Course Name: Bachelor of Science
Discipline: Mathematics
(For those who joined in June 2024 and later)

COURSE OBJECTIVES:

The syllabus for B.Sc. Mathematics degree under semester system has been designed on the basis of Choice Based Credit System, (CBCS) which will help the students to go for higher studies in any reputed institution all over India and to form a platform to prepare for any National level tests or any career development programs.

To enable the students to understand various applications of Mathematics in Real life as well as in any other allied subjects like Physics, Chemistry etc.

ELIGIBILITY FOR ADMISSION:

Candidate should have passed the Higher Secondary Examination conducted by the Board of Higher Secondary Education, Govt. of Tamil Nadu or any other Examinations accepted by the Syndicate as equivalent there to with Mathematics as one of the Subjects.

DURATION OF THE COURSE: Three Years

COURSE SCHEME:

I year B.SC. MATHEMATICS

Semester	Part	Subject Name	Hours	Credit	Int + Ext =Total	Local	Regional	National	Global	Professional Ethics	Gender	Human Values	Environment & Sustainability	Employability	Entrepreneurship	Skill Development	Subject Code	Revised / New / No Change / Interchanged & Percentage of Revision
I	Part I	Tamil	6	3	25+75=100												**U24PT11**	**New**
	Part II	English	6	3	25+75=100												U23PE11	No Change
	Core 1	**Theory of Equations and Trigonometry**	5	4	25+75=100	✔	✔	✔	✔					✔	✔	✔	**U24MAC11**	**New**
	Core2	**Calculus**	5	4	25+75=100	✔	✔	✔	✔					✔	✔	✔	**U24MAC12**	**New**

	SBE 1	**Applications of Calculus**	2	2	25+75=100	✔	✔	✔	✔					✔	✔	✔	**U24MAS11**	**New**
	Allied 1	**Mechanics, Properties of Matter and Sound / General Chemistry-I**	4	4	25+75=100												**U24PHAX11/ U24CHAX11**	**Mark Change**
	Allied 1 Lab	**LAB**: Physics Practical –I / Volumetric Analysis	2	-	40+60=100												-	-
	Total		**30**	**20**														
II	Part I	**Tamil**	6	3	25+75=100												**U24PT21**	**New**
	Part II	English	6	3	25+75=100												U23PE21	No Change
	Core 3	**Differential Equations**	5	4	25+75=100	✔	✔	✔	✔					✔	✔	✔	**U24MAC21**	**New**
	Core4	Analytical Geometry 3D and Vector Calculus	5	4	25+75=100	✔	✔	✔	✔					✔	✔	✔	U23MAC22	No Change
	SBE 2	**Applications of Vector Calculus**	2	2	25+75=100	✔	✔	✔	✔					✔	✔	✔	**U24MAS21**	**New**
	Allied 2	**Thermal Physics** / General **Chemistry-II**	4	4	25+75=100												**U24PHAX21/ U24CHAX21**	**Revised 40%/ Revised 5%**
	Allied 2 Lab	**LAB: Physics Practical –I** / Volumetric Analysis	2	2	40+60=100												**U24PHAXP21** / U23CHAXP21	**Revised 25%/** No Change
	Total		**30**	**22**														

Semester	Part	Subject	Hours	Credit	Int +Ext = Total	Subject Code	Courses having focus on employability/ entrepreneurship/ skill development
III	Part I	Tamil / Hindi	6	3	25+75=100		
	Part II	English	6	3	25+75=100		
	Core 5	Sequences and Series	4	4	25+75=100		employability/ entrepreneurship/ skill development
	Allied 3	Electricity & Electronics /General Chemistry – III	4	4	25+75=100		
	Allied 3 Lab	LAB: Physics Practical – II / Organic Qualitative Analysis	2	--	--		
	Allied 4	Numerical Methods	6	4	25+75=100		employability/ entrepreneurship/ skill development
	SBE 3	Applications of Differential Equations and Laplace Transforms	2	2	25+75=100		employability/ entrepreneurship/ skill development
	SL	Value Education	--	3	25+75=100		
IV	Part I	Tamil / Hindi	6	3	25+75=100		
	Part II	English	6	3	25+75=100		
	Core 6	Modern Algebra	6	4	25+75=100		employability/ entrepreneurship/ skill development
	Allied 5	Optics, Spectroscopy & Modern Physics / General Chemistry – IV	4	4	25+75=100		
	Allied 5 Lab	LAB: Physics Practical – II / Organic Qualitative Analysis	2	2	40+60=100		
	Allied 6	Mechanics	4	4	25+75=100		employability/ entrepreneurship/ skill development
	Allied 6 Practical	LAB: Numerical Methods and Mechanics	2	**1**	40+60=100		employability/ entrepreneurship/ skill development
	SL	Environmental Studies	--	2	25+75=100		

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Courses having focus on employability/ entrepreneurship/ Skill development
V	Core 7	Graph Theory and its Applications	5	4	25+75=100		employability/ entrepreneurship/ Skill development
	Core 8	Linear Algebra and Matrices	5	4	25+75=100		employability/ entrepreneurship/ skill development
	Core 9	Real Analysis	5	4	25+75=100		employability/ entrepreneurship/ skill development
	Allied 7	Theory of Numbers	6	4	25+75=100		employability/ entrepreneurship/ skill development
	Elective 1	Linear Programming	5	5	25+75=100		employability/ entrepreneurship/ Skill development

	SBE – 4	Employability Skills	2	2	25+75=100		Skill development
	NME – 1	Fundamentals of Mathematics	2	2	25+75=100		employability/ entrepreneurship/ skill development

Semester	Part	Subject	Hour	Credit	**Int+Ext= Total**	Subject Code	Courses having focus on employability/ entrepreneurship/ Skill development
VI	Core 10	Complex analysis	6	5	25+75=100		employability/ entrepreneurship/ skill development
	Core 11	Probability Distributions	6	5	25+75=100		employability/ entrepreneurship/ skill development
	Core 12	Operations Research	6	5	25+75=100		employability/ entrepreneurship/ skill development
	Allied 8	Project	6	5	100+0=100		employability/ entrepreneurship/ skill development
	SBE – 5	Transformation Techniques	2	2	25+75=100		employability/ entrepreneurship/ skill development
	SBE – 6	Statistics	2	2	25+75=100		employability/ entrepreneurship/ skill development
	NME – 2	Statistics and Operations Research	2	2	25+75=100		employability/ entrepreneurship/ skill development

SEMESTER I

Core - 1

Course Title: THEORY OF EQUATIONS AND TRIGONOMETRY	**Total Hours: 75** **Contact Hours per Week : 5**
Course Code: U24MAC11	**Total Credits: 4**

Objectives:

- To develop skills of solving algebraic equations.
- To impart basic knowledge about hyperbolic functions and properties.

Course Outcomes:
On completing this course, students can/are

Cos	CO Statements
CO1:	Capable of solving algebraic equations using the relations between the roots and coefficients.
CO2:	Get skills in transforming equations in one form into another.
CO3:	Capable of finding the solutions of numerical equations using Horner's method.
CO4:	Perform expansion of sinθ, cosθ tanθ and power of sinθ and cosθ, in terms of

	functions of multiples of θ.
CO5:	Understand hyperbolic functions and logarithm of complex numbers.

Unit I **[15 Hours]**

Introduction-Remainder Theorem - Nature of roots - Relations between the roots and the coefficients of equations.

[Text Book 1 : Chapter 6 - § 1 to 11]

Unit II **[15 Hours]**

Symmetric function of the roots - Sum of powers of the roots of an equation - Transformations of equations : Reciprocal equations.

[Text Book 1 : Chapter 6 - § 12, 13, 15 - 15.1, 15.2, 15.3, 16 - 16.1, 16.2]

Unit III **[15 Hours]**

To increase or decrease the roots of a given equation by a given quantity – Form of quotient and reminder when a polynomial is divided by a binomial - Removal of terms - Horner's method.

[Text Book 1 : Chapter 6 - § 17, 18, 19, 30]

Unit IV **[15 Hours]**

Expansions of $\cos n\theta$ and $\sin n\theta$ - Expansion of $\tan n\theta$ in powers of $\tan\theta$ – Expansion of $\tan(A+B+C+\cdots)$ - Powers of sines and cosines of θ interms of functions of multiples of θ - Expansions of $\sin^n\theta$ & $\cos^n\theta$ in a series of ascending powers of θ.

[Text Book 2 : Chapter III - § 1, 2, 3, 4, 5]

Unit V **[15 Hours]**

Hyperbolic functions : Definition - Relations between hyperbolic functions - Relation between hyperbolic functions and circular functions – Inverse hyperbolic functions – logarithms of complex quantities : Definition – Logarithm of $(x+iy)$- General value of logarithm of $(x+iy)$.

[Text Book 2 : Chapter IV - All Articles, Chapter 5 - § 5 – 5.1, 5.2]

Text Books :

1. T. K. Manicavachagam Pillai, T. Natarajan & K. S. Ganapathy, Algebra - Volume 1, S. Viswanathan & Company, 2015.
2. S.Narayanan and T. K. Manicavachagam Pillay,Trigonometry (for B.Sc Mathematics Major), S. Viswanathan & Company, 2014.

Reference Books :

1. S. Arumugam, Algebra, Scitech Publishers, Chennai.
2. S. Arumugam, Trigonometry and Fourier Series, Scitech Publishers, Chennai.
3. S L Loney, Plane Trigonometry Part-1, Arihant Publications; Sixth edition, 2016.
4. H.S.Hall and S.R.Knight, Higher Algebra, Seventh Edition, Arihant Publications, 2022, Meerut, India.

