsive forces.	
Unit-III	Motion on smooth and rough plane curves. Projectile motion of a particle in a plane. Vector angular velocity.	
Unit-IV	General motion of a rigid body. Central Orbits, Kepler laws of motion. Motion of a particle in three dimensions. Acceleration in terms of different co-ordinate systems.	

**Books Recommended:**

2. S.L.Loney : An Elementary Treatise on the Dynamics of a Particle and a Rigid Bodies, Cambridge University Press, 1956
3. F. Chorlton : Dynamics, CBS Publishers, New Delhi
4. A.S. Ramsey: Dynamics Part-1&2, CBS Publisher & Distributors.

## NEW SCHEME

### Scheme of Examination of B.A./B.Sc 6<sup>th</sup> Semester Mathematics (w.e.f. 2014-2015)

### Real and Complex Analysis

**Paper: 12BSM 361**

**Max. Marks:**

**7 x 4 = 28**

**2 x 6 = 12**

**Total = 40**

**Time: 3 Hours**

**Note:** The question paper will consist of **five** sections. Each of the first four sections(**I-IV**) will contain two questions(each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions(each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Jacobians, Beta and Gama functions, Double and Triple integrals, Dirichlets integrals, change of order of integration in double integrals.	
Unit-II	Fourier's series: Fourier expansion of piecewise monotonic functions, Properties of Fourier Co-efficients, Dirichlet's conditions, Parseval's identity for Fourier series, Fourier series for even and odd functions, Half range series, Change of Intervals.	
Unit-III	Extended Complex Plane, Stereographic projection of complex numbers, continuity and differentiability of complex functions, Analytic functions, Cauchy-Riemann equations. Harmonic functions.	
Unit-IV	Mappings by elementary functions: Translation, rotation, Magnification and Inversion. Conformal Mappings, Mobius transformations. Fixed pints, Cross ratio, Inverse Points and critical mappings.	

#### **Books Recommended:**

5. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
6. R.R. Goldberg : Real analysis, Oxford & IBH publishing Co., New Delhi, 1970
7. D. Somasundaram and B. Choudhary : A First Course in Mathematical, Analysis, Narosa Publishing House, New Delhi, 1997
8. Shanti Narayan : A Course of Mathematical Analysis, S. Chand & Co., New Delhi
9. R.V. Churchill & J.W. Brown: Complex Variables and Applications, 5<sup>th</sup> Edition, McGraw-Hill, New York, 1990
10. Shanti Narayan : Theory of Functions of a Complex Variable, S. Chand & Co., New Delhi.

## Linear Algebra

**Paper: 12BSM 362**

**Max. Marks:**

<b>7 x 4 = 28</b>
<b>2 x 6 = 12</b>
<b>Total = 40</b>

**Time: 3 Hours**

**Note:** The question paper will consist of **five** sections. Each of the first four sections (**I-IV**) will contain two questions (each carrying 7 marks) and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions (each carrying 2 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Vector spaces, subspaces, Sum and Direct sum of subspaces, Linear span, Linearly Independent and dependent subsets of a vector space. Finitely generated vector space, Existence theorem for basis of a finitely generated vector space, Finite dimensional vector spaces, Invariance of the number of elements of bases sets, Dimensions, Quotient space and its dimension.	
Unit-II	Homomorphism and isomorphism of vector spaces, Linear transformations and linear forms on vector spaces, Vector space of all the linear transformations Dual Spaces, Bidual spaces, annihilator of subspaces of finite dimensional vector spaces, Null Space, Range space of a linear transformation, Rank and Nullity Theorem,	
Unit-III	Algebra of Linear Transformation, Minimal Polynomial of a linear transformation, Singular and non-singular linear transformations, Matrix of a linear Transformation, Change of basis, Eigen values and Eigen vectors of linear transformations.	
Unit-IV	Inner product spaces, Cauchy-Schwarz inequality, Orthogonal vectors, Orthogonal complements, Orthogonal sets and Basis, Bessel's inequality for finite dimensional vector spaces, Gram-Schmidt, Orthogonalization process, Adjoint of a linear transformation and its properties, Unitary linear transformations.	

**Books Recommended:**

14. I.N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
15. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal : Basic Abstract Algebra (2<sup>nd</sup> edition).
16. Vivek Sahai and Vikas Bist : Algebra, Narosa Publishing House.

I.S. Luther and I.B.S. Passi : Algebra, Vol.-II,  
Narosa Publishing House.

## Numerical Analysis

Part-A (Theory)  
Paper: 12BSM 363

**Max. Marks:**

$5.5 \times 2 = 11$
$5 \times 2 = 10$
$1.5 \times 6 = 9$
<b>Total = 30</b>

**Time: 3 Hours**

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**Note:-** The question paper will consist of **five** sections. Each of the first two sections (**I-II**) will contains two questions (each carrying 5.5 marks). Each of the **IIIrd** and **IVth** sections will contain two questions (each carrying 5 marks). The students shall be asked to attempt **one** question from each section (**I-IV**). **Section-V** will contain **six** short answer type questions (each carrying 1.5 marks) without any internal choice covering the entire syllabus and shall be **compulsory**.

Unit	Contents	No. of Periods
Unit-I	Finite Differences operators and their relations. Finding the missing terms and effect of error in a difference tabular values, Interpolation with equal intervals: Newton's forward and Newton's backward interpolation formulae. Interpolation with unequal intervals: Newton's divided difference, Lagrange's Interpolation formulae, Hermite Formula.	
Unit-II	Central Differences: Gauss forward and Gauss's backward interpolation formulae, Sterling, Bessel Formula. Probability distribution of random variables, Binomial distribution, Poisson's distribution, Normal distribution: Mean, Variance and Fitting.	
Unit-III	Numerical Differentiation: Derivative of a function using interpolation formulae as studied in Sections –I & II. Eigen Value Problems: Power method, Jacobi's method, Given's method, House-Holder's method, QR method, Lanczos method.	
Unit-IV	Numerical Integration: Newton-Cote's Quadrature formula, Trapezoidal rule, Simpson's one-third and three-eighth rule, Chebychev formula, Gauss Quadrature formula. Numerical solution of ordinary differential equations: Single step methods-Picard's method. Taylor's series method, Euler's method, Runge-Kutta Methods. Multiple step methods; Predictor-corrector method, Modified Euler's method, Milne-Simpson's method.	

**Books Recommended:**

1. Babu Ram: Numerical Methods, Pearson Publication.
2. R.S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.
3. M.K. Jain, S.R.K. Iyengar, R.K. Jain : Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
4. M.K. Jain, S.R.K. Iyengar, R.K. Jain : Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
5. C.E. Froberg : Introduction to Numerical Analysis (2<sup>nd</sup> Edition).
6. Melvin J. Maaron : Numerical Analysis-A Practical Approach, Macmillan Publishing Co., Inc., New York
7. R.Y. Rubnistein : Simulation and the Monte Carlo Methods, John Wiley, 1981
8. Radhey S. Gupta: Elements of Numerical Analysis, Macmillan Publishing Co.

**Part-B (Practical)****Max. Marks: 12****Time: 3 Hours**

There will be a separate practical paper which will consist simple programs in C and the implementation of Numerical Methods, studied in the paper 12BSM 363 (Part-A).

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