## B.Sc. PHYSICS CHOICE BASED CREDIT SYSTEM (CBCS)

Syllabus 2015 – 2016



(Established Under Section 3 of UGC Act, 1956)

## KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University) (Established Under Section 3 of UGC Act 1956) Eachanari Post, Coimbatore – 641 021

## Semester I L T P C

## **15LAU101 பகுதி - | தமிழ்ப் பாடத்திட்டம் (2015 - 2016)** 5 - - 5

#### பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

#### பாடத்திட்டப் பயன் விளைவு

- இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
- தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்'; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
- வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல்.
- சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
- மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்.

| பகுதி – I, த                | மிழ்   | பர <mark>ு</mark> வம் I |
|-----------------------------|--|-------------------------|
| 15LAU101                    | : தமிழ் முதல் தாள்   | 5-H,5-C                 |
| அலகு <mark>– I :</mark> இ   | க்கால இலக்கியம்  | 12                      |
|                             | <b>தத்துவம் :</b> மகாகவி பாரதியார்  – பகைவனுக்கு அருள்வாய்.  |                         |
|                             | கவிஞர் ந.பிச்சமூர்த்தி – கிளிக்கூண்டு  |                         |
|                             | இயற்கை : பாவேந்தர் பாரதிதாசன்  – அழகின் சிரிப்பு – ஞாயிறு.   |                         |
|                             | சமுதாயம் : கவிக்கோ அப்துல் ரகுமான் – இன்றைய நிலை   |                         |
|                             | அறவயல் : கவிஞா சிறப் பாலசுப்பிரமணியன் – காலம்.<br>பென்னியம் : கவிஞர் சிவரமனி – வையசுக்கை வெற்றிசொள்ள |                         |
|                             | குமலியல் : அன்பாகவன் - மாணம்   |                         |
|                             | காதல் : வைரமுத்து - காதல் உயில்  |                         |
|                             | <b>தன்னம்பிக்கை</b> பா.விஜய் - தன்னம்பிக்கை  |                         |
| அலகு – II : அ               | yற இலக்கியம்   |                         |
|                             | 1. திருக்குறள் - தேர்ந்தெடுக்கப்பட்ட குறள்கள் 20   |                         |
|                             | 2. நான்மணிக்கடிகை  - தேர்ந்தெடுக்கப்பட்ட ஐந்து பாடல்கள்  |                         |
|                             | 3. திரிகடுகம் - தேர்ந்தெடுக்கப்பட்ட ஐந்து பாடல்கள்   |                         |
| அலகு <mark>-</mark> III : ச | ிற்றிலக்கியம்  |                         |
|                             | 1. நரிவிருத்தம் - அறன் வலியுறுத்தல்  |                         |
|                             | 2. தமிழ் விடு தூது -  தமிழின் சிறப்புரைத்தல்   |                         |
|                             | 3. மதுரை மீனாட்சியம்மைப் பிள்ளைத்தமிழ் - தொடுக்கும் கடவுள் பழ  | ழம் <mark>பாட</mark> ல் |
| அலகு – IV : .               | சிறுகதை  |                         |
|                             | 1. புதுமைப்பித்தன் - நிகும்பலை   |                         |
|                             | 2. தனுஷ்கோடி ராமசாமி -  கந்தகக் கிடங்கிலே  |                         |
|                             | 3. கந்தர்வன் - துண்டு  |                         |
|                             | 4. வாஸந்தி - வடிகால்   |                         |
|                             | 5. சி.ஆர். ரவீந்திரன் - வழுக்குமரம்  |                         |
| அலகு- V : ெ                 | மாழிப்பயிற்சி  |                         |
|                             | 1. விண்ணப்பங்கள் எழுதுதல் மற்றும் கடிதப் பயிற்சி   |                         |
|                             | 2. மொழிபெயர்ப்புப் பயிற்சி   |                         |
| பாட நூல்: க                 | <b>ற்பகச்சோலை – தமிழ் ஏடு.</b> கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை செ                                 | வளியீடு.                |
|                             |  |                         |

Part I TAMIL 2015. Karpagam University, Coimbatore - 21.

#### 15ENU101

## ENGLISH-I

## L T P C 4 - - 4

#### **Course Objectives**

- To enable the learners to acquire English language skills at a faster pace.
- To introduce different kinds of literary works
- To familiarize different genres of Literature
- To instruct moral values through literature.
- To improvise their productive and receptive skills
- To strengthen the basic knowledge about grammar.

#### **Course Outcomes**

- 1. Learn to reflect on the literary works and communicate flexibly.
- 2. Reading and comprehending literary works
- 3. Genres of literature to provide moral education
- 4. Develop communication skills in business environment
- 5. Interpersonal skills will be developed.
- 6. Betterment of language competence

## UNIT I:

Prose: Google Guys (Extract) – Richard L Brandt Poetry: The Blind Pedlar – Osbert Sitwell Short Story: A Garden So Rich – Christie Craig Vocabulary: Prefixes, Antonyms, Sentence Completion Grammar: Articles, Adverbs, Pronouns Composition: Proverb Expansion

## **UNIT II:**

Prose: Happiness 101 – Geeta Padmanabhan Poetry: An Old Woman – Arun Kolatkar Vocabulary: Suffixes, Analogies Grammar: Nouns, Adjectives Composition: Dialogue Writing

## **UNIT III:**

Prose: Structured Procrastination – John Perry Short Story: The Umbrella Man – Roald Dahl One-Act Play: The Boy Who Stopped Smiling – Ramu Ramanathan Vocabulary: Synonyms, Euphemisms, Word Definitions Grammar: Verbs, Conjunctions and Interjection, Indirect/Reported Speech

## **UNIT IV:**

Poetry: No Sentence – Anjum Hassan One-Act Play: While the Auto Waits- O' Henry Vocabulary: Words Often Confused, Anagrams Grammar: Prepositions, Voice- Active and Passive Composition: Letter Writing- Informal

## UNIT V:

Short Story: The Bird – Amar Jalil One-Act Play: The Cellphone Epidemic – Claudia I. Haas Vocabulary: Portmanteau Words, One Word Substitute Grammar: Questions, Pronunciation Composition: Letter Writing- Formal

#### **Prescribed Texts:**

- 1. Rao, G. Chandralekha and et al. Spring 2013. Emerald Publishers: Chennai.
- 2. Syamala, V. English for Communication. 2006. Emerald Publishers: Chennai
- 3. To enable the learners to acquire English language skills at a faster pace.
- 4. To train the learners to reflect on the literary works and communicate flexibly.

LTPC

## 15PHU101PROPERTIES OF MATTER AND MECHANICS6 - - 6

#### **Course Objectives**

- To know how to use Newton's laws of motion
- To solve advanced problems involving the dynamic motion of mechanical systems and other advanced mathematics in the solution of the problems.
- To find the use of conservation of energy and linear and angular momentum
- To solve dynamics problems.
- To understand the concept of oscillations.
- To gain the knowledge on elasticity.

## **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Understand the basic concepts of mechanics
- 2. Understand the concepts of simple harmonic motion
- 3. Define the motion of mechanical systems and their degrees of freedom.
- 4. Study the interaction of forces between solids in mechanical systems.
- 5. Application of the vector theorems of mechanics and interpretation of their results.
- 6. Analyse the mechanics as a systematic tool for problem solving.

## UNIT-I

**Gravitational fields and potentials:** Nature of motion under central forces - Kepler's laws - Newton's law of gravitation - Gravitational potential and field - Gravitational potential and field due to (i) Spherical shell (ii) Solid sphere – Boys' method of determining 'G'

## UNIT-II

**Elasticity:** Elastic constants of an isotropic solid - Relations connecting them - Poisson's ratio - Bending of beams - Uniform and non-uniform bending - Bending moment of a bent beam - cantilever - Static and dynamic methods - Torsion in a wire - Rigidity modulus determination by Static and dynamic methods.

## UNIT-III

**Surface tension:** Surface tension and Surface energy- Pressure difference across a spherical surface- Pressure difference across a curved surface - Angle of contact - Angle of contact for water in a glass - Vapour pressure over a flat and curved surface - Variation of Surface tension with temperature - Jaegar's method - Quincke's method.

## UNIT-IV

**Viscosity:** Streamline flow and Turbulent flow - Stoke's law - Stoke's method for the coefficient of viscosity - Poiseuille's method for the coefficient of viscosity - correction to Poiseuille's equation - Ostwald's viscometer - Variation of viscosity with temperature and pressure - Friction and Lubrication - Searle's viscometer - Viscosity of gases - Modification of Poiseuille's formula for gases - Rankine's method for determining the coefficient of viscosity of a gas.

## UNIT-V

**Motion of rigid body:** Moment of inertia of a rod, disc, spherical shell, solid and hollow spheres - Theory of compound pendulum and Kater's pendulum - Determination of 'g' - Derivation of expressions for angular momentum and kinetic energy of a system of N particles.

Friction-Static Friction - Laws of Friction-Angle and cone of Friction - Motion up and down on a rough inclined plane.

## **Suggested Book**

- 1. Mathur. D.S, 11<sup>th</sup> edition 2010, Elements of properties of matter, S. Chand .& company, New Delhi
- 2. Brijlal and N. Subramanyam, 1<sup>st</sup> edition 2004, Properties of matter, S. Chand & Company, NewDelhi.
- 3. Murugesan. R, Revised edition 2004, Properties of matter, S. Chand & Company, New Delhi.
- 4. Mathur.D.S., 2004 edition, Mechanics, S. Chand & Company, New Delhi.
- 5. Uppadahayay. J. C., 2003, Properties of Matter, Ram Prakash and Sons, Agra.
- 6. Katie Dicker 1<sup>st</sup> edition 2011 properties of matter Wind mills book ltd

| <b>B.Sc Physics</b> |                      | 2015-2018 |
|---------------------|----------------------|-----------|
|                     | Semester – I         | L T P C   |
| 15PHU111            | PHYSICS PRACTICALS I | 5 3       |
|                     |                      |           |

## **Course Objective**

- The objective of this course is to learn how to apply thermodynamic principles in order to interpret thermodynamic systems and predict their behaviors.
- To determine Stefan's Constant.
- To determine the coefficient of thermal conductivity of Cu by Searle's Apparatus.
- To apply the theoretical knowledge into the experiments and find the solutions.
- To apply the concepts and principles of black-body radiation to analyze radiation phenomena in thermodynamic systems.
- To experience the practical difficulties to find the physical constant values

## **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Understand and analyze basic theory and principles of forces in mechanics and their relationship to engineering applications
- 2. Perform experiments on any material to identify the strength the given objects
- 3. Comment on the relation between frequency, length and tension of a stretched string under vibration.
- 4. Analyze motion, forces and motion, work and energy problems and their relationship to engineering applications.
- 5. Conduct experiments on wooden bar and to identify its the strength
- 6. Test a wire or cylindrical rod for its strength.

## ANY TEN EXPERIMENTS

- 1. Thickness and length of a material Vernier caliper & Screw gauge
- 2. Acceleration due to gravity Simple pendulum
- 3. Acceleration due to gravity and moment of inertia compound pendulum
- 4. Rigidity modulus Torsional pendulum
- 5. Verification of laws of transverse vibration and frequency of fork sonometer.
- 6. Young's modulus non-uniform bending- pin and microscope
- 7. Young's modulus- non-uniform bending- optic lever
- 8. Young's modulus-cantilever
- 9. Co-efficient of viscosity-stoke's method.
- 10. Frequency of tunning fork- resonance column.

- 11. Surface tension of water- capillary rise
- 12. Stoke's formula- spectrometer.

#### **Suggested Books**

- 1. Ouseph C.C., U.J. Rao and V. Vijayendran 2007, Practical Physics and Electronics, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai
- 2. Singh S.P., 2003, Advanced Practical Physics 1, 13<sup>th</sup> Edition, PragathiPrakashan, Meerut
- 3. Singh S.P., 2000, Advanced Practical Physics 2, 12<sup>th</sup> Edition, PragathiPrakashan, Meerut
- 4. Gupta S.L. and V.Kumar, 2002, Practical Physics, 25<sup>th</sup> Edition, PragathiPrakashan, Meerut

#### Semester – I

## 15PHU102 ALLIED MATHEMATICS - I

L T P C 6 2 - 4

#### **Course Objectives**

This course enables the students to learn

- The concepts of Matrices and their properties.
- Techniques of differentiation and integration.
- The basic concepts of linear algebra.
- The concepts of principles of mathematical induction.
- The solution and application of linear systems.
- The application of matrix, inverse of matrix and system of linear equations.

#### **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Solve simultaneous equations with the help of matrices.
- 2. Mastery in the concepts of vector and scalar fields.
- 3. Gain the intellectual knowledge of complex functions and their applications.
- 4. Solve equations with the help of Complex variables.
- 5. Acquire fundamental knowledge in the techniques of differentiation.
- 6. Know the properties of definite integrals.

#### UNIT I

Matrices:Different types of matrices – Inverse of a matrix – Solution of simultaneous equations by matrix method- Cayley-Hamilton theorem( Statement only)-Verification.

## UNIT II

Vector calculus: Concepts of vector and scalar fields- Derivative of a vector - The Del operator, Gradient – Divergence of a vector – Curl of a vector- Directional derivative – Formula involving  $\nabla$  operator. Laplacian Operator.

#### UNIT III

Complex variables: Analytical function –Cauchy –Reimann equations – The necessary and sufficient condition for f(z) to be analytic – Polar form of C-R equation-Properties of analytic function – Construction of analytic functions – Milne Thomson method.

#### UNIT IV

Differential calculus: Differentiation- Curvature and radius of Curvature in Cartesian and Polar form – Evolutes – Involute.

#### UNIT V

Integral Calculus: Definite and Indefinite integrals – Methods of Integration – Integration by substitution – Integration by parts.

## **Suggested Books**

- 1. Venkataraman. M. K.,1998. Engineering Mathematics, The National Publications & Co., Chennai. ( Unit I , II)
- 2. Manickavasagam Pillai.T.K , and S. Narayanan, 2002."Calculus", Volume I, and Volume II S.V Printers & Publishers, Chennai.( Unit IV , V)
- 3. Sastry .S.S,2009, Engineering mathematics, PHI learning Pvt. Ltd, New Delhi( Unit III).
- 4. Singaravelu.A.,2011, Engineering Mathematics Vol 1&Vol 2 Meenakshi Publications, Arpakkam.
- 5. Venkataraman.M.K., 2001. Engineering Mathematics Vol 2, National Publishing Company, Chennai.

#### Semester – I

## LTPC

## **15FCA101** FOUNDATION COURSE A - VALUE EDUCATION 2 - - 1

#### **Course Objectives**

- To improve the integral development of human begins
- To train the students towards sustainable lifestyle
- To create awareness about the values and their significance and role
- To imbibe the concept of discipline and freedom

#### UNIT – I

Concept of Self, self-awareness, self-esteem and self-confidence.Concept of personality, determinants and disorgiansation of it. Personality development – meaning.

#### <mark>UNIT – II</mark>

Goal setting – meaning and importance; steps in goal setting Manners and Etiquette – meaning need and importance; means to improve. Positive thinking.

#### <mark>UNIT – III</mark>

Discipline – meaning. Concept of Roles and Responsibility Time Management – Meaning and steps for effective time management.

#### UNIT – IV

Interpersonal relationship – meaning and importance; means to improve it. Healthy friendship.

## UNIT – V

Family Relationship importance of it; Means to improve. Spiritualism – meaning. Its relationship with Altruism, sacrifice, self control, tolerance and truthfulness.

#### **TEXT BOOKS**

1. Karpagam University Study Material, 2015.

#### Semester – I

## 15SSD101 SOFT SKILL DEVELOPMENT - I

#### L T P C 2 - - -

#### **Course Objectives**

- To achieve the analytical and reasoning competencies and to improve their communication and presentation skills.
- By practicing Quantitative Aptitude Objective Questions and Answers an individual for competitive exams, entrance exams, and interviews.
- Questions have practical as well as theoretical approach and discussion in forum option is good for explanations so that one can understand them easily and conceptually.
- Practice daily for good results and to learn and master various Quantitative Aptitude subjects.

#### **Course Outcomes**

- 1. To impact knowledge on both Aptitude and Soft skills to the students
- 2. To critically evaluate and demonstrate various principles involved in solving mathematical problems.
- 3. To adopt new and faster methods of calculations.
- 4. Reinforcing competencies in soft skills which are crucial in a social setting.
- 5. Students can able to solve the complex problems.
- 6. Students can improve their English fluency by using different verbal's and vocabularies.

#### UNIT - I

Introduction to Quantitative Aptitude, Speed Maths, Problems on Numbers, Averages, Ratios and Proportions, Problems on Ages

## UNIT - II

Number Series, Blood Relation, Image Analysis, Direction Sense, Syllogism, Coding and Decoding

#### UNIT – III

Percentages, Data Interpretation, Profit and Loss, Simple Interest and Compound Interest

#### UNIT - IV

Parts of Speech, Tense, Subject Verb Agreement, Active and Passive Voice, Articles, Prepositions

#### UNIT - V

Conditional Clause, Degrees of Comparison, Goal Setting, Interpersonal Skills.

#### Semester – II

#### 15LSU201

#### LANGUAGE – II

#### L T P C 5- - 5

பகுதி - I தமிழ்ப் பாடத்திட்டம்

#### (இளநிலை அறிவியல் பட்ட வகுப்புகளுக்குரியது)

#### பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

#### பாடத்திட்டப் பயன் விளைவு

- இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
- தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்'; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
- வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல்.
- சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
- மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

அலகு - I : பக்தி இலக்கியம்

- 1. சைவம் மூவர் தேவாரத்திலிருந்து தேர்ந்தெடுக்கப்பெற்ற15 பாடல்கள்
- 2. வைணவம் ஆண்டாள் நாச்சியாரின் திருப்பாவையிலிருந்து 11 பாடல்கள்

அலகு – II : சங்கஇலக்கியம்

அ). எட்டுத்தொகை

நற்றிணை: 1. இலை இல பிடவம், திணை – முல்லை, ஆசிரியர் – விழிக்கட் பேதைப் பெருங்கண்ணனார். 2. மடல் மா ஊர்ந்து, திணை – குறிஞ்சி, ஆசிரியர் – மடல் பாடிய மாதங்கீரனார்.

குறுந்தொகை : 1. உள்ளார் கொல்லோ, திணை – பாலை, ஆசிரியர் – பெருங்கடுங்கோ. 2. யாரினும் இனியன், திணை – மருதம், ஆசிரியர் – வடமவண்ணக்கன் தாமோதரனார்.

ஐங்குறுநூறு: 1. நுண்ணேர் புருவத்த, திணை – குறிஞ்சி, ஆசிரியர் – கபிலர். 2. அவறொறுந் தேரை, திணை – முல்லை, ஆசிரியர் - பேயனார்.

பதிற்றுப்பத்து – ததைந்த காஞ்சி, ஆசிரியர் - பாலைக் கௌதமனார்.

பரிபாடல் - வையை - திரை இரும் பனிப் பௌவம், ஆசிரியர் - மையோடக் கோவனார்.

கலித்தொகை – கடும் புனல் கால் பட்டு, திணை – பாலை, ஆசிரியர் - பெருங்கடுங்கோ.

அகநானூறு - 1. ஆடு அமைக் குயின்ற, திணை – குறிஞ்சி, ஆசிரியர் – கபிலர். 2.யான் எவன் செய்கோ தோழி, திணை – பாலை, ஆசிரியர் – நோய்பாடியார். புறநானூறு -1. சிறப்பில் சிதடு முறுப்பில், திணை – பொதுவியல், ஆசிரியர் – உறையூர் முதுகண்ணன் சாத்தனார். 2.இளையரு முதியரும் வேறுபுலம் படா – ஆசிரியர் – கயமனார்.

ஆ). பத்துப்பாட்டு - சிறுபாண் ஆற்றுப்படை – கடையெழு வள்ளல்களின் சிறப்பு, நல்லியக்கோடனின் சிறப்பு, ஈகைத் திறம்.

அலகு - III : காப்பியங்கள்

1.மணிமேகலை –பாத்திரம் பெற்ற காதை – தீவதிலகை, மணிமேகலைக்குச் சொல்லியது, சிறைக்கோட்டம் அறக்கோட்டமாக்கிய காதை – மணிமேகலை வேண்ட, மாவண்கிள்ளி, சிறைக்கோட்டத்தை அறக்கோட்டமாக்கியது.

2. கம்பராமாயணம் - இலக்கியநயம் மிக்க, தேர்ந்தெடுக்கப்பெற்ற 41 பாடல்கள்.

அலகு - IV : கட்டுரைகள்

- 1.திருக்குறளில் மனிதவள மேலாண்மைக் கருத்துக்கள் திருமிகு ஹரி விஜயலட்சுமி.
- 2. தமிழர் வளர்த்த நுண்கலைகள்: சிற்பமும் ஓவியமும் தொ.மு. பாஸ்கரத் தொண்டைமான்.
- 3. சமயமும் தமிழும் பேராசிரியர் அ.ச.ஞானசம்பந்தன்.
- 4.தமிழில் அறிவியல் ஒரு பார்வை பேராசிரியர் சிவகுமார்.
- 5. இன்றைய நெருக்கடிப் பிரச்சனைகள் நீர்வளம் முனைவர் ச. முத்துக்குமரன்.

அலகு - V : இலக்கணமும் மொழிப்பயிற்சியும் 1.எழுத்து, சொல், பொருள் இலக்கண எழுத்துப்பயிற்சிகள் 2.பொதுக் கட்டுரைகள் பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு. கற்பகம் பல்கலைக்கழகத் தமிழ்த் துறை வெளியீடு.

## L T P C 4 - - 4

15ENU201

## ENGLISH – II

**Course Objectives:** 

- To enable the learners to acquire English language skills through literature.
- To familiarize them with English literature.
- To acquire Grammar knowledge.
- To help learners imbibe cultural values.
- To acquire skill of making correct sentences.
- To reflect originality on the application of soft skills and express in writing their views.

#### **Course Outcomes:**

- 1. Learn to enjoy the ecstasy of literature.
- 2. The select literary pieces will develop the confidence level of the learners.
- 3. To get the social values.
- 4. To know the importance of communication
- 5. Get sound knowledge in English
- 6. Trained to communicate well for business purpose.

#### UNIT I:

Prose: The Unexpected- Robert Lynd Poetry: The Village Schoolmaster – Oliver Goldsmith Short Story: The Lion's Share – Arnold Bennett Vocabulary: Homonyms Grammar: Irregular Verbs

## **UNIT II:**

**Prose:** Travel by Train – J. B. Priestly **Poetry:** The Gift of India – Sarojini Naidu **Grammar:** Sentence patterns **Composition:** Reading Comprehension

## **UNIT III:**

Prose: Women's Education is Almost More Important than the Education of Boys and Men – Indira Gandhi
Short Story: The Necklace – Guy De Maupassant
One-Act Play: The Referee – W.H. Andrews and Geoffrey Dearmer
Vocabulary: Similes
Grammar: Discourse Markers
Composition: Report Writing

## UNIT IV:

**Poetry:** Ozymandias – P.B. Shelley **One-Act Play:** The Pot of Broth- W.B. Yeats **Vocabulary:** Collective Nouns **Grammar:** Correction of Sentences **Composition:** Picture Reading

#### UNIT V:

Short Story: The Silver Butterfly– Pearl S. Buck One-Act Play: The Bear – Anton Chekov Vocabulary: Acronyms Grammar: Question Tags Composition: Drafting Advertisement

#### **Prescribed Texts**

1. Wings of Communication 2014. Board of Directors. Emerald Publishers: Chennai **Reference** 

2. Syamala, V. English for Communication. 2006. Emerald Publishers: Chennai.

#### Semester – II

#### L T P C 6 - - 6

#### 15PHU201

## HEAT AND THERMODYNAMICS

## **Course Objectives**

- The objective of this course is to give awareness on different laws of thermodynamics and its effect on different aspects in life.
- The aim of statistical mechanics is to give knowledge on the laws of classical thermodynamics for macroscopic systems using the properties of its atomic particles.
- To apply the concepts and principles of black-body radiation to analyze radiation phenomena in thermodynamic systems.
- To apply the concepts and laws of thermodynamics to solve problems in thermodynamic systems such as gases, heat engines and refrigerators etc.
- To give knowledge on the statistical mechanics and explain the applications of thermodynamics.
- To provide the correlation of thermodynamical problems with statistical concepts.

## **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Differentiate the terms heat and temperature and measure temperature using thermometer and convert one scale of temperature to another scale.
- 2. Understand specific heat capacity of gas and the different theories on specific heat capacity
- 3. Differentiate between principles and methods to produce low temperature, liquefy air, helium and hydrogen
- 4. Define postulates of kinetic theory of gases and arrive at theorem of equipartition of energy and derive Van der Waal's equation.
- 5. Identify and describe the statistical nature of concepts and laws in thermodynamics, in particular: entropy, temperature, chemical potential, Free energies, partition functions.
- 6. Fermi-Dirac and Bose-Einstein distributions to solve problems in some physical systems.
- 7. Apply the concepts and principles of black-body radiation to analyze radiation phenomena in thermodynamic systems.
- 8. Apply the concepts and laws of thermodynamics to solve problems in thermodynamic systems.

## <mark>UNIT I</mark>

Definitions – Newton's law of cooling – specific heat of a liquid calendar and Barne's continuous flow method – two specific heats of a gas – specific heat of a gas by Joly's differential steam calorimeter – Regnault's method – Dulong and Petit's law – variation of specific heat ad atomic heat with temperature.

#### <mark>UNIT II</mark>

**Transmission of heat :**Conduction – Co-efficient of the thermal conductivity – Cylindrical flow of heat – determination of thermal conductivity of rubber and bad conductor – Lee's disc method. Conduction – Radiation – Black body – Wein's Law - Raleigh – Jean's Law – Stefan's law – Experimental Determination of Stefan's constant – Mathematical derivation of Stefan's law

## <mark>UNIT III</mark>

**Kinetic theory of gases:** Maxwell's law of distribution of molecular velocities – Experimental verification – equilibrium speed distribution of velocities. Mean free path – transport phenomena – diffusion – viscosity and thermal conduction of gases – Vander walls equation – relation between Vander Wall's constant and critical constants.

## <mark>UNIT IV</mark>

**Laws of Thermodynamics:** First law of thermodynamics – Isothermal and Adiabatic process – gas equation during an adiabatic process – Work done an adiabatic expansion of gas – equation of an adiabatic curve – isothermal processes – Determination of D by Clement and Desorme's method – second law of thermodynamics – Carnot's engine- Working efficiency – Carnot's refrigerator – Carnot's Theorem.

## <mark>UNIT V</mark>

**Concept of entropy:** Entropy Change in entropy in a reversible process and irreversible process – temperature entropy diagram – Entropy of a perfect gas – increase of entropy in any irreversible process – Thermo dynamics functions – Maxwell's thermodynamics

## **Text Books**

- 1. Thermal Physics, R. Murugesan, I Edi, 2002 .S Chand & company
- 2. Heat & Thermodynamics, Brijlal& N. Subramaniam ;revised edition 2010; S Chand & company
- 3. Heat M. Narayanamurthi and N. Nagaratnam; springer
- 4. Heat and Thermodynamics Zemansky and R.H. Dcltanann; 7<sup>th</sup> edition 1996; Mcgraw hill
- 5. Heat and Thermodynamics D.S. Mathur, S. Chand & Co, 5<sup>th</sup> edition 2004.
- 6. Heat and Thermodynamics Agarwal, Singhal, Sathyaprakash 18<sup>th</sup> edition 2006 pragathiprakashen
- 7. Thermal Physics Agarwal, Sathyaprakash 25<sup>th</sup> edition 2013 pragathiprakashen

#### L T P C - - 5 3

## 15PHU211

## PHYSICS PRACTICALS II

**Course Objectives** 

- To establish a grounding in electromagnetism in preparation for more advanced courses.
- Assess the contributions of physics to our evolving understanding of global change and sustainability while placing the development of physics in its historical and cultural context.
- Basic definitions (stress, strain, Hooke's law and Poisson's ratio) of elasticity
- Stress Strain Diagram
- Determination of rigidity modulus and time period.
- Moment of Inertia and calculating MI of an irregular body

## **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. To gain knowledge and develop skills in the basic concept of electric forces.
- 2. Deal with liquids based on their viscosity
- 3. Compare the thermal conductivity of solids
- 4. Analyze the heat capacity of liquids
- 5. To understand Gauss law and its applications.
- 6. Distinguish first order and second order spectrum.

## ANY TEN EXPERIMENTS

- 1. Co-efficient of thermal conductivity-Lee's disc method
- 2. Temperature coefficient of resistance of a thermistor-Post office box
- 3. Newton's law of cooling
- 4. Specific heat capacity of liquid Joule's calorimeter
- 5. Stephan's law
- 6. Copper voltameter
- 7. Co-efficient of viscosity of water-Poiseuille's method
- 8. Potentiometer temperature co-efficient of material
- 9. Meter bridge
- 10. Young's modulus-uniform bending Koieng's method
- 11. Young's modulus-non uniform bending Koieng's method
- 12. Spectrometer  $\boldsymbol{\mu}$  of prism
- 13. Spectrometer wavelength of a spectral line by grating

## **Suggested Books**

- 1. Ouseph C.C., U.J. Rao and V. Vijayendran 2007, Practical Physics and Electronics, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai
- 2. Singh S.P., 2003, Advanced Practical Physics 1, 13th Edition, Pragathi Prakashan, Meerut
- 3. Singh S.P., 2000, Advanced Practical Physics 2, 12th Edition, Pragathi Prakashan, Meerut

## L T P C 6 2 - 4

## 15PHU202

## ALLIED MATHEMATICS - II

**Course Objectives** 

This course enables the students to learn

- The Concept of Fourier analysis and solving boundary value problems.
- Techniques of Fourier and Laplace transform to solve differential equations.
- Numerical techniques of differentiation and integration.
- To find the solution for physical problems.
- To get mathematical foundation to formulate and solve problems arising in physics

## **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Appreciate the physical significance of Fourier series.
- 2. Understand the mathematical principles on transforms.
- 3. Apply mathematical foundation to formulate and solve problems arising in physics
- 4. Synthesize numerical techniques for practical problems
- 5. Apply their knowledge to find the solution for physical problems.
- 6. Solve the Fourier series problems and apply it for practical things.

## UNIT I

Fourier series: Definition – Finding Fourier coefficients for a given periodic function with period  $2\pi$  – Odd and Even functions – Half Range Series.

## UNIT II

Fourier Transforms: Definition of Fourier Transform-Properties of Fourier Transform- Inverse Fourier transform-Convolution theorem-Finite Fourier Sine & Cosine Transform – Parseval's theorem.

## UNIT III

Laplace Transforms: Definition of Laplace Transform - Properties of Laplace Transform, Inverse Laplace Transform. Application of Laplace Transform.

## UNIT IV

Differential Equations: Types of Linear differential equations with constant coefficients – Simultaneous differential equations with constant coefficient.

## UNIT V

Numerical methods: Solving simultaneous equations–Gauss Elimination method, Gauss Jordan method, Gauss – Seidel method. Numerical Integration – Trapezoidal Rule, Simpson's Rule.

Bachelor of Science, Physics, 2015, Karpagam Academy of Higher Education, Eachanari post, Coimbatore-641021, India.

## **SUGGESTED BOOKS**

- 1. Sastry .S.S,2009. Engineering Mathematics, PHI learning Pvt. Ltd, New Delhi.
- 2. Kandasamy. P., K.Thilagavathy., and K.Gunavathy., 2003. Numerical methods, S. Chand & company Ltd , New Delhi.
- 3. Singaravelu.A.,2011,Engineering Mathematics Vol I &Vol II Meenakshi Publications, Arpakkam.
- 4. Venkataraman.M.K., 2001. Engineering Mathematics Vol II, National Publishing Company, Chennai.
- 5. Manicavachagom Pillay.T.K ,S.Narayanan,2000, "Calculus Vol II", S. Viswanathan (Printers and Publishers), PVT., LTD.
- 6. Sundaram.V, R. Balasubramaniam, And K.A.Lakshminarayanan, 2001, Engineering Mathematics Vol III, Vikas Publishing House PVT., LTD, New Delhi.

#### Semester II

#### LTPC 2 - - 1

#### 15FCB201 FOUNDATION COURSE - B ENVIRONMENTAL STUDIES

#### **Course Objectives**

- To create the awareness about environmental problems among people.
- To develop an attitude of concern for the environment.
- To motivate public to participate in environment protection and improvement.
- To understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
- To apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- To gain knowledge on environmental issues. •

## **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- 2. Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
- 3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- 4. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
- 5. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- 6. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
- 7. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as interdisciplinary scholars and / or practitioners.

Unit - I: Eco system and natural resources: Environment - Definition - components -Ecosystem -Definition, Concept, Scope, importance, structure and functions of ecosystem. Energy flow, Ecological succession. Food chains and food webs. Classification of ecosystem. Natural resources: Forest resources; water resources

Unit - II: Environmental pollution: Cause, effects and control measures of Air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution and nuclear hazards pollution. Solid waste management.

Bachelor of Science, Physics, 2015, Karpagam Academy of Higher Education, Eachanari post, Coimbatore-641021, India.

**Unit - III: Biodiversity and its conservation**: Introduction- Definition, genetic, species and ecosystem diversity, biogeographical classification of India- Value of biodiversity: Consumptive, productive uses; social, ethical, aesthetic and option values. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.

**Unit - IV: Social issues and the environment**: Urban problems related to energy- water conservation and management -Rain water harvesting- water shed management. Resettlement and Rehabitilisaion. Natural resources and associated problems and sustainable utilization. Environmental Education

**Unit - V: Environment ethics:** Environmental Ethics - Gender equity, ethical basis of environment education and awareness, conservation ethic and traditional value systems of India. Valuing nature, cultures, social justice, Human heritage, equitable use of resources, preserving resources for future generation, common property resources, Ecology and its uses and its degradation, Introduction to Environmental Protection Act (EPA).

#### Suggested Books

- 1. Agarwal, K.M., P.K. Sikdar and S.C. Deb, 2002. A Text Book of Environment, Mac Millan India Ltd, Kolkatta, India.
- 2. Kotwal, P.C. and S. Banerjee, 2002. Biodiversity Conservation In Managed forest and protected areas, Agrobios, India.
- 3. Singh, M.P., B.S. Singh and Soma S. Dey, 2004. Conservation of Biodiversity and Natural Resources. Daya Publishing House, Delhi.
- 4. Uberoi, N.K., 2005. Environmental Studies, Excel Books Publications, New Delhi, India.
- 5. Shaw, R and Krishnamurthy, R.R. 2009. Disaster management: global challenges and local solutions Universities Press (India) Private Ltd, Hyderabad.
- 6. Sorokin Pitirim. A,1942. Man and Society In Calamity. New York: Dutton, 1942
- 7. Patrick L.Abbott, 2008. Natural Disasters, McGraw Hill, New York. Page: 1-7.

#### Semester – II

#### 15SSD201

## SOFT SKILL DEVELOPMENT – I

L T P C 2 - - 1

#### **Course Objectives**

- To achieve the analytical and reasoning competencies and to improve their communication and presentation skills.
- By practicing Quantitative Aptitude Objective Questions and Answers an individual for competitive exams, entrance exams, and interviews.
- Questions have practical as well as theoretical approach and discussion in forum option is good for explanations so that one can understand them easily and conceptually.
- Practice daily for good results and to learn and master various Quantitative Aptitude subjects.

#### **Course Outcomes**

- 1. To impact knowledge on both Aptitude and Soft skills to the students
- 2. To critically evaluate and demonstrate various principles involved in solving mathematical problems.
- 3. To adopt new and faster methods of calculations.
- 4. Reinforcing competencies in soft skills which are crucial in a social setting.
- 5. Students can able to solve the complex problems.
- 6. Students can improve their English fluency by using different verbal's and vocabularies.

#### UNIT - I

Introduction to Quantitative Aptitude, Speed Maths, Problems on Numbers, Averages, Ratios and Proportions, Problems on Ages

## UNIT - II

Number Series, Blood Relation, Image Analysis, Direction Sense, Syllogism, Coding and Decoding

## UNIT – III

Percentages, Data Interpretation, Profit and Loss, Simple Interest and Compound Interest

#### $\mathbf{UNIT}-\mathbf{IV}$

Parts of Speech, Tense, Subject Verb Agreement, Active and Passive Voice, Articles, Prepositions

#### UNIT - V

Conditional Clause, Degrees of Comparison, Goal Setting, Interpersonal Skills.

ТТРС

## Semester – III

| 15ENU301 | ENGLISH – III (Communicative English) | 4 4 |
|----------|---------------------------------------|-----|

#### **Course Objective:**

- To develop confidence to respond in English during situations where the use of English is imperative.
- To develop fluency in actual conversation in the English language.
- To develop speech skills necessary for confident and intelligent participations in Group Discussions and develop skills related to teamwork in work places.
- To develop confidence to respond in English during situations where the use of English is imperative.
- To develop fluency in actual conversation in the English language.
- To develop knowledge about business communication.

#### **Course Outcome**

After successful completion of the course, the student is expected to

- 1. Students learnt the basics and purposes of listening skill.
- 2. Students understand importance of speaking.
- 3. Students developed the speaking skills on telephone, business and also in travel
- 4. Learnt some effective vocabulary learning strategies.
- 5. Students will able to communicate clearly and effectively and handle their day to day affairs well with their knowledge of language skills.
- 6. Students understand importance of learning communicative English.

## UNIT I

**Listening:** Listening comprehension – Listening for Specific Information –Note Taking – Interpreting Charts and Diagrams.

## UNIT II

**Speaking:** Essentials of effective communication – Greeting and Introducing – Making requests – Asking for permission – Giving and Denying Permission – Offering and Accepting Help – Asking for and Declining Help – Giving Instructions and Orders - Talking about likes and dislikes.

**Telephone Skills** – Understanding telephone conversation – handling calls – leaving messages – making requests - giving instructions and orders

**Discussion Skills** – Giving your opinion – agreeing and disagreeing – Making suggestions – Interrupting – questioning – reporting – Dealing with questions. (Completing dialogues)

## UNIT III

**Reading:** Reading – Reading with a purpose –Skimming and Scanning – locating main points – reading critically – Sequencing of sentences – Reading comprehension.

## UNIT IV

**Writing: Paragraph Writing** – Descriptive and Narrative. Safety Instructions/ Suggestions. Expansion of Abbreviations – Spellings- Report writing.

**Translation-** Translating short sentences and passages from English to Tamil and from Tamil to English.

## UNIT V

**Vocabulary: Improve English vocabulary:** Synonyms – Antonyms – Prefixes – Suffixes – Idioms – Collocations – Different types of English – British and American (Choose the best answer type from a database of 50 words each for each topic)

**Functional Grammar:** Forming questions, getting answers – Articles – Parts of Speech – Punctuation – Common mistakes in English (Homophones)(Exercise based)

## **Suggested Books:**

- 1. Language in Use: Kenneth Anderson, Cambridge University Press.
- 2. Study Speaking: A course in Spoken English for Academic Purpose: Kenneth Anderson, Joan MacLean and Tony Lynch, Cambridge University Press, 2008.
- 3. Spoken English Part I & II (for Tamil speakers), Orient Longman Pvt. Ltd.
- Dr. J. John Love Joy, Dr.FrancisM.Peter S.J. "Lets Communicate Basic English for Everyone", Vaigarai Publications, 1<sup>st</sup> edition, Dindigul 2007.

LTPC

#### Semester – III

## 15PHU301ELECTRICITY AND MAGNETISM5 - - 5

#### **Course Objectives**

- To establish grounding in electromagnetism in preparation for more advanced courses.
- The major concepts covered are: the abstraction from forces to fields using the examples of the gravitational, electric and magnetic fields, with some applications; the connection between conservative forces and potential energy; how charges move through electric circuits; the close connection between electricity and magnetism, leading to the discovery of electromagnetic waves.
- To use electromagnetic theory and principles in a wide range of applications.
- To understand the calculus along with physical principles
- To effectively solve problems encountered in everyday life, further study in science, and in the professional world.
- To gain confidence in their ability to apply mathematical methods to understand electromagnetic problems to real-life situations.

#### **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Apply knowledge of electricity and magnetism to explain natural physical processes and related technological advances.
- 2. Gain confidence in their ability to apply mathematical methods to understand electromagnetic problems to real-life situations.
- 3. Use an understanding of calculus along with physical principles to effectively solve problems encountered in everyday life, further study in science, and in the professional world.
- 4. Be able to use electromagnetic theory and principles in a wide range of applications.
- 5. Design experiments and acquire data in order to explore physical principles, effectively communicate results, and critically evaluate related scientific studies.
- 6. To develop an understanding of the principles of electricity and magnetism.

#### UNIT - I

**Electrostatics:** Gauss theorem, application of Gauss theorem - Electric intensity at a point immediately adjacent to a charged conductor-Energy stored in unit volume of an electric field. Spherical Capacitor - Cylindrical Capacitor - Force of attraction between charged plates of a Capacitor - change in energy of a parallel plate Capacitor when the distance between the plates is altered and when a dielectric slab is introduced between the plates - types of Capacitors - Guard ring Capacitor - Electrolytic Capacitor - Variable Capacitor.

Polarization in dielectric materials - Parallel plate Capacitor and dielectric slab - Boundary conditions - depolarization factor

## UNIT - II

**Magnetism**: Properties of the magnetic field B - Divergence of B - Curl of B - Magnetic vector potential - Electron theory of magnetism - Dia, para and ferromagnetism – Ferri and Antiferro magnetism – Domain Theory of Ferrimagnetism - Magnetic field (B)-magnetization (M) -Magnetic field intensity (H) - Magnetic susceptibility and magnetic permeability - Magnetic materials and magnetization- Magnetic hysteresis - Area of the hysteresis loop - Ferro magnets-Determination of susceptibility - Curie balance method - Guoy's method.

## UNIT - III

Thermal effects of electricity: Seeback effect-Laws of thermo e.m.f - Peltier effect - Peltier coefficient - Determination of Peltier coefficient at a junction - Thermo dynamical consideration of Peltier effect -Thomson effect -Thomson coefficient - emf generated in a thermocouple taking both Peltier effect at the junctions and Thomson effect in metals - Thermo electric power - applications of thermodynamics to thermocouple - Thermoelectric diagrams and their uses.