Core - 2

Course Title: CALCULUS	**Total Hours: 75** **Contact Hours per Week : 5**
Course Code: U24MAC12	**Total Credits: 4**

Objectives:

- To introduce the n^{th} derivative
- To get adequate knowledge about curvatures, evolute and envelopes.
- To enable the students to determine definite integrals.
- To derive some properties of Beta and Gamma functions

Course Outcomes:
On completing this course, students can/are

Cos	CO Statement
CO1:	Acquire knowledge about Differential Calculus, subfield of Calculus.
CO2:	Understand that the derivative of a function at a chosen input value describes the rate of change of the function near that input value.
CO3:	Learn about envelopes and evolutes and know that an evolute is the envelope of the normals to a curve.
CO4:	Find large number of industrial applications like the shape of cooking towers, mirrors used for long distance telescope.
CO5:	Get the skills of evaluating integrals by the method of substitution, integration of functions, integration of trigonometric functions, evaluation of definite integrals, reduction formula.
CO6:	Know the usage of special types of integrals namely Beta and Gamma integrals.

Unit I: Differentiation **[15 Hours]**

n^{th} Derivative of some standard functions-Leibnitz's theorem.

Unit II: Applications of Differentiation **[15 Hours]**

Polar curves-Pedal equation of a curve (p-r equation).

Unit III: Applications of Differentiation (Continued..) **[15 Hours]**

Curvature-Evolutes-Envelopes.

Unit IV: Evaluation of Integrals **[15 Hours]**

Evaluation of Definite integrals-Integration by parts-Reduction formulae : $\int x^n e^{ax} dx$, $\int x^n \cos ax dx$, $\int \sin^n x dx$, $\int \cos^n x dx$, $\int \tan^n x dx$, $\int \cot^n x dx$, $\int \sec^n x dx$, $\int \operatorname{cosec}^n x dx$, $\int \sin^m x \cos^n x dx$, $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x dx$.

Unit V: Beta and Gamma functions **[15 Hours]**

Beta and Gamma functions-Properties and results involving Beta and Gamma functions.

Text Book:

- S. Arumugam & A. Thangapandi Issac, Calculus, New Gamma Publishing House, 2014.

Course contents:

Unit-I Part-I Differential Calculus:Chapter-2 ,Sections 2.12 to 2.13

Unit-II Part-I Differential Calculus:Chapter-3 ,Sections 3.2, 3.3

Unit-III Part-I Differential Calculus:Chapter-3 ,Sections 3.4 to 3.6

Unit-IV Part-II Integral Calculus:Chapter-2 ,Sections 2.6 to 2.8

Unit-V Part-II Integral Calculus:Chapter-4 ,Section 4.1

Reference Books:

1. S. Narayanan, T.K. Manickavasagam Pilay, Calculus – Volume I, S. Viswanathan (Printers & Publishers) Pvt. Ltd., 2015.
2. Khalil Ahamad, Text book of Differential Calculus , Anamaya Publishers, New Delhi, 2004.
3. S. Narayanan, T.K. Manickavasagam Pilay, Calculus – Volume II, S. Viswanathan (Printers & Publishers) Pvt. Ltd., 2004.
4. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005

SBE -1

Course Title: APPLICATIONS OF CALCULUS	**Total Hours: 30** **Contact Hours per Week : 2**
Course Code: U24MAS11	**Total Credits: 2**

Objectives:
The students can

- Find the maxima and minima of functions of two variables.
- Understand the concept of Jacobians
- Find the Taylor's series expansion of functions
- Evaluate double integrals
- Evaluate triple integrals

Course Outcomes:

On completing this course, students can/are

Cos	CO Statement
CO1:	Able to apply the knowledge of differential calculus in finding the maximum/minimum values in the field of commerce, economics, science and engineering and other branches of arts.

CO2:	Understand the role of Jacobian in the context of integration
CO3:	Know the usefulness of series expansion in handling the functions by expanding the function in terms of series
CO4:	Much aware of how the concept of integration is very useful in getting the area and volume of the standard/random shapes which are essential in real life problems.

Unit I* **[6 Hours]**

Maxima and Minima of functions of two variables

Unit II **[6 Hours]**

Jacobians

Unit III **[6 Hours]**

Taylor's series expansion-Taylor's series expansion of some standard functions.

Unit IV* **[6 Hours]**

Double Integrals- evaluation of double integrals.

Unit V* **[6 Hours]**

Triple integrals – Change of variables in double and triple integrals.

NOTE: For all the units marked with *, one or more industrial visits may be organized by the Faculty member(s). This will enable the students to understand more about the course contents in relation to real life.

Text Book:

- S. Arumugam & A. Thangapandi Issac, Calculus, New Gamma Publishing House, 2014.

Course Contents :

Unit-I Part-I Differential Calculus: Chapter-3, Section 3.7
Unit-II Part-I Differential Calculus:Chapter-3, Section 3.9
Unit-III Part-I Differential Calculus:Chapter-3, Section 3.13
Unit-IV Part-II Integral Calculus:Chapter-3, Sections 3.1 and 3.2
Unit-V Part-II Integral Calculus: Chapter-3, Sections 3.3 and 3.4

Reference Books:

1. S. Narayanan, T.K. Manickavasagam Pilay, Calculus – Volume I, S. Viswanathan (Printers & Publishers) Pvt. Ltd., 2015
2. Khalil Ahamad, Text book of Differential Calculus, Anamaya Publishers, New Delhi, 2004.
3. S. Narayanan, T.K. Manickavasagam Pilay, Calculus – Volume II, S. Viswanathan (Printers & Publishers) Pvt. Ltd., 2004.
4. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005

Course 1

Course Title : **Mechanics, Properties of Matter and Sound**	Total Hours : 4
Course Code : **U24PHAX11**	Total Credits : 4

Course Outcomes

COs	CO Statement
CO1	Understanding the concepts of projectile motion
CO2	Knowing about friction and mechanics of rigid body
CO3	Understanding the concept of gravity and gravitation
CO4	Learning elastic properties of bodies
CO5	Understanding basic principles of sound

UNIT-I: **12 Hours**

Impact of Elastic Bodies: Impulse of a force – Collision – Fundamental principles of impact – Oblique of a smooth sphere on a fixed smooth plane – Direct impact of two smooth spheres – Loss of K.E. due to direct impact of two smooth spheres – Oblique impact of two smooth spheres – Loss of K.E. due to oblique impact.

Projectile Motion: Range on an inclined plane - Range and time of flight down an inclined plane - Two body problem and the reduced mass.

UNIT-II: **12 Hours**

Friction: Introduction – Static, dynamic, rolling and limiting friction – Laws of static friction – Experimental method for determining coefficient of friction between two surfaces – Equilibrium of a rough inclined plane acted upon by an external force.

Mechanics of a rigid body: Kinetic energy of a rotating body - Torque - Angular momentum – Relation between torque and angular momentum – Angular momentum of a system of particles - Conservation of angular momentum – some examples of conservation of angular momentum

Moment of inertia – Introduction - Parallel axes theorem - Perpendicular axes theorem - Moment of inertia of a thin circular ring, circular disc, solid cylinder and solid sphere, hollow cylinder and sphere.

UNIT-III: **12 Hours**

Gravitation: Newton's laws of Gravitation – Kepler's laws of planetary motion – Determination of G-Boy's method – Gravitational field and Gravitational strength - Variation of 'g' with latitude or rotation of the Earth - Variation of 'g' with altitude - Variation of 'g' with depth - Compound pendulum.

Centre of Gravity: Introduction – Centre of gravity of a right solid cone - Centre of gravity of a solid hemisphere - Centre of gravity of a hollow hemisphere - Centre of gravity of a solid tetrahedron.

UNIT-IV: **12 Hours**

Elasticity: Introduction - Different moduli of elasticity - Work done in twisting a wire - Torsional oscillation of a body - Rigidity modulus by torsion pendulum (Dynamic torsion method).

Bending of beams: Definition - Expression for bending moment - Depression at the mid - point of a beam loaded at the middle - Uniform bending of a beam - Measurement of Young's modulus by bending of a beam.

Viscosity: Introduction - Streamline and Turbulent flow - Poiseuille's formula for the flow of a liquid through a capillary tube - Corrections to Poiseuille's formula - Poiseuille's method for determining coefficient of viscosity of a liquid.

UNIT-V: **12 Hours**

Sound: Simple harmonic motion – Composition of two simple harmonic motions in a straight line - Composition of two simple harmonic motions of equal time periods at right angles – Superposition of harmonic waves of nearly the same frequency – Demonstration of beats – analytical treatment of beats – applications of the phenomenon of beats – Equation of a Plane Progressive waves – Properties of Progressive waves - Stationary waves – Properties of Stationary longitudinal waves – Melde's Experiment – AC frequency measurement using Sonometer

Book for study:

1. **Mechanics and Mathematical Physics** - R. Murugesan, S. Chand & Company Pvt. Ltd. 2016.
   Unit: I: 1.1 - 1.7, 2.1- 2.4
2. **Properties of Matter** - R. Murugesan, S. Chand & Company Pvt. Ltd. 2014.
   Unit: II: 22.1 – 22.5, 10.5 - 10.11, 7.1-7.10
   Unit: III: 6.1 - 6.4, 6.7- 6.10, 20.1 – 20.5
   Unit: IV: 1.1 - 1.2, 1.12-1.17, 1.19 – 1.21, 2.1-2.5
   Unit: V: 11.1, 12.1, 12.2, 13.1 - 13.4, 15.1, 15.2, 16.1 - 16.3, 17.1, 17.2

Books for Reference:

1. Mechanics by D.S. Mathur - S. Chand & Co. Reprint 2020.
2. Element of Properties of matter by D.S. Mathur - S. Chand & Co. Reprint 2016.
3. A Textbook of Sound by N. Subrahmanyam & Brijlal S. Chand & Co. Second Edition 2018.

