Estd: 1966

**SARASWATHI NARAYANAN COLLEGE**
**(An Autonomous Institution Affiliated to Madurai Kamaraj University)**
**(Reaccredited with Grade 'B' by NAAC)**
**Perungudi, MADURAI – 625 022.**
**Website : www.sncollegemadurai. org**
**E.mail: sncollegemdu@yahoo.com**
**Ph.: 0452 2690635 Fax: 0452 2690635**


# DEPARTMENT OF PHYSICS

## Choice Based Credit System (CBCS)
## Learning Outcomes-based Curriculum Framework (LOCF)
## M.Sc. Physics Programme (SF)
## (For those who join in June 2022)

## DEPARTMENT OF PHYSICS

1. **Mr. M. Sudharsan M.Sc., M.Phil., Assistant Professor and Head**
2. **Mrs. S. Nithya, M.Sc., (Ph.D) Assistant Professor**

## PROFILE OF THE COLLEGE

Thiru. L. Narayanan Chettiar, a renowned philanthropist founded Saraswathi Narayanan College at Perungudi near Madurai Airport in the year 1966. The college is a prestigious academic powerhouse catering to the educational needs of students hailing from economically weaker and socially oppressed section of our society. It imparts education of the highest quality to students irrespective of caste, creed and religion. The guiding principles of our college are duty, devotion and distinction. The institution has proved an innovative leader and a catalyst in the best educational, cultural and economic interests of students. It is committed to make the students morally upright, intellectually resourceful, socially advantaged and globally competent. It is devoted to teaching, research and extension activities with equal importance.

The college set off its academic journey with Pre-University Courses in the year 1966 – 67. The Institution started offering UG programmes from the academic year 1968 – 69. It was upgraded as Post-Graduate Institution in 1979 – 80 and as Research Institution in 1984 – 85. The co-educational system was introduced for M.Phil. programmes in the academic year 2001 – 02 and for PG programmes in the year 2002 – 03 with the noble objective of promoting higher education among girls in rural areas. Girls have been enrolled in UG programmes also since the academic year 2010 – 11.

The green campus of 66 acres has a built-up area of 1,70,059 sq.ft. A new library housed at Silver Jubilee building was built at the cost of Rs.25,00,000/- and it was inaugurated by His Excellency Dr. M. Chenna Reddy, then the Governor of Tamilnadu on 04.04.1994. The library was dedicated to the memory of Achi. The major donor of this building was Tmt. Saraswathi Narayanan, the better half of the Founder President Thiru. L. Narayanan Chettiar. Sri Vidhya Ganapathi Temple was built and consecrated on 27.08.2015.

The Departments of Botany, Mathematics, Commerce, English, Economics and Chemistry have been upgraded as university recognized research centres to carryout M.Phil and Ph.D research programmes in the college. NAAC accredited the college with grade B+ in the year 2005. UGC accorded the status of Autonomy to our institution in the year 2007. NAAC re-accredited the college with grade B (CGPA of 2.78) in the year 2016. UGC extended the Status of Autonomy to the institution for another period of five years from the academic year 2016 – 17.

