VIRUDHUNAGAR HINDU NADARS' SENTHIKUMARA NADAR COLLEGE
(An Autonomous Institution Affiliated to Madurai Kamaraj University)
Virudhunagar – 626 001.

Course Name: Bachelor of Science
Discipline   : Chemistry
CHOICE BASED CREDIT SYSTEM
(For those who joined in June 2023)
COURSE SCHEME:

II year B.Sc. CHEMISTRY

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
III	Part 1	**Tamil**	6	3	25+75 = 100												**U24PT31**	**Interchange from II semester**
	Part 2	**English**	6	3	25+75 = 100												**U24PE31**	**New**
	Core III	Inorganic and Physical Chemistry	4	4	25+75 = 100			✔						✔			**U24CHC31**	**Mark Change**
	Core II Lab	**LAB**: Semi-micro Inorganic Qualitative Analysis	2	-	---			✔								✔	---	--
	Allied I	**Differential Equations and Laplace Transform / Oils and Fats-III**	6/4	4/3	25+75 = 100	✔								✔			**U24MAAX31/ U24CHA31**	**Revised 42%/ Revised 20 %**
	Allied II Lab	**LAB**: Food Analysis	2	-	---	✔										✔	---	No Change
	Allied II	**Physics:** Mechanics, Properties of Matter and Sound	4	4	25+75 = 100											✔	**U24PHAY31**	**Mark Change**
	Allied II Lab	**LAB**: Physics Practical - I	2	-	---												---	**----**
	SL	**Value Education**	-	3	25+75 =												**U24VE31**	**New**

					100														
		Total	30	21/20															
IV	Part 1	**Tamil**	6	3	25+75 = 100													**U24PT41**	**Interchange from III semester**
	Part 2	**English**	6	3	25+75 = 100													**U24PE41**	**New**
	Core IV	Organic and Physical Chemistry	4	4	25+75 = 100			✔						✔				**U24CHC41**	**Mark Change**
	Core II Lab	**LAB: Semi-micro Inorganic Qualitative Analysis**	2	2	40+60 = 100			✔									✔	**U24CHCP41**	**New**
	Allied I	**Statistics, Groups and Fourier Series / Oils and Fats-IV**	6/4	4/3	25+75 = 100	✔								✔				**U24MAAX41/ U24CHA41**	**Revised 5%/ Revised 20 %**
	Allied II Lab	**LAB**: Food Analysis	2	2	40 + 60 = 100	✔											✔	U22CHAP41	No Change
	Allied II	**Physics: Thermal Physics**	4	4	25+75 = 100												✔	**U24PHAY41**	**Revised 40%**
	Allied II Lab	**LAB: Physics Practical - I**	2	2	40+100 = 100												✔	**U24PHAYP41**	**Revised 25%**
	SL	**Environmental Studies**	-	2	25+75 = 100													**U24ES41**	**New**
	Total		30	24/25											✔				

SEMESTER –III
Core subject III – Inorganic and Physical Chemistry

Hours per week: 4 **Subject Code: U24CHC31**
Credits: 4

Course Outcome:

CO1: To understand the principles of separation methods to separate various metals from their ores and different refining methods

CO2: To study the laws of radioactivity and to detect and measure radioactivity and applications of radioisotopes

CO3: To learn the halogens, preparation, applications and structure of halogen compounds various oxidation states of halogens in acids

CO4: To apply phase rule and study phase diagrams of one and two component systems and their interpretations.

CO5: To know the distribution law in the study of complex ions and solvent extraction, and liquid crystals

Unit I: General principles of metallurgy   **12 Hours**

Ores: Types of ores. Flux – types, ore dressing – gravity separation – froth flotation – magnetic separation – Roasting – calcination – smelting – autoreduction, Electrolytic reduction, pyrometallurgy – reduction by carbon – Aluminothermite process – Kroll's process. Refining of metals: cupellation, zone refining, electrolytic refining, van-Arkel De boer method. Different furnaces used for the metallurgical processes: Reverberatory, Blast, Electric and muffle furnace.