Semester I/III & III – Part III – Allied Subject –

General Chemistry-I for Physical Sciences

(Physics & Mathematics)

Hours per week: 4 **Credits: 4** **Subject Code: U24CHAX11**

Course Outcome:

CO1: To get a knowledge on organic chemistry
CO2: To understand the basic concepts of detection and estimation of elements
CO3: To know the details about periodic table and its periodic properties.
CO4: To learn Chemical equilibrium and its importance, and the basic concepts of acids and bases
CO5: To acquire knowledge on petroleum and fertilizers

Unit I: Basic concepts of organic chemistry **12 Hours**

Organic compounds – general properties and classification of organic compounds – functional groups – homologous series. IUPAC Nomenclature for simple acyclic compounds

(Aliphatic compounds). Isomerism – types of structural isomers and stereoisomerism – R-S configuration of one asymmetric carbon and cis-trans isomerism with examples.

Unit II: Detection and estimation of elements **12 Hours**

Detection of nitrogen, halogens and sulphur – Estimation of carbon and hydrogen by Liebig's combustion method – estimation of nitrogen by Dumas method – estimation of halogens by Carius method. Determination of empirical and molecular formula – structural formula. Types of reactions – addition, elimination and substitution reactions.

Unit III: Periodic table, Periodic properties and Hydrogen **12 Hours**

Periodic Table:Long form of the periodic table – general characteristics of groups and periods – classification of elements on the basis of electronic configuration.

Periodic properties:

Atomic and ionic radii – electron affinity – ionization energy – electronegativity.

Hydrogen:

Isotopes of hydrogen – preparation, properties and uses of Deuterium-ortho and para hydrogen.

Unit IV: Chemical equilibrium and Ionic equilibrium **12 Hours**

Characteristic of Chemical equilibrium– Reversible reaction – Equilibrium law – Equilibrium constant- Equilibrium constant in terms of partial pressures- Kc and Kp relationship – Le Chatelier's principle-Synthesis of Ammonia by Haber process.

Acids, bases and salts: pH – Buffer solution – Henderson equation and its significance.

Electrolyte: Classification and example – Ostwald's dilution law.

Unit V: Petroleum and fertilizers **12 Hours**

Petroleum: Refining– composition and uses of petroleum fractions - thermal and catalytic cracking – Rating of fuels- octane number, cetane number - antiknock agents- unleaded petroleum – synthetic petrol.

Fertilizers: Role of micro and macro nutrients in plant growth - important manures – manufacture of urea - super phosphate - ammonium fertilizers, mixed fertilizers and biofertilizers.

Reference Books:

Units I & II

1. B.S.Bahl and ArunBahl, Advanced Organic Chemistry, S.Chand& Co., Ltd., 2008.
2. M.K.Jain and S.C Sharama., Modern Organic Chemistry, Vishal Publishing Co.., 2016

Unit – III

1. R.D.Madan, SatyaPrakash's Modern Inorganic Chemistry, S.Chand& Co., Ltd., 2008.
2. P.L.Soni and Mohan Katiyal, Textbook of Inorganic Chemistry, Sultan Chand & Sons, 2008.

Unit – IV

1. B.R.Puri, L.R.Sharma and S.Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2004.
2. ArunBahl ,B.S. Bahl and G.D.Tuli, Essentials of Physical Chemistry, S.Chand& Co., Ltd., 2008.

Unit – V

1. K.S.Tewari, N.K.Vishnoi and S.N.Mehrota, A Text book of Organic Chemistry, 2nd revised edition, Vikas Publishing House PVT LTD, New Delhi, 2005.

2. B.N. Chakrabarty Industrial Chemistry Oxford & IBH Oxford & IBH Publishing Company&Co, 1981.

SEMESTER - II

CORE 3

Course Title: DIFFERENTIAL EQUATIONS	**Total Hours: 75** **Contact Hours per Week : 5**
Course Code: U24MAC21	**Total Credits: 4**

Objectives:

- To understand the basic terminologies in differential equations.
- To solve the differential equations of first order and higher degree.
- To facilitate a better understanding of some special methods of solving standard forms of partial differential equations

Course Outcomes:
On completing this course, students can/are

Cos	CO Statement
CO1:	Get skill of solving the ordinary differential equations, particularly homogeneous and non homogeneous equations.
CO2:	Able to find particular integrals of ordinary differential equations.
CO3:	Get exposure to the concepts of Charpit's method.
CO4:	Acquire the knowledge of solving partial differential equations.
CO5:	Be familiar with Lagrange's equation.

UNIT I: **[15 Hours]**

Introduction-Solutions of differential equations-Formation of differential equations-Equations of first order and of the first degree-Type A:Variable separable - Type B: Homogeneous equations- Type C: Non Homogeneous equations- Type D: Linear equations-Type E: Bernoulli's equation- Type F: Exact differential equations.

UNIT II: **[15 Hours]**

Equations of first order and Higher degree –Type A: Equations solvable for p - Type B: Equations solvable for x and y, Type C: Clairaut's form- Linear Equations with constant coefficients–Particular integrals for e^{ax}, sinax, cosax

UNIT III: **[15 Hours]**

Linear Equations with constant coefficients – Particular integrals for x^n, e^{ax}V - Linear Equations with variable Coefficients – Equations reducible to the linear Equations.

UNIT IV: **[15 Hours]**

Partial Differential Equations of the first order–Classification of integrals– Formation of partial differential equations–Lagrange's Method of solving the linear equations.

UNIT V: **[15 Hours]**

Partial Differential Equations of the first order– Special Methods–Standard forms (i) F(p,q)=0, ii) F(x,p,q)=0, F(y,p,q)=0, iii) $f_1(x,p) = f_2(y,q)$ iv) Clairaut's form – Equations reducible to standard forms- Charpit's method.

Text Book:

- S.Narayanan and T.K.Manickavachagom Pillay, DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS, S.Viswanathan (Printers &Publishers), Pvt.,Ltd;

Course Contents :

Unit I: Chapter I: Sections 1,2,3. Chapter II: Sections 1,2,3,4,5,6.
Unit II: Chapter IV: Sections 1,2,3. Chapter V: Sections 1, 2, 3, 4- 4.1,4.2 (a), (b).
Unit III: Chapter V: Sections 4.2- (c), (d), 5 and 6.
Unit IV: Chapter XII: Sections 1, 2, 3 and 4.
Unit V: Chapter XII: Sections 5 and 6

Reference Book:

- S. Arumugam , Thangapandi Issac, DIFFERENTIAL EQUATIONS AND APPLICATIONS, New Gamma Publishing House.

Core 4

Course Title: ANALYTICAL GEOMETRY 3D AND VECTOR CALCULUS	**Total Hours: 75** **Contact Hours per Week: 5**
Course Code: U23MAC22	**Total Credits: 4**

Objectives:

- To learn and visualize geometrical figures in three dimensional space.
- To study the differentiation of scalar valued and vector valued functions and their properties.

Course Outcomes:
On completing this course, students can/are

Cos	CO Statement
CO1:	Know various forms of equations of a plane in three dimensional spaces.
CO2:	Study vector differentiation and vector integration.
CO3:	Find the shortest distance between two skew lines.
CO4:	Understand the concept of Gradient, Curl and Divergence.
CO5:	Be able to evaluate line integrals and Surface integrals.

UNIT I: **[15 Hours]**

Rectangular Cartesian co-ordinates – Distance between two points - Direction cosines - The relation between direction cosines and direction ratios.

UNIT II: **[15 Hours]**

Planes – Equation of a plane – Angle between two planes – Angle bisectors of two planes.

UNIT III: **[15 Hours]**

Straight Lines – Equation of a straight line – a plane and a line – skew lines.

UNIT IV: **[15 Hours]**

The Sphere: Introduction – Equation of a sphere – Tangent line and Tangent Plane – Section of a Sphere.

UNIT V: **[15 Hours]**

Vector Differentiation: Introduction – Differentiation of vectors - Gradient. - Divergence and Curl.

Text Book:

- S. Arumugam and A. Thangapandi Isaac, Analytical Geometry 3D & Vector calculus, New Gamma publishing House, 2011.

Course Contents:

Unit I: Chapter : 1 Sections : 1.1, 1.2 and 1.3.
Unit II: Chapter : 2 Sections : 2.1, 2.2, 2.3.
Unit III: Chapter :3 Sections : 3.1, 3.2.
Unit IV: Chapter: 4 (full).
Unit V: Chapter : 5 Sections : 5.1, 5.2, 5.3, 5.4.

Reference Books:

1. T. K. Manickavasagam Pillay & T. Natarajan, A Text Book of Analytical geometry (Part II – Three dimenstions), S. Viswanathan Printers pvt. Ltd.
2. T. K. Manickavasagam Pillay and others, Vector Calculus, S. Viswanathan Printers pvt. Ltd.
3. Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010.

SBE 2

Course Title: APPLICATIONS OF VECTOR CALCULUS	**Total Hours: 30** **Contact Hours per Week : 2**
Course Code: U24MAS21	**Total Credits: 2**

Objectives:

- To study the concept of Line and Surface integrals
- To know how they are connected with double and triple integrals using three famous theorems

Course Outcomes:
On completing this course, students can/are

Cos	CO Statement
CO1:	Able to compute the double integrals much easier way by using line integrals
CO2:	Much aware of link between the double integrals and triple integrals and use a proper (easier) dimension to resolve the given problem.
CO3:	Able to apply the knowledge of line integrals or vector integrals to most of the physical problem but not limited branch of physics.
CO4:	Much flexible or well equipped in finding value of the double, triple integrals

Unit I **[6 Hours]**

Line integrals – work done by a force.

Unit II **[6 Hours]**

Surface integrals.

Unit III **[6 Hours]**

Green's Theorem in plane.

Unit IV **[6 Hours]**

Stoke's Theorem.

Unit V **[6 Hours]**

Gauss Divergence Theorem.

Text Book :

- S. Arumugam and A. Thangapandi Isaac, Analytical Geometry 3D & Vector Calculus, NewGamma publishing House, 2011.

Course Contents :

Chapter 7 : Sections 7.0,7.1, 7.2, 7.3.

Reference Book :

1. T. K. Manickavasagam Pillay and others, Vector Calculus, S. Viswanathan Printers pvt. Ltd.
2. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005

Course 2

Course Title : **Thermal Physics**	Total Hours : 4
Course Code : **U24PHAX21**	Total Credits : 4

Course Outcomes

COs	CO Statement
CO1	Learning fundamentals of heat
CO2	Knowing isothermal and adiabatic processes
CO3	Understanding the principles of conduction, convection and radiation
CO4	Getting knowledge about kinetic theory of gases
CO5	Understanding the principles of thermodynamics

UNIT: I **12 Hours**

Fundamentals of Heat : Concept of heat and temperature – Thermometry – Types of thermometers – Centigrade, Fahrenheit and Rankine scales – Relation between Celsius, Kelvin, Fahrenheit and Rankine scales of temperature – Liquid thermometers – Errors and correction in a mercury thermometer – Gas equation – Advantages of gas thermometer – Seeback effect – Peltier effect – Thomson effect – Thermo electric thermometer.

UNIT: II **12 Hours**

Isothermal and Adiabatic Process : Isothermal and adiabatic process – Gas equation during on Adiabatic process – Specific heat capacity - Dulong and Petit's law- Experiment to determine the specific heat capacity of a liquid – The two specific heat capacity of a gas – Difference between the two specific heat capacities – Joly's differential steam calorimeter for finding C_v – Regnault's method to find C_p.

UNIT: III **12 Hours**

Conduction, Convection and Radiation : Thermal conduction – Coefficient of thermal conductivity – Lee's disc method of determining the thermal conductivity of a bad conductor – Convection – Convection in the Atmosphere – Lapse rate – Stability of the

atmosphere – Greenhouse effect - Thermal radiation – Energy distribution in black body radiation – Planck's law of radiation Wien's law – Rayleigh Jean's law – Stefan's law – Solar constant – Temperature of the sun.

UNIT: IV **12 Hours**

Kinetic theory of gases : Three states of mater – Concept of Ideal or perfect gas – Kinetic model – Expression for the pressure exerted by a gas – Degrees of freedom – Equipartition of energy – Atomicity of gases – Maxwell's law of distribution of molecular velocities – Experimental verification – Mean free path – Expression for the mean free path – Transport phenomena (Viscosity, Thermal conductivity and Diffusion)

UNIT: V **12 Hours**

Thermodynamics: Thermodynamics - Heat engine - Carnot's theorem - Derivation of efficiency - second law of thermodynamics - entropy - change of entropy in Carnot's cycle - Change of entropy in conversion of ice into steam - Joule-Kelvin effect - simple theory of Porous-plug experiment - adiabatic demagnetism - Superconductivity.

Book for study:

1. Heat Thermodynamics and Statistical Physics – Brijlal N. Subrahmanyam, P.S.Hemne

Unit-I Chapter – 13 (**13.1, 13.2, 13.3, 13.4, 13.5, 13.6, 13.7, 13.8, 13.9, 13.17, 13.18, 13.20, 13.23**)

Unit-IV Chapter – 1 (**1.1, 1.2, 1.3, 1.4**)

2. Thermal Physics - R.Murugesan and Er. Kiruthiga Sivaprasath

Unit-II Chapter – 13 (**13.1, 13.3, 13.4**)
Chapter – 1 (**1.3, 1.4, 1.9, 1.10, 1.11, 1.12, 1.13**)

Unit-III Chapter – 4 (**4.1, 4.2, 4.4, 4.5, 4.8, 4.10, 4.11, 4.12, 4.16, 4.25, 4.29**)
Chapter – 11 (**11.1, 11.2, 11.3, 11.4, 11.5**)

Unit-IV Chapter – 7 (**7.3, 7.4, 7.5, 7.6, 7.11, 7.12, 7.13, 7.14, 7.15, 7.16**)

Unit-V Chapter – 2 (**2.1, 2.2, 2.3, 2.4, 2.6, 2.11, 2.13, 2.14, 2.16**)
Chapter – 3 (**3.1, 3.2, 3.3, 3.11**)
Chapter – 15 (**15.1**)

Book for Reference:

1. Heat and Thermodynamics - Brijlal & N. Subrahmanyam, S. Chand & Co. 2004.

Course 3

Course Title : **Lab: Physics Practical –I**	Total Hours : 2
Course Code : **U24PHAXP21**	Total Credits : 2

Course Outcomes:

COs	CO Statement
CO1	Student can get basic practical knowledge about General Physics
CO2	Understand the practical and theory knowledge of thermal physics
CO3	Do the experiments on Sound
CO4	Do experiments based on Viscosity
CO5	Do experiments based on Surface Tension

1. Estimation of instrumental errors (Screw gauge, Vernier Caliper and Travelling Microscope) - **Orientation Session**
2. Determination of Young's Modulus by Uniform bending (Pin & Microscope) method.
3. Determination of Young's Modulus by Non-Uniform bending (Optic lever) method.
4. Determination of Young's Modulus by Cantilever depression method.
5. Determination of 'g' using Compound pendulum.
6. Determination of Rigidity Modulus and Moment of inertia using Torsion pendulum with loads.
7. Verification of laws of vibration using Sonometer.
8. Determination of Frequency of AC mains using Sonometer.
9. Determination of Frequency of Tuning fork using Melde's String.
10. Determination of Thermal conductivity of bad conductor using Lee's disc method.
11. Determination of Coefficient of viscosity of a liquid using Stoke's method.
12. Determination of Coefficient of viscosity of water by Poiseuille's flow method
13. Determination of Surface Tension by Capillary rise method.
14. Verification of parallel axes theorem and perpendicular axes theorem on moment of inertia.

Semester II & IV – Part III – Allied Subject
General Chemistry-II for Physical Sciences
(Physics &Mathematics)

Hours per week: 4 **Credits: 4** **Subject Code: U24CHAX21**

Course Outcome:

CO1: To learn the basics of gaseous state
CO2: To search out an idea on colloids.
CO3: To get adequate knowledge on nuclear chemistry
CO4: To study fundamental ideas on organic chemistry
CO5: To know the ideas about the polymer and its applications.

Unit I: Gaseous state **12 Hours**

Postulates of kinetic theory of gases – derivation of expression for pressure of an ideal gas on the basis of kinetic theory – deducing the basic gas laws. Deviation of real gases from ideal behavior – reasons for deviation. Derivation of van der Waals gas equation – explanation of behavior of real gases on the basis of van der Waals gas equation. Liquefaction of gases – Joule Thomson effect –inversion temperature.

Unit II: Colloids **12 Hours**

Colloidal state of matter – various types – classification. Sols – dialysis – electro osmosis-electrophorosis – stability of colloids – protective action – Hardy Schulze law – gold number.
Emulsion: types of emulsion – emulsifier.
Gels: Classification, preparation – application of colloids.

Unit III: Nuclear Chemistry **12 Hours**

Composition of the nucleus – Nuclear forces – mass defect – binding energy – Nuclear stability – Soddy's displacement law – law of radioactive disintegration. Nuclear fission – fusion –theory – application – principle of atom bomb and hydrogen bomb. Application of radioactive isotopes – medicinal field – agriculture – industry – analytical field – carbon dating.

Unit IV: Basic concepts of organic chemistry **12 Hours**

Nature of valency of carbon in organic compounds – tetrahedral arrangement of carbon – bond breaking and bond forming in organic reaction – homolytic and heterolytic cleavage – reaction intermediates – formation, stability and reactions of carbocation, carbanion and free radicals. Electrophiles and nucleophiles – definition and examples. Hybridization – definition – sp, sp^2 and sp^3 with examples.

Unit V: Polymers **12 Hours**

Polymers – general characteristics – plastics, elastomers, and fibres – thermoplastics and thermosetting plastics - methods of polymerization – bulk, suspension and solution polymerization. Uses of polycarbonates, polyurethanes, epoxy resins and teflons.

Reference Books

1. B.R.Puri, L.R.Sharma and S.Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2004.
2. P.L.Soni and Mohan Katiyal, Textbook of Inorganic Chemistry, Sultan Chand & Sons, 2008.
3. P.L.Soni, Textbook of Organic Chemistry, Sultan Chand & Sons, 2008.
4. B.S.Bahl and ArunBahl, Advanced Organic Chemistry, S.Chand& Co., Ltd., 2008.

Semester – II & IV

Part III– Allied Chemistry Lab I – LAB: Volumetric Analysis

Hours per week: 2 **Subject Code:** U23CHAXP21 **Credits: 2**

(Exam to be conducted at the end of even Semester)

Course Outcome:

CO1: To acquire the basic principles of volumetric titration,
CO2: To understand the basic knowledge on standard solution, molar and the indicator
CO3: To get the knowledge on the titration between acidimetry and alkalimetry
CO4: To develop the basic knowledge on permanganometry
CO5: To know the fundamental knowledge on iodometry

A double titration involving making up of the solution to be estimated or single titration involving making up of the solution to be estimated and the preparation of standard solution.

(a) Acidimetry and alkalimetry

1. Titration between a strong acid and strong base.
2. Titration between a strong acid and weak base.
3. Titration between a weak acid and strong base.

(b) Permanganometry

1. Titrations between potassium permanganate and oxalic acid, ferrous sulphate and ferrous ammonium sulphate.

(c) Iodometry

1. Titrations between sodium thiosulphate with potassium permanganate and potassium dichromate (demonstration only)