## M.Sc Physics – Course Structure for the Academic year 2022-23

| SEMESTER I | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course type | Title of the course | Course Code | H/ W | Credit | Addl. Credit | Exam Hrs. | CIA | Ext. |
| CC-1 | Mathematical Physics – I | LPPHCT11 | 5 | 4 | - | 3 | 25 | 75 |
| CC-2 | Classical Mechanics | LPPHCT12 | 5 | 4 | - | 3 | 25 | 75 |
| CC-3 | Digital Memory Circuits and Design | LPPHCT13 | 5 | 4 | - | 3 | 25 | 75 |
| CC-4(P) | General Physics Practical | LPPHCL21 | 5 | - | - | - | - | - |
| CC-5(P) | Electronics Practical | LPPHCL22 | 5 | - | - | - | - | - |
| DSE-1 | Numerical methods | LPPHDS11 | 5 | 4 | - | 3 | 25 | 75 |
| DSE-4 | C Programming | LPPHDS12 | | | | | | |
| Ad.Cr.Co : MOOC | MOOC-1 | | | | - | - | - | - |
| | | | 30 | 16 | - | | | |
| **SEMESTER II** | | | | | | | | |
| CC-6 | Mathematical Physics – II | LPPHCT21 | 5 | 4 | | 3 | 25 | 75 |
| CC-7 | Electromagnetic Theory | LPPHCT22 | 5 | 4 | | 3 | 25 | 75 |
| CC-8 | Statistical Mechanics | LPPHCT23 | 5 | 4 | | 3 | 25 | 75 |
| CC-4(P) | General Physics Practical | LPPHCL21 | 5 | 4 | | 3 | 40 | 60 |
| CC-5(P) | Electronics Practical | LPPHCL22 | 5 | 4 | | 3 | 40 | 60 |
| DSE-2 | Laser Optics | LPPHDS21 | 3 | 3 | | 3 | 25 | 75 |
| | Nano Physics | LPPHDS22 | | | | | | |
| AEC-1 | Acoustics | LPPHAE21 | 2 | 2 | | 3 | 25 | 75 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Atomic Physics | LPPHAE22 | | | | | | |
| SLC-1 | Fiber Optics Communication | LPPHSC21 | - | - | 2 | 3 | 100 | - |
| | Physics in Home Appliances | LPPHSC22 | | | | | | |
| Ad.Cr.Co : MOOC | MOOC-1 | | | | - | - | - | - |
| | | | 30 | 25 | | | | |
| SEMESTER III | | | | | | | | |
| CC-9 | Quantum Mechanics | LPPHCT31 | 5 | 5 | | 3 | 25 | 75 |
| CC-10 | Solid State Physics | LPPHCT32 | 5 | 5 | | 3 | 25 | 75 |
| CC-11 | Molecular Spectroscopy | LPPHCT33 | 5 | 5 | | 3 | 25 | 75 |
| CC-12(P) | Advanced Physics Practical | LPPHCL41 | 4 | | | | | |
| CC-13(P) | Project / Dissertation | LPPHPJ41 | 4 | | | | | |
| GEC-1 | Physics for competitive Exam | LPPHNM31 | 5 | 4 | | 3 | 25 | 75 |
| AEC-2 | UGC- CSIR NET/SET Preparation General Paper | LPPHAE31 | 2 | 2 | | 3 | 25 | 75 |
| | Molecular Biophysics | LPPHAE32 | | | | | | |
| SLC-2 | Semiconductor Physics | LPPHSC31 | - - | - | 2 | 3 | - | 100 |
| | Physics in Some living Systems | LPPHSC32 | | | | | | |
| Ad.Cr.Co : MOOC | MOOC-2 | | | | - | - | - | - |
| | | | 30 | 21 | | | | |

SEMESTER IV

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CC-14 | Nuclear and particle Physics | LPPHCT41 | 5 | 5 | - | 3 | 25 | 75 |
| CC-15 | Microprocessor | LPPHCT42 | 5 | 5 | - | 3 | 25 | 75 |
| CC-16 | Thin filmsand Crystal growth | LPPHCT43 | 5 | 5 | - | 3 | 25 | 75 |
| CC-12(P) | Advanced Physics Practical | LPPHCL41 | 5 | 4 | - | 3 | 40 | 60 |
| CC-13 | Project / Dissertation | LPPHPJ41 | 4 | 4 | - | 3 | 50 (P) | 50 (VV) |
| DSE-3 | Renewable energy sources | LPPHDS41 | 4 | 3 | - | 3 | 25 | 75 |
| | Astronomy and Astro Physics | LPPHDS42 | | | | | | |
| SEC-1 | Applied electronics | LPPHSE41 | 2 | 2 | - | 3 | - | 100 |
| | Modern Optics | LPPHSE42 | | | | | | |
| Ad.Cr.Co : MOOC | MOOC-2 | | | | - | - | - | - |
| | | | 30 | 28 | | | | |

**DEPARTMENT OF PHYSICS – PG – CBCS - LOCF**

**(For those who join in June 2022)**

**Title of the Course: Mathematical Physics – I** **Semester: I**

**Course Code: LPPHCT11** **Contact Hours: 5hrs/w** **Credit: 4**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- solve vector algebra related problems independently.
- understand the algebraic operations of matrices and its applications in various fields in physical sciences.
- decipher the basics and applications of fourier series related integrals and transforms
- decipher the basics and applications of fourier series transforms
- solve partial differential equations in various coordinates systems