#### UNIT - IV

Inductive and capacitive effects: Growth and decay of current in an inductive - Resistive circuit - charging and discharging of a capacitance through a resistance - Charging and discharging of a capacitance through an inductance and a resistance - Discharge of a capacitance through an inductance inductance - Oscillatory circuits.

Analysis of the A.C circuits (with the vector diagrams) containing (I) resistance and inductance (ii) capacitance and resistance (iii) resistance, inductance and capacitance - LCR series resonance circuit - LC parallel and L, R and C parallel resonance circuits -power consumed by the above circuits - q factor and band width of response of a tuned circuit-sharpness of resonance.

## UNIT –V

Electric induction: Induced emf, Faraday's Law and Lenz's Law -The emf induced in a rotating coil -search coil - Eddy current - Electromagnetic damping - Self and mutual inductances - expressions and determination by experiment - Energy stored in an inductor - Artificial external pacemakers - Electromagnetic measurement of blood flow.

Charged particles in a uniform and constant electric field - Charged particles in an alternating electric field - Charged particles in a uniform and constant magnetic field -magnetic focusing - charged particles in combined electric and magnetic field when the fields are parallel and are in mutually perpendicular directions.

#### **Suggested Books:**

- 1. Brijlal and Subramanyam, 1<sup>st</sup> editon; 2004, Electricity and magnetism, S. Chand & Company, New Delhi
- 2. Murugesan. R, 9<sup>th</sup> edition 2014, Electricity and magnetism, S. Chand & Company, New Delhi.
- 3. Nagarathinam and Lakshminarayanan, 2002, Electricity and magnetism, 2nd Edition, The National Publishing Inc., New Delhi.
- 4. Tewari. T.K., 1<sup>st</sup> edition 2005, Electricity and magnetism, S. Chand & Company, New Delhi.
- 5. Mathur. D.S., 2004, electricity and magnetism, S.Chand & Company, New Delhi.
- 6. Vasudeva. D.N., 2004, Electricity and magnetism, S. Chand & Company, New Delhi.

# LTPC 4 - - 4

## 15PHU302

## SOLID STATE PHYSICS

## **Course Objective:**

- This course integrates theory of Solid State Physics with experimental demonstrations in the Physics Lab.
- The course will provide a valuable theoretical introduction and an overview of the fundamental applications of the physics of solids.
- It includes theoretical description of crystal and electronic structure, lattice dynamics, and optical properties of different materials (metals, semiconductors, dielectrics, magnetic materials and superconductors), based on the classical and quantum physics principles.
- To calculate thermal and electrical properties in the free-electron model.
- To gain a basic knowledge of crystal systems and spatial symmetries.
- To know what phonons are, and be able to perform estimates of their dispersive and thermal properties.

#### **Course Outcomes**

After successful completion of the course, the student is expected to

- 1. Account for interatomic forces and bonds.
- 2. Have a basic knowledge of crystal systems and spatial symmetries.
- 3. Account for how crystalline materials are studied using diffraction, including concepts like form factor, structure factor, and scattering amplitude.
- 4. Know what phonons are, and be able to perform estimates of their dispersive and thermal properties.
- 5. Calculate thermal and electrical properties in the free-electron model.
- 6. Explain superconductivity using BCS theory
- 7. Outline the importance of solid state physics in the modern society.

## <mark>UNIT 1</mark>

Crystallography: Distinction between crystalline and amorphous solids – Different features of the crystal – Crystal lattice – Basis – Crystal structure – Unit cell – Number of lattice points per unit cell- Bravais lattices – Miller indices – Elements of Symmetry – Structure of KCl and NaCl crystal – Atomic Packing – Atomic radius –-Lattice constant and density- Crystal structure.

## <mark>UNIT 2</mark>

Bond theory of solids – Classification of solids – Basics of Bond theory – Optical properties of solids – Specific heat capacity of solids – Dulong and Pettit's law – Einstein's theory of specific heat of solids – Fermi levels.

#### **B.Sc** Physics

## <mark>UNIT 3</mark>

Magnetic properties of materials : Introduction – Langevin's theory of diamagnetism – Langevin's theory of paramagnetism – Ferromagentism – Weiss theory of Ferromagentism – Nuclear magnetic resonance – Ferro electricity – Ferroelectric crystals – Quantum theory of paramagnetism – Cooking by adiabatic demagnetization of a paramagnetic salt.

## <mark>UNIT 4</mark>

Free electron theory – Drude Lorentz theory – Explanation of Ohm's law – Electrical conductivity – Thermal conductivity – Wide-Mann and Franz ratio – Sommerfield model – Schotcky effect – Hall effect – Hall voltage and Hall coefficient – Mobility and Hall angle – Importance of Hall effect – Experimental determination of Hall coefficient.

## <mark>UNIT 5</mark>

Dielectrics- Dielectric constant and displacement vector- Clausissmossotti relation- Atomic or molecular polarizability – Types of polarizability -Super conductivity – Phenomena – magnetic properties – Super conductor – Meissner effect – Experimental facts – Isotopes effect – Thermodynamic effect.

#### **Suggested Books:**

- 1. Gupta and Kumar; pragthiprakashen; Solid State Physics;
- 2. R Murugesan; S.Chand& Co; 2004 1<sup>st</sup> edition Modern Physics
- 3. Charles Kittel, Introduction to Solid State Physics, 7<sup>th</sup> edi 2000; willey eastern ltd, new delhi
- 4. A J Dekker; 2000; rev edition; Mcmillan India ltd Solid State Physics

#### L T P C - - 4 2

## 15PHU311

## PHYSICS PRACTICALS III

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## **Course Objective**

The aim of the course is to make them to

- Understand and working of polarimeter.
- Understand the resolving power of different optical instruments.
- The objective of this course is to learn how to apply thermodynamic principles in order to interpret thermodynamic systems and predict their behaviors.
- To determine Stefan's Constant.
- To determine the coefficient of thermal conductivity of Cu by Searle's Apparatus.
- To apply the theoretical knowledge into the experiments and find the solutions.
- To experience the practical difficulties to find the physical constant values

## **Course Outcomes**

After successful completion of the course, the student is expected to

- 1. Demonstrate the effect of magnetic field on current carrying conductors
- 2. Examine the effect horizontal component of earth's magnetic field on magnetic materials
- 3. Analyze the effects of refractive index of a medium using optical instruments
- 4. Gain knowledge on various theories of light.
- 5. Predict the curvature of a transparent medium.
- 6. Acquire skills to identify and apply formulas of optics and wave physics.
- 7. Understand the properties of light like reflection, refraction, interference, and diffraction etc., and applications of diffraction and polarization.

## ANY TEN EXPERIMENTS

- 1. Spectrometer i- i curve
- 2. Spectrometer i- d<sup>'</sup> curve
- 3. Spectrometer dispersive power of grating
- 4. Potentiometer emf of thermocouple
- 5. Newton's ring
- 6. Air wedge
- 7. Tan A
- 8. Tan B
- 9. Low and high range voltmeter calibration
- 10. Focal length of concave lens

- 11. Focal length of convex lens
- 12. Current voltage sensitivity- B.G
- 13. Mutual inductance of coil B.G

## **Suggested Books**

- 1. Ouseph C.C., U.J. Rao and V. Vijayendran 2007, Practical Physics and Electronics, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai
- 2. Singh S.P., 2003, Advanced Practical Physics 1, 13th Edition, PragathiPrakashan, Meerut
- 3. Singh S.P., 2000, Advanced Practical Physics 2, 12th Edition, PragathiPrakashan, Meerut
#### L T P C 4 - - 4

#### 15PHU303A

### ALLIED CHEMISRY – I

**Course Objectives** 

- The molecular orbital theory, preparation and properties of inorganic compounds.
- Theory of covalent bond, polar effects and stereochemistry of organic compounds.
- About important industrial chemicals like silicones, fuel gases and fertilizers and their impact on environment.
- To understand types and structure of different compounds.
- To understand types and structure of inorganic carbon compounds.
- To distinguish between intra and inter molecular hydrogen bonding.
- To understand the electro chemistry of chemicals.

#### **Course Outcome**

After successful completion of the course, the student is expected to

- 1. The molecular orbital theory, preparation and properties of inorganic compounds.
- 2. Theory of covalent bond, polar effects and stereochemistry of organic compounds.
- 3. About important industrial chemicals like silicones, fuel gases and fertilizers and their impact on environment.
- 4. Elements of photochemistry, chemical kinetics and chromatography.
- 5. Gain knowledge on bonding of elements, preparation of new compounds, properties of new materials, etc.,
- 6. Understand the concept of dye, properties of dye and their applications in day to day life.

#### Unit-I

**Chemical Bonding:** Molecular orbital theory-linear combination of atomic orbitals-bonding and antibonding molecular orbitals-energy level diagram-bond order- M.O. configuration of  $H_2$ ,  $N_2$  and  $F_2$  molecules. Diborane: Preparation, properties and structure. NaBH<sub>4</sub>: Preparation and uses. Borazole: Preparation and properties. Interhalogen compounds: ICl, BrF<sub>3</sub>, IF<sub>5</sub> - preparation, properties, uses and structure. Basic properties of iodine. Compounds of sulphur: Sodium hydrosulphite- preparation, properties, uses and structure. Per acids of sulphur: Preparation, properties, uses and structure.

#### Unit-II

**Industrial Chemistry:** Silicones: Synthesis, properties and uses. Fuels gases: Natural gas-water gas-semi water gas-carbureted water gas-producer gas- oil gas (Manufacturing details not required). Fertilizers: NPK fertilizer-ammonium sulphate-urea-superphosphate of lime-triple superphosphate- potassium nitrate-ammonium nitrate. Pollution: Water, air and soil pollution-sources and remedies-acid rain-ozone hole-greenhouse effect.

Bachelor of Science, Physics, 2015, Karpagam Academy of Higher Education, Eachanari post, Coimbatore-641021, India.

## Unit- III

#### **Covalent Bond and Stereoisomerism:**

**Covalent Bond:** Orbital overlap, hybridization and geometry of  $CH_4$ ,  $C_2$   $H_4$  and  $C_2H_2$ .Polar effects:Inductive effect-electromeric effect- mesomeric effect- steric effect- hyperconjugation.

**Stereoisomerism:** Elements of symmetry-polarised light and optical activity-isomerism in tartaric acid-racemisation- resolution- geometrical isomerism of maleic and fumaric acids-keto-enoltautomerism of acetoacetic esters.

#### Unit- IV

#### Dyes, Chemotherapy and Vitamins:

**Dyes:** Terms used chromophore, auxochrome, bathachromic shift and hypsochromic shiftclassification of dyes – based on chemical structure and application-one example each for azo, triphenylmethane, vat and mordant dyes- preparation.

**Chemotherapy:** Preparation, uses and mechanism of action sulpha drugs- preparation and uses of prontosil, sulphadiazine and sulphafurazole-structure and uses of pencillins and chloromycetin.

**Vitamins:** Diseases caused by the deficiency of vitamins A,  $B_1$ ,  $B_2$ , C and D-sources of these vitamins.

#### Unit- V

#### Elements of Photochemistry, Chemical Kinetics and Chromatography:

**Elements of Photochemistry:** Photochemical laws-Beer Lambert's law-Grotthuss-Draper law-Stark-Einstein law (statement only).

**Chemical Kinetics:** Rate-order-molecularity-pseudo first order reactions-zero order reactionsdetermination of order of reaction-measurement of order and rates of reactions-effect of temperature on reaction rate-energy of activation.

**Chromatography:** Principles and applications of Column, Paper and Thin Layer Chromatography.

#### Suggested Books

- 1. V.Veeraiyan & A.N.S. Vasudevan, Text Book of Allied Chemistry (II Edition), Highmount Publishing House, Chennai (2005).
- 2. B.R.Puri and L.R.Sharma, Principles of Inorganic Chemistry, Shobanlal & Company Ltd., Jalandar (2002).
- 3. B.S.Bahl&ArunBahl, Advanced Organic Chemistry, S.Chand & Company Ltd., New Delhi (2005).
- 4. Puri, Sharma &Pathania, Physical Chemistry, Vishal Publishing Company Ltd., Jalandhar (2003).
- 5. R.Gopalan&S.Sundaram, Allied Chemistry (III Edition), Sultan Chand & Sons., New Delhi (2003).

Bachelor of Science, Physics, 2015, Karpagam Academy of Higher Education, Eachanari post, Coimbatore-641021, India.

15PHU303B

#### Semester – III

#### **ALLIED STATISTICS - I**

L T P C 4 - - 4

#### **Course Objectives**

This course enables the students to learn

- The Concept of Fourier analysis and solving boundary value problems.
- Techniques of Fourier and Laplace transform
- To solve differential equations.
- Numerical techniques of differentiation and integration.
- Basic concepts in probability theory and statistical measures.
- Commonly used probability distributions (both discrete and continuous).

#### **Course Outcomes**

After successful completion of the course, the student is expected to

- 1. Appreciate the physical significance of Fourier series
- 2. Understand the mathematical principles on transforms.
- 3. Apply mathematical foundation to formulate and solve problems arising in physics
- 4. Synthesize numerical techniques for practical problems.
- 5. Understand the mathematical concept of Regression.
- 6. Gain knowledge on Correlation apply it for interpretation.

#### UNIT I

Meaning and definition of statistics – sources of data – collection of data – primary and secondary data - methods of primary data collection –sources of secondary data – Classification of data . Diagrammatic representation– Bar diagram and Pie diagram – Graphic representation – Histogram, Frequency distribution, Ogives.

#### UNIT II

Measures of Central tendency - Arithmetic Mean, Median, Mode - problems on individual, discrete and continuous series, Harmonic Mean and Geometric Mean.

#### UNIT III

Measures of Dispersion – Range, Inter Quartile range, Quartile deviation, Mean Deviation, Standard deviation and Coefficient of variation – problems on individual, discrete and continuous series.

#### UNIT IV

Correlation – meaning and definition – types of Correlation – degrees of Correlation – Methods of finding Correlation coefficient – scatter diagram – Karl Pearson's correlation coefficient – Rank correlation coefficient - Computation and interpretation.

#### UNIT V

Regression - meaning and definition - Regression equation Regression in two variables – two regression lines - X on Y and Y on X – properties of regression equation – problems using normal equations and regression coefficients.

#### Suggested Book

- 1. Pillai R.S.N., and Bagavathi V., 2002. Statistics , S. Chand & Company Ltd, New Delhi.
- 2. Dr.P.N.Arora, 1997, A foundation course statistics, S.Chand& Company Ltd, New Delhi.
- 3. Navnitham P.A , 2004, Business Mathematics And Statistics, Jai Publications, Trichy,
- 4. Gupta S.C., and Kapoor V.K., 1999. Fundamentals of Mathematical statistics, Sultan Chand & Sons, Educational Publishers, New Delhi.
- 5. Gupta S.P., 2001, Statistical methods, Sultan Chand & Sons, New Delhi.

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#### Semester – III

# 15PHU303CALLIED BIOINFORMATICS - I4 - - 4

#### **Course Objectives:**

- The course aims to provide students with a foundation in the basic concepts of Biophysics.
- Topics will include canonical and non-canonical structures of nucleic acids, structure of proteins, enzymes etc.
- Fundamental concepts that underlie biomolecular interactions will be discussed
- Biophysical methods that are employed for the structural analysis of these systems will be introduced at an elementary level.
- To apply chemical reaction to formulate and solve problems arising in physics.

#### **Course Outcome**

After successful completion of the course, the student is expected to

- 1. Demonstrate knowledge of the fundamental concepts in physics and chemistry that underlie biological processes.
- 2. Appreciate the physical significance of biomolecules.
- 3. Apply chemical reaction to formulate and solve problems arising in physics.
- 4. Understand the concept of Regression.
- 5. Gain knowledge on Comparative modeling and visualization of molecules.
- 6. Define the structural characteristics of nucleic acids and proteins and examine parameters that variously determine their stability and function(s).

#### UNIT-I

**Introduction to Bioinformatics:** Objectives, History of Bioinformatics, Human Genome Project, application of bioinformatics – Molecular medicine, biotechnology, agricultural, forensic analysis.

#### UNIT-II

Introduction to Biological databases-Types of databases, sequence databases-nucleic acid sequence databases-Gene bank, EMBL, DDBJ, protein sequence database- Swiss-Prot, PIR, PDB structural databases, Serach and retrieval of Entrez, bibliographic databases-Pubmed.

#### UNIT-III

Sequence alignment-local, global, pairwise and multiple alignment, Similarity searching programs- BLAST, FASTA; Gene prediction strategies and programs- Genscan, Genemark.

#### UNIT-IV

Protein secondary structure prediction, three dimensional structure prediction, Comparative modeling and visualization of molecules. Visualization-Rasmol, Deep view.

#### UNIT-V

Source of data – Primary and secondary data. Classification and tabulation of data. Diagrammatic and graphic presentation of data. Measures of central tendency: arithmetic mean, median, mode. Measures of variation: range, quartile deviation, mean deviation, standard deviation (simple problems only).

#### Suggested Books

- 1. Palanichamy. 1999. Statistical methods for Biologists. 3<sup>rd</sup>edition. Palani Paramount Publications, Palani.
- 2. S.P.Gupta. 2007. Statistical methods. Sultan Chand and Sons Educational Publishers, New Delhi.
- 3. Ignacimuthu. S, 2013. Basic Bioinformatics, 2<sup>nd</sup> edition Alpha Science Intl Ltd Chennai.
- 4. S.C. Rastogi. 2009. Bioinformatics Concepts, Skills & Applications, CBS Publishers & Distributors, India.
- 5. Abraham Silberchatz Henry K.Forth and Sudharshan, 1997. "Database System Concepts" Tata McGraw Hill, New Delhi.
- 6. Arthur M. Lesk, 2014. Introduction to Bioinformatics, 4<sup>th</sup> edition. Oxford University Press, Oxford.
- 7. Attwood. K. and J. Parry-Smith, 2003. Introduction to Bioinformatics, Pearson Education, Singapore.
- 8. David W. Mount, 2013. Bioinformatics: Sequence and Genome Analysis. 2<sup>nd</sup> edition, Cold Spring Harbour Laboratory Press, New York.
- 9. Sundararajan. S and R. Balaji, 2003. Introduction to Bioinformatics, Himalaya Publishing House, Mumbai.
- 10. Steve Selvin. 2005. Biostatistics. 1<sup>st</sup> edition. Pearson Education Pte Ltd., New Delhi.
- 11. Jerald H Zar. 2005. Biostatistical Analysis. 4<sup>th</sup> edition. Pearson Education Pte Ltd., New Delhi.
- 12. Daniel. 2006. Biostatistics: A Foundation for analysis in the health sciences. 7<sup>th</sup> edition. John Wiley and Sons, Inc., New York.
- 13. SundarRao. P.S.S., and J.Richard., 2012. 5<sup>th</sup> edition, Introduction to Biostatistics and Research Methods, PHI Publication, New Delhi.

LTPC

#### Semester – III

## 15PHU311AALLIED CHEMISRY PRACTICALS - I- - 3 2

#### **Course Objective**

- To make the student able to identify the elements and the functional groups present in an organic compound.
- The student on successful completion of the course should learn the principles of volumetric analysis.
- To estimate the compounds by acidimetry, alkalimetry and permanganometry.
- To acquire practical skills in volumetric analysis.
- To understand the basic principles of volumetric analysis.
- To estimate the Acidimetry & Alkalimetry by volumetric analysis

#### **Course Outcome**

After successful completion of the course, the student is expected to

- 1. Learnt about the qualitative analysis of organic compounds.
- 2. Learnt the detection of elements and functional groups present in an organic compound by systematic analysis.
- 3. Verify the presence compositions by experimentally.
- 4. Analyse the properties of different chemical compounds by experimentally.
- 5. Differentiate the chemicals such as aldehydes, Ketones, amines, diamides etc.,
- 6. Identify the chemical properties of different chemicals.

#### Contents

Systematic analysis of an organic compound, preliminary tests, detection of elements present, aromatic or aliphatic, saturated or unsaturated, nature of the functional group, confirmatory tests– aldehydes, ketones, amines, diamide, carbohydrates, phenols, acids, esters & nitro compounds.

Note: Each student should analyse minimum 6 compounds.

#### **REFERENCE BOOKS:**

- 1. R. Ramasamy, Allied Chemistry Practical Book, Priya Publications, Karur (2008).
- 2. A.O. Thomas, Practical Chemistry for B.Sc. Main Students, Scientific Book Centre, Cannanore-1, Kerala (2010).
- 3. V.Venkateswaran, R.Veeraswamy and A. R. Kulandaivelu, Basic Principles of Practical Chemistry, 2<sup>nd</sup> Edition, S.Chand Publications, New Delhi (2004).

#### L T P C - - 3 2

#### 15PHU311B ALLIED STATISTICS PRACTICALS - I

# **Course Objective**

- Demonstrate knowledge of probability and the standard statistical distributions.
- Demonstrate knowledge of fixed-sample and large-sample statistical properties of point and interval estimators.
- Demonstrate knowledge of the properties of parametric, semi-parametric and nonparametric testing procedures.
- Demonstrate the ability to perform complex data management and analysis.
- Demonstrate the ability to apply linear, nonlinear and generalized linear models.
- Demonstrate understanding of how to design experiments and surveys for efficiency.

#### **Course Outcome**

After successful completion of the course, the student is expected to

- 1. Continue their higher studies and scientific research to analyze and solve complex problems in the field of computer science.
- 2. Design, develop and test the solutions using contemporary technologies with full participation in profession and society.
- 3. Communicate effectively in their work environment with multidisciplinary team for their lifelong learning, ethical and professional development.
- 4. Participate in national mission through technical expertise, leadership and entrepreneurship.
- 5. Demonstrate knowledge of classical and repeated measures multivariate methods and computational techniques.

#### List of Experiments

- 1. Using SPSS Package, draw bar diagram and pie diagram fordiscrete series.
- 2. Using Excel Package, draw bar diagram and pie diagram fordiscrete series.
- 3. Using SPSS Package, calculate the Mean for individual, discrete and continuous series.
- 4. Using Excel Package, calculate the Mean for individual, discrete and continuous series.
- 5. Using SPSS Package, calculate the Median for individual and discrete series.
- 6. Using SPSS Package, calculate the Mode for individual and discrete series.
- 7. Using SPSS Package, calculate the Standard deviation.
- 8. Using SPSS Package, calculate the Karl Pearson's Correlation.
- 9. Using SPSS Package, calculate the Rank Correlation Coefficient for Untied Rank.
- 10. Using SPSS Package, calculate the Rank Correlation Coefficient for Tied Rank.

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#### Semester – III

## 15PHU311CALLIED BIOINFORMATICS PRACTICALS - I- - 32

#### **Course Objective**

- The course aims to provide students with a foundation in the basic concepts of Biophysics.
- Topics will include canonical and non-canonical structures of nucleic acids, structure of proteins, enzymes etc.
- Fundamental concepts that underlie biomolecular interactions will be discussed
- Biophysical methods that are employed for the structural analysis of these systems will be introduced at an elementary level.

#### **Course Outcome**

After successful completion of the course, the student is expected to

- 1. Students will function successfully in the laboratory and use safe laboratory practices.
- 2. Students will critically evaluate data and design experiments to test hypotheses relevant to the practice of Biochemistry and Biophysics.
- 3. Students will demonstrate awareness of ethical issues in the practice of science.
- 4. Appreciate the physical significance of biomolecules.
- 5. Apply chemical reaction to formulate and solve problems arising in physics.
- 6. Understand the concept of Regression.

#### **List of Practicals**

- 1. Introduction to MS Office.
- 2. Analysis of databases
  - NCBI
  - EMBL
  - DDBJ
  - PIR
  - -SWISS PROT
- 3. Retrieval of protein structures –PDB
- 4. Bibliographic Databases
  - Pubmed
  - Medline
- 5. Secondary structure prediction

- SOPMA

6. Molecular Visualization and analysis

- RASMOL

7. Sequence similarity search for a pair of sequences using

- BLAST

#### - FASTA

Multiple sequence alignment

 CLUSTAL

#### **REFERENCE BOOKS**

- Allen Bregman, 2001. Laboratory Investigations in Cell and Molecular Biology, Wiley.. Arthur M. Lesk, 2014. Introduction to Bioinformatics, 4<sup>th</sup> edition. Oxford University Press, Oxford.
- 2. Attwood. K. and J. Parry-Smith, 2003. Introduction to Bioinformatics, Pearson Education, Singapore.
- DealtryG.B.andRickwood D.. 1992, Cell biology-Lab Fax (1<sup>st</sup> edition) Black well Scientific Publishers, New Delhi.
- 4. David W. Mount, 2013. Bioinformatics: Sequence and Genome Analysis. 2<sup>nd</sup> edition, Cold Spring Harbour Laboratory Press, New York.
- 5. Mani K., N. Vijayaraj. 2004. Bioinformatics- A practical approach, Aparnaa publication, India.
- 6. Rajan S.and.Selvi Christy R, 2011. Experimental procedures in Life Sciences,
- 7. Published by Anjanna Book House, Chennai.

#### Semester-III

#### 15FCC301A INTRODUCTION TO COMPUTERS

L T P C 4 0 0 2

#### **Course Objectives**

This course enables the students

- To develop skills for quantitative estimation using computer language.
- To code various differentiation and integration methods in a modern computer language.
- To plot the graphs of function
- To develop an understanding of computer networking basics.
- To develop an understanding of different components of computer networks, various protocols, modern technologies and their applications.

#### **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Solve complicated matrix related problems like matrix inverse and matrix multiplication.
- 2. Acquire problem-solving skills through computer programming.
- 3. Plot various functions and parametric curves.
- 4. Understand the basic coding of MS Office Word.
- 5. Gain knowledge on Internet Terminology.
- 6. Apply their knowledge to solve the problems.

#### Unit-I

Introduction- Characteristics of computers- development of computers- generations of computers- classification of computers-the computer system- types of Input/ Output and memory devices-computer software-categories of software.

#### Unit-II

Starting with MS Office Word – Working with Text – working with tables-Checking spelling and grammar- adding graphics to document- Mail merge- printing a document – Advanced features of MS Office Word- Keyboard shortcuts.

#### Unit III

Starting with MS Office Excel- Working with Excel workbook-working with worksheetformulas and functions-inserting charts-sorting-importing data-printing in excel- Advanced features of MS Office Excel.

#### Unit IV

Starting with MS Office PowerPoint – Working with PowerPoint- Working with different views-Designing Presentations- Slide Show.- Printing in PowerPoint.

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#### Unit-V

The Internet-Evolution of Internet-Owner of Internet- Anatomy of Internet – Internet Terminology- Getting Connected to Internet- Web Brower- Electronic Mail- Search engines-Uses of internet to society.

#### **Suggested Book**

- 1. Fundamentals of Computers: For Undergraduate Courses in Commerce and Management, ITL Education Solutions. 2011. Pearson, New Delhi.
- PradeepK.Sinha, PritiSinha. Computer Fundamentals, 2007, 6<sup>th</sup> Edition BPB Publications, New Delhi.
- 3. V. Rajaraman. Fundamentals of Computers, Prentice-Hall Of India Pvt. Limited, 2003.
- 4. Wallace Wang.Microsoft Office 2007 For Dummies,1<sup>st</sup> Edition Wiley Publishing Inc.

#### LTPC 4 0 0 2

#### 15FCC301B **INTRODUCTION TO MULTIMEDIA**

#### **Course Objectives**

This course enables the students

- To develop skills for quantitative estimation using computer language.
- Acquire basic knowledge on Multimedia devices.
- Understand current trends in multimedia by experiencing a variety of applications and development packages.
- To train and give idea about computer graphics.
- To gain the skills and project-based experience needed for entry into web design and development careers.
- To understand how the web pages are designed interactively.

#### **Course Outcomes**

After successful completion of the course, the student is expected to

- 1. This course in curriculum is an introduction to the multimedia and its applications.
- 2. This course enables students to understand how the web pages are designed interactively.
- 3. How to critically evaluate website quality, learn how to create and maintain quality web pages learn to create and manipulate images.
- 4. Gain the skills and project-based experience needed for entry into web design and development careers.
- 5. Gain knowledge on Computer based animation.
- Apply knowledge to Creating animation. 6.

#### UNIT - I

Multimedia – An overview: Introduction – Multimedia presentation and production – Characteristics of Multimedia presentation - Hardware and Software Requirements - Uses of Multimedia. Text: Types of text - Font - Text File formats. Image: Image data representation – Image file formats - Image processing software. Graphics: Advantages of graphics - Uses -Components of a graphics system.

#### UNIT - II

Audio: Sound waves - Types and properties of sound - Components of audio system - Digital audio - Musical Instrument Digital Interface (MIDI) - Audio file formats - Audio processing software. Video: Motion video - Television systems - Video file formats - Video processing software. Animation: Uses of animation – Computer based animation – Animation file formats – Animation software.

#### UNIT - III

Introducing Photoshop elements: About elements – Welcome screen – Create mode – Menu bar – Toolbox – Options bar – Panels. Organizing images: Obtaining images – Tagging images - Searching for images - Opening and saving images.Selecting Areas – Layers – Text and Drawing Tools.

#### UNIT - IV

Understanding Flash: Understanding Flash basic elements – Creating a simple animation. Learning Flash Toolbox: Learning the toolbox – Using tools. Learning Flash Panels: Understanding the panels. Using timeline and layers: Understanding how timeline works – Understanding layers. Drawing objects: Drawing lines and fills – Using colors – Rotating, skewing and scaling – Grouping objects.

#### UNIT - V

Creating animation – How animation works – Creating motion tweens – Creating shape tweens. Understanding masks – Creating masks. Creating symbols and using the library: Learning about symbols – Creating symbols – Using libraries. Learning Basic Action Script concepts: Action Script basics – Data type basics.

#### Suggested Books

- 1. Ranjan Parekh, 2013, Principles of Multimedia, 2<sup>nd</sup> Edition, Tata McGraw hill.
- 2. Nick Vandome, 2011, Photoshop Elements 9, Tata McGraw hill.
- Brian Underdahl, 2002, Macromedia Flash MX A Beginners Guide, Dreamtech Press. Tay Vaughan, 2002, Fundamentals of Multimedia, 5<sup>th</sup> Edition, Tata McGraw-Hill.
- 4. Bill Sanders. 2001. Flash5 Action Script, 1<sup>st</sup> Edition, Dream Tech Press, New Delhi

#### L T P C 4 - - 4

#### 15ENU401

#### ENGLISH – IV

**Course Objectives:** 

- To train the students in understanding the concepts of communication.
- To be familiar with the four basic skills of English.
- To train students in developing their written communication.
- To train students in developing their presentation skills.
- To acquire the skill of making grammatically correct sentences.
- To reflect originality on the application of soft skill views and express in writing their views.

#### **Course Outcome:**

- 1. Students have acquired proficiency in communication.
- 2. Students have become adept in written communication and presentation skills.
- 3. Developed the skill of writing in English and that of public speaking.
- 4. Establish and maintain social relationships.
- 5. Develop communication skills in business environment.
- 6. Enhanced communication competency through LSRW skills

**UNIT I** – Concept of Communication – Barrier to Communication –Body language – Personality Development – Etiquette and Manners- Soft Skills – Emotional Intelligence

**UNIT II** – Listening Comprehension – Reading Comprehension – Paragraph writing – Precis Writing – Writing Resume and Covering Letter -Speaking – Welcome Address, Vote of Thanks, Compering, Debates, Role Play, Dialogues – Vocal Communication Techniques. Voice, Quality, Volume, Pitch

**UNIT III** – Dicto Composition – Letter Writing (Informal, Letters to the Editor etc) – Term paper – Book reviews

**UNIT IV** – Business Correspondence – Layout of Business Letter – Formal Styles of Business Letters – Letters of Acceptance, Appointment, Resignation, Complaint, Sending E-mails.

**UNIT V** – Effective Presentation – Planning – Audience Analysis –Logical Sequencing – Timing of the Presentation – Conclusion – Answering Queries – Group Discussion – Interview.

#### **Suggested Books:**

- 1. Juneja. P. Om and AaratiMujumdar, "Business Communication -Techniques and Methods", Orient Blackswan Pvt. Ltd., Hyderabad: 2010.
- 2. Badi, R.V and K. Aruna. Business Communication, 2008, Vrinda Publications: New Delhi.
- 3. Balasubramanian M and G Anbalagan. Performance in English. 2007.Anuradha Publications: Kumbakonam
- 4. Mohan, Krishna and Meenakshi Raman.2008, Effective English Communication, Tata McGraw Hill: New Delhi.
- 5. Selley, John. Oxford Guide to Effective Writing and Speaking. 2005. OUP: New Delhi.

#### Semester – IV

#### 15PHU401

#### NUCLEAR PHYSICS

L T P C 6 - - 6

#### **Course Objective**

- This is a basic course in Physics which deals with the phenomena taking place in the nuclear domain. Students will be given an insight into the dimensions of a nucleus.
- The aim is to tell them about the stability of nucleus and various other properties.
- The students will learn about various types of radiations and their interaction with matter.
- Students will learn the methods to find the mass and charge of any nucleus by using some instruments.
- To gain knowledge in the content areas of nuclear and particle physics.
- Students will learn the concept of nuclear reactions.

#### **Course Outcomes**

After successful completion of the course, the student is expected to

- 1. Determine the charge, mass of any nucleus by using various spectrographs.
- 2. They are able to understand the size of nucleus and all its properties.
- 3. Develop and communicate analytical skills in subatomic physics.
- 4. This course has led the students to understand interaction of various types of radiation with matter which they observe in their daily life. It's easy for them now to relate the theory to practical.
- 5. Acquire knowledge in the content areas of nuclear and particle physics, focusing on concepts that are commonly used in this area.
- 6. Students now know various methods of accelerating various types of particles to perform scattering experiments.

#### UNIT - I

Basic nuclear structure: Classification of nuclei - Nuclear spin angular momentum - Nuclear magnetic dipole moment - Electric quadrupole moment - Nuclear size - Nuclear stability - Nuclear forces - Meson theory of nuclear forces - Theories of nuclear composition - Protonelectron hypothesis - Models of nuclear structure - Liquid drop model - Shell model. Synchrocyclotron - Betatron - Electron Synchrotron and proton synchrotron.

#### UNIT - II

**Radioactivity**: Determination of e/m of alpha particles - Determination of the charge of alpha particles - Experimental measurement of range of alpha particles - Geiger and Nuttal experiment - Geiger Nuttal law - Alpha particle disintegration energy - Determination of e/m of beta particles - Origin of the line and continuous spectrum - Neutrino theory of beta decay - K-electron capture - Origin of gamma rays - Absorption of gamma rays - Natural radioactive series - Law of successive disintegration - Radioactive equilibrium and radioactive dating.

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#### UNIT - III

**Nuclear Models**: Discovery of artificial transmutation - Rutherford's experiment - Bohr's theory of nuclear disintegration - Nuclear reactions - Energy balance in nuclear reactions and the Q-value. Transmutation by (i) Alpha particles (ii) Protons (iii) Deuterons and (iv) Neutrons. The scattering cross-section and its determination. Production of radioisotopes and their uses.

#### UNIT - IV

**Nuclear Reactions**: Nuclear fission - Energy released in fission - Bohr and Wheeler's theory of nuclear fission - Chain reaction - Multiplication factor - Natural uranium and chain reaction - Design of nuclear reactor - Breeder reactor - Nuclear fusion - Source of stellar energy - Thermonuclear reactions - Transuranic elements.

Ionization chamber – Geiger-Muller counter – Proportional counter – Wilson's cloud chamber – Bubble chamber – Their principles and working.

#### UNIT - V

**Particle Physics**: Baryons - Leptons - Mesons - Particles and antiparticles - concept of antimatter - strong interaction - Electromagnetic interaction - Weak interaction - Gravitational interaction - Elementary particle quantum numbers - Conservation laws and symmetry - Charge conjugation, parity and time reversal - CPT Quark model – Nuclear isotopes - Introduction to medical physics.

#### **Suggested Books**

- 1. Murugeshan. R, 2000 editon, Nuclear Physics, S. Chand & Company, New Delhi.
- 2. Brijlal and Subramaniam, 1<sup>st</sup> editon2001, Atomic and Nuclear Physics, S. Chand & Company, New Delhi.
- 3. Murugeshan. R, 17<sup>th</sup> edition 2014, Modern Physics, S. Chand & Company, New Delhi.
- 4. Theraja. B.L., 2002, Modern Physics, S. Chand & Company, New Delhi.
- 5. Tayal. D.C. ,5<sup>th</sup> edition 2014, Nuclear Physics, Himalaya Publishing house, Mumbai.
- 6. Goshal. S. N, Atomic and Nuclear Physics Vol.1&2 2014, S.Chand& Company

#### L T P C 6 - - 6

#### 15PHU402

#### **OPTICS & SOUND**

#### **Course Objective**

- This course builds the ideas of harmonic motion to cover in depth concept of waves in physics with particular emphasis on light waves as an example.
- The foundation of the course is Fourier theory, which will then be used to understand dispersion of waves, image formation in optics and diffraction and other aspects of Fourier optics.
- Understand how the principle of superposition is applied when two pulses meet
- Define three terms to describe periodic waves: speed, wavelength, and frequency
- Explain the characteristics of transverse and longitudinal waves.
- Identify the relationship between the speed, wavelength, and frequency of a wave.

#### **Course Outcome**

After successful completion of the course, the student is expected to

- 1. To develop an understanding of the principles of optics.
- 2. Understand linear, time-invariant systems.
- 3. Understand the role of the wave equation and appreciate the universal nature of wave motion in a range of physical systems
- 4. To build connections between mathematical development and conceptual understanding.
- 5. Understand dispersion in waves and model dispersion using Fourier theory.
- 6. Understand optical phenomena such as polarization, birefringence, interference and diffraction in terms of the wave model.

#### UNIT 1 - Geometrical Optics

Aberrations - Spherical aberrations in lens - coma - Astigmatism - chromatic aberration - dispersion by a prism - Cauchy's dispersion formula - dispersive power, achromatism in prism - deviation without dispersion - chromatic aberrations in a lens - circle of least confusion - achromatic lens - condition for achromatism of two thin lenses separated by a finite distances.

#### UNIT 2 - Physical Optics

#### Interference

Fresnel's Biprism – Interference in thin films due to reflected light – Fringes due to wedgeshaped thin film – Newton's rings – Refractive index of the Liquid – Michelson interferometer –Determination of a wave length of monochromatic light – difference in Wave length betweentwo neighboring spectral lines – Fabry Perot Interferometer.

#### UNIT - 3 Diffraction

Fresnel's assumptions – rectilinear propagation of light – half period zone – Zone Plates – Action and Construction – comparison with a convex lens – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction at a Single light – Diffraction grating – Resolving power & Dispersivepower of Grating.

#### UNIT 4 - WAVES AND OSCILLATIONS

Simple harmonic motion - free, damped, forced vibrations and resonance - Fourier's Theorem -Application to saw tooth wave and square wave - Intensity and loudness of sound - Decibels -Intensity levels - musical notes - musical scale. Acoustics of buildings: Reverberation and time of reverberation - Absorption coefficient - Sabine's formula - measurement of reverberation time - Acoustic aspects of halls and auditoria.

#### UNIT-V- ULTRASONICS

Ultrasonic waves - Different modes - Characteristic properties - Behaviour - Focusing - Stationary waves and resonance - Attenuation - Diffraction - Sources of ultrasound. Piezoelectric crystal - Low frequency / high Intensity applications - high frequency - low intensity applications - clinical applications of different scans.

#### Suggested Books

- 1. A Text book of Optics Brijlal&Subramaniam; 25<sup>th</sup> edition 2014 S.Chand& co New delhi
- Text book of sound by BrijLal&Subramaniam, N Vikas Publishing House, New Delhi,2<sup>nd</sup>editon 2014
- 3. Text book of sound by M N Srinivasan Himalaya Publications (1991).
- 4. Science and technology of Ultrasonics by Baldevraj,and V. Rajendran 1<sup>st</sup> edition 2009Narosa (2004).
- 5. Optics and Spectroscopy R Murugesan 9<sup>th</sup> edition 2014 S.Chand& co.
- 6. Optics AjoyGhatak 5<sup>th</sup> edition 2014; Tata Mcgraw hill.
- 7. Optics 2<sup>nd</sup> edition 2011; Miller V Keiln; Thomas E. Furtak; CBS publishers.

#### L T P C - 53

#### 15PHU411

#### PHYSICS PRACTICALS IV

**Course Objectives:** 

- To familiarize the students with working, design and analysis of basic amplifier circuits.
- To design and analyze wave shaping circuits, rectifiers and power supply circuits
- Introduce the basic concept of qualitative and quantitative analysis of an instruments.
- Study the concept of separation science and its applications.
- To understand the concept of spectrometer
- To know about the resistance usages

#### **Course Outcomes:**

After successful completion of the course, the student is expected to

- 1. Handle any kind of process by framing it in block diagram, mathematical model and different process variables.
- 2. Use modern engineering tools and techniques in the practice of electronic devices.
- 3. Know all the industrial processes and demonstrate their knowledge in designing the control loops for these processes.
- 4. Measure the thickness of thin material using optical means
- 5. Determine the wavelength of Mercury spectrum
- 6. Estimate the specific resistance of any conductor
- 7. Analyze frequency response of RLC circuit.

#### ANY TEN EXPERIMENTS

- 1. Spectrometer hollow prism
- 2. Spectrometer- Cauchy's constant
- 3. M-Field along the axis of a circular coil carrying current
- 4. Elongation of spring
- 5. Calibration of high range ammeter-reduction factor-potentiometer
- 6. Energy band gap Ge/Si diode
- 7. PN junction diode characteristics
- 8. Characteristics of Zener diode
- 9. CRO
- 10. High resistance by charging B.G

- 11. High resistance by discharging B.G
- 12. B-H curve
- 13. Spectrometer narrow angle prism

#### **Suggested Books**

- 1. Ouseph C.C., U.J. Rao and V. Vijayendran 2007, Practical Physics and Electronics, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai
- 2. Singh S.P., 2003, Advanced Practical Physics 1, 13th Edition, PragathiPrakashan, Meerut
- 3. Singh S.P., 2000, Advanced Practical Physics 2, 12th Edition, PragathiPrakashan, Meerut

#### L T P C 4 - - 4

#### 15PHU403A

#### ALLIED CHEMISRY - II

**Course Objectives** 

- To make the student to be conversant with the extraction of metals, coordination chemistry, preparation, properties uses and structure of naphthalene and heterocyclic compounds.
- To make the student acquire sound knowledge of electrochemistry, biological functions of amino acids and proteins, thermodynamic laws, entropy, enthalpy change and the principles of electroplating.
- To understand the concept of aromaticity and preparation of aromatic compounds including heterocyclic compounds.
- To identify the new materials by different synthesis methods.
- To classify the proteins, amino acids, carbohydrates, etc

#### **Course Outcome**

After successful completion of the course, the student is expected to

- 1. The student understand the metallurgy of metals and the theories of coordination compounds and the industrial importance of EDTA, haemoglobin and chlorophyll.
- 2. Understand the concept of aromaticity and preparation of aromatic compounds including heterocyclic compounds.
- 3. Understand the preparation, classifications and properties of amino acids, proteins and carbohydrates.
- 4. Know the concept of Heterocyclic Compounds and their properties, synthesis methods.
- 5. Apply their knowledge to identify the new materials by different synthesis methods.
- 6. Classify the proteins, amino acids, carbohydrates, etc.

#### Unit-I

#### Metals and Coordination Chemistry:

**Metals:** General methods of extraction of metals-methods of ore dressing-types of furnacesreduction methods-electrical methods-types of refining-Van Arkel process-Zone refining.

**Coordination Chemistry:** Nomenclature-theories of Werner, Sidgewick and Pauling-chelation and its industrial importance-EDTA-haemoglobin-chlorophyll-applications in qualitative and quantitative analysis.

#### Unit-II

#### Aromatic Compounds and Heterocyclic Compounds:

**Aromatic Compounds:** Aromaticity-Huckel's (4n+2) rule- aromatic electrophilic substitution in benzene- mechanism of nitration, halogenation, alkylation, acylation and sulphonation. Naphthalene: Isolation, preparation, properties and structure.

Heterocyclic Compounds: Preparation and properties of pyrrole, furan, thiophene and pyridine.

#### Unit-III

#### Amino acids, Proteins and Carbohydrates:

**Amino acids:** Classification, preparation and properties. Peptides-preparation of peptides (Bergmann method only).

Proteins: Classification, properties, biological functions and structure.

**Carbohydrates:** Classification, preparation and properties of glucose and fructose- discussion of open chain and ring structures of glucose and fructose-glucose-fructose inter conversion.

#### Unit-IV

**Energetics:** Type of systems-processes and their types - isothermal, adiabatic, reversible, irreversible and spontaneous processes-statement of first law of thermodynamics-need for the second law of thermodynamics-heat engine-Carnot cycle-efficiency-Carnot theorem-thermodynamics scale of temperature-Joule-Thomson effect- Enthalpy- Entropy and its significance-Free energy change.

#### Unit-V

**Electrochemistry:** Kohlrausch law-conductometric titrations-hydrolysis of salts-galvanic cells-E.M.F.-standard electrode potentials-reference electrodes- electrochemical series and its applications-buffer solution-buffer solution in the biological systems-pH and its determinationprinciples of electroplating.

#### **Suggested Books**

- 1. V.Veeraiyan& A.N.S. Vasudevan, Text Book of Allied Chemistry (II Edition), Highmount Publishing House, Chennai (2005).
- 2. B.R.Puri and L.R.Sharma, Principles of Inorganic Chemistry, Shobanlal& Company Ltd., Jalandar (2002).
- 3. B.S.Bahl&ArunBahl, Advanced Organic Chemistry, S.Chand& Company Ltd., New Delhi (2005).
- 4. Puri, Sharma & Pathania, Physical Chemistry, Vishal Publishing Company Ltd., Jalandhar (2003).
- 5. R.Gopalan&S.Sundaram, Allied Chemistry (III Edition), Sultan Chand & Sons., New Delhi (2003).

#### L T P C 4 - - 4

#### 15PHU403B

#### **ALLIED STATISTICS - II**

**Course Objectives** 

- To provide students with a repertoire of mathematical methods that are essential to the solution of advanced problems encountered in the fields of applied physics
- In addition, intended to prepare the student with mathematical tools and techniques that are required in advanced courses offered in the applied physics.
- Demonstrate the ability to perform complex data management and analysis.
- Demonstrate the ability to apply linear, nonlinear and generalized linear models.
- Demonstrate understanding of how to design experiments and surveys for efficiency.
- Statistics is a scientific discipline by which statisticians assist other scientists and researchers in making informed decisions in the face of uncertainty.

#### **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Communicate mathematical and statistical knowledge and ideas to the students.
- 2. Apply his/her knowledge and skills to carry out advanced tasks and projects.
- 3. Contribute innovations and application of basic research.
- 4. Know the concept of different test methods.
- 5. Obtain the knowledge on problem solving and explain their steps.
- 6. Understand the concept of time series, probability, distribution, etc.,

#### UNIT I

Probability – definitions – addition and multiplication rules (only statements), permutation and combination, diagrammatic representation of probability (Venn diagram) – simple problems.

#### UNIT II

Probability distribution - Binomial distribution – Poisson Distribution – properties, mean and variance, Normal distribution–characteristics of normal curve (No derivations) simple problems only.

#### UNIT III

Test of Significance: Basic concepts – Z-test for two means – Small sample tests- t- test for single mean, two means – Chi Square Test.

#### UNIT IV

Index numbers – meaning and definition – uses – methods of construction – Unweighted and weighted index number – Laspeyre's, Paasche's and Fischer's method – Tests for an ideal index number – Wholesale and Cost of living index .

#### UNIT V

Time Series: Meaning – Components – Models – Business forecasting – methods of estimating trend – graphic, semi average, moving average and least square method – Seasonal variation – Methods of Simple Average.

#### **Suggested Book**

- 1. Pillai R.S.N., and Bagavathi V., 2002., Statistics, S. Chand & Company Ltd, New Delhi.
- 2. Gupta S.C., and Kapoor V.K., 1999. Fundamentals of Mathematical statistics, Sultan Chand & Sons, Educational Publishers, New Delhi.
- 3. Dr.P.N.Arora, 1997, A foundation course statistics, S. Chand & Company Ltd, New Delhi.
- 4. Navnitham P.A , 2004, Business Mathematics And Statistics, Jai Publications, Trichy,
- 5. Gupta S.P., 2001, Statistical methods, Sultan Chand & Sons, New Delhi.
- 6. Richard. I. Levin., & David. S. Rubin., 1998. Statistics for management, Seventh edition, Prentice hall of India, New Delhi.

LTPC

#### Semester – IV

## 15PHU403CALLIED BIOINFORMATICS - II4 - - 4

#### **Course Objective**

- This paper is aimed at giving idea to the students regarding the nature of human body and usage of different radiations for the treatment of body.
- To get introduced to the basic concepts of Bioinformatics and its significance in Biological data analysis.
- To explain about the methods to characterise and manage the different types of Biological data.
- Give an overview about pathway and enzyme databases, Sequence submission tools.
- To describe about Multiple Sequence Alignment, its significance, algorithms and tools used for MSA
- To classify and explain about tools used for genome sequence assembly

#### **Course Outcomes**

After successful completion of the course, the student is expected to

- 1. Gain knowledge on Different areas of research in bio Physics
- 2. Understand and apply key concepts specific to energy deposition for both ionizing
- 3. Know about the Gene therapy and Genetic variability.
- 4. Understand the concept of NCBI, DDBJ, and EMBL.
- 5. Analyse the Biological Database and its Types.
- 6. Gain knowledge on Gel electrophoresis, NMR Spectroscopy, X-Ray Diffraction, et.,

#### Unit I

Data generation: Generation of large scale molecular biology data. (Through Genome sequencing, Protein sequencing, Gel electrophoresis, NMR Spectroscopy, X-Ray Diffraction, and microarray). Applications of Bioinformatics.

#### Unit II

Biological Database and its Types Introduction to data types and Source. Population and sample, Classification and Presentation of Data Quality of data, private and public data sources. General Introduction of Biological Databases; Nucleic acid databases (NCBI, DDBJ, and EMBL).

#### Unit III

Data storage and retrieval and Interoperability Flat files, relational, object oriented databases and controlled vocabularies. File Format (Genbank, DDBJ, FASTA, PDB, SwissProt). Introduction to Metadata and search; Indices, Boolean, Fuzzy, Neighboring search

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#### Unit IV

Sequence Alignments and Visualization Introduction to Sequences, alignments and Dynamic Programming; Local alignment and Global alignment algorithm and example) Pairwise alignment (BLAST and FASTA Algorithm) and multiple sequence alignment (Clustal W algorithm)

### Unit V

Gene Expression and and Representation of patterns and relationship General introduction to Gene expression in prokaryotes and eukaryotes, transcription factors binding sites. SNP, EST, STS. Introduction to Regular Expression, Hierarchies, and Graphical models (including Marcov chain and Bayes notes). Genetic variability and connections to clinical data.

### **Suggested Books**

- 1. Palanichamy. 1999. Statistical methods for Biologists. 3<sup>rd</sup>edition. Palani Paramount Publications, Palani.
- 2. S.P.Gupta. 2007. Statistical methods. Sultan Chand and Sons Educational Publishers, New Delhi.
- 3. Ignacimuthu. S, 2013. Basic Bioinformatics, 2<sup>nd</sup> edition Alpha Science Intl Ltd Chennai.
- 4. S.C. Rastogi. 2009. Bioinformatics Concepts, Skills & Applications, CBS Publishers & Distributors, India.
- 5. Abraham Silberchatz Henry K.Forth and Sudharshan, 1997. "Database System Concepts" Tata McGraw Hill, New Delhi.
- 6. Arthur M. Lesk, 2014. Introduction to Bioinformatics, 4<sup>th</sup> edition. Oxford University Press, Oxford.
- 7. Attwood. K. and J. Parry-Smith, 2003. Introduction to Bioinformatics, Pearson Education, Singapore.
- 8. David W. Mount, 2013. Bioinformatics: Sequence and Genome Analysis. 2<sup>nd</sup> edition, Cold Spring Harbour Laboratory Press, New York.
- 9. Sundararajan. S and R. Balaji, 2003. Introduction to Bioinformatics, Himalaya Publishing House, Mumbai.
- 10. Steve Selvin. 2005. Biostatistics. 1<sup>st</sup> edition. Pearson Education Pte Ltd., New Delhi.
- 11. Jerald H Zar. 2005. Biostatistical Analysis. 4<sup>th</sup> edition. Pearson Education Pte Ltd., New Delhi.
- 12. Daniel. 2006. Biostatistics: A Foundation for analysis in the health sciences. 7<sup>th</sup> edition. John Wiley and Sons, Inc., New York.
- 13. SundarRao. P.S.S., and J.Richard., 2012. 5<sup>th</sup> edition, Introduction to Biostatistics and Research Methods, PHI Publication, New Delhi.

#### Semester – IV

#### LTPC - - 3 2

#### 15PHU411A **ALLIED CHEMISRY PRACTICALS - II**

#### **Course Objective**

- This paper presents the basic Principles of quantitative analysis in Chemistry.
- Enable the students to learn about the fundamentals of Practicals in Chemistry.
- The student on successful completion of the course should learn the principles of volumetric analysis.
- To estimate the compounds by acidimetry, alkalimetry and permanganometry.
- To acquire practical skills in volumetric analysis.
- To understand the basic principles of volumetric analysis.
- To estimate the Acidimetry & Alkalimetry by volumetric analysis •

#### **Course Outcomes**

After successful completion of the course, the student is expected to

- 1. Learnt about the quantitative analysis.
- 2. Learnt the estimation of sample present in a solution by volumetric analysis.
- 3. Analysis the volumetric of given samples.
- 4. Know the procedure of Permanganometry analysis.
- 5. Understand the basic knowledge on experimental procedurers.
- 6. Apply their theoretical knowledge and find the new materials by different reaction schemes.

#### List of Experiments

#### I. VOLUMETRIC ANALYSIS

#### A. Acidimetry&Alkalimetry

- 1. Estimation of sodium carbonateusing standard sodium hydroxide.
- 2. Estimation of sodium hydroxide using standard sodium carbonate.
- 3. Estimation of sulphuric acid using standard oxalic acid.
- 4. Estimation of potassium permanganate using standard sodium hydroxide.

#### **B.** Permanganometry

- 1. Estimation of ferrous sulphate using standard Mohr's salt.
- 2. Estimation of oxalic acid using standard ferrous sulphate.
- 3. Estimation of calcium-direct method.

#### Suggested books

- 1. R. Ramasamy, Allied Chemistry Practical Book, Priya Publications, Karur (2008).
- 2. A.O. Thomas, Practical Chemistry for B.Sc. Main Students, Scientific Book Centre, Cannanore-1, Kerala (2010).
- 3. V. Venkateswaran, R. Veeraswamy and A. R. Kulandaivelu, Basic Principles of Practical Chemistry, 2<sup>nd</sup> Edition, S. Chand Publications, New Delhi (2004).

# LTPC

#### **15PHU411B ALLIED STATISTICS PRACTICALS - II**

- - 3 2

#### **Course Objective**

- The course is designed to provide students with transferable skills, to understand the uses of SPSS, as a tool to summarize and aid in the interpretation of research findings.
- Demonstrate knowledge of probability and the standard statistical distributions.
- Demonstrate knowledge of fixed-sample and large-sample statistical properties of point and interval estimators.
- Demonstrate knowledge of the properties of parametric, semi-parametric and nonparametric testing procedures.
- Demonstrate the ability to perform complex data management and analysis.
- Demonstrate the ability to apply linear, nonlinear and generalized linear models.

#### **Course Outcome**

After successful completion of the course, the student is expected to

- 1. Continue their higher studies and scientific research to analyze and solve complex problems in the field of computer science.
- 2. Design, develop and test the solutions using contemporary technologies with full participation in profession and society.
- 3. Communicate effectively in their work environment with multidisciplinary team for their lifelong learning, ethical and professional development.
- 4. Participate in national mission through technical expertise, leadership and entrepreneurship.
- 5. Demonstrate knowledge of classical and repeated measures multivariate methods and computational techniques.

#### List of Experiments

- 1. Using SPSS Package, hypothesis test using Z- test for two different populations.
- 2. Using SPSS Package, hypothesis test using Z- test for two different samples.
- 3. Using SPSS Package, hypothesis test using t- test for two different populations.
- 4. Using SPSS Package, hypothesis test using t- test for two different samples.
- 5. Using SPSS Package, hypothesis test using Chi Square Test.
- 6. Using Excel Package, Calculate Laspeyre's, method.
- 7. Using Excel Package, Calculate Paasche's method.
- 8. Using Excel Package, Calculate Fischer's method.
- 9. Using Excel Package, Calculate moving average and show the results in graph.
- 10. Using Excel Package, Calculate seasonal indices by the methods of simple average.

LTPC

#### Semester – IV

#### 15PHU411C ALLIED BIOINFORMATICS PRACTICALS - II -- 32

#### **Course Objective**

- The course is designed to provide students with transferable skills, to understand the uses of SPSS, as a tool to summarize and aid in the interpretation of research findings.
- To be comfortable using SPSS as a data analysis tool
- To understand how to work with SPSS
- To learn to use new features of SPSS on their own
- To acquire information (samples)
- To understand how to enter and reorganize information within SPSS
- To understand how to effectively summarize research finds using SPSS through the use of appropriate indexes and tables.

#### **Course Outcome**

- 1. be able to choose charts to successfully highlight their research results
- 2. be able to understand and interpret charts
- 3. understand the basic principles behind inferential statistcs
- 4. be able to carry out inferential statistical analysis using SPSS
- 5. be able to integrate information and build models
- 6. be able to edit SPSS output
- 7. be able to use SPSS output to produce scientifically sound research reports

#### **List of Experiments**

- 1. Using SPSS Package, hypothesis test using Z- test for two different populations.
- 2. Using SPSS Package, hypothesis test using Z- test for two different samples.
- 3. Using SPSS Package, hypothesis test using t- test for two different populations.
- 4. Using SPSS Package, hypothesis test using t- test for two different samples.
- 5. Using SPSS Package, hypothesis test using Chi Square Test.
- 6. Using Excel Package, Calculate Laspeyre's, method.
- 7. Using Excel Package, Calculate Paasche's method.
- 8. Using Excel Package, Calculate Fischer's method.
- 9. Using Excel Package, Calculate moving average and show the results in graph.
- 10. Using Excel Package, Calculate seasonal indices by the methods of simple average.

#### Semester V

## 15PHU501ATOMIC AND MOLECULAR PHYSICS5 -

L T P C 5 - - 5

#### **Course Objective**

- This paper explains the evolution of matter from electron to molecules, different properties of atoms and molecules, structure of molecuels, radioactivity etc.
- The student knowledge of the basics of science atom and molecules
- Learn the basic atomic concepts and principles, and the basics of emission spectroscopy with a highlight on its practical and scientific significance.
- Describe the atomic spectra of one and two valance electron atoms.
- Explain the change in behaviour of atoms in external applied electric and magnetic field.
- Explain rotational, vibrational, electronic and Raman spectra of molecules.
- Describe electron spin and nuclear magnetic resonance spectroscopy and their applications.

#### **Course Outcomes**

After successful completion of the course, the student is expected to

- 1. To make the students understand the basics of atoms and molecules, molecular structure, different types energy transfer in molecules etc.
- 2. Understand the emergence of quantum concept.
- 3. Distinguish between different photo devices and working.
- 4. Understand different atom models.
- 5. Analyse the prerequisite in a molecule towards its Rotational and vibrational activity.
- 6. Gain knowledge on theory of diamagnetism and paramagnetism.

#### <mark>UNIT I</mark>

Discharge of electricity through gases – Cathode rays, positive rays, x-rays – Discovery of electron – Determination of e/m by Thomson's method – Determination of charge of electron – Thomson's experiment - Electron theory and applications – electrical conductivity in metals – Thermal conductivity – Thermo-electric effect – Langevin's theory of diamagnetism and paramagnetism – Thermionic emission – photoelectric emission – applications

#### <mark>UNIT II</mark>

The Thomson atom model – Rutherford atom model – Bohr atom model – Applications of Bohr's theory – excitation and ionization of atoms – X-ray spectra – Continuous and

Characteristic x-ray spectra – The Sommerfeld relativistic atom model – Vector atom model – Electronic structure in atoms – Fine structure of spectral lines

#### <mark>UNIT III</mark>

Radioactivity – origin of radiation from natural radioelements – alpha disintegration – wave mechanical theory – Beta disintegration – internal conversion of gamma rays – gamma ray emission – origin of gamma rays

#### <mark>UNIT IV</mark>

Molecular Structure – General classification of molecules – Electronic structure in molecules – linkage between atoms – electrovalent and covalent atomic molecules – wave mechanical theory of covalent linkage – Van der Waals type of binding – metallic binding – electric moments of molecules – size and shape of molecules – heat of disassociation – photo-chemical disassociation – Frank Condon principle

#### <mark>UNIT V</mark>

Molecular spectra – experimental study – theoretical explanation – pure rotation spectra – rotation-vibration spectra – Fortrat diagram – Peculiarities of certain band spectra – Isotopic effect in molecular spectra.

#### Suggested Book:

- 1. Murugeshan. R, 17<sup>th</sup> edition 2014, Modern Physics, S. Chand & Company, New Delhi.
- 2. Arutherbeiser ; 1<sup>st</sup> edition 1969 Mcgraw hill ; Prespective of morden physics.
- 3. J.B.Rajam, 'Atomic Physics', S.Chand& Co., New Delhi, 7<sup>th</sup> edition 2009.
- 4. White H.E., 'Introduction to Atomic Spectra', McGraw Hill Book Co., New York, 1934.
- 5. Banwell, 'Fundamentals of Molecular Spectroscopy', Tata McGraw Hill Education, 1994.

#### Semester-V

# LTPC

#### 15PHU502 CLASSICAL AND QUANTUM PHYSICS

# 5 - - 5

#### **Course Objectives**

- This paper explains the shortcomings of quantum mechanics in explaining different subatomic physics and the evolution of quantum mechanics.
- This course is part one of a two semester course focused on a rigorous exposition to the principles of Quantum mechanics.
- The Dirac bra-ket formalism will be introduced and used throughout to present the principles of Quantum Mechanics in a general context.
- We will discuss analytic solutions to the Schriodinger equation for a variety of potentials in one, two and three dimensions.
- The role of symmetries as the underlying principle of Quantum Mechanics will be emphasized throughout the course.
- The use of symmetry principles and operators methods will be discussed.