Unit II: Nuclear Chemistry   **12 Hours**

Mass defect and binding energy, packing fraction, stability of nucleus – law of radioactivity – Soddy's group displacement law. Artificial radioactivity, nuclear fission – atom bomb – principle and working of nuclear reactor – nuclear fusion – Stellar energy and hydrogen bomb. Detection and measurement of radioactivity – GM and scintillation counters. Applications of radioisotopes in agriculture, medicine, study of reaction mechanism and industry – Radiocarbon dating.

Unit III: Halogens and their compounds   **12 Hours**

Comparative study of halogens – Preparation, properties and structure of OF_2, O_2F_2, Cl_2O, Cl_2O_6 , Cl_2O_7 , BrO_2 , BrO_3 and I_2O_5 – Oxyacids of halogens: oxidation state of halogens in acids – preparation, uses and structure of hypochlorous acid , chloric acid, perchloric acid and periodic acid. Bleaching powder – preparation, properties and uses. Relative strength of oxyacids of halogens - Interhalogen compounds: Types and general methods of preparation – Structure of XY, XY_3, XY_5 and XY_7

Unit IV Phase rule   **12 Hours**

Mathematical statement of phase rule – phase – component – degree of freedom, phase rule study of one component system – water – sulphur, carbon dioxide – polymorphism – phase rule study of two component systems – reduced phase rule – simple eutectic system – Pb–Ag system – KI water system – compound formation systems with congruent and incongruent melting points, Ferric chloride – water system, sulphur – water system.
Solubility of partially miscible liquids – Types – Upper CST – Phenol – water system – Lower CST – Trimethylaniline – water system and Nicotine – water system

Unit V Distribution law and liquid crystals   **12 Hours**

Nernst distribution law – association – dissociation – chemical combination of solute – application of distribution law: study of association of solute and dissociation of solute, distribution indicators, study of complex ions and solvent extraction.

Liquid crystals: Mesomorphic state – vapour pressure – temperature diagrams – thermography – thermographic liquid crystals – smectic, nematic, chloesteric, disc shaped and polymer liquid crystals.

Reference Books:
Units I to III
1. Satyaprakash's Modern Inorganic Chemistry, R.D.Madan, S.Chand& Co., New Delhi, 2005.
2. Principles of Inorganic Chemistry, B.R.Puri, L.R.Sharma and K.C.Kalia, Milestone Publishers, New Delhi, 2011.
3. Concise Inorganic Chemistry, Fifth edition, J.D.Lee, Blackwell Science Ltd., Oxford Universities Press, 2000.
4. Textbook of Inorganic Chemistry, R.Gopalan. Universities Press. Ltd., 2012.

Units IV and V
1. Principles of Physical Chemistry ,B.R.Puri, L.R.Sharma and S.Pathania, Vishal Publishing Co., New Delhi, 2005.
2. Textbook of Physical Chemistry, P.L.Soni, Sultan Chand & Sons, New Delhi, 2008.

e-Resources:
Unit I
Metallurgy: https://youtu.be/m8foHebU354
Electrolytic refining: https://youtu.be/_w65Hk22gQY
Zone refining: https://youtu.be/NPzP3hjtKEc
Furnaces: https://youtu.be/0XiI1OIaJpg
Tricks to memorize ores: https://youtu.be/KeaWDFqlO9g
Unit II
Nuclear fusion and fission: https://youtu.be/6ATgANPHpQk
GM Counter: https://youtu.be/Sr1BdM89RnA
Radiocarbon dating: https://youtu.be/XbHmKEanN10
Unit IV
Phase rule: https://youtu.be/y4X6UvbtT3M
One component system: https://youtu.be/HKSKWvg4NNA
Lead – Silver system: https://youtu.be/ANC7bHZxBp8
Unit V
Application of distribution law: https://youtu.be/vkHK-dnl_zk
Liquid crystals: https://youtu.be/vzVjbd8_Ur0
Field visit: Visit to nearby industries – Preparation of Industrial visit report

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ANCILLARY MATHEMATICS

Ancillary Mathematics III – Differential Equations and Laplace Transforms

Contact Hours per Semester: 90Hrs   **Subject Code: U24MAAX31**

Contact Hours per week: 6 Hrs   **Credit: 4**

Objectives:

- To enable the students to know the methods of solving differential equations and Partial differential equations
- To understand the Laplace transform, inverse Laplace transform and its applications.

Course Outcomes:

On completing this course, Students can/are

Cos	CO Statements
CO1:	Solve the first order linear differential equations of different types
CO2:	Derive the complementary function and particular integral of higher order linear equations
CO3:	Get skills in the concept of Laplace transform of a function f(x)
CO4:	Capable of finding the inverse Laplace transform and solve the differential equations using the transforms
CO5:	Understand the formation and solve the problems on first order partial differential equations

Unit I: **(15 Hours)**

Differential Equations of First Order: Differential equations- Equations of first order and first degree (Type A, Type B, Type C) –Exact differential equations – Integrating factors - Linear equations.
  Chapter I: Sections: 1.1, 1.2, 1.3, 1.4,1.5

Unit II: **(15 Hours)**

Linear Equations of Higher Order: Introduction - Linear equations with constants coefficients–Methods of finding complementary functions - Methods of finding particular integrals.
  Chapter II: Sections: 2.0, 2.1, 2.2, 2.3.

Unit III: **(15 Hours)**

Laplace Transform- Introduction **-** Laplace transform - **The Inverse Laplace Transforms –** Inverse Laplace transforms– Solution of differential equations using Laplace transform.

Unit IV: **(15 Hours)**

Partial Differential Equations: Introduction - Formation of partial differential equations - First order partial differential equations-Methods of solving first order partial differential equations.
  Chapter IV: Sections: 4.0,4.1, 4.2, 4.3.

Unit V: (15 Hours)
Partial Differential Equations: Some standard forms (Types 1 to 4) – Charpit's method
   Chapter IV: Sections: 4.4, 4.5.

Text Book:
1. S.Arumugam, Issac, Allied Mathematics, Paper III MKU, June 2012, New Gamma Publishing House, Palayamkottai.

Reference Books:
1. S. Narayanan and T.K. Manicavachagom Pillay, Differential Equations and its Applications, Reprint October 2014, S.Viswanathan (Printers & Publishers) Pvt Ltd.,
2. S. Arumugam, A. Thangapandi Isacc, A.Somasundaram, Differential Equations and Applications, Yes Dee Publishing Pvt Ltd.

Oils and Fats– III

Hours per week: 4 **Subject code: U24CHA31**
Credits: 3

Course Outcome:
CO1: To know the sources and constituents of castor, coconut, soyabean, sunflower, cottonseed, corn, sesame, Tall oil and rice bran oils.
CO2: To understand the sources and constituents of avocado, walnut, hemp, hazelnut, crambe, Marigold, tung, lard, tallow, fish oils and animal and butter fats.
CO3: To become mastery over refining and bleaching processes.
CO4: To get knowledge on characteristics and method of extraction of a few oils
CO5: To learn the fundamentals of spoilage of oils, prevention methods and uses of oils and fats

Unit I: Sources and Constituents of Oils and Fats – I **12 Hours**
Sources and Constituents of Castor oil – Cocoa butter – Coconut oil – Groundnut oil –Olive oil – Soyabean oil- Sunflower oil – Cottonseed oil – Corn oil – Sesame oil – Tall oil – Rice bran oil.

Unit II: Sources and Constituents of Oils and Fats – II **12 Hours**
Sources and Constituents of Avocado oil – Walnut – Hemp – Hazelnut – Crambe – Marigold - Tung oil – Animal Fats – Butter fat – Lard – Tallow – Fish oil.

Unit III: Oil Extraction Methods - I **12 Hours**
Extraction of oils from seeds – Refining processes – Degumming – Neutralization – Bleaching – Deodorization and physical refining – super refining – Processing – Blending – Fractionation – Winterization – Hydrophilisation – Urea fractionations.

Unit IV: Oil Extraction Methods - II **12 Hours**
Characteristics and method of extraction of the following: Castor oil, sesame oil, cotton seed oil, sunflower oil, coconut oil, soyabean oil.

Unit V: Spoilage of oils **12 Hours**
Methods of spoilage- rancidity – oxidative and hydrolytic rancidity- prevention of rancidity- hydrogenation –reversion- prevention of reversion - facts about fat- uses of oils and fats .

Reference Books:

Units I and II
1. F.D.Gunstone, The Chemistry of Oils and Fats, Blackwell Publishing Ltd., 2004.
2. E.A.Weiss, Oilseed Crops, Longman Group Limited, 1983.

Units III , IV and V
1. F.D.Gunstone, The Chemistry of Oils and Fats, Blackwell Publishing Ltd., 2004.
2. M.M.Chakrabarty, Chemistry and Technology of Oils and Fats, Allied Publishers Pvt Ltd,2003.
3. SBP Board of Consultants and Engineers, Fatty Acids and Products, Small Business Publications, 1970.
4. E.A.Weiss, Oilseed Crops, Longman Group Limited, 1983.

e-Resources:
1. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=19660
2. https://www.heartandstroke.ca/healthy-living/healthy-eating/fats-and-oils

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ANCILLARY PHYSICS

Course Title : **Mechanics, Properties of Matter and Sound**	Total Hours : 4
Course Code : U24PHAY31	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 - IV
Part III – Core Subject – Organic and Physical Chemistry

Hours per week: 4   Subject code: U24CHC41
                                                         Credits: 4

Course Outcome:

CO1: To understand structure of benzene, the concept of aromaticity and mechanism of electrophilic aromatic substitution reactions
CO2: To know preparation, properties, uses and structure of heterocyclic compounds
CO3: To get knowledge on carbohydrates, their classification, preparation, properties, structure and uses of a few carbohydrates
CO4: To learn about the different types of crystal systems, methods for the determination of inter-planar spacing, band theory of solids and defects in solids
CO5: To apply colligative properties to determine molecular weight

Unit I: Structure of benzene, aromaticity and orientation   12 Hours
Structure of benzene, resonance energy of benzene. Aromaticity – Huckel rule. Mechanism of aromatic electrophilic substitution reactions – halogenation, nitration and sulphonation of benzene – Friedel-Crafts alkylation and acylation. Directive influence of substituents – *ortho-para-* and *meta-* directing groups – effect of substituents on reactivity – theory of directing effects – theory of activating and deactivating effects.

Unit II: Heterocyclic compounds   12 Hours
Classification of heterocyclic compounds – Preparation, properties, uses and structure of 5–membered heterocycles – pyrrole, furan, thiophene. 6-Membered heterocycles – pyridine – preparation, properties and structure of pyridine. Condensed ring heterocycles – preparation, properties and uses of indole, quinoline and isoquinoline.

Unit III: Carbohydrates   12 Hours
Definition – classification – monosaccharides – properties and uses of glucose and fructose – configuration of glucose – Haworth structure – Kiliani synthesis – conversion of glucose to fructose and vice versa. Disaccharides: preparation and structure of sucrose – Distinction among sucrose, glucose and fructose.
Polysaccharides: preparation, uses and structure of starch and cellulose (No structural elucidation).

Unit IV: Solid state   12 Hours
Isotropy and anisotropy – symmetry in crystal systems – space lattice – unit cell – Bravais lattices – seven crystal systems – laws of crystallography – law of constancy of interfacial angle, law of symmetry, law of rational indices – Miller indices – symmetry elements in a crystal. X-Ray diffraction: Bragg's equation and its derivation – Rotating crystal method and Powder diffraction method for determination of inter-planar spacing.
Types of crystals: Ionic (NaCl and CsCl), molecular (water), covalent (diamond and graphite) and metallic crystals.
Band theory of solids - Conductors, insulators and semiconductors – Defects of solids: Frenkel, Schottky, metal excess and metal deficiency defects.

Unit V: Dilute solution and colligative properties   12 Hours
Colligative properties – Vapour pressure lowering (Raoult's law) – Determination of molecular weights from relative lowering of vapour pressure – Depression of freezing point –

cryoscopic – Determination of molecular weight from depression of freezing point – Elevation of boiling point ebullioscopic – Determination of molecular weight from elevation of boiling point – Osmosis and osmotic pressure – Determination of molecular weight by osmotic pressure measurement – Abnormal colligative properties – van't Hoff factor - Dissociation of solute molecule – Association of solute molecules.

Reference Books:
Units I to III
1. P.L.Soni and H.M.Chawla, Textbook of Organic Chemistry, Sultan Chand & Sons, New Delhi, 2007.
2. B.S.Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand & Co. Ltd., New Delhi, 2003.
3. M.K.Jain and S.C.Sharma, Modern Organic Chemistry, Vishal Publishing Co., New Delhi, 2014.
Units IV and V
1. Principles of Physical Chemistry, B.R.Puri, L.R.Sharma and S.Pathania, Vishal Publishing Co., New Delhi, 2005.
2. Textbook of Physical Chemistry, P.L.Soni, Sultan Chand & Sons, New Delhi, 2008.
3. Essentials of Physical Chemistry, ArunBahl, B.S.Bahl and G.D.Tuli, S.Chand& Co., New Delhi, 2004.
4. V. Sangaranarayanan and V. Mahadevan Textbook of Physical Chemistry, Universities Press Pvt. Ltd., 2011

e-Resources:
Unit I
> Aromaticity:
> Structure of benzene: https://youtu.be/SjHMz-ZSw-4
> Electrophilic substitution reactions: https://youtu.be/7Fax9QfjRMs
> Effect of substituents: https://youtu.be/bikoWAKL86E
Unit II
> Heterocyclic compounds: https://youtu.be/Tg7GwnOl2x4
Unit III
> Classification of carbohydrates: https://youtu.be/kCFecd97aew
> Haworth structure of glucopyranose: https://youtu.be/kwDlmtQa2h0
> Structure of glucose: https://youtu.be/2tYNimQmgqE
> Kiliani – Fischer synthesis: https://youtu.be/9BGmDp6p3Vk
Unit IV
> Miller indices: https://youtu.be/1mWgEQAIbQs
> Bragg's equation: https://youtu.be/lNHqtFxSs_8
> Band theory of solids: https://youtu.be/eVSRFq4hgVg
> Defects of solids: https://youtu.be/x1enNvEKc4g
Unit V
> Colligative properties: https://youtu.be/koi3Fhsbd6k
> Raoult's law: https://youtu.be/epub6cTmh_I

Field visit: Visit to nearby industries – Preparation of Industrial visit report
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Part III – Core I – LAB: SEMI-MICRO INORGANIC QUALITATIVE ANALYSIS

Hours per week: 2   **Credits: 2**   **Subject Code: U24CHCP41**

Course Outcome:
CO1: To acquire the knowledge of semimicro analysis
CO2: To practice the identification of various anions
CO3: To analyse the various cations present in the mixture
CO4 : To understand the concept of interfering anions
CO5: To acquire the knowledge of how to present the Report of an analysis.

Semi-micro Inorganic Qualitative Analysis
Analysis of a mixture containing two anions (of which one is an interfering anion) and two cations.
Anions: Carbonate, sulphate, nitrate, fluoride, chloride, bromide, iodide, oxalate, borate, phosphate and chromate.
Cations: Lead, bismuth, copper, cadmium, iron (II and III), aluminium, chromium, zinc, manganese, cobalt, nickel, barium, strontium, magnesium and ammonium.
        *Field/Industrial visit (Report submission only)

Ancillary Mathematics IV – Statistics, Groups and Fourier Series
Contact Hours per Semester: 90 Hrs   **Subject Code: U24MAAX41**
Contact Hours per Week: 6 Hrs   **Credit: 4**

Objectives:
- To know the statistical methods
- To introduce the abstract systems and Fourier series

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

Cos	CO Statements
CO1:	To apply the knowledge of statistics to find the relation between the variables involved in a data set.
CO2:	To understand the use of index number in the real life problems.
CO3:	Able to find the missing terms in a pattern of sequence of numbers or data value.
CO4:	Able to demonstrate the application of abstract structures in real life problems.
CO5:	Understand the use of Fourier series to the real life problems.

Unit I: Correlation and Regression: Definition of Correlation, Usefulness, Types of correlation – Coefficient of correlation: Karl Pearson's coefficient of correlation (excluding grouped bi-variate data) – Rank correlation coefficient: Spearman's rank correlation coefficient, merits and demerits of Rank correlation. Regression: Definition – Use of Regression analysis - Significance of regression study - difference between correlation and regression - Regression equations: Regression equation of X on Y and Regression equation of Y on X (excluding regression equation in a bi-variate grouped distribution) .
Text Book 1 - Chapter 12: Pages: 363, 364, 365, 366, 369-380,389-393, 431-434, 437-440, 445-449..

Unit II: Index Numbers: Definition – Characteristics of index numbers – Uses – Types of index numbers – Weighted Index number – Weighted average of Price relative – Quantity Index number – Consumer Price Index number.
Text Book 1 - Chapter 14: Pages: 487-491, 498-505, 519-528 and appropriate miscellaneous illustrative problems.

Unit III: Interpolation and Extrapolation: Meaning – Uses – Assumptions - Method of Interpolation: Algebraic method (1. Binomial Expansion method, Interpolating two or more missing values, 2. Newton's method of advancing Differences, 3. Newton-Gauss forward method, 4. Newton-Gauss backward method and 7. Lagrange's method)**.**
Text Book 1 - Chapter: 16 - Pages: 611 – 627, 630 – 633 and appropriate miscellaneous illustrative problems.

Unit IV: Groups: Introduction – Definition and Examples - Elementary properties of a group – Permutation groups - Subgroups - Cyclic groups.
Text Book 2 - Chapter 3: Sections: 3.0, 3.1, 3.2, 3.4, 3.5, 3.6.

Unit V: Fourier Series: Fourier series – Cosine and Sine series – Half range Fourier Sine series – Half range Fourier Cosine series.
Text Book 3 - Chapter 6: Full

Text Books:
1. R.S.N. Pillai and V. Bagavathi, Statistics, Seventeenth Edition (Reprints 2005), S. Chand & Company Ltd, India.
2. S. Arumugam and A. Thangapandi Isaac, Modern Algebra, Reprint July 2008, Scitech Publications (India) Pvt Ltd, Chennai.
3. S. Arumugam and A. Thangapandi Isaac, Sequences and Series and Fourier Series, August 2006, New Gamma Publishing House, Palayamkottai.

Reference Books:
1. Arumugam, Isaac, Statistics, New Gamma Publishing House, Palayamkottai.
2. Arumugam, Issac, Ancillary Mathematics, Paper III, August 2006, New Gamma Publishing House, Palayamkottai.

Oils and Fats-IV

Hours per week: 4   **Subject Code: U24CHA41**
                                                                                  Credits:3
Course Outcome:
CO1: To understand the source and function food and role of constituents of food
CO2: To study the role of carbohydrates, lipids, amino acids, proteins, vitamins and minerals
CO3: To acquire knowledge on food additives
CO4: To get mastery over food preservation
CO5: To learn about food adulterants and prevention of food adulteration

Unit I: Introduction to Food Science   **12 Hours**
Food: Source, functions of food–food groups–food guide–basic five food groups, usage of the food guide – food in relation to health– objectives of cooking.
Constituents of foods**:** Major and minor nutrients of natural food- Role of Major and minor

nutrients of natural food and their functions.

Unit II: Food Chemistry   12 Hours

Carbohydrates: Classification of carbohydrates–functions of sugars in foods–Caramelization and Maillard reactions.

Lipids: Classification – role of lipids– fatty acids– Reaction of fat– lipids in food.

Amino acids: Essential and non-essential amino acids

Proteins: Classification–Peptides–Protein structure–Properties of protein–Food protein–Nutritional importance.

Vitamins: Classification – Source– Function – deficiency diseases. Minerals: Macronutrients-Micronutrients

Unit III: Food additives   12 Hours

Definition–Need for food additives–antioxidants–chelating agents–colouring agents–
–curing agents–Emulsions–Flavours and flavour enhancers–Nutrient supplements–non-nutritive sweeteners

Unit IV: Food preservation and Food preservatives   12 Hours

Food preservation: Food spoilage–Methods of food preservation–Preservation by low temperature–Effect of freezing on nutritive value–Preservation by high temperature–Preserve by preservatives– Preservation by dehydration.

Food preservatives: Sodium chloride, Sugar, Sulphur dioxide, Nitrate, Nitrite, Sorbic acid, Acetic acid, Propionic acid, Benzoic acid, Parabens, Epoxides and antibiotics.

Unit V: Food adulteration   12 Hours

Adulteration–adulterant–Types of adulterants–Intentional adulterants–Methods of detection– Incidental adulterants –Food laws –Mandatory measures–Prevention of food adulteration (PFA) – Essential commodities act – Bureau of Indian standard – AGMARK standard.

References Books:
Unit I
1. Norman N. Potter, Food Science, CBS Publishers and Distributors, New Delhi, 1994.
2. Lillian Hoagol and Meyer, Food Chemistry, CBS Publishers and Distributors, New Delhi. 1994.
3. B.Srilakshmi, Dietetics, New Age International Publishers, New Delhi, Seventh edition, 2014.
Unit II
1. N.Shakuntala Manay and M.Shadaksharaswamy, Foods, Facts and Principles, New Age International Publisher, New Delhi, Third edition, 1997.
2. Owen R Fennema, Food Chemistry, Marcel Decker Inc., New York. 1996.
Unit III
1. N.Shakuntala Manay and M.Shadaksharaswamy, Foods,Facts and Principles, New Age International Publisher, New Delhi, Third edition, 1997.
2. Lillian Hoagol and Meyer, Food Chemistry, CBS Publishers and Distributors, New Delhi, 1994.
3. Owen R Fennema, Food Chemistry, Marcel Decker Inc.,New York. 1996.
Unit IV
1. B.Srilakshmi, Food Science, New Age International Publishers, New Delhi, Fifth edition,

2010.

2. N.Shakuntala Manay and M.Shadaksharaswamy, Foods, Facts and Principles, New Age International Publisher, New Delhi, Third edition, 1997.

Unit V

1. B.Srilakshmi, Food Science, New Age International Publishers, New Delhi, Fifth edition 2010.

2. M. Swaminathan, Advanced Text Book on Food and Nutrition, Volume I and II, Printing and Publishing Co.,Ltd., Bangalore. 1993.

Allied Oils and Fats Practical II– LAB: Food Analysis

(to be conducted at the end of Semester IV)

Hours per week: 2   **Subject Code:** U22CHAP41   **Credits: 2**

Course Outcome:

CO1: To impart basic knowledge about nutrients.
CO2: To get mastery over food constituents
CO3: To understand the constituents of milk, wheat, potatoes, bread, eggs and cheese
CO4: To estimate reducing sugar and creatine
CO5: To determine the amount of phosphate by Fiske and Subbarow method.

1. (a) Qualitative Analysis of some Bio-organic compounds
        Carbohydrate, Fat, Protein and Vitamins
   (b) Food Analysis
        (i) Milk analysis
        (ii) Analysis of Wheat flour
        (iii) Analysis of Potatoes
        (iv) Analysis of Bread
        (v) Analysis of Egg
        (vi) Analysis of Cheese
2. (a) Estimation of reducing sugar by using Benedict's reagent.
   (b) Estimation of creatine by Folin method.
   (c) Estimation of Inorganic phosphate by Fiske and Subbarow method.

Course 2

Course Title : **Thermal Physics**	Total Hours : 4
Course Code : U24PHAY41	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 : **U24PHAYP41**	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.