

ANNAMALAI UNIVERSITY
BACHELOR OF SCIENCE
B.Sc. MATHEMATICS DEGREE COURSE
(2021 - 2022)

The Course of Study and the Scheme of Examinations

S. No.	Part	Study Components		Ins. Hrs / week	Credit	Title of the Paper	Maximum Marks		
		Course Title					CIA	Uni. Exam	Total
SEMESTER I									
1	I	Language	Paper-1	6	4	Tamil/Other Languages	25	75	100
2	II	English (CE)	Paper-1	6	4	Communicative English I	25	75	100
3	III	Core Theory	Paper-1	5	3	Algebra	25	75	100
4	III	Core Theory	Paper-2	5	3	Trigonometry	25	75	100
5	III	Allied -1	Paper-1	4	3	(to choose any 1 out of 4)	25	75	100
6	III	Allied- 1	Practical-1	2	0	(For Practical Allied subjects)	0	0	0
7	III	PE	Paper 1	6	3	Professional English I	25	75	100
8	IV	Environmental Studies		2	2	Environmental studies	25	75	100
		Sem. Total		36	22		175	525	700
SEMESTER II									
8	I	Language	Paper-2	6	4	Tamil/Other Languages	25	75	100
9	II	English (CE)	Paper-2	6	4	Communicative English II	25	75	100
10	III	Core Theory	Paper-3	4	3	Calculus	25	75	100
11	III	Core Theory	Paper-4	4	3	Analytical Geometry of three dimensions	25	75	100
12	III	Allied-1	Paper-2	4	3	(to choose any 1 out of 4) (For Practical Allied subjects)	25	75	100
13	III	Allied Practical - 1	Practical-1	2	2	(to choose any 1 out of 4) (For Practical Allied subjects)	25	75	100
14	III	PE	Paper 1	6	3	Professional English II	25	75	100
15	IV	Value Education		2	2		25	75	100
16	IV	Soft Skill		2	1		25	75	100
		Sem. Total		36	25		225	675	900

ANNAMALAI UNIVERSITY

B.Sc. MATHEMATICS

**SYLLABUS
CBCS PATTERN
(2021 - 2022)**

SEMESTER I

PAPER - 1

ALGEBRA

Objectives

In this Course students are exposed to topics like Theory of Equations, Summation of Series, Matrices, Continued Fractions and Elementary Number Theory. The stress is on the development of problem solving skills.

UNIT-I: THEORY OF EQUATIONS

Polynomial Equations – Relation between roots and coefficients - Symmetric Functions of roots in terms of Coefficients - Transformation of Equations - Reciprocal Equations.

UNIT-II: THEORY OF EQUATIONS (Contd...)

Descartes Rule of Signs - Approximate Solutions of Polynomials by Horner's method - Newton - Raphson method of Solving a Cubic Polynomial.

UNIT-III: SUMMATION OF SERIES

Summation of series using Binomial - Exponential and Logarithmic series (Theorems without proofs) - Approximation using Binomial, Exponential and Logarithmic series - simple problems.

UNIT-IV: MATRICES

Symmetric - Skew Symmetric, - Hermitian - Skew Hermitian - Orthogonal and Unitary Matrices - Eigen Values - Eigen Vectors – Cayley-Hamilton Theorem (without proof) - Similar Matrices - Diagonalisation of a Matrix.

UNIT-V: ELEMENTARY NUMBER THEORY

Prime Number - Composite Number - Decomposition of a Composite Number as a Product of Primes uniquely (without proof) - Divisors of a Positive Integer - Congruence Modulo n - Euler Function (without Proof) - Highest Power of a Prime Number p contained in $n!$ - Fermat's and Wilson's Theorems (statements only) - simple problems.

Recommended Texts

T.K.Manicavachagom Pillay, T.Natarajan and K.S.Ganapathy.(2004) *Algebra*, Volume I & II S.Viswanathan Printers & Publishers Pvt. Ltd. Chennai.

Reference Books

1. P.Kandasamy, K.Thilagavathy (2004), Mathematics for B.Sc. Vol-I, II, III & IV, S.Chand& Company Ltd., New Delhi-55.
2. S.Arumugam (2003) *Algebra*. New Gamma Publishing House, Palayamkottai.
3. A.Singaravelu (2003) *Algebra and Trigonometry*, Vol.-I & II Meenakshi Agency, Chennai.
4. S.Sudha(1998) *Algebra and Trigonometry*, Emerald Publishers, Chennai.

Course Outcomes

At the end of the course the student will be able to

- [1] know the relationship between roots and coefficients.
- [2] identify the nature of the roots of the given equation .
- [3] evaluate sum to infinity of the given binomial, exponential and logarithmic series.
- [4] identify the types of matrices and calculate the Eigen values of a given square matrix.
- [5] know the number theory concepts.

PAPER - 2
TRIGONOMETRY

Objectives

This course is a fundamental one for many courses of this Degree Programme. This covers topics on the expansions of trigonometric functions, hyperbolic functions, inverse circular, inverse hyperbolic functions and it aims to develop computational skills.

UNIT-I

Expansions of $\cos n\theta$, $\sin n\theta$ in powers of $\cos\theta$ and $\sin\theta$ - Expansion of $\tan n\theta$ in powers of $\tan\theta$ - Expansion of $\tan(A+B+C+\dots)$ - Formation of Equations.
Chapter III section 1 to 3

UNIT-II

Powers of sines and cosines of θ in terms of functions of multiples of θ - Expansions of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in a series of ascending powers of θ - Approximation problems - Expansions of Inverse Circular Functions.
Chapter III Sections 4 and 5

UNIT-III:

Hyperbolic Functions: Definition - Relation between Hyperbolic and Circular Functions - Inverse Hyperbolic Functions.
Chapter IV sections 1 to 2.3

UNIT-IV

Resolution into Factors - simple problems only - DeMoivre's Property on the Circle and Cote's Property on the Circle - Logarithm of complex quantities.
Chapter V Sections 2 and 3(Problems only) 4, 4.1, 4.2, 5, 5.1, 5.2.

UNIT-V

Summation of Trigonometric Series: Method of Differences - Angles are in A.P, C+iS method of summation - Gregory Series - Euler Series.
Chapter VI Sections 1, 2, 3, 3.1, 3.2.

Recommended Text

1. S.Narayanan and T.K. Manicavachagom Pillay (2004) *Trigonometry*.S.Viswanathan Printers & Publishers Pvt. Ltd. Chennai.

Reference Books

1. P.Kandasamy, K.Thilagavathy (2004), Mathematics for B.Sc. Vol.-I, II, III & IV, S.Chand & Company Ltd., New Delhi-55.
2. S.Duraipandian and LaxmiDuraipandian (1984) *Trigonometry*. Emerald Publishers, Chennai.
3. B.S.Grewal. (2002) *Higher Engineering Mathematics*. Khanna Publishers. New Delhi.
4. S.L.Loney. (1982) *Plane Trigonometry*, Part II, Cambridge University Press, London.
5. A.Singaravelu (2003) *Algebra and Trigonometry*, Vol.-I Meenakshi Agency, Chennai.
6. P.R.Vittal. (2004) *Trigonometry*, Margham Publications, Chennai.

Course Outcomes

At the end of the course the student will be able to

- [1] know the expansions of $\cos^n\theta$, $\sin^n\theta$ in powers of $\cos\theta$ and $\sin\theta$
- [2] expand powers of sines and cosines of θ in terms of functions of multiples of θ
- [3] know the concept of hyperbolic functions
- [4] know the logarithm of complex quantities
- [5] find the summation of trigonometric series.

SEMESTER II

PAPER - 3

CALCULUS

Objectives

The course introduces students to the fundamental principles, concepts and knowledge in the areas of Differential and Integral Calculus. This prepares the students to apply these fundamental concepts and working knowledge to other courses.

UNIT-I: Differential Calculus

n^{th} derivative - Leibnitz's theorem (Without proof) and its application - Jacobians - Total differential - Maxima and Minima functions of two and three independent variables - Lagrange's method (without proof) - Simple problems.

UNIT-II: Differential Calculus (Contd...)

Polar coordinates – Relation between Cartesian and Polar coordinates - Polar Equation of a Straight line, Circle and Conic only (Related problems not necessary) - Angle between radius vector and tangent – Angle between two curves – Curvature - Radius of Curvature in Cartesian and Polar coordinates.

UNIT-III: Differential Calculus (Contd...)

Centre of Curvature – Evolutes – Envelopes – Asymptotes – General method of finding asymptotes (First Section - Rational algebraic curves only).

UNIT-IV: Integral Calculus

Reduction formula for $\sin^n x$, $\cos^n x$, $\tan^n x$, $\sin^m x \cos^n x$ - Beta and Gamma Functions - Properties and Problems – Definite Integral – Properties - Simple Problems.

UNIT-V: Integral Calculus (Contd...)

Double Integrals - Change of order of Integration - Triple Integrals - Applications to Area, Surface Area and Volume.

Recommended Text

S.Narayanan and T.K.Manicavachagom Pillay (2004) *Calculus*.S.Viswanathan Printers & Publishers Pvt. Ltd. Chennai.

Reference Books

1. P.Kandasamy, K.Thilagavathy (2004), Mathematic for B.Sc. Vol.-I, II, III & IV, S.Chand& Company Ltd., New Delhi-55.
2. Shanti Narayan (2001) *Differential Calculus*. Shyamalal Charitable Trust, New Delhi.
3. Shanti Narayan (2001) *Integral Calculus*.S.Chand& Co. New Delhi.
4. S.Sudha (1998) *Calculus*. Emerald Publishers, Chennai.
5. G.B.Thomas and R.L.Finney. (1998) *Calculus and Analytic Geometry*, Addison Wesley (9thEdn.), Mass. (Indian Print)
6. P.R.Vittal. (2004) *Calculus*, Margham Publication, Chennai.

Course Outcomes

At the end of the course the student will be able to

- [1] determine extreme values of the given function
- [2] know the concept of Cartesian and polar coordinates
- [3] gain the knowledge of curvature, evolutes and envelope concepts
- [4] solve integration problems
- [5] evaluate double and triple integrals.

PAPER - 4

ANALYTICAL GEOMETRY OF THREE DIMENSIONS

Objective:

To deepen the knowledge of the students in various concepts of Analytical Solid Geometry.

Unit I: Plane

General equation of a plane – Equation of a plane in the normal form – Angle between planes – Plane through three given points – Equation of a plane through the line of intersection of two planes.

UNIT II: Straight Line

Symmetrical form of a straight line – Image of a point with respect to a plane – Image of a line with respect to a plane – Length and equation of the shortest distance between two skew lines - Coplanar lines.

UNIT III: Sphere

Equation of the sphere – Length of the tangent – Tangent plane – Section of a sphere by a plane – Orthogonal spheres – Equation of a sphere through a given circle.

UNIT IV: Cone

Equation of a cone with a given vertex and a given guiding curve - Equation of a cone with its vertex at the origin - Condition for the general equation of the second degree to represent a cone - Right circular cone – Enveloping cone - Tangency of a plane to a cone.

UNIT V: Cylinder

Equation of a cylinder with a given generator and a given guiding curve - Right circular cylinder - Enveloping cylinder – Enveloping cylinder as a limiting form of an enveloping cone.

Recommended Text

T.K.Manickavachagom Pillay & others. (2004) *Analytical Geometry* (Three Dimensions)
S.Viswanathan Printers & Publishers Pvt. Ltd. Chennai.

Reference Books

1. P.Duraipandian and LaxmiDuraipandian (1965) *Analytical Geometry-2D*, Asia Publishing company, Bombay
2. P.Duraipandian and LaxmiDuriapandian (1975) *Analytical Geometry-3 D*, Emerald Publishers, Chennai.
3. G.B.Thomas and R.L.Finney.(1998) *Calculus and Analytic Geometry*, Addison Wesley (9thEdn.), Mass. (Indian Print).
4. P.R.Vittal (2003) *Coordinate Geometry*. Margham Publishers, Chennai

Course Outcomes

At the end of the course the student will be able to

- [1] know the equation of the plane and its applications
- [2] gain the knowledge of straight line and its applications
- [3] solve sphere related problems
- [4] know the concepts of cone, right circular cone and enveloping cone
- [5] know the concepts related to cylinder.

ALLIED SUBJECTS FOR MATHEMATICS STUDENTS

To choose any two out of the following Four Allied subjects as Allied I and Allied II. Each Allied subject consists of two papers as paper I and Paper II and one Practical paper.

1. Mathematical Statistics (Paper I and II)
2. Numerical Methods (Paper I and II)
3. Physics (Paper I and II)
4. Chemistry (Paper I and II)

ALLIED
MATHEMATICAL STATISTICS - I

Objective

To apply Statistics Methods for Mathematical Problems.

UNIT-I

Concept of Sample Space - Events - Definition of Probability (Classical, Statistical and Axiomatic) - Addition and Multiplication laws of Probability - Independence of Events - Conditional Probability - Baye's Theorem - Simple Problems.

UNIT -II

Random Variables (Discrete and Continuous) - Distribution Function - Expectation and Moments - Moment Generating Function - Probability Generating Function - Cumulant Generating Function - Simple Problems.

UNIT-III

Characteristic Function - Properties - Uniqueness and Inversion Theorem (Statement only) Chebychev's Inequality - Simple Problems

UNIT-IV

Concept of Bivariate Distribution - Correlation - Karl Pearson's Coefficient of Correlation - Rank Correlation - Linear Regression.

UNIT-V

Standard distributions: Discrete distributions - Binomial, Poisson, Hyper Geometric and Negative Binomial Distributions - Continuous Distributions Normal, Uniform, Exponential.

Recommended text book:

S.C. Gupta & V.K. Kapoor : Fundamentals of Mathematical Statistics, Sultan & sons

Books for Reference

1. Hogg, R.V. & Craig.A.T.(1998) : Introduction to Mathematical Statistics, Macmillan
2. Mood. A.M. Graybill. F.A.&Boes.D.G.(1974) : Introduction to theory of Statistics, McGraw Hill.
3. Snedecor.G.W. & Cochran.W.G.(1967) : Statistical Methods, Oxford and IBH
4. Hoel, P.G (1971): Introduction to Mathematical Statistics, Wiley.
5. Wilks S.S. Elementary Statistical Analysis, Oxford and IBH

ALLIED

MATHEMATICAL STATISTICS II

Objective

To apply Statistics for Mathematical problems

UNIT-I

Statistical Population Census and Sampling Survey - Parameter and Statistics - Sampling and Sampling Distribution and Standard Error. Sampling distributions - students 't', chi - square and F distributions.

UNIT-II

Test of significance - Large sample test for proportion, mean and standard deviation - Exact test based on 't', Chi - square and F distribution with respect to population mean, variance and correlation coefficient - Tests of independence of attributes - goodness of fit tests.

UNIT-III

Point estimation - Concept of unbiasedness, consistency, efficiency and sufficiency - Cramer- Rao Inequality - Methods of Estimation - Maximum Likelihood Estimation - Method of Moments.

UNIT-IV

Test of Hypothesis: Null and Alternate Hypothesis - Type I and Type II error - Power of the test - Neymann Pearson lemma - Likelihood Ratio Test - Concept of Most Powerful test (Statement and Results only) - Simple Problems

UNIT-V

Analysis of Variance - One - way and Two-way Classification - Basic Principles of Design of Experiments - Randomization, Replication, Local Control, Completely Randomized Design, Randomized Block Design and Latin Square Design.

Recommended Text:

S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan & sons

Books for Reference

1. Hogg, R.V. & Craig. A. T. (1998): Introduction to Mathematical Statistics, Macmillan
2. Mood.A.M., Graybill. F.A. & Boes. D.G. (1974): Introduction to theory of Statistics, McGraw Hill.
3. Snedecor. G.W. & Cochran. W.G. (1967): Statistical Methods, Oxford and IBH
4. Hoel. P.G (1971): Introduction to Mathematical Statistics, Wiley.
5. Wilks . S. S. Elementary Statistical Analysis, Oxford and IBH

6. O. Kempthorne - Design of Experiments
7. Das and Giri : Design of Experiments Wiley Eastern

**ALLIED PRACTICAL
MATHEMATICAL STATISTICS**

**ALLIED PRACTICAL
MATHEMATICAL STATISTICS**

1. Measures of location and Dispersion (absolute and relative)
2. Computation of Correlation Coefficient for raw and Grouped data, Rank Correlation Coefficient
3. Computation of Regression Equations for Raw and Grouped Data
4. Curve Fitting by the Method of Least Squares
 - a. $y=ax+b$
 - b. $y=ax^2+bx+c$
 - c. $y=ae^{bx}$
 - d. $y=ax^b$
5. Fitting of Binomial, Poisson, Normal distributions and tests of goodness of fit.
6. Large sample tests with regard to population mean, proportion, standard deviation
7. Exact tests with Respect to Mean, Variance and Coefficient of Correlation
8. Test for Independence of Attributes Based on Chi-Square Distribution
9. Confidence Interval based on Normal, t and Chi-square and F Distributions
10. Problems based on ANOVA-one way and two way Classification
11. Completely Randomized Design
12. Randomized Block Design
13. Latin Square Design

Note

Use of scientific calculator shall be permitted for practical examination. Statistical and Mathematical tables are to be provided to the students at the examination hall.

- Mathematics faculty alone should be appointed as examiners.

Books for Reference

1. Hogg, R.V. & Craig, A.T. (1998): Introduction to Mathematical Statistics, Macmillan.
2. Mood, A.M., Graybill, F.A. & Boes, D.G. (1974) : Introduction to theory of Statistics, McGraw Hill.
1. Snedecor, G.W. & Cochran, W.G. (1967): Statistical Methods, Oxford and IBH
2. Hoel, P.G (1971): Introduction to Mathematical Statistics, Wiley.
3. S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan & sons
4. S.C. Gupta & V.K. Kapoor: Fundamentals of Applied Statistics, Sultan & sons

5. Wilks . S. S. Elementary Statistical Analysis, Oxford and IBH
6. O. Kempthorne - Design of Experiments.

ALLIED PAPERS

NUMERICAL METHODS - I

Objectives

This course will cover basic methods for finding the Finite differences, Central differences, Inverse interpolation, Summation of series, Interpolation for equal & unequal intervals, Solutions of simultaneous equations, Important principles, Method and Processes to get numerical results, Reliability of numerical result.

UNIT-I: Finite Differences

First and higher order differences-forward differences and Backward differences-Properties of operators-Differences of a Polynomial-Factorial Polynomials-Operator E, Relation between Δ , ∇ and E-Interpolation - Newton - Gregory forward & backward formulae for interpolation.

UNIT-II: Central Differences

Central difference Operators-Central differences formulae: Gauss Forward and Backward formulae-Sterling's formula-Bessel's formula.

UNIT-III: Interpolation for Unequal Intervals

Divided differences-Newton's divided differences formula and Lagrange's-Estimating the Missing terms (With one or more missing values).

UNIT-IV: Inverse Interpolation

Lagrange's method and Reversion of series method (Using Newton's forward formula only).

Summation of series: Sum to n term of the series whose general term is the first difference of a function-summation by parts.

UNIT-V: Solutions of Simultaneous Linear Equations

Gauss elimination method-matrix inversion method-Gauss-Jordan Method, Gauss-Seidal method (Three unknowns only).

Recommended Text

1. B.D. Gupta.(2001) *Numerical Analysis*.Konark Pub. Ltd., Delhi
2. M.K. Venkataraman. (1992) *Numerical methods for Science and Engineering* National Publishing Company, Chennai.

Reference Books

1. S. Arumugham. (2003) *Numerical Methods*, New Gamma Publishing, Palamkottai.
2. H.C. Saxena. (1991) *Finite differences and Numerical analysis* S.Chand & Co.,

Delhi

3. A.Singaravelu (2004). *Numerical Methods* Meenakshi Agency, Chennai
4. P.Kandasamy, K.Thilagavathy (2003) *Calculus of Finite difference & Numerical Analysis*, S. Chand & Company Ltd., New Delhi-55.

NUMERICAL METHODS II

Objectives

This course covers the techniques of Numerical Differentiation and Numerical Integration. It also deals with solution of difference equations, Algebraic and Transcendental equations and Numerical solution of Ordinary differential equations of first order.

UNIT-I: Numerical Differentiation

Newton's forward and backward differences to compute derivatives-derivative using divided differences formula-maxima and minima using the above formulae.

UNIT-II: Numerical Integration

General Quadrature formula-Trapezoidal rule-Simpson's one third rule-Simpson's three-eighth rule, Weddle's rule- Euler-Maclaurin Summation Formula

UNIT-III: Difference Equations

Linear differences equations-Linear homogeneous difference equation with constant co-efficient-Particular integrals for a^x , x^m , $\sin ax$, $\cos ax$ and $a^x f(x)$.

UNIT-IV: Solution of Algebraic and Transcendental Equations

Bisection method-Iteration method-Regula-falsi method (False Position Method)-Newton-Rapson Method.

UNIT-V: Numerical Solution of Ordinary Differential Equations (First order only)

Euler's method- Euler's modified method-Picard's method - Taylor's methods-Runge-Kutta method (Fourth order only).

Recommended Text

1. B.D. Gupta. (2001) *Numerical Analysis*. Konark Pub. Ltd., Delhi
2. M.K.Venkataraman. (1992) *Numerical methods for Science and Engineering* National Publishing Company, Chennai.

Reference Books

1. Gupta-Malik, Calculus of finite differences and numerical Analysis, KrishbaPrakashanMandir, Meerut Seventh Edition.
2. S.C.Saxena, Calculus of finite differences and Numerical Analysis, S.Chand& Co., New Delhi. IX Edition.
3. A.Singaravelu, Numerical methods, Meenakshi Publications-First Edition 1992.
4. P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite Difference & Numerical Analysis, S.Chand& Company Ltd., New Delhi-55.

**ALLIED PRACTICAL
NUMERICAL METHODS**

LIST OF PROBLEMS

1. Derivatives by Newton's method
2. Gauss elimination method.
3. Gauss-Jacobi method.
4. Gauss-Siedel method.
5. Newton's forward and backward interpolation.
6. Lagrange interpolation.
7. Trapezoidal and Simpson one-third rules.
8. Euler's method.
9. Picard's method
10. Runge-Kutta's method.

**ALLIED
PHYSICS
PAPER-1**

Course Objectives

1. To understand the basics of gravitation and to study the properties of matter.
2. To learn the law of thermoelectric circuits and thermoelectric diagrams.
3. To teach the growth and decay of a transient current and magnetometer.
4. To explain production of ultrasonics and reverberation time.
5. To know the basics of laser and fibre optics principles and applications.

UNIT-1: Properties of Matter

Gravitation: Acceleration due to gravity -Determination of 'g' by Simple pendulum - Drawbacks of simple pendulum –Determination of time period of compound pendulum - 'g' by compound pendulum -Centre of Oscillation and Centre of Suspension are interchangeable-Determination of 'g' by Bar/compound pendulum.

Elasticity: Bending of beams -Expression for bending moment - Cantilever Depression at the loaded end of a cantilever Expression for Young's modulus -non-uniform bending-Pin and microscope method.

Torsion : Torsion couple – Potential energy in a twisted wire – Torsional pendulum – Time period -Determination of rigidity modulus by Torsional oscillation (without masses).

Viscosity: Viscosity of a liquid -Viscous force - Co-efficient of viscosity of a liquid – Poiseuille's formula -Experimental method using Burette- Effect of temperature and pressure on viscosity-applications.

Surface Tension: Surface tension of a liquid-Surface Tension and interfacial surface tension by the method of drops-applications.

UNIT-2: Thermo Electricity

Seeback, Peltier and Thomson effects - laws of thermoelectric circuits -Peltier coefficient - Thomson coefficient -application of thermodynamics to a thermocouple and expressions for Peltier and Thomson coefficients -thermo electric power and thermo electric diagrams.

UNIT-3: Transient Current and Magnetism

Growth and decay of current in a circuit containing resistance and inductance- Growth and decay of charge in circuit containing resistance and capacitor - growth and decay of charge in a LCR circuit – condition for the discharge to be oscillatory – frequency of oscillation.

Magnetism -Magnetic moment and pole strength of a magnet – Deflection magnetometer – Tan C Position- Vibration magnetometer – Theory – Period of Oscillation – Determination of M and B_H using the deflection magnetometer and the vibration magnetometer .

UNIT -4: Acoustics

Sound: Transverse vibration of strings -Velocity and frequency of vibrations of a stretched string -laws -Sonometer -A.C. Frequency - Steel wire- Brass wire.

Introduction to Ultrasonics – Piezo electric effect–production by Piezo electric method – properties –applications- Acoustics of buildings – reverberation time – derivation of Sabine's formula – determination of absorption coefficient-Acoustic aspects of halls and auditoria.

UNIT-5:Lasers and Fibre Optics

Laser: Introduction - Principles of laser -Einstein's explanation for stimulated emission – Differences between stimulated and spontaneous emission - Population inversion –Properties of laser -Types of lasers - He- Ne Laser - Semiconductor Laser-Applications of laser.

Fibre optics: Basic principle of an optical fibre -Total internal reflection -Basic structure of an optical fibre -Numerical aperture –Coherent bundle – Attenuation and dispersion - classification of optical fibres-step index and graded index fibers – single mode and multi mode fibers-Fibre optic communication system block diagram.-applications.

Text Books

Unit 1 and Unit 4

1. R. Murugesan and KiruthigaSivaprasath, Properties of Matter and Acoustics, S. Chand & Co. New Delhi, Kindle edition.

Unit 2 and Unit 3

1. R. Murugesan, Electricity & Magnetism, S. Chand & Co. New Delhi, 2019.

Unit 5

1. N Subrahmanyam, BrijLal and M.N Avadhanulu, A Text Book of Optics, S. Chand &Co. New Delhi, Revised Edition as per UGC model syllabus.

Reference Books

1. BrijLal and N Subrahmanyam,Electricity and Magnetism, S Chand & Company Pvt Ltd, New Delhi, 2000.
2. D.C. Tayal, Electricity and Magnetism, Himalaya Publishing House,Bombay, 2014.
3. BrijLal and N.Subrahmanyam, A Text Book of Sound,Vikas Publications, New Delhi (2 Edition)
4. C.L.Arora, Physics for Degree Students B.Sc First Year, S. Chand Publishing, 2013.
5. K.Thyagarajan and Ajay Ghatak, Introduction to Fibre optics-, Cambridge University.

6. Ajay Ghatak and K.Thyagarajan, Fiber optics and Lasers-The two revolutions, Macmillan, 2006.
7. K.Thyagarajan and Ajay Ghatak, Lasers; Fundamentals and applications, Springer.
8. Modern Physics – R,Murugesan, KiruthigaSivaprasath, S.Chand&Co, New Delhi, 2016.

E-MATERIALS

1. <https://courses.lumenlearning.com/physics/chapter/16-4-the-simple-pendulum/>
2. https://www.youtube.com/watch?v=aw0_seEt4v0
3. https://en.wikipedia.org/wiki/Thermoelectric_effect
4. https://www.youtube.com/watch?v=S0I37M2sx_0
5. <https://physicscatalyst.com/electromagnetism/growth-and-decay-charge-R-C-circuit.php>
6. <https://www.youtube.com/watch?v=PLQQPXot6vE>
7. https://www.youtube.com/watch?v=d0_Eff4MXwM
8. <https://www.techglads.com/cse/sem1/production-of-ultrasonics-by-piezoelectric-methods/>
9. https://thefactfactor.com/facts/pure_science/physics/optical-fibre/5159/
10. <https://www.youtube.com/watch?v=auk1OS0SVWc> (Tamil video)

Course Objectives

1. After studied unit-1, the student will be able to find the acceleration due to gravity at a place using simple pendulum and compound pendulum. Also can know the properties of matter like elasticity, viscosity and surface tension.
2. After studied unit-2, the student will be able to learn thermo emf using Seebeck and Peltier effects and hence understand thermoelectric circuits.
3. After studied unit-3, the student will be able to explain growth and decay of a transient current in a circuit containing resistance-inductance, resistance-capacitance and LCR in series. Also will be able to determine the horizontal components of earth's magnetic induction at a place using deflection magnetometer in Tan C position.
4. After studied unit-4, the student will be able to derive the expression for the velocity of a sound in a stretched string and hence they can determine the frequency of A.C mains.
5. After studied unit-5, the student will be able to understanding the principle of laser and can demonstrate the working of He-Ne laser and applications of laser. Also, the student will be able to learn the fibre optics, structure and application in communication.

**ALLIED
PHYSICS
PAPER-2**

Course Objectives

1. To study the concept of special theory of relativity.
2. To expose the structure of atom with different models.
3. To know the definition of binding energy and to study about nuclear models
4. To learn the different number system in digital electronics and logic gates
5. To give an introduction about nanomaterial.

UNIT-1: Special Theory of Relativity

Frames of reference-inertial frames and non-inertial frames -Galilean transformations - Michelson-Morley experiment-interpretation of results - postulates of special theory of relativity Lorentz transformation equations -length contraction - time dilation - transformation of velocities -variation of mass with velocity -Mass-energy equation.

UNIT-2: Atomic Physics

Bohr atom model – Critical Potentials - Experimental determination of critical potentials - Franck and Hertz's experiment -Sommerfield's Relativistic atom model The vector atom model – spatial quantization–spinning of an electron –quantum numbers associated with the vector atom model – coupling schemes –LS and jj coupling – the Pauli's exclusion principle – Stern and Gerlach experiment

UNIT-3: Nuclear Physics

Binding energy-Binding energy per nucleon-Packing fraction-Nuclear models – liquid drop model – semi empirical mass formula – merits and demerits -shell model -evidences for shell model – nuclear radiation detectors –ionization chamber – G.M Counter-Wilson cloud chamber-Particle accelerators-Cyclotron-Betatron.

Unit-4: Digital Electronics

Number systems -Decimal, Binary, Octal and Hexadecimal system – Conversion from one number system to another- Binary Arithmetic -Addition –Subtraction- 1's and 2's complement -Binary codes- BCD code – Excess 3 code, Gray code.

NAND, NOR and EXOR – functions and truth tables. NAND & NOR as universal gates-Half adder and Full adder - Half subtractor and Full subtractor using NAND gate only.

UNIT-5: Nanomaterial

Introduction-Nanomaterial- Properties of nanomaterial (size dependent) -synthesis of nanomaterial- sol gel- hydrothermal method-Scanning Electron Microscope (SEM)- Principle and Instrumentation-Fullerenes- Carbon nanotubes- Fabrication and structure of carbon nanotubes - Properties of carbon nanotubes (Mechanical and Electrical) - Applications ofCNT's.

Text Books

Unit 1 to Unit 3

1. Modern Physics – R,Murugesan, KiruthigaSivaprasath, S.Chand&Co, New Delhi, 2016

Unit 4

1. V.Vijayendran, Introduction to Integrated Electronics (Digital & Analog), S. Viswanathan, Printers & Publishers Private Ltd, Chennai, 2007

Unit 5

1. V. Raghavan, *Material Science and Engineering* ,Printice Hall India.,2004.

Reference Book

1. Allied Physics – R. Murugesan S. Chand & Co. New Delhi, 2005.
2. A Text book of Digital electronics – R.S.Sedha, S.Chand&Co, 2013
3. Malvino and Leech, Digital Principles and Application, 4th Edition, Tata McGraw Hill, New Delhi, 2000.
4. Dr. M.N. Avadhanulu, *Material science*, S.Chand& Company, New Delhi, 2014.
5. M.Arumugam, *Material science*, Anuradhapublishers, 1990.
6. V. Rajendran, *Material Science*, Tata McGraw Hill Ltd, New Delhi,2001.
7. D.C.Tayal, Nuclear Physics, Himalaya Publishing House, 2009

E-MATERIALS

1. https://en.wikipedia.org/wiki/Galilean_transformation
2. https://www.youtube.com/watch?v=NH3_IkSB9s
3. <https://www.youtube.com/watch?v=EEWuUst2GK4>
4. https://en.wikipedia.org/wiki/Vector_model_of_the_atom
5. <https://www.tutorialspoint.com/what-is-a-geiger-muller-counter>
6. <https://www.youtube.com/watch?v=jxY6RC52Cf0>
7. https://www.tutorialspoint.com/digital_circuits/digital_circuits_number_systems.htm
8. <https://www.youtube.com/watch?v=4ae9sJBBkvw>
9. <https://en.wikipedia.org/wiki/Nanomaterials>
10. <https://www.youtube.com/watch?v=mPxoJz6treE> (Tamil video)

Course Outcomes

1. After studied unit-1, the student will be able to study the frames of reference, Galilean transformation equations and special theory of relativity.
2. After studied unit-2, the student will be able to describe the different atomic models and Stern and Gerlach Experiment.
3. After studied unit-3, the student will be able to explain binding energy, liquid drop model, G.M counter and particle accelerators.
4. After studied unit-4, the student will be able to know the conversion of number systems from one to other and also will be able to design universal gates using NAND and NOR gates.
5. After studied unit-5, the student will be able to understanding the basics of nanomaterial, synthesis and its applications.

ALLIED PRACTICAL- PHYSICS

ALLIED PRACTICAL- PHYSICS

List of Experiments (Any 12 Experiments only)

1. Determination of 'g' using Compound pendulum.
2. Young's modulus-Non-Uniform bending-Pin & microscope
3. Rigidity Modulus – Torsional oscillation method (without masses).
4. Rigidity Modulus – Static Torsion method using Scale and Telescope.
5. Surface tension and Interfacial Surface tension by Drop Weight method.
6. Sonometer – Frequency of a Tuning fork.
7. Sonometer –Determination of A.C. frequency- using steel and brass wire
8. Air Wedge – Determination of thickness of a thin wire
9. Newton's Rings – Radius of Curvature of a convex lens.
10. Spectrometer – Refractive index of a liquid – Hollow prism.
11. Spectrometer grating – Minimum Deviation- Wavelength of Mercury lines.
12. Potentiometer – Calibration of Low range voltmeter.
13. Deflection magnetometer and Vibration magnetometer-Tan C Position-Determination of m and B_H .
14. Figure of merit- Table galvanometer.
15. Construction of AND, OR gates using diodes and NOT gate using a transistor.
16. NAND/NOR as universal gate.
17. Half adder and Full adder using NAND gate.
18. Half subtractor and Full subtractor using NAND gate.
19. Lasers: Study of laser beam parameters.
20. Measurement of Numerical aperture (NA) of a telecommunication graded index optic fiber.
21. Fiber attenuation of a given optical fiber.

Text Books

1. C.C. Ouseph, U.J. Rao, V. Vijayendran, Practical Physics and Electronics, S. Viswanathan, Printers & Publishers Private Ltd, Chennai, 2018.
2. M.N.Srinivasan, S. Balasubramanian, R.Ranganathan, A Text Book of Practical Physics, Sultan Chand & Sons, New Delhi, 2015.

Reference Books

1. Dr. S. Somasundaram, Practical Physics, Apsara Publications, Tiruchirapalli, 2012.
2. R. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi, 2011.

ALLIED
PAPER – 1
CHEMISTRY – I

OBJECTIVE:

- Basic knowledge on Metallurgy, Cycloalkanes, Polarising Effects, Stereochemistry, Chemical Kinetics, Catalysis, Photochemistry, VSEPR Theory, Fuels, Osmosis, Nuclear Chemistry, Petroleum Chemistry, Chemistry of Naphthalene, Conductors and Applications wherever necessary are to be taught for I- Semester.

UNIT – I

1.1 General Metallurgy - Extraction of Metals - Minerals and Ores- Difference between Minerals and Ores – Minerals of Iron, Aluminum and Copper - Ore Dressing or Concentration of Ores - Types of Ore Dressing- Froth Floatation process, Gravity separation and Magnetic separation.

1.2 Calcination, Smelting, Roasting, Flux, Slag - Definition - Reduction methods - Goldschmidt Aluminothermic process and Carbon Reduction method - Refining of Metals - Electrolytic, Van Arkel and Zone Refining.

1.3 Ores of Titanium and Cobalt - Extraction of Titanium and Cobalt.

UNIT – II

2. Cycloalkanes - Preparation – Wurtz reaction and Dieckmann's condensation - Properties of Cycloalkanes – Substitution and Ring opening reactions.

2.2 Polarisation - Inductive effect, Mesomeric effect and Steric effect (Acid and Base Strength).

2.3 Stereoisomerism – Types - Cause of Optical Activity – Enantiomers - Diastereomers - Meso form - Optical Activity of Lactic acid and Tartaric acid - Racemisation and Resolution – Definition and Methods - Geometrical isomerism – Definition and example - Maleic and Fumaric acid – Differences.

UNIT – III

3.1 Chemical Kinetics – Rate of a reaction – Definition of Order and Molecularity – Distinction between Order and Molecularity - Derivation of First order rate equation - Half Life Period of first order reaction.

3.2 Catalysis - Catalyst - Autocatalyst - Enzyme catalyst - Promoters - Catalytic poisons –
Active Centre - Differences between Homogeneous and Heterogeneous Catalysis - Industrial Applications of Catalysts.

3.3 Photochemistry – Grothus-Draper’s law – Stark-Einstein’s law - Quantum yield – Photosynthesis - Phosphorescence – Fluorescence.

UNIT – IV

4.1 VSEPR Theory – Hybridisation and Shapes of simple molecules BF_3 , PCl_5 , SF_6 and XeF_6 .

4.2 Fuels – Classification of Fuels - Calorific value of Fuels – Water gas, Carbureted Water gas and Producer gas – Composition and Uses - Non-Conventional fuels - Need of Solar Energy - Applications - Biofuels – Oil gas, Natural gas and LPG – Uses.

4.3 Osmosis - Osmotic pressure - Reverse osmosis – Definition - Desalination of Sea water.

UNIT – V

5.1 Nuclear Chemistry – Atomic number, Mass number - Isotopes, Isobars and Isotones – Definition and Examples - Definition of Half life period - Nuclear Binding Energy, Mass Defect and N/P ratio - Nuclear Fission and Nuclear Fusion (Elementary idea) - Applications of Radioisotopes in Medicine, Agriculture and Industries – Carbon Dating.

5.2 Crude Oil - Petroleum - Petroleum Refining - Cracking - Applications of Cracking

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Naphthalene – Preparation – Haworth's method – Properties – Oxidation, Reduction and Uses of Naphthalene - Structure of Naphthalene (Structural elucidation not necessary).

5.3 Conductors, Insulators, Semiconductors, N- and P- Type Semiconductors – Definitions and Examples.

ALLIED PAPER – 2

CHEMISTRY – II

OBJECTIVE:

- Basic knowledge on Coordination Chemistry, Industrial Chemistry, Carbohydrates, Aminoacids, Proteins, Electrochemistry, Paints and Pigments, dyes, Vitamins, Medicinal Chemistry, Corrosion and Applications wherever necessary are to be taught for II- semester.

UNIT – I

1.1 Coordination Chemistry - Nomenclature of Coordination Compounds - Ligands, Central Metal Ion and Complex Ion – Definition and Examples – Coordination Number - Werner’s Theory of Coordination Compounds - Chelates - Functions and Structure of Haemoglobin and Chlorophyll.

1.2 Industrial Chemistry - Fertilisers and Manures – Biofertilisers - Organic Manures and their importance - Role of NPK in plants - Preparation and Uses of Urea, Ammonium Nitrate, Potassium Nitrite and Super Phosphate of Lime.

1.3 Contents in Match Sticks and Match Box - Industrial making of Safety Matches – Preparation and Uses of Chloroform, DDT, Gammexane and Freons.

UNIT – II

2.1 Carbohydrates - Definition and Examples - Classification – Oxidation and Reduction Reactions of Glucose - Structure of Glucose (Structural elucidation not necessary) - Uses of Starch - Uses of Cellulose Nitrate and Cellulose Acetate.

2.2 Amino Acids – Definition and Examples - Classification of Amino Acids -

Preparation - Gabriel Phthalimide Synthesis – Properties – zwitterion and Isoelectric point - Structure of Glycine.

2.3 Proteins – Definition - Classification of Proteins based on Physical properties and Biological functions - Primary and Secondary Structure of Proteins (Elementary Treatment only) – Composition of RNA and DNA and their Biological role - Tanning of Leather - Alum (Aluminum chloride tanning) - Vegetable tanning – Chrome Tanning.

UNIT – III

3.1 Electrochemistry - Electrolytes – Definition and Examples – Classification - Specific and Equivalent Conductance - their determination – Variation of Specific and Equivalent conductance with Dilution – Ostwald’s Dilution Law and its Limitations.

3.2 Kohlrausch’s Law - Determination of Dissociation Constant of weak Electrolytes using Conductance measurement - Conductometric titrations.

3.3 pH – Definition and pH determination by indicator method - Buffer solutions - Buffer action - Importance of buffers in the living systems.

UNIT – IV

4.1 Paints - Components of Paint – Requisites of a Good Paint - Pigments – Classification of Pigments on the basis of Colour – Examples - Dyes – Definition – Chromophores and Auxochromes – Examples - Colour and Dyes - Classification based on Constitution and Application – Examples.

4.2 Vitamins – Definition – Classification – Water Soluble and Fat Soluble –

Occurrence - Biological Activities and Deficiency Diseases caused by Vitamin A, B, C, D, E and K - Hormones – Definition and Examples – Biological Functions of Insulin and Adrenaline.

4.3 Chromatography - Principles and Applications of Column and Paper chromatography- R_f value.

UNIT – V

5.1 Drugs - Sulpha Drugs – Preparation and Uses of Sulphapyridine and Sulphadiazine - Mode of Action of Sulpha Drugs - Antibiotics - Uses of Penicillin, Chloramphenicol and Streptomycin - Drug Abuse and Their Implication - Alcohol – LSD.

5.2 Anaesthetics - General and Local Anaesthetics - Antiseptics - Examples and their Applications - Definition and One Example each for Analgesics, Antipyretics, Tranquilizers, Sedatives - Causes, Symptoms and Treatment of Diabetes, Cancer and AIDS.

5.3 Electrochemical Corrosion and its Prevention – Electroplating – Applications.

ALLIED PRACTICAL CHEMISTRY

VOLUMETRIC ANALYSIS

1. Estimation of HCl – Standard sulphuric acid.
2. Estimation of Borax - Standard Sodium Carbonate.
3. Estimation of NaOH – Standard Oxalic Acid.
4. Estimation of FeSO₄ – Standard FAS.
5. Estimation of Oxalic acid – Standard FeSO₄.
6. Estimation of FAS – Standard Oxalic Acid.
7. Estimation of Oxalic acid – Standard Oxalic Acid.
8. Estimation of Fe²⁺ using Diphenylamine / N- Phenyl Anthranilic acid as indicator.

ORGANIC ANALYSIS

Systematic Analysis of Organic Compounds containing One Functional Group and Characterisation by Confirmatory Tests.

Reactions of Aromatic Aldehyde, Carbohydrates, Mono and Dicarboxylic acids,

Phenol, Aromatic Primary Amine, Amide and Diamide.

REFERENCE BOOKS

- ❖ Inorganic Chemistry - P. L. Soni - Sultan Chand (2006).
- ❖ Inorganic Chemistry - B. R.. Puri, L. R. Sharma and K. C. Kallia – Milestone Publications (2013).
- ❖ Selected Topics in Inorganic Chemistry - W. U. Malik, G. D. Tuli and R. D. Madan - S. Chand Publications (2008).
- ❖ Text Book of Inorganic Chemistry – R. Gopalan, Universities Press – 2012.
- ❖ Text Book of Organic Chemistry - P. L. Soni - Sultan Chand & Sons - 2007.
- ❖ Advanced Organic Chemistry - Bahl and Arun Bahl - Sultan Chand and Co. Ltd – 2012.

- ❖ Organic Reaction Mechanisms - Gurdeep Chatwal- Himalaya Publishing House.
- ❖ A Text Book of Organic Chemistry K. S. Tewari, N. K. Vishol, S. N. Mehrotra-Vikas Publishing House – 2011.
- ❖ Principles of Physical Chemistry - B. R. Puri, Sharma and Madan S. Pathania, Vishal Publishing Company – 2013.
- ❖ Text Book of Physical Chemistry - P. L. Soni, O. P. Dharmarha and U. N. Dash - Sultan Chand & Co – 2006.
- ❖ Understanding Chemistry – C. N. R. Rao, Universities Press – 2011.