#### **Course Outcome**

After successful completion of the course, the student is expected to

- 1. Understand the interpretation of wave function of quantum particle.
- 2. Know the quantum phenomena are exposed to the student.
- 3. Understanding the behavior of quantum particle encountering a i) barrier, ii) Potential.
- 4. Gets exposed to solving non-relativistic hydrogen atom, for its spectrum and eigenfunctions.
- 5. Study of influence of electric and magnetic fields on atoms will help in understanding Stark effect and Zeeman Effect respectively.
- 6. Understand the difference between classical and quantum concept.
- 7. Use the superposition principle to predict experimental outcomes for measurement of observables on simple quantum systems.
- 8. Apply the uncertainty principle and heuristic arguments to obtain rough descriptions of quantum systems.
- 9. Describe generally the physical implications, such as possible bound states and un-bound states for any given hamiltonian.

#### UNIT - I

Introduction - Inadequacy of classical mechanics - Dual nature of light - Dual nature of matter; De-Broglie wavelength - Experimental detection of wave properties of material particles based on diffraction of electrons; Davisson and Germer experiment -Normal incidence and oblique incidence - G.P. Thomson's experiment - Wave velocity and Group velocity for De-Broglie waves - Wave packet-Relationship between particle velocity and Group velocity for De-

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#### **B.Sc** Physics

Broglie waves - relation between phase velocity and group velocity for a non-relativistic free particle.

#### UNIT - II

Introduction-statement of the uncertainty principle - Physical significance of Heisenberg's uncertainty relation - Illustration of uncertainty principle - Examples of position, momentum, uncertainty - Heisenberg's Gamma ray microscope. Diffraction of a beam of electrons by a slit - Application of the uncertainty principle - The non existence of the electron in the nucleus - The radius of the Bohr's first orbit of H2 atom and energy in the ground state.

#### UNIT - III

Physical interpretation of the wave function - Equation of motion of matter wave (i) Time-independent Schroedinger equation (ii) Schroedinger equation for a free particle and (iii) Time dependent Schroedinger equation-Solution of the Schroedinger equation -Orthogonal, normalized and orthonormal of wave function - Expectation values of dynamical qualities, probability current density, particle flux-Ehrenfest's theorem. Eigen function, Eigen value and Eigen value equation - orthogonality of Eigen function - Reality of energy Eigen value.

#### UNIT - IV

Constraints and degrees of freedom-generalized coordinates-generalized displacement-velocityacceleration-momentum-force-potential-D'Alembert's principle-Lagrangian differential equation from D' D'Alembert's principle-Application of Lagrangian equation of motion to linear harmonic oscillator, simple pendulum and compound pendulum.

#### UNIT - V

Phase Space - Hamiltonian function - Hamilton's variational principle - Hamilton's canonical equations of motion - Physical significance of H - Application of Hamiltonian equation of motion to simple pendulum, compound pendulum and linear harmonic oscillator.

#### **Suggested Books**

- 1. Aruldhas G., 2009, Quantum Mechanics, 2nd Edition, Printice Hall of India, New Delhi
- Gupta , Kumar, Sharma 19<sup>th</sup> edition, 2008, classical mechanics ; pragrathiprakeshan; Meerut.
- 3. SathyaPrakash and G.K. Singh, 2003, Quantum Mechanics, KedarNath&Ram Nath& Co, Meerut, New Edition.
- Singh. S.P., 2<sup>nd</sup> edition 2013, Elements of Quantum Mechanics, M.K. Badge & Kamal Singh, S.Chand& Co, New Delhi.
- 5. SathyaPrakash, 2002, Mathematical Physics, 4th Edition, S. Chand & Company, New Delhi.
- 6. Leonard.I.Schiff, 1968, Quantum Mechanics, 3rd Edition, McGraw Hill International, Auckland.

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#### L T P C 5 - - 5

## 15PHU503

# LASER AND SPECTROSCOPY

**Course Objectives** 

- Laser is a versatile tool with applications in almost all fields from medical to astronomy, communications, welding, cutting etc.
- This paper explains the characteristics of lasers, different types of lasers and their construction. Applications of lasers in different fields are also explained.
- To give exposure to students about the characteristics of different lasers, their fabrication techniques, applications etc. To provide a basis of LASER.
- To develop the student should have had a knowledge on the different types of lasers ... radiation-Power radiated by a point charge Velocity and acceleration ...
- Spectroscopy; Basic principle of NMR and its Applications.
- Basic Laser principles, Laser behaviour, Properties of laser radiations, Different types of Lasers and Laser applications

# **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Absorption and spontaneous and stimulated emission in two level system, the effects of homogeneous and inhomogeneous line broadening, and the conditions for laser amplification.
- 2. Know the operations and basic properties of the most common laser types, He-Ne, Argonion, and carbon-dioxide, ruby, titanium sapphire, neodymium YAG and glass, knowledge of other main laser types.
- 3. Classify fibers as single-mode, multimode step index and multi-mode graded index.
- 4. Understanding of the physics of lasers, their unique properties and potential for applications.
- 5. Understand the laser action phenomena, properties of laser.
- 6. Understand the fundamental processes that occur during the interaction of light and matter

# UNIT-I

# Laser physics

Basic Principle of Laser - Einstein Coefficients - condition for light amplification - Population Inversion - Threshold Condition - Line shape function - Optical Resonators - Three level and four level systems.

# UNIT-II

Types of lasers and output modulation methods

#### **B.Sc** Physics

2015-2018

Solid State lasers - Ruby and Nd-YAG Laser - Gas lasers - He-Ne and Co2 lasers - semiconductor lasers - Heterojunction lasers - Liquid Dye lasers - Q switching and mode locking.

# UNIT-III

### Applications of LASER

Application of laser in industry - cutting and welding - Drilling - surface Hardening - Medical applications - laser as diagnostic and therapeutic tool - Holography - Theory of recording and reconstruction - application of Holography.

### <mark>UNIT IV</mark>

#### **Basic Elements of Spectroscopy:**

Quantum of Energy-Regions of Spectrum-Representation of Spectrum-Basic Elements of Practical Spectroscopy-Signal to Noise Ratio-Resolving Power-Width & Intensity of Spectral Transitions

#### **Microwave Spectroscopy**

Classification of Molecules-Interaction of Radiation with Rotating MoleculesRotational Spectrum of Rigid Diatomic Molecule-Example of CO-Information derived from Rotational Spectrum

# <mark>UNIT V</mark>

**I.R spectroscopy**: Practical aspects – Theory of I.R rotation vibration spectra of gaseous diatomic molecules – applications of I.R spectroscopy – Basic principles of F.T.I.R spectroscopy Raman spectroscopy: Classical and Quantum theory of Raman effect - Rotation vibration Raman spectra of diatomic and polyatomic molecules – Applications - Laser Raman spectroscopy - Surface Enhanced Raman Scattering.

- 1. Aruldhas. G., 2008, Molecular Structure and Spectroscopy, 2nd Edition, Prentice Hall of India, New Delhi
- 2. Laser theory and applications by K. Thyagarajan and Ajoy Ghatak,1<sup>st</sup> edition Cambridge University Press, 1999.
- Introduction to laser Spectroscopy, D L Andrews and A Ademidov 2<sup>nd</sup> edition 2005, Springer
- An Introduction to laser: Theory and Applications by M. N. Avadhanulu, S. Chand and Co., New Delhi 2<sup>nd</sup> edition 2015.

#### Semester-V

### L T P C 5 - - 5

## 15PHU504

# BASIC ELECTRONICS

# **Course Objectives**

- This course provides in-depth knowledge of switching theory and the design techniques of digital circuits, which is the basis for design of any digital circuit.
- The aim of this course is to enable the students to design and trouble shoots the electrical circuits, networks and appliances through hands-on mode.
- To use Circuit Theory as a carrier of the fundamentals of Linear System and Continuous Signal Analysis so that the students are well-prepared to take up a detailed study of higher level subjects
- To apply their knowledge to analog and digital electronics, pulse electronics, analog and digital communication systems, digital signal processing, control systems, and power electronics at a later stage.
- To make the students understand coherence between theoretical and practical measurement.
- To use the techniques, skills and modern technical tools necessary for technical or engineering practice.
- The primary objective of this course is to provide a thorough understanding and working knowledge of design, implementation and analysis of instruments.

# **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Apply concepts for the design of Regulators and Amplifiers.
- 2. Verify the theoretical concepts through laboratory and simulation experiments.
- 3. Implement mini projects based on concept of electronics circuit concepts.
- 4. Have basic knowledge of semiconductor diode, rectifier and filter circuits.
- 5. Understand transistor biasing and working principle of Amplifiers.
- 6. Explain feedback and oscillatory circuits.
- 7. An idea about Multivibrators and operational amplifiers.
- 8. Comprehend the operation and characteristics of FET, MOSFET, SCR and UJT.

# UNIT I

# **Basic concepts of semiconductors**

P-N junction Diode-Diode Characteristics-Expression for Diode current (Expression without derivation)-Static and Dynamic resistances-Junction capacitance-Equivalent circuit-Avalanche and Zener breakdown-PIV -Voltage regulation-Line regulation and load regulation- Rectifiers-Half wave-Centre tapped full wave and Bridge rectifiers-Derivation of efficiency and ripple factor of half wave and full wave rectifiers,LED,SCR.

# <mark>UNIT II</mark>

# **Transistors**

Transistors-Bipolar junction transistors-Mechanism of amplification in a transistor- Common base, common emitter and common collector configurations and their characteristics-Active, saturation and Cut-off regions-Current gain  $\alpha$ ,  $\beta$ ,  $\gamma$  and their relationships-Experiment to draw the characteristics of transistor in the CB and CE modes-Leakage currents-Expressions for output currents in the three modes-Transistor as a switch,FET,MOSFET,UJT.

# <mark>UNIT III</mark>

# **Amplfiers**

Different transistor amplifier configurations:- C-B, C-E, C-C, their characteristics, amplification factors, their relationships, Load line Analysis, Expressions for voltage gain, current gain and power gain of C.E amplifier, cut-off and saturation points, Transistor biasing, Different types of biasing - Base resistor, voltage divider bias method, single stage transistor amplifier circuit, load line analysis, DC and AC equivalent circuits.

# <mark>UNIT IV</mark>

# **Operational amplifer**

Operational amplifier- Block diagram-characteristics-parameters- Applications of Op-amp: Inverting-Non-inverting-differentiator-integrator-comparator-adder-subtractor- Active filters using 741: high pass and low pass filters- band pass filter-Schmitt trigger.

# <mark>UNIT V</mark>

# **Oscillators**

Oscillatory Circuits-LC, RC oscillators, tuned collector oscillator, Hartley, Colpitt's, phase shift Oscillators, Weinbridge oscillators. Multivibrators-Astable ,monostable and Bistablemultivibrtors(using 555 Timer)

- 1. V.K. METHA Principles of Electronics S Chand & co Newdelhi 11<sup>th</sup> edition 2014
- 2. Solid State Electronics-B.L.Theraja: S.Chand C 5<sup>th</sup> edition 2014.
- 3. A Text Book of Applied Electronics-R.S.Sedha: S.Chand Co. Multi Colour Edn.
- 4. Malvino A.P. 7<sup>th</sup> edition 2013, Electronics Principles, Tata McGraw Hill, New Delhi
- 5. Milmann and Halkias, 48<sup>th</sup> reprint 2008, Integrated Electronics, Tata McGraw Hill, New Delhi.

#### Semester-V

# LTPC

## 15PHU505A

# NUMERICAL METHODS

5 - - 5

## **Course Objectives**

- Numerical methods is very important where large number of calculations are involved, and the original calculations from first principles is very difficult and complicated. In this paper, different methods are introduced for carrying out complicated calculations.
- This paper explains the different numerical methods of calculations which is of very much importance in the analysis of many problems in Physics.

### **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Demonstrate basic knowledge of numerical methods.
- 2. Demonstrate an understanding of the applicability of numerical methods for modeling physical systems and its advantages and disadvantages.
- 3. Communicate mathematical and physical knowledge and ideas to the students.
- 4. Understand the relationship between observation and theory and their use in building the basic concepts of computing.
- 5. Gain the knowledge on curve fitting and plotting the data.
- 6. Know the processes of data analysis and interpretation of physical problems.

# UNIT I

Principle of least squares - fitting a straight line - linear regression - fitting a parabola fitting an exponential curve.

# UNIT II

Bisection method - method of successive approximations - RegulaFalsi method -Newton-Raphson method - Horner's method - Euler's method - modified Euler's method -RungeKutta method (II & IV).

# UNIT III

Gauss elimination method - Gauss-Jordan method - Gauss-Seidel method - computation of inverse of a matrix using Gauss elimination method - method of triangularisation.

# **UNIT IV**

First differences - difference tables - properties of the operator A.E.D. Linear interpolation: Newton forward interpolation formula and backward interpolation formula - Bessel's Formula.

Interpolation with unequal intervals: Lagrange's interpolation formula.

UNIT V

Trapezoidal rule - Simpson's 1/3 rule and 3/8 rule - practical applications - Weddle's rule - Gaussian Quadrature formulae.

- 1. E Balagurusamy 1<sup>st</sup> edition 2014 numerical methods Tata Mcgraw hills
- 2. Venkatraman, M.K., 1977, Numerical Methods in Science and Engineering, National publishing Company, Chennai.
- 3. Shastry, S.S, 2007, Introductory Methods of Numerical Analysis, Prentice Hall of India, Pvt. Ltd., New Delhi.
- 4. M K Jain, R K Jain, SRK Iyenger 6<sup>th</sup> edition 2014 Numerical methods for Scientific and Engineering Computation, New Age Publishers.

#### Semester-V

# LTPC

## 15PHU505B

# RENEWABLE ENERGY SOURCES

5 - - 5

#### **Course Objective**

- To understand the various forms of conventional energy resources.
- To learn the present energy scenario and the need for energy conservation
- To explain the concept of various forms of renewable energy
- Give outline division aspects and utilization of renewable energy sources for both domestics and industrial application.
- To provide the awareness and need of renewable energy.
- To describe the uses, needs and applications of various renewable energy sources. •

# **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.
- 2. Understand the concept of hydro energy resources and their classification.
- 3. Describe the use of solar energy and the various components used in the energy production with respect to applications like - heating, cooling, desalination, power generation, drying, cooking etc.
- 4. Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications.
- 5. Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications.
- 6. Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations.

# **UNIT I**

# Solar Energy

Review of energy resources, solar energy estimation of intensity of terrestrial radiation, solar radiation on inclined plane surface, estimation of monthly average, daily total radiation and diffused radiation on horizontal surface, solar collectors. Flat plate collector- Solar water heatersolar cooker & furnaces, solar greenhouse. Solar thermomechanical systems- thermal water pump- solar cell characteristics, solar cell module, panel and array construction, applications.

# **UNIT II**

# Wind and Ocean Energy

Origin of winds, Factors affecting wind energy, Nature of winds, Variation of wind speed with height, Major applications of wind power, Wind turbine, Energy available in windpower extraction- Axial thrust or turbine, Torque developed by turbine, Dynamic matching for

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#### **B.Sc** Physics

maximum power extraction. Wind turbine operation and power versus wind speed characteristics, Wind energy Conversion Systems- Fixed speed drive scheme- Variable speed drive scheme. Tidal Energy-range power-tidal energy conversion schemes. Wave energy-Power in waves. Ocean Thermal Energy-OTEC

# <mark>UNIT III</mark>

### **Biomass**

Biofuels .Biomass resources-Biomass conversion Technologies. Urban waste to energy conversion. Biomass gasification. Biomass to Ethanol production. Biogas from waste Biomass. Biogas plants and operational parameters-Constant pressure and constant volume type Biogas plants-Comparison. Landfilvl reactors.

# **UNITIV**

# Geo-thermal energy

Origin and distribution of Geothermal energy. Types of Geothermal resources. Hydro-thermal resources-dry steam system-wet steam system. Geopressured resources- hot dry rock resources-magma resources exploration and development of Geothermal resources. Environmental aspects.

### <mark>UNIT V</mark>

#### Emerging trends in Renewable Energy Sources.

Fuel cell- Classification of fuel cells –Phosphoric acid Fuel cell(PAFC), Alkaline Fuel Cell(AFC) –Solid polymer Fuel cell(SPFC) Molten carbonate Fuel cell(MCFC) Solid oxide Fuel cell (SOFC) FUEL for FUEL cells-efficiency of a fuel cell- V I characteristics of Fuel cell. Chemical polarization- resistance polarization- concentration polarizationFuel cell power plant hydrogen energy- production- storage conversion to energy sources and safety issues, Hydropower resources, Magneto Hydrodynamic (MHD) power conversion, MHD generator-MHD system- Thermal electric power conversion, Thermo electric power generator.

- 1. Rai G. D.: Non-conventional energy sources, Khanna Pub., 4th Edn, 2000.
- 2. B. H. Khan: 2<sup>nd</sup> edition Non-conventional energy resources, Tata McGraw-Hill, 2006.
- 3. Rao S. and B. B. Parulekar: Energy Technology, Non-Conventional, Renewable and Conventional, Khanna Publications, 3rd edn., 1999.
- 4. Gupta B. R.,6<sup>th</sup> edition 2013 Generation of electrical energy, S Chand & Co

### L T P C 5 - - 5

## 15PHU505C

# NON-LINER OPTICS

## **Course Objectives**

- Study of non-linear optical properties of materials is very important as many of such materials are used in different instruments etc.
- This paper gives basic knowledge about different nonlinear optical properties and their theoretical aspects.
- To be able to apply the fundamental concepts of optics in lasers, optical fiber communications and optoelectronics.
- Apply the concept of optical fiber, its construction and importance in communication physics.
- To analyze different laser systems and its applications in various fields.
- To identify few different applications of optics i.e. Laser, Fiber Optics, Optoelectronics and Non Linear Optics.
- To understand the basic lasing mechanism, types of Lasers, characteristics of Laser Light, types of Lasers,

### **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Know the absorption and spontaneous and stimulated emission in two level system, the effects of homogeneous and inhomogeneous line broadening, and the conditions for laser amplification.
- 2. Know the operations and basic properties of the most common laser types, He-Ne, Argon-ion, and carbon-dioxide, ruby, titanium sapphire, neodymium YAG and glass, knowledge of other main laser types.
- 3. Classify fibers as single-mode, multimode step index and multi-mode graded index.
- 4. Describe modes in multimode fibers and mode field parameter in single-mode fibers.
- 5. Basic ideas about Non-linear equations and chaos.
- 6. Understand the difference between linear and nonlinear properties.

# <mark>UNIT I</mark>

Review of the concepts of polarizability and dielectric tensor of a medium. Frequency dependence of the dielectric tensor – wave vector dependence of the dielectric tensor – electromagnetic waves in an isotropic dielectrics.

# <mark>UNIT II</mark>

Introduction to non linear optics- Nonlinear dielectric response of matter – frequency variation of the nonlinear susceptibilities – properties of non linear susceptibilities- time domain descrption of optical non- linear susceptibilities- wave vector dependence of the nonlinear susceptibilities.

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# <mark>UNIT III</mark>

Second harmonic generation – perturbation theory – phase matching evolution of SHW under phase matching conditions. Four wave mixing spectroscopy – optical phase conjugation – nonlinear materials.

# <mark>UNIT IV</mark>

Scattering of light – Raman scattering – Quantum theory of Raman scattering – Brillouin scattering. Interaction of atoms with nearly resonant fields – wave function under near resonant conditions. Bloch equations – self induced transparency.

# <mark>UNIT V</mark>

Fibre optics – normal modes of optical fibres – nonlinear Schrodinger equations – linear theory. Basic concepts of solutions and non-linear periodic structures. Effect of fibre loss – effect of waveguide property of a fibre – conditions of generation of a solutions in optical fibres.

- 1. D.L. Mills,1<sup>st</sup> edition 1998 Basic Concepts of Nonlinear Optics ,Springer
- 2. F.Zernike and J.E. Midwinter, Applied Nonlinear Optics, revised edition 2006, Dover books
- 3. G.C. Baldwin,1<sup>st</sup> edition 1969 An Introduction to Nonlinear Optics Tata McGraw Hills
- 4. AjoyGhatak&Tyagarajan 1<sup>st</sup> edition 2011,Introduction to Fibre Optics Tata McGraw Hills

#### L T P C - - 5 3

# 15PHU511

# PHYSICS PRACTICALS V

**Course Objective** 

- To gain knowledge on the applications of operational amplifier such as adder, subtractor, inverting and non-inverting amplifier, voltage follower.
- To gain knowledge on characteristics of transistors
- To gain knowledge on construct amplifiers
- To gain knowledge on oscillators using transistors and study their performance.
- To understand the various parameters of the Hysteresis loop
- Acquire the knowledge of semiconducting and dielectric materials.

# **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Study the working of different electronic components/ circuits practically.
- 2. Learn to minimize contributing variables and recognize the limitations of equipment.
- 3. Design and construction of circuits using analog component and trouble shooting of the circuits.
- 4. Understand the Biasing network for BJT and FET, transient analysis and frequency response of BJT and FET in single stage and multistage amplifier.
- 5. Understand the frequency response feedback amplifier using BJT and FET and Tuned amplifier.
- 6. Understand the operation of Oscillators and waveform generators.

# ANY TEN EXPERIMENTS

- 1. Transistor characteristics CE &CB
- 2. JFET characteristics
- 3. UJT characteristics
- 4. Full wave & Half wave rectifier
- 5. Op-amp inverting & non- inverting circuits
- 6. High pass op-amp
- 7. Low pass Op-amp
- 8. Clipper circuits
- 9. Clamping circuits
- 10. CE amplifier
- 11. Hartley oscillator

12. Colpit's oscillator

13. Adder & subtrator Op-Amp

- 1. Ouseph C.C., U.J. Rao and V. Vijayendran 2007, Practical Physics and Electronics, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai
- 2. Singh S.P., 2003, Advanced Practical Physics 1, 13th Edition, PragathiPrakashan, Meerut
- 3. Singh S.P., 2000, Advanced Practical Physics 2, 12th Edition, PragathiPrakashan, Meerut

LTPC

# Semester-VI

# 15PHU601DIGITAL ELECTRONICS AND MICROPROCESSOR5 - - 5

#### **Course Objectives**

- Digital electronics is very important in present day life due to its applications in almost all fields of life.
- Any signals stored in memory are first digitized. So it is important to have knowledge about digital electronics.
- This paper is intended to give an insight into the theory and applications of digital electronics, design of circuits with digital devices, details of microprocessor and its applications.
- To apply their knowledge to analog and digital electronics, pulse electronics, analog and digital communication systems, digital signal processing, control systems, and power electronics at a later stage.
- To make the students understand coherence between theoretical and practical measurement.
- To use the techniques, skills and modern technical tools necessary for technical or engineering practice.
- The primary objective of this course is to provide a thorough understanding and working knowledge of design, implementation and analysis of instruments.

#### **Course Outcomes (Cos)**

After successful completion of the course, the student is expected to

- 1. Acquire the basic knowledge of digital logic levels and application of digital electronics circuits.
- 2. Perform the analysis and design of various digital electronic circuits.
- 3. Acquired knowledge about Microprocessors and its need.
- 4. Identify basic architecture of different Microprocessors.
- 5. Conversion between various number systems
- 6. Employ Logic gates for carrying out logic operations
- 7. Apply the concept of Boolean laws and employ a Karnaugh Map to reduce Boolean expressions.
- 8. Design various combinational and sequential circuits using flipflops.
- 9. Explain different types of memory used in computers.

#### UNIT - I

Decimal, binary, octal, hexadecimal - Conversion of number system - Conversion of decimal to binary, binary to decimal- decimal to octal - Octal to decimal - Octal to binary - Binary to octal -

#### **B.Sc** Physics

Decimal to hexadecimal - Hexadecimal to decimal, hexadecimal to binary - Binary to hexadecimal.

Binary coded decimal - 8421 code - Alphanumeric codes ASCII code - EBCDIC code - Error detecting code – Parity - Even parity and odd parity method.

# UNIT - II

Logic gates - AND, OR, NOT, NAND, NOR gates - Construction of circuit only I/C - Action truth table - Logic symbol.

Boolean operators - Logic expressions – Demorgan's theorems - Laws and rules of Boolean algebra - Truth table - Reducing Boolean expressions, K maps; logic diagrams of Boolean algebra expressions - Converting logic circuits to expressions.

### UNIT - III

Flip-flop definitions; clocked flip-flop; S-R flip-flop: JK flip flop: T-flip flop; D flip flop; master slave J-K flip flop: construction circuits. Ring counter; Ripple counter and mod counters

#### UNIT - IV

XOR gates half adder - Full adder - Full subtracter - Parallel binary adder - Parallel binary subtracter - Construction, action and truth table.

Magnetic tape - Magnetic disc - Floppy disc - Magnetic cores - Magnetic core logic, coincident memory - Memory addressing. MOS - random access memory - MOD read only memory PROM-EPROM.

#### UNIT - V

Brief history, organization of 8085 - Data and address bus, addressing the I/O devices, registers in the 8085, instruction set - Instruction types, and classification of instruction, simple programs.

- 1. Floyd, 2003, Digital Fundamentals, 8th Edition, Pearson education, New Delhi.
- 2. Ramesh Gaonkar 6<sup>th</sup> edition 2013 Microprocessor Architecture, Programming and Applications with 8085 ,PENRAM International P Ltd.
- 3. Malvino and Leach, 1983, Digital Principles and Applications, 3rd Edition, Tata McGrawHill, New Delhi.
- 4. Aditya P. Mathur, 1995, Introduction to Microprocessor, 3rd Edition, Tata McGrawHill, New Delhi.
- 5. Morris Mano. M, 1<sup>st</sup>2002, Digital Logic and Computer Design, Prentice Hall, New Delhi.
- 6. Paul M.Julich and John Hilburn, 1<sup>st</sup> 1987, Microcomputers / Microprocessors, Prentice Hallof India, New Delhi.

### Semester-VI

#### 15PHU602

#### STATISTICAL MECHANICS

L T P C 5 - - 5

#### **Course Objectives**

- To create a bridge between theory of the micro-world and macroscopic phenomena.
- To give explanation for the properties of macroscopic systems using the knowledge of the properties of individual molecules.
- To provide rigorous definitions of thermodynamic quantities and derivations of the laws of thermodynamics from the laws of quantum mechanics.
- The aim of statistical mechanics is to give knowledge on the laws of classical thermodynamics for macroscopic systems using the properties of its atomic particles.
- To apply the concepts and principles of black-body radiation to analyze radiation phenomena in thermodynamic systems.
- To apply the concepts and laws of thermodynamics to solve problems in thermodynamic systems such as gases, heat engines and refrigerators etc.
- To give knowledge on the statistical mechanics and explain the applications of thermodynamics.
- To provide the correlation of thermodynamical problems with statistical concepts.

# **Course Outcomes**

After successful completion of the course, the student is expected to

- 1. Understand the concepts of statistical mechanics
- 2. Know about different types of distributions, Maxwell-Boltzmann distribution, Fermi-Dirac distribution and Bose-Einstein distribution.
- 3. Different types of particles follow different distributions and hence it is necessary to have idea about these distributions.
- 4. Compare Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Statistics and derive its outcomes.
- 5. Understand the classical and quantum theory of radiation.
- 6. Know the concept apply on the Thermodynamical problems.

# UNIT I

# Classical Statistics

Entropy and Thermodynamic Probability. Maxwell-Boltzmann Distribution Law. Ensemble Concept. Partition Function. Thermodynamic Functions of Finite Number of Energy Levels. Negative Temperature. Thermodynamic Functions of an Ideal Gas. Classical Entropy Expression, Gibbs Paradox. Law of Equipartition of Energy – Applications to Specific Heat and its Limitations.

# <mark>UNIT II</mark>

Statistical definition of temperature, pressure, entropy and chemical potential. Partition function of a system in thermal equilibrium with a heat bath.

# **Classical Theory of Radiation**

Properties of Thermal Radiation. Blackbody Radiation. Pure Temperature Dependence. Kirchhoff's Law. Stefan-Boltzmann Law and Wien's Displacement law. Saha's Ionization Formula. Saha equation for thermal ionization and its application to astrophysics.

# <mark>UNIT III</mark>

# Quantum Theory of Radiation Radiation

Stefan-Boltzmann Law: Thermodynamic Proof. Radiation Pressure. Spectral Distribution of Black Body Radiation. Wien's Distribution Law and Displacement Law. Rayleigh-Jean's Law. Ultraviolet Catastrophe. Planck's Quantum Postulates. Planck's Law of Blackbody Radiation : Experimental Verification. Deduction of (1) Wien's Distribution Law, (2) Rayleigh-Jeans Law, (3) Stefan-Boltzmann Law and (4) Wien's Displacement Law from Planck's Law.

# <mark>UNIT IV</mark>

# **Bose-Einstein Statistics**

B-E distribution law. Thermodynamic functions of a Completely Degenerate Bose Gas. Bose-Einstein condensation, properties of liquid He (qualitative description). Radiation as photon gas. Bose's derivation of Planck's law.

# <mark>UNIT V</mark>

Fermi-Dirac Statistics Fermi-Dirac Distribution Law. Thermodynamic functions of an ideal Completely Degenerate Fermi Gas. Fermi Energy. Electron gas in a Metal. Specific Heat of Metals. White Dwarf Stars. Chandrasekhar Mass Limit.

- 1. Lokanathan S. and R.S.Ganbhir, 'Statistical and Thermal Physics: an introduction', Printice Hall of India, New Delhi, 1991.
- 2. Reif F., 'Statistical Physics: Berkeley Physics Course', Volume 5, Tata McGraw-Hill Company Ltd, 2008
- 3. Patharia R.K., 'Statistical Mechanics', Oxford: Butterworth, 1996.
- 4. Haung K., 'Statistical Mechanics', K. Huang, Wiley, 1987.

#### L T P C 5 - - 5

## 15PHU603A

# MATHEMATICAL PHYSICS

**Course Objectives** 

- To provide students with a repertoire of mathematical methods that are essential to the solution of advanced problems encountered in the fields of applied physics and engineering.
- In addition, intended to prepare the student with mathematical tools and techniques that are required in advanced courses offered in the applied physics
- To communicate mathematical and physical knowledge and ideas to the students.
- To learn the fundamentals and applications of Complex Variable, Analyticity, Cauchy-Riemann and Cauchy's Integral.
- To contribute innovations and application of basic research.
- To get knowledge to find the relationship between observation and theory and their use in building the basic concepts of computing.

# **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Communicate mathematical and physical knowledge and ideas to the students.
- 2. Get introduced to Special functions like Gamma function, Beta function, Delta function, Bessel functions and their recurrence relations
- 3. Learn the fundamentals and applications of Complex Variable, Analyticity, Cauchy-Riemann and Cauchy's Integral.
- 4. Build connections between mathematical development and conceptual understanding.
- 5. Understand the relationship between observation and theory and their use in building the basic concepts of computing.
- 6. Contribute innovations and application of basic research.

# UNIT - I

Operations with Del operator - Gradient of scalar field, physical interpretation -Divergence of a vector function - curl of a vector - curl of the curl - The Laplacian operator -Line, surface and volume integrals - Important vector identities - Gauss divergence theorem -Problems in Gauss divergence theorem - Stoke's theorem and its proof with simple problems -Classification of vector fields - Orthogonal, curvilinear coordinates, differential operators interms of orthogonal curvilinear coordinates - gradient, curl and Laplacian in spherical polar coordinates and cylindrical coordinates.

Tensors – Contrvariant and covariant tensor

#### UNIT - II

Matrices-Special types of matrices -Transpose of a matrix - Conjugate of a matrix -Conjugate transpose of a matrix-symmetric and antisymmetric matrices - Hermitian and skew -Hermitian matrices - Determinant of a matrix - Adjoint of a matrix - Inverse of a matrix -Unitary matrices - Rank of a matrix and simple problems - Characteristic matrix and characteristic equation - Characteristic vector - Methods of finding the Eigen values and Eigen vectors of a matrix.

#### UNIT - III

Differential Equations: Introduction – Solution in simple cases of ordinary differential equations of second order – Simple problems from Physics – Partial Differential equations – Special types of differential equations arising in Physics.

Group Theory: Introduction in sets, mappings and binary operations – groups – elementary properties of groups – The centre of a group – Cosets or consents of a subgroup – cyclic group.

#### UNIT - IV

Functions of a complex variable – single and multivalued functions – Cauchy – Riemann differential equation – analytical – line integrals of complex function – Cauchy's integral theorem and integral formula – derivatives of an analytic function – Taylor's variable – Residue and Cauchy's residue theorem – application to the equation of definite integrals – conformal transformation – Invariance of the Laplacian.

#### <mark>UNIT – V</mark>

Arithmetic mean - Median - Quartiles - Deciles - Percentiles - Mode - Empirical relation between mean, median and mode - Geometric mean, harmonic mean - Relation between arithmetic mean, geometric mean and harmonic mean - Range - Range meanor average deviation - Standard deviation - Variance and mean square deviation.

- 1. SathyaPrakash, 2002, Mathematical Physics, 4th Edition, S. Chand & Company, New Delhi.
- 2. Gupta. B.D., 2002, Mathematical Physics, 2nd Edition, Vikas Publishing house Pvt Ltd, New Delhi.
- 3. Gerald C.F., 1998, Applied Numerical Analysis, 5th Edition, Addison Wesley, California.
- 4. Rajput. B.S., 2003, Mathematical Physics, 16th Edition, PragatiPrakasan, Meerut.
- 5. Pipes L.A. and L.R. Harwill, 'Applied Mathematics for Engineers and Physicists', McGrawhill, 1970.

#### Semester-VI

# **15PHU603B** NANOTECHNOLOGY AND ITS APPLICATION 5 - - 5

# L T P C 5 - - 5

### **Course Objective:**

- This course covers the different classes of nanomaterials that have been developed in recent years in light of various technological applications.
- In order to understand the behavior of these nanomaterials, quantum phenomena and the limitations of basic physical laws that are important at the nanometer length scale are introduced and developed.
- In particular, properties that exhibit size effects (including electronic, magnetic, photonic, and mechanical) at the nanometer length scale will be presented so that nanomaterials becoming increasing relevant to modern technologies can be better understood.
- The course will cover recent breakthroughs and assess the impact of this burgeoning field.
- Specific nanofabrication topics include epitaxy, beam lithographies, self- assembly, biocatalytic synthesis, atom optics, and scanning probe lithography.
- The course consists of topics in fundamental nanoscale science, plus an overview of areas in nanotechnology.

### **Course Outcome**

After successful completion of the course, the student is expected to

- 1. Explain the fundamental principles of nanotechnology and their application to biomedical engineering.
- 2. Apply engineering and physics concepts to the nano-scale and non-continuum domain.
- 3. Identify and compare state-of-the-art nanofabrication methods
- 4. perform a critical analysis of the research literature.
- 5. Design processing conditions to engineer functional nanomaterials.
- 6. Evaluate current constraints, such as regulatory, ethical, political, social and economical, encountered when solving problems in living systems.

# UNIT I

Structure: Size dependence of properties – Crystal Structures – Face centrednano particles – Particle size determination – Surface structure

# <mark>UNIT II</mark>

Metal nano particles: Magic numbers – Theoretical model of nano particles – Geometric structure – Reactivity – Fluctuations – Magnetic clusters – Bulk to nano transitions Semi conducting nano particles – optical properties – photo fragmentation – Coulombic explosion.

# <mark>UNIT III</mark>

Semiconductors: sensors, electronic devices – brief explanation and examples – classification of nanomaterials as nanoparticles, nanorods, nanotubes, and nanowires – structure and applications of the above

# <mark>UNIT IV</mark>

Instrumentation: Working principle, and applications of scanning electron microscope transmission electron microscope - scanning tunneling microscope - atomic force microscope, and surface plasmon resonance – theories and principles of soft lithography, self assembled monolayers and multilayers

# <mark>UNIT V</mark>

Polymers: Forming and Characterizing polymers – Polymerisation – Sizes of polymers – Nano crystals – Condensed ring types – Poly diacetylene types – Polymers – Conductive polymers – Supra molecular structures – Transition-metal mediated types – Dendritic molecules – Supra molecular dendrimers – Micellers

- 1. Charles P. Poole Jr., Frank J.Owens,1<sup>st</sup> edition 2003, Introduction to Nanotechnology, Wiley India, New Delhi
- 2. Mick Wilson, Kamail Kannangara,1<sup>st</sup> edition 2005 Geoff Smith, Michele Simmons, BurkhardRaguse, Nano technology, Overseas Press India(P) Ltd., New Delhi
- 3. Mark Ratner, Daniel Ratner, 1<sup>st</sup> edition 2009 Nano-Technology, A gentle introduction to the new big idea, Pearson Education (Singapore) (P) Ltd., New Delhi.
- 4. Jean-Marie Lehn, 1994, Supramolecular Chemistry, Journal of Chemical Sciences, Vol. 106, No.5, pages 915-922.
- 5. Jonathan Steed and Jerry Atwood, 2009, Supramolecular Chemistry, 2nd Edition, John Wiley & Sons, New York.
- 6. Jacob Israelachvili, 1992, Intermolecular and Surface Forces, 2nd Edition, Academic Press.
- 7. Jackie Ying, 1<sup>st</sup> edition 2001, Nanostructured Materials, Academic Press.
- 8. G. Timp, 1<sup>st</sup> edition 1999, Nanotechnology, Springer Verlag, New York.

### L T P C 5 - - 5

## 15PHU603C

# ASTROPHYSICS

**Course Objectives** 

- Astronomy and Astrophysics is a very fundamental subject in Physics.
- Includes study of the solar system, evolution of stars, different physical processes going on stellar bodies, life cycle of stars etc.
- Be able to read technical articles efficiently for key concepts
- Have experience working and discussing in a group setting
- Be able to use analytical and mathematical skills to solve problems
- Acquire critical thinking skills by learning to evaluate the evidence behind a scientific theory

# **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Plan and engage in an independent and sustained critical investigation of a chosen research topic to generate new knowledge in an area of astronomy and astrophysics.
- 2. Systematically evaluate relevant theory and concepts in astronomy and astrophysics,
- 3. Relate these to appropriate methodologies and evidence and draw appropriate conclusions.
- 4. Demonstrate capacity for astronomy and astrophysics reasoning through analyzing, proving and explaining concepts from the chosen research area.
- 5. Have Peripheral ideas about astronomy and astrophysics.
- 6. Gain the knowledge on Astronomical instruments, Stellar Evolution, Theories of the universe, etc.,

# <mark>UNIT- I</mark>

Astronomical instruments Optical telescope - reflecting telescope - types of reflecting telescope - advantages of reflecting telescope - Radio telescopes - astronomical spectrographs photographic photometry - photo electric photometry - detectors and image processing.

# UNIT-II

Solar system The sun-physical and orbital data - Photosphere - Chromosphere - corona - solar prominences - sunspot - sunspot cycle - theory of sunspots - solar flare - mass of the sun - solar constant - temperature of the sun - source of solar energy - solar wind. Other members of the solar system - Mercury - Venus - Earth - Mars - Jupiter - Saturn - Uranus - Neptune - Pluto -Moon - Bode's law - Asteroids - comets - Meteors.

#### UNIT-III

Stellar Evolution, Binary and variable stars Birth of a star - Death of a star - Chandrasekhar limit - white dwarfs - Neutron stars - black holes - Quasars - Nebulae - Supernovae Binary stars -Origin of Binary stars. Variable stars - Cepheid variables - RV Tauri variables - long period variables - irregular variables - flare stars.

# UNIT-IV

Magnitudes, distance and spectral classification of stars Magnitude and brightness - apparent magnitude of stars - absolute magnetic of stars - relation between apparent magnitude and absolute magnitude of stars - Luminosities of stars - measurement of stellar distance - Geometrical parallax method - distance from red shift measurement - Harvard system of spectral classification.

# UNIT-V

Theories of the universe, galaxies and star clusters Origin of the universe - the big bang theory - the steady state theory - the oscillating universe theory - Hubble's law. Galaxies - types of galaxies - Milky Way - star clusters - open clusters - globular clusters.

# **Text Books:**

- 1. K.S. Krishnasamy, 'Astro Physics a modern perspective,' Reprint, New Age International (p) Ltd, New Delhi,2002.
- 2. Baidyanath Basu, 'An introduction to Astro physics', second printing, prentice Hall of India Private limited, New Delhi,2001.
- 3. R. Murugesan, ' Modern Physics', Eleventh revised edition, S. Chand & Company Ltd, New Delhi, 2003.
- 4. S. Kumaravelu, 'Astronomy, Janki calendar corporation, Sivakasi, 1993
- Baker and Fredrick, 'Astronomy, ninth edition, Van No strand Rein hold, Co, New York -1964.
  Illustrated World of Science Encyclopedia - Vol I and Vol VIII - Creative world publication - Chicago.

#### Semester-VI

#### LTPC 5 - - 5

#### 15PHU604A

# ELECTROMAGNETIC THEORY

#### **Course Objective**

The aim and objective of the course

- The aim of this course is to provide the students with the fundamental principles of electrical energy (electro- magnetism).
- It is very important to understand the propagation of waves in different media, its transmission and reception.
- To understand the relation between electric and magnetic fields.
- To gain the knowledge on electromagnetic wave propagations.
- To describe simple models for electromagnetic interaction with media
- To experience the wave propagation in different media. •

### **Course Outcome**

After successful completion of the course, the student is expected to

- 1. Calculate electric and magnetic fields from stationary and dynamic charge and current distributions.
- 2. Use electromagnetic wave theory and principles in a wide range of applications.
- 3. Solve such problems in simple geometries using separation of variables and the method of images.
- 4. Define and derive expressions for the energy both for the electrostatic and magnetostatic fields.
- 5. Gain confidence in their ability to apply mathematical methods to understand electromagnetic problems to real-life situations.
- 6. Solve simple electrostatic boundary problems.
- 7. Describe simple models for electromagnetic interaction with media
- 8. Choose adequate models and solution methods for specific problems.

# **UNIT-I**

Electrostatics: Electric intensity – Electric potential – Gauss Law - Dielectric and its polarization - Electric displacement D - Dielectric constant & Polarisibilitya - Clausius-Mossotti relation (Non-polar molecules) - The Langevin equation (Polar molecules) -Electrostatic energy

#### **UNIT II**

Magnetostatics: Current density J – Ampere's law of force – Biot-Savart law – Ampere's circuital law – Magnetic scalar potential  $\phi m$  (no applications) – Magnetic vector potential A – Magnetisation and magnetization current – Magnetic intensity – Magnetic susceptibility and Permeability.

# UNIT III

# Maxwell's Equations

Maxwell Equations-Displacement Current-Vector and Scalar Potentials. Gauge Transformations: Lorentz and Coulomb Gauge. Boundary Conditions at Interface between Different Media. Wave Equations. Plane Waves in Dielectric Media. Poynting Theorem and Poynting Vector. Electromagnetic Energy Density. Physical Concept of Electromagnetic Field Energy Density, Momentum Density and Angular Momentum Density.

# UNIT IV

Interaction of E.M.Waves with matter (Macroscopic): Boundary conditions at interfaces - Reflection and refraction – Frenel's laws-Brewster's law and degree of polarization - Total internal reflection and critical angle.

# UNIT V

Interaction of E.M.Waves with matter (Microscopic): Scattering and Scattering parameters -Scattering by a free electron (Thomson Scattering) - Scattering by a Bound electron (Rayleigh scattering) – Dispersion Normal and Anomalous – Dispersion in gases (Lorentz theory)

- 1. Chopra & Agarwal 2004, Electromagnetic theory, 6th Edition, Nath& Co, Meerut.
- 2. Jacson. J.D., 1998, Classical Electro dynamics, 3rd Edition, Willey Eastern, New Delhi.
- 3. Schwaritz. M. 1972, Revised edition, Principles of Electro dynamics, McGraw Hill, Auckland.
- Jordon and Balmain 2<sup>nd</sup> edition 2002, EMW radiating systems, Prentice Hall of India Pvt Ltd, New Delhi.
- 5. Gupta, Kumar and Singh, 2007, Electro dynamics, 19th Edition, PragatiPrakasan, Meerut, New Delhi.
- SatyaPrakash10<sup>th</sup> edition 2003, Electromagnetic theory and Electro dynamics, Kedar Nath Ram Nath & Co, Meerut.
- 7. Griffiths D., 1998, Introduction to Electrodynamics, 3rd Edition, Printice Hall of India, New Delhi.

# LTPC

## 15PHU604B

# **OPTICAL COMMUNICATION**

5 - - 5

#### **Course Objectives**

- In the present day life, methods of communication have improved quite a lot.
- Optical communication where light is used as the carrier wave has become important due to its high frequency.
- This paper is contains different techniques used in optical communication, like optical fiber. laser etc.
- This course provides basic of optical communication system.
- Students will learn about optical fiber transmission link with the functional description of • each block, Point -to-point link -system considerations, Link power budget and rise.

# **Course Outcomes:**

After successful completion of the course, the student is expected to

- 1. Explain the concept of amplitude and frequency modulation
- 2. Know fundamental of Optical sources and their uses.
- Compare working principle of single mode and multimode optical fibres. 3.
- Distinguish Digital modulation (pulse code and Pulse amplitude modulation) types 4.
- 5. Explain the fundamentals of nonlinear properties of optical fibers.
- 6. Know the optical waves in communication and the methods of implementation are explained in this paper.

# UNIT I

Evolution of Optical Communication, Evolution of fiber types, guiding properties of fibers, crosstalk between fibers, dispersion properties of fibers, nonlinear properties of optical fibers, SRS, SBS, Intensity dependent refractive index. Characterization of materials for fibers, fiber perform preparation, cable structures, connectors, splicing.

# **UNIT II**

Transmission characteristics of optical fibre, attenuation, absorption and scattering losses, nonlinear losses, wavelengths for communication, bend losses, dispersion effects in optical fibres- material and waveguide dispersions, modal birefringence and polarization maintaining fibres.

#### **UNIT III**

Optical sources- LED, structures, materials, quantum efficiency, power, modulation-Laser Diode, Modes and threshold conditions, laser diode rate equations, external quantum efficiency, resonant frequencies, laser diode structures and radiation patterns, single mode lasers, modulation of laser diodes, temperature effects.

Bachelor of Science, Physics, 2015, Karpagam Academy of Higher Education, Eachanari post, Coimbatore-641021, India.

# UNIT IV

Photodetectors, photodetector noise, signal to noise ratio, optical receiver operation, error sources, receiver configuration, digital receiver performance calculations, pre amplifier types, High impedance and Trans impedance amplifiers, analog receivers.

# UNIT V

Digital transmission systems, Point to point links, link power budget, rise time budget, line coding, coherent systems, heterodyne and homodyne detection, WDM concepts and components, operational principle of WDM, Optical Amplifiers, semiconductor optical amplifiers, Erbium Doped Fiber Amplifiers, Gain and Power Conversion Efficiency.

- Gerd Keiser, 'Optical Fiber Communications', 5<sup>th</sup> edition, Tata McGraw Hill, New Delhi, 2013.
- Senior M., 'Optical Fiber Communications Principles and Practices', Prentice Hall India (1994)

#### L T P C 5 - - 5

### 15PHU604C

# BIOPHYSICS

## **Course Objectives**:

- The course aims to provide students with a foundation in the basic concepts of Biophysics.
- Biophysics is an interdisciplinary science that employs and develops theories and methods of the physical sciences for the investigation of biological systems.
- Topics will include canonical and non-canonical structures of nucleic acids, structure of proteins, enzymes etc.
- Fundamental concepts that underlie biomolecular interactions will be discussed and biophysical methods that are employed for the structural analysis of these systems will be introduced at an elementary level.
- To Understand the concept of life of molecules.
- The physical quantities such as temperature, energy, enthalpy, entropy, and free energy will be employed to understand why a biological system choses particular state at conditions under study.

# **Course Outcome**

After successful completion of the course, the student is expected to

- 1. Demonstrate knowledge of the fundamental concepts in physics and chemistry that underlie biological processes.
- 2. Define the structural characteristics of nucleic acids and proteins
- 3. Examine parameters that variously determine their stability and function(s).
- 4. Describe the principles that govern biomolecular interactions
- 5. Appreciate how established methods of research and enquiry are employed to analyze the different aspects of these interactions.
- 6. Understand the concept of life of molecules.

# Unit I

Atoms and Molecules: Introduction – Physical and chemical properties of atoms and molecules – Internal structure of atom and molecule – Proton, neutron and electron – Chemical bonds – Orientation of bonds in space – Energy of atoms – Hydrogen bond – Molecular weight and mole – Bond energy.

# Unit II

Matter and mechanics of cell: Materials of the cell – Celluloid – Kinetic molecular theory – Diffusion – Osmosis – Osmotic pressure ad turgor pressure – Water potential – Methods for measuring osmotic pressure of cell – Permeability – Theories of cell permeability – Imbibition – Volume changes, energy relations and effect of temperature on imbibition.

# Unit III:

Physics in biological systems: Breathing – Inspiration – Expiration – Other mechanical actions – Types of breathing – Artificial breathing – Lung air volume – Modified form of breathing – Periodic breathing – Coughing – Swallowing – Sneezing.

# Unit IV

Molecular physics in plant physiology: Distribution of light – light on lend – Wavelength and energy – light in water – orientation – Central importance of light to the physiology of plants – Photochemistry – Electronic transition in atoms, molecules and crystals – Other transitions.

# Unit V

Ultra sound: Generation of Ultrasound scanning – A mode scan – TM mode – Echo encephalograph (EEG) – Echo opthalmoscope – B mode scan – Gray scale imaging – Measurement of motion – Doppler technique – Ultrasonic technique – Methods & Instrumentation.

- 1. Arora M.P., 'Bio Physics', 1st edition 2005, Himalaya Publishing House
- 2. Rodney Cotterill, 'Bio Physics An Introduction', 1<sup>st</sup> edition 2014 Wiley Student Edition.

LTPC

#### Semester - VI

| 15PHU691 | PROJECT | 3 |
|----------|---------|---|
|          |         |   |

#### **Course Objectives**

- The aim of the B.Sc. project work is to expose the students to preliminaries and methodology of research in Theoretical Physics and Experimental Physics.
- Students get the opportunity to participate in some ongoing research activity and development of a laboratory experiment.
- To explain the physics problem and its solution in both words and appropriately specific equations to both experts and non-experts.
- To understand the objective of a physics laboratory experiment, properly carry out the experiments, and appropriately record and analyze the results.
- To use computers in data acquisition and processing and how to use available software as a tool in data analysis.
- To think creatively about scientific problems and their solutions.

### **Course Outcomes (COs)**

After successful completion of the course, the student is expected to

- 1. Complete an independent research project, resulting in research outputs in terms of publications in journals and conference proceedings.
- 2. To apply his/her knowledge and skills to carry out advanced tasks and projects.
- 3. Apply their knowledge to develop the instruments.
- 4. Verify the basic principles and laws experimentally as a project.
- 5. Demonstrate knowledge of contemporary issues in their chosen field of research.
- 6. Demonstrate an ability to present and defend their research work.

LTPC

#### Semester - IV

# 15OEU401ATMOSPHERE AND WEATHER- - - 3

#### **Course Objective**:

- The aim of this course is not just to impart theoretical knowledge to the students but to enable them to develop an awareness
- To understand the causes and effects of different weather phenomenon and basic forecasting techniques.
- To know the role of air, water, and wind in weather systems.
- Assess variability and change within this expanded, extended and quality assured network.
- To explain what causes different types of weather.
- To understand the concept of Ecosystems and climate interactions

#### **Course Outcomes**

After successful completion of the course, the student is expected to

- 1. Demonstrate knowledge of cloud properties.
- 2. Demonstrate knowledge of the thermodynamic drivers of cloud development and evolution.
- 3. Demonstrate knowledge of basic atmospheric chemistry and its role in atmospheric phenomena.
- 4. Determine if the atmosphere is stable or unstable from a vertical temperature profile
- 5. Understand atmospheric general circulation and the basic principles of physical and applied climatology and climate change.
- 6. Explain the composition and structure of the atmosphere.

#### UNIT - I

Atmospheric composition - Laws of thermodynamics of the atmosphere - Adiabatic process - Potential temperature - The Clauses – Clapyeron equation - law of black body radiation - solar and terrestrial radiation - Albedo - Green house effect - Heat balance of earth atmosphere system.

#### UNIT - II

Fundamental force - Non-Inertial reference frames and apparent forces - Structure of static atmosphere - Momentum - Continuity and energy equations - Thermodynamics of the dry atmosphere - Elementary applications of the basic equations.

The circulation theorem - Voracity, Potential Voracity, Voracity and potential Voracity equations.

# UNIT - III

Wind - Temperature and pressure distribution over India in the lower - Middle and upper atmosphere during pre, post and mid-monsoon season - Monsoon circulation in the meridonal (Y-Z) and (X-Y) planes - Energy cycle monsoon - Dynamics of monsoon depressions and easterly waves - Intra-Seasonal and inter-annual variability of monsoon - Quasi-be weekly and 30-60 day oscillations - ENSO and dynamical mechanism for their existence.

# UNIT - IV

Role of meteorology on atmospheric pollution - Atmospheric boundary layer, air stability, local wind structure, Ekman spiral, turbulence boundary layer scaling - Residence time and reaction rates of pollutants, sulphur compounds nitrogen compounds - carbon compounds, organic compounds, aerosols, toxic gases and radioactive particles trace gases.

# UNIT - V

Basic meteorology - radar principles and technology - Radar signal processing and display -Weather radar-observation of precipitating systems - Estimation of precipitation radar observation of tropical cyclones - Use of weather radar in aviation, clear air radars - Observation of clear air phenomena - Other radar systems and applications.

- 1. Frederick K.Lutgens and Edward J.Tarbuk, The atmosphere, Holton. J.R, 1992, Dynamic Meteorology, Academic press New York.
- 2. Keshvamuthhy. R.N. and M.ShankarRao, 1992, The Physics of Monsoons, Allied Publishers, New Delhi
- 3. Haltiner. G.J. and R.T. Villians, 1980, Numerical Weather Prediction, John Wiley and sons, New Delhi.
- 4. Tom Lyons and Prillscott, Principles of Air Pollution Meteorology, CBS publishers and Distributors (P) Ltd.

#### SPECIAL PAPER I FOR B.Sc. (Hon.) Semester V

# 15PHU506 ADVANCED QUANTUM MECHANICS

#### **Course Objectives**

- This paper explains the shortcomings of quantum mechanics in explaining different subatomic physics and the evolution of quantum mechanics.
- This course is part one of a two semester course focused on a rigorous exposition to the principles of Quantum mechanics.
- The Dirac bra-ket formalism will be introduced and used throughout to present the principles of Quantum Mechanics in a general context.
- We will discuss analytic solutions to the Schriodinger equation for a variety of potentials in one, two and three dimensions.
- The role of symmetries as the underlying principle of Quantum Mechanics will be emphasized throughout the course.
- The use of symmetry principles and operators methods will be discussed.

### **Course Outcomes :**

After successful completion of the course, the student is expected to

- 1. Study the problems like scattering problem, relativistic quantum mechanics, quantum electrodynamics etc.
- 2. Calculate the de Broglie Wavelength of a wave associated with the particle.
- 3. Explain the importance of Field theory.
- 4. Explain the Angular momentum commutation relations and describe the applications.
- 5. Describe wave function and derive the Schrödinger equation and interpret the wave function and eigen value equation.
- 6. Describe the different types of potentials and derive the solutions of Schrödinger equation for the same.
- 7. Apply the variational principle and find the value of energy at ground state of helium.

# UNIT - I

**Wave Mechanics** Matter waves – Uncertainty principle –Wave packet – Time-dependent and Time-independent Schrodinger equations for a free particle and particle in a potential – Linear vector space – Hilbert's space – Orthogonal and orthonormal functions – Linear operator – Eigen functions and Eigen values – Hermitian operator – Dirac's notation – Equations of motion – Schrodinger, Heisenberg and Interaction representation – Momentum representation.

# UNIT - II

**One dimensional potential well:** Square-well potential with rigid walls – Square-well potential with finite walls – Square-well potential barrier – Alpha emission – Bloch waves in a periodic potential – Linear harmonic oscillator (Schrodinger method and operator method) – Free particle. **Three dimensional potential Well:** Particle moving in a spherically symmetric potential – System of two interacting particles – Rigid rotator – Hydrogen atom – Hydrogenic orbitals – The free particle – Three-dimensional square-well potential - Deutron

### UNIT - III

**Time-independent Perturbation theory:** Basic concepts – Non-degenerate energy levels – First and Second order corrections for energy and wave functions – Ground state of Helium atom – Effect of electric field on the ground state of hydrogen atom (Stark effect) Degenerate energy levels – Effect of electric field on the n=2 state of hydrogen atom – Variational principle – Variation method for excited states – Application of variation method to ground state of helium – The WKB method

Time dependent perturbation theory: Introduction – First-order perturbation – Harmonic perturbation – Transition to continuum states (Fermi's Golden rule) – Absorption and emission of radiation – Transition probability – Selection rules

### UNIT IV

**Angular momentum:** Angular momentum operators – Angular momentum commutation relations – Eigen values and Eigen functions of  $L^2$  and  $L_z$  – General angular momentum – Eigen values of  $J^2$  and  $J_z$  – Ladder operators ( $J_+$  and  $J_-$ ) – Angular momentum matrices – Matrices for  $J^2$ ,  $J_z$ ,  $J_+$ ,  $J_-$ ,  $J_x$  and  $J_y$  – Spin angular momentum – Spin ½ systems – Spin vectors for spin ½ systems – Addition of angular momentum – Clebsh-Gordan coefficients.

Scattering: Scattering cross-section –Significant number of partial waves – Scattering by an attractive square-well potential – Briet-Wigner formula – Scattering length – Expression for phase shift – Integral equation – The Born approximation – Scattering by screened coulomb potential – Validity of Born approximation - Laboratory and center of mass co-ordinate systems

#### UNIT V

**Field theory:** Introduction – Classical approach to field theory – Relativistic Lagrangian and Hamiltonian of a charged particle in an electromagnetic field – Field: Lagrangian and Hamiltonian formulations – Quantum equation for the field – Second quantisation – Quantisation of non-relativistic Schroedinger equation – Creation, annihilation and number operators.

#### **Suggested Books**

1. Aruldhas. G, 2008, Quantum Mechanics, 2<sup>nd</sup> Edition, Prentice-Hall of India, NewDelhi.

- Gupta, Kumar and Sharma, 2002, Quantum Mechanics, 22<sup>nd</sup> Edition, Jai Prakash Nath & Co, Meerut.
- 3. Satya Prakash, 2003, Quantum Mechanics, New Edition Kedar Nath & Ram Nath & Co,Meerut.
- 4. Leonard Schiff, 1968, Quantum Mechanics, 3<sup>rd</sup> Edition, McGraw Hill International, Auckland.
- 5. Engen Merzbacher, 1997, Quantum Mechanics, 3<sup>rd</sup> Edition, Wiley, Weinheim.
- 6. Mathews. P.M. and K. Venkatesan, 2002, Textbook of Quantum Mechanics, McGraw
- 7. Hill International, Weinheim.
- 8. Chatwal R.G. and Sk. Anand, 2004, Quantum Mechanics, Himalaya Publishing House, New Delhi
- 9. Thangappan. V. K., 1993, Quantum Mechanics, Tata McGraw Hill, New Delhi

LTPC

# SPECIAL PAPER I FOR B.Sc. (Hon.) Semester VI

# 15PHU605EMERGING TRENDS IN MATERIALS SCIENCE- - - 5

#### **Course Objectives:**

- To give an exposure to students about different characteristics of materials, their importance, study of these characteristics, preparation of different materials.
- To review physics in the context of materials science & engineering.
- To describe the different types of bonding in solids, and the physical ramifications of these differences.
- To describe and demonstrate diffraction, including interpretation of basic x-ray data. Give an introduction to metals, ceramics, polymers, and electronic materials in the context of a molecular level understanding of bonding.
- Give an introduction to the relation between processing, structure, and physical properties.
- Give the beginning student an appreciation of recent developments in materials science & engineering within the framework of this class.
- Give the beginning student an opportunity for teamwork in research Give the beginning student practice in basic expository technical writing

# **Course Outcomes**

After successful completion of the course, the student is expected to

- 1. Different types of materials for new applications like solar cells, sensors etc. etc.
- 2. Know about various types of bonding.
- 3. Distinguish between various types of crystal imperfection.
- 4. Explain the basics of crystal growth.
- 5. An idea about basics of thin film technology and few deposition methods.
- 6. Describe nondestructive testing methods and its applications.

#### Unit I

Crystalline solids – space lattice – the basis and crystal structure; crystal translational vectors, symmetry operation primitive lattice cell and unit cell symmetry elements, Fundamental type of lattice, atomic packing, atomic radius, lattice constants and density, crystal structure other cubic structure – type of bonding – Ionic bonding – Energy of formation of NACL molecules, madelung constants – potential energy of diagram of ionic molecules – calculation of repulsive exponent – Born Haber cycle characteristics of ionic bond.

# Unit II

Ionic conductivity – Normal and super ionic conductors – Mass transport in crystals – Diffusion – Atomic diffusion theory – Experimental determination of the diffusion constant – Ionic conduction – Experimental results – for ionic conduction – The Einstein relation – Dielectric loss in ionic crystals – Electronic conduction in ionic crystals – Excess conductors – Deficit conductors – Amphoetric semiconductor.

# Unit III

Phenomenological Models – Huberman's Theory – Ries Strassler Toom's Theory – Weleh and Diene Theory – Lattice Gas theory – Free ion model – Domain Model – Riea and Roth Theory – The Path Probability Method – The static variables – the Path variables – The path Probability – Stationary state condition – Classification of Superionic solids – Crystalline and Amorphous – Glasses – Dispersed solid Electrolytes – polymers – Ion exchange resins – biological basis resins – Classification over conducting ion species – mode and mechanism of conduction in each case and their corresponding criteria to be superionic conductors.

# Unit IV

Structural characterization – XRD surface Analysis, EXAFS, IPS and Quasi neutron scattering – Thermo dynamical characterization – Differential scanning calorimetry, Differential Thermal Analysis, Thermo Gravimetric Analysis and Thermo electric power – Ion transport properties – Electrical conductivity – Two probe method – four probe method – Immitance spectroscopy – Dynamical conductivity – state conductivity – polarisation characteristic – determination of small electronic transport numbers – The permeation Technique (Static) – The polarization cell (Static) – the polarized cell technique (Dynamic) – The permeation technique (Dynamic).

# Unit V

Application of superionic solid – Battery and Non-Battery application – conventional cells – fuel cells – Supercapacitors-sensors and partial pressure – gauges – Oxygen and non-Oxygen sensors – coulometers – timers – Diffusion coefficient measurement in solids and liquids – Electro chemic displays.

- 1. Askeland D., 'Material Science and Engineering', Cengage Learning India Pvt Ltd (2010)
- 2. Khurmy R.S., ' Material Science', S.Chand Co., New Delhi,2004
- 3. Lectures on solid state physics (Eds. G Bush and H Schade), international series on Natural Philosophy Vol. 79 Pergamon, press 1976
- 4. "Solid Electrolytes" (Eds. S Geller) Springer Verlag New York 1977
- 5. 'Importance Spectroscopy' (Eds. Joscher) Springer Verlag
- 'Physics of Electrolytes Transport Processes solid Electrolytes and in Electrodes (Eds. J Hladik) Academic press, New York 1972.
Bachelor of Science, Physics, 2015, Karpagam Academy of Higher Education, Eachanari post, Coimbatore-641021, India.