**Pre-Required Knowledge:**

- ✓ Scalar, vectors, vector algebra
- ✓ Properties of matrices, transpose and inverse of matrices
- ✓ Analysis for periodic function

**Unit I: Vectors**

Vector Algebra – Gradient of a scalar field- Line, Surface and Volume integrals- Divergence of a vector function – Curl of a vector function – Important vector Identities- Gauss Divergence Theorem – Deduction from Gauss Divergence Theorem – stokes Theorem – Deductions from Stokes Theorem – Green's Theorem – orthogonal Curvilinear Coordinates – Application of vectors to -The equation of heat flow in solids.

**Unit II: Matrices**

Algebraic operation of matrices – Sub matrices – Partitioning of matrices – Special types of matrices – Symmetric and Antisymmetric matrices – Hermitian and skew –Hermitian matrices – Determinant of a matrix – Cofactors of a determinant- Minors of a matrix – singular and non singular

matrices – Adjoint of a matrix – Orthogonal matrices – Unitary matrices – Trace of a matrix – Rank of a matrix – solution of Linear equations – Eigen value , Eigen vectors , Characteristics equation of a matrix – Cayley – Hamilton Theorem.

**Unit III: Fourier Series and Integrals**

Fourier series – Dirichlet's Theorem and conditions – Change of interval from (-π, π ) to (-l.l) - Complex form of Fourier series – Fourier Series in the interval (0,T) –Change of interval from (0,T) to (0,2l) –Uses of Fourier series – Physical examples of Fourier series –Properties of Fourier series-Fourier Integral.

**Unit IV: Fourier Transforms**

Fourier's Transform – Properties of Fourier's Transform - Fourier Transform of a derivative – Fourier sine and cosine Transform of derivatives – Finite Fourier Transforms – Simple Applications of Fourier Transforms.

**Unit V: Laplace Equations**

Solution of Laplace's Equation in Cartesian Coordinates - Solution of Laplace's Equation in Two – Dimensional Cylindrical Co-ordinates(r,Θ) Circular Harmonics - Solution of Laplace's equation in general Cylindrical Co-ordinates(General Cylindrical Harmonics) - Solution of Laplace's equation in Spherical Polar Coordinates: Spherical Harmonics

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Divergence of a vector function
- ✓ Hermitian matrices
- ✓ Dirichlet's Theorem and conditions
- ✓ Finite Fourier Transforms
- ✓ Two Dimensional Cylindrical Co-ordinates(r,Θ) Circular Harmonics

**Suggested Readings:**

**(i) Text Book:**

SatyaPrakash, Mathematical Physics including classical mechanics, Sultan Chand & Sons, sixth revised Edition, reprint (2016)

**(ii) Reference Books:**


1. Arfken, G.B., Weber, H.J., &Harris, F.E. Mathematics Methods for Physicists – A Comprehensive guide, Elsvier, Academic press, New York, 7th Edition, (2013)
2. Gupta, B.D. Mathematical Physics,–Vikas Publishing house Pvt Ltd. 3rd Edition (2005)
3. Dass, H.K. Mathematical Physics, S. Chand &Co , New Delhi. 7th Revised Edition, (2014)


**(iii) Web Sources:**

1. http://inside.mines.edu/~aflourno/MathPhys/511.shtml
2. https://nptel.ac.in/courses/115/103/115103036/
3. https://nptel.ac.in/courses/115/106/115106086/

---

**Title of the Course: Classical Mechanics** **Semester: I**

**Course Code: LPPHCT12** **Contact Hours: 5hrs/w** **Credit: 4**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- independently solve various problems using lagrangian formulations.
- formulate hamiltonian equations and learn its applications.
- understand the applications of canonical transformation and poisson brackets
- acquire knowledge on hamiltonian jacobi theory and its applications and understand theory and applications of small oscillations.
- describe the kinematics of rigid body and pseudo forces.

**Pre-Required knowledge:**

- ✓ Newton's laws of motion, vector algebra, differential and integral calculus
- ✓ Linear momentum, angular momentum, kinetic energy, potential energy, conservation of momentum and energy
- ✓ Work, power

**Unit I: Lagrangian Formulations**

Mechanics of Particle – Systems of Particles – Configurational space - Degrees of Freedom – Constraints - classifications – force of constraints – difficulties introduced - Generalized coordinates – Principle of Virtual work – D'Alembert's principle - Langrange's equation from D'Alembert's principle – Applications to simple pendulum and Atwood's machine. – Hamilton's principle – Lagrange's equation from Hamilton's principle.

**Unit II: Hamiltonian Methods and variational principles**

Phase space – Generalized momentum – Hamiltonian function and conservation of Energy – Jacobi's integral - Hamiltonian canonical equation of motion – equations in different coordinate systems - Application of Hamiltonian dynamics to Harmonic oscillator, particle in a central force field

Variational Principles – Calculus of variation and Euler Lagrange's equations – Applications of variational principle – shortest distance between two points – Brachistochrone problem - $\Delta$ variation - Principle of Least action – Proof-Deduction of Hamilton's equations from variational principle.

**Unit III: Canonical Transformation and Poisson's Brackets**

Canonical transformation – Legendre transformations - Generating functions - condition for canonical transformation – simple problems – Bilinear Invariant condition – Infinitesimal contact transformations -Poisson's brackets – Properties and fundamentals of Poisson's brackets – Invariance of Poisson brackets under canonical transformations. – Liouville's theorem.

**Unit IV: Hamilton-Jacobi theory and Small Oscillations**

Hamilton-Jacobi equation for Hamilton's principle function-Example: Harmonic oscillator problem-Hamilton's characteristic function-Action-angle variable-application to Kepler problem in action angle variables. One dimensional Oscillators – Solutions of the differential equations - Normal coordinates and Normal modes of vibration- General theory of small oscillations Secular Equation and Eigen value function – two coupled Pendulum only - vibrations of linear triatomicmolecule.

**Unit V: Kinematics of Rigid body**

Generalized coordinates of rigid body- Body and Space reference system - -Euler angle -infinitesimal rotation-Components of angular velocity - angular momentum – principle axes – principal moments of Inertia - rotational kinetic energy of motion -Euler's equations of motion-torque free motion of a rigid body-Motion of a heavy symmetrical top – Gyroscope – Pseudo forces – Centrifugal force – Free fall of a body on earth's surface – Focault pendulum.

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Lagrange's equation from D'Alembert's and Hamilton's principles
- ✓ Applications of Lagrange's and Hamiton's equations.
- ✓ Jacobi's integral, canonical transformation
- ✓ Normal coordinates and Normal modes of vibration
- ✓ Euler's equations of motion

**Suggested Readings:**

**(i) Text Book:**

Upadhyaya, J.C. Classical Mechanics, Himalaya publishing house, Mumbai, 2nd edition, (2015)

**(ii) Reference Books:**

1. Goldstein, H., Poole, P. and Safko, J. Classical Mechanics, Pearson Publishers, 3rd edition, (2013).

2. Gutpa, S.L. Kumar,V& Sharm H.V Classical Mechanics , Pragati Prakashan, Meerut, (2016).
3. Gupta, K.C., ClassicalMechanics of Particles and Rigid Bodies-New Age International Publishers, New Delhi, Third edition,(2018).
4. Rana, N.C. and Joag, P.J. Classical Mechanics,Tata McGraw Hill, New Delhi, (2015).
5. Gupta, B.D. and Satya Prakash, Classical Mechanics, Keder Nath Publishers,Meerut, Revised Edition, (2015).

**(iii) Web Sources:**

1. https://ocw.mit.edu/courses/physics/8-09-classical-mechanics-iii-fall-2014/lecture-notes/MIT8_09F14_full.pdf
2. https://nptel.ac.in/courses/115/106/115106123/
3. https://en.wikipedia.org/wiki/Lagrangian_mechanics

---

**Title of the Course: Digital Memory Circuits and Design Semester: I**
**Course Code: LPPHCT13 Contact Hours: 5hrs/w Credit: 4**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- understand the techniques of memory devices
- implement sequential circuits
- understand and implement the concept of state machines
- understand the concept of adc and dac
- understand the concept of multiplexed display system

**Pre-Required Knowledge:**

- ✓ Memory Circuits
- ✓ Integrated circuits, sequential circuits
- ✓ Digital and analog electronics

**Unit I: Memory Devices**

Introduction – Classification of memories – Read only memory (ROM) – Architecture of ROM – Types of ROM – Organization of a simple ROM – applications of ROM – Programmable of ROM (PROM) – random access memory

(RAM) – Types of RAM – Static RAM – Dynamic RAM (DRAM) – Advantages of RAM – Memory decoding – Programmable logic devices (PLD) – Programmable logic array (PLA) – Programmable array logic (PAL)

**Unit II: Synchronous Sequential Circuits**

Introduction – Classification of sequential circuits – design of synchronous sequential circuits –design of serial binary adder – design of sequence detectors – design of odd and even parity generator – Synchronous sequential circuit design using algorithmic state machine (ASM) – Algorithmic state machines(ASMs) – ASM Charts – Procedure for design using ASM charts – Design of parity bit generator using ASM chart – Analysis of Synchronous sequential circuit.

**Unit III: Asynchronous Sequential Circuits**

Introduction – Design of asynchronous sequential circuits –design of pulse mode asynchronous sequential circuits – Incompletely specifies state machines – problems in asynchronous sequential circuits – Cycles – Races – Hazards – Design of hazard free switching circuits – Static hazards elimination – Dynamic and essential hazards elimination.

**Unit IV: D/A AND A/D Converters**

Introduction – Analog and Digital data conversions – Specifications of D/A converter – Basic D/A conversion techniques – Weighted resistor type D/A converter – R-2R Ladder D/A converter – Multiplying D/A converters (MDACs) – Sampling process – A/D converters – Specifications of A/D converter – Classification of A/D converters – Simultaneous type A/D converter – Continuous type A/D converter – Successive approximation type A/D converter – Analog to Digital converter using voltage to time conversion.

**Unit V:Applications of Digital Circuits**

Introduction – Frequency counter – Five digit frequency counter – Time meter – Four digit time meter – Bar graph display system – Multiplexed display system – four digit multiplexed display system – Advantages of multiplexed display system – four digit counter with multiplexed seven segment display decoder – Dot matrix display system – Digital

Voltmeters – Three digit digital voltmeter – Merits and Demerits of digital voltmeter – Digital Multimeter (DMM) – Measurement of Current - Measurement of Resistance.

.**Suggested Topics for Group Discussion/Presentation:**

- ✓ Organization of a PROM
- ✓ Algorithmic state machines
- ✓ Hazards elimination
- ✓ A/D Accuracy and Resolution
- ✓ Frequency counter Resolution

**Suggested Readings:**

**(i) Text Book:**

Salivahanan, S. and Arivalagan, S. Digital circuits and Design, Vikas Publishing house Pvt. Ltd. 3rd edition, (2007), Reprint(2010)..

**(ii) Reference Books:**


1. Jain, R.P. Modern Digital Electronics – Tata McGraw Hill, (2007).
2. Coughlin, R.F and Driscol, F.F. Op-Amp and linear integrated circuits. Prentice Hall of India, New Delhi, (1996).
3. Malvino, A. and Bates, D.J. Electronic Principles, McGraw Hill, 7th edition, (2007).
4. Mehta, V.K., Principles of Electroni, S.Chand and Company,6th revised edition (2001).
5. Salivahanan, S. Suresh Kumar, N. & Vallavaraj, A. Electronic Devices And Circuits, Tata McGraw Hill (2005)
6. Gaykwad, R.A. Op-Amps and Linear Integrated Circuits, Pearson Education Pvt. Ltd., New Delhi, Seventh Indian Edition Reprint (2004).


**(iii) Web Sources:**

1. https://www.coursera.org/lecture/rf-mmwave-circuit-design/power-amplifiers-5N91v
2. https://www.youtube.com/watch?v=CeD2L6KbtVM
3. https://www.youtube.com/watch?v=kiiA6WTCQn0

4. https://www.fmf.unilj.si/~ponikvar/PDFji/Handbook%20of%20Operational%20Amplifier%20Applications%20-%20sboa092a.pdf
5. https://www.ee.ucl.ac.uk/~ademosth/E757/Topic4.pdf

---

**Title of the Course: Numerical Method** **Semester: I**

**Course Code: LPPHDS11 Contact Hours: 5hrs/w** **Credit: 4**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- apply numerical techniques in solving numerical equations using various iterative methods
- understand the algebraic equations
- develop knowledge in interpolations
- acquire the adequate mathematical knowledge in performing differentiations and integrations using iterative methods
- solve the mathematical equations using c programming language

**Pre-Required knowledge:**

- ✓ Equations for curves, data fitting
- ✓ Integration and differentiation basics
- ✓ C-Programming language syntax & programming

**Unit I: Iterative Methods**

Introduction- Beginning an iterative method- The method of Successive bisection- Newton Raphson iterative method – The Secant method-The method of Successive approximations-comparison of iterative methods.

**Unit II:Simultaneous Algebraic Equations**

Introduction – The Gauss Elimination method- Pivoting- Ill conditioned equations. Refinement of the solution obtained by Gaussian elimination- The Gauss Seidal iterative method- An algorithm to implement the Gauss-seidal method- comparison of direct and iterative methods.

**Unit III: Interpolation**

Lagrange interpolation – difference tables – Truncation error in interpolation- Least squares approximation of functions – Linear regression – Algorithm for linear regression.

**Unit IV: Differentiation and Integration**

Differentiation and Integration: Formulae for numerical integration – Simpson's rule- Gaussian quadrature formulae – Numerical solution of Differential equations Higher order differential equations.

**Unit V: Applications using C-Programming language**

Programs for 1. Solution of an equation by iterative method (Newton Raphson method) 2. Solution of simultaneous equations. 3. Calculation of mean and variance. 4. Calculation of correlation coefficients – Linear regressions. 5. Solution of first order differential equation (Runge –Kutta method) 6. Solution of second order differential equation (Runge-Kutta method) 7.Evaluation of definite integrals (Trapezoidal and Simpson rule) 8. Evaluation on inverse of a matrix (Programs in C language only)

**Suggested Topics for Group Discussion/Presentation**

- ✓ Secant method to solve quadratic equation
- ✓ Gauss Elimination method to solve algebraic equation
- ✓ Lagrange interpolation method
- ✓ Gaussian quadrature formulae
- ✓ Solution of an equation by iterative method (Newton Raphson method)

**Suggested Readings:**

**(i) Text Books**:

1. Rajaraman, V. Computer oriented Numerical methods, Prentice Hall of India Pvt.Ltd. New Delhi, 3rd edition, (2016).
2. Jain, M.K. Iyengar, S.K and Jain R.K. Numerical methods for Scientific and Engineering Computation, New Age International Publishers. 6th Edition, (2012).

**(ii) Reference Book:**

Conte, S.D. and Boor C.de. Elementary Numerical Analysis An Algorithmic Approach, McGraw Hill International Company, New York, 3rd Edition, (1983).

**(iii) Web Sources:**

1. Bisection Method | Lecture 13 | Numerical Methods for Engineers - Bing video
2. https://www.math.hkust.edu.hk/~machas/numerical-methods.pdf
3. https://nptel.ac.in/courses/111/107/111107105/

---

**Title of the Course: C Programming** **Semester: I**

**Course Code: LPPHDS12** **Contact Hours: 5hrs/w** **Credit: 4**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- understand the basis of C Programming
- acquire knowledge in functions and classes
- understand file operations
- acquire knowledge in Pointers and arrays
- acquire skills in writing their own programs

**Pre-Required Knowledge:**

- ✓ Arithmetic logic and reasoning
- ✓ Basic mathematical skills
- ✓ Numerical ability

**Unit I: Fundamentals**

Structure of C program, keywords, identifiers, constants, variables, data types, type conversion, Types of operators and expressions, Input and output functions in C - Decision Statement- IF-ELSE statement , break, continue, goto, switch ( ) case and nested IF statement.

**Unit II: Loops and arrays**

Loop Control Statements- For loop, While loop, Do –While loop and nested loops. Arrays – Definition, Initialization,

characteristics, One,Two, Three and Multidimensional arrays, scanf( ) and printf( ) functions, working with strings and standard functions.

**Unit III: Pointers and strings**

Pointers – Introduction, features, Declaration, Arithmetic operations, Pointers and Arrays, Arrays of pointers, pointers to pointers, pointers and strings, void pointers.

**Unit IV: Functions and storages**

Functions – Declaration, Prototype, Types of functions, call by value and reference, Function with operators, function with decision statements, function with loop statements, Function with Arrays and Pointers, Types of storage classes.

**Unit V: File Operations**

Structure and Union – Declaration, Initialization, structure within structure, Array of structure, Enumerated data types, Union of structure, Files – Streams and file types, file operations, File I/O , Read, Write and other file function.

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Decision Statement- IF-ELSE statement
- ✓ For loop, While loop, Do
- ✓ Pointers and Arrays,
- ✓ Types of storage classes
- ✓ Structure and Union

**Suggested Readings:**

**(i) Text Book:**

Balagurusamy, E., Programming in AnsiC,Tata McGraw Hill, New Delhi, 6th Edition, (2012).

**(ii) Reference Books:**

1. Kamthane, A.N. Programming in C, Pearsons International, New Delhi, (2011).
2. Gottfried, B., Programming with C, Schaum's outline Series, Tata McGraw Hill, New Delhi, (1996).

**(iii) Web Sources:**

1. https://nptel.ac.in/courses/106/104/106104128/

2. https://nptel.ac.in/courses/106/105/106105171/
3. https://cw.fel.cvut.cz/old/_media/courses/be5b99cpl/lectures/be5b99cpl-lec01-handout.pdf

---

**Title of Paper: Mathematical Physics – II** **Semester: II**
**Course Code: LPPHCT21** **Contact Hours: 5hrs/w** **Credit: 4**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- understand the group theory and its applications
- acquire knowledge about various theorems and functions of a complex variables
- solve various problems in physics where tensor analysis is required
- acquire knowledge in legendre functions and its applications
- thoroughly understand the bessel functions and their field of applications

**Pre-Required knowledge:**

- ✓ Important theorems in group theory
- ✓ Differential equations, functions.
- ✓ Integral, differential calculus

**Unit I: Group Theory**

Concept of a group-Abelian group-The generators of finite group-The cyclic group-The group multiplication table-Rearrangement theorem-Subgroups-Cosets-Conjugate elements and classes-The product of classes-Representation of a groups-Reducible and irreducible representations-Some important theorems on representations-The orthogoanality theorem.

**Unit II: Complex Variables**

Introduction – Functions of a complex variable – definition – Analytic function – The necessity and sufficient conditions for a function f(z) to be analytic – Cauchy's – Riemann differential equations – Laplace equations : harmonic

functions – Line integral of a complex function – Cauchy's Integral theorem – Cauchy's Integral formula – Taylor's series – Laurent series – singularities of an analytic function – Residues and their evaluation – Cauchy's Residue theorem.

**Unit III: Tensors**

Introduction – 'n' dimensional space – superscripts and subscripts – coordinate transformation – scalars, contravariant and covariant vectors – Algebraic operations of tensors – symmetric and anti-symmetric tensors – covariant differentiation of vectors –covariant differentiation of tensors of higher rank – intrinsic derivatives – simple applications of tensors to non-relativistic physics i) Tensors in dynamic of a particle ii)Tensor in elasticity: strain, stress and Hooke's law iii) Tensors in rigid bodies.

**Unit IV: Special functions I**

Legendre differential equation and Legendre function – Generating function of legendre polynomial-Rodrigue's formula for Legendre polynomial-Recurrence formula for $P_n(x)$– symmetry property of beta function– Evaluation of beta function – Transformation of Beta function – Relation between beta and gamma function.

**Unit V: Special functions II**

Bessel's function of first and second kind – Recurrence formula for Jn(x) – Generating function for Jn(x) – Orthonormality of bessel's functions – Hermite differential equations and polynomials – Generating function – Recurrence formula for Hermite polynomials

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Rearrangement theorem
- ✓ Cauchy's Integral formula
- ✓ Symmetric and anti-symmetric tensors
- ✓ Relation between beta and gamma function
- ✓ Orthonormality of Bessel's functions

**Suggested Readings:**

**(i) Text Book:**

Satya Prakash, Mathematical Physics including classical mechanics, Sultan Chand & Sons, New Delhi sixth revised Edition 2012 reprint, (2016)

**(ii) Reference Books:**


1. Arfken G.B., Weber, H.J., Harris, F.E. Mathematics Methods for Physicists – A Comprehensive guide, Elsvier, Academic press, New York, 7th Edition, (2013).
2. Gupta, B.D., Mathematical Physics, Vikas Publishing house Pvt Ltd. New Delhi, 3rd Edition (2005).
3. Dass, H.K. Mathematical Physics, S. Chand &Co , New Delhi. 7th Revised Edition, (2014).
4. Cotton, F.A., Chemical Applications of Group Theory, John Wiley & Sons (India edition), 3rd Edition,(2008).


**(iii) Web Sources:**

1. https://nptel.ac.in/courses/115/103/115103036/
2. https://nptel.ac.in/courses/115/101/115101122/
3. https://www.youtube.com/watch?v=r_Yv5ZrrEGE

---

**Title of the Course: Electromagnetic Theory** **Semester: II**

**Course Code: LPPHCT22** **Contact Hours: 5hrs/w** **Credit: 4**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- acquire theoretical knowledge on electric field, electric potential and gauss's law and its applications
- know the various applications of magneto statics
- understand the theory of origin of magnetic field in matter
- acquire knowledge of electromagnetic induction and maxwell's equations
- have thorough understanding of the applications of wave propagation.

**Pre-Required knowledge:**

- ✓ Electrostatic forces, vector addition of electrostatic forces, electric field and magnetic field
- ✓ Current electricity, atomic and magnetic properties, dipole, dipole moment
- ✓ Concept of electromagnetic waves, electromagnetic spectrum, propagation of electromagnetic waves.

**Unit I: Electrostatics**

Coulomb's law – Electric field – Continuous charge distributions – Divergence and curl of E – Field lines, flux and Gauss's law – Applications of Gauss's law – Electric potential – Poisson's and Laplace's equations – Potential of a localized charge distribution – work and energy in electrostatics – Energy of point and continuous charge distribution – conductors – properties – capacitors, energy stored in a capacitor – Multipole expansion, approximate potential at large distance, monopole and dipole terms – Electric fields in matter – induced and permanent dipoles – alignment of polar molecules – polarization – Field of a polarized object – bound charges – Gauss's law in the presence of Dielectrics – Susceptibility, permitivity, dielectric constant

**Unit II: Magnetostatics**

Lorentz Force law – Cyclotron and Cycloid motions - Current density – line, surface and volume current densities – continuity equation – Biot-Savart law – Applications- magnetic field due to long straight wire and current carrying circular loop – Force between two parallel wires – Divergence and Curl of B – Ampere's Law – Applications – solenoid – toroid – Comparison between Magnetostatics and Electrostatics - Magnetic vector potential.

**Unit III: Magnetic field in Matter**

Torque and forces on magnetic dipoles - Paramagnetism – Effect of magnetic field on atomic orbital – Diamagnetism - Magnetization – Field of a Magnetized object – Bound currents – Ampere's law in magnetized materials - Ferro

Magnetic susceptibility and permeability – Ferromagnetism and hysteresis loop.

**Unit IV: Electromagnetic Induction and Maxwell's equation**

Ohm's law – Joule heating law – electromotive force – motional emf – flux rule – Faraday disk – electromagnetic induction – Faraday's law – Induced electric field – Mutual and self inductance – Energy in magnetic field – Maxwell's equations - Maxwell's equations in matter – Boundary conditions – Poynting's theorem and Poynting vector.

**Unit V: Wave propagation**

Electromagnetic waves in vacuum – monochromatic plane waves – energy and momentum in electromagnetic waves – electromagnetic waves in matter – propagation in linear media – Reflection and Transmission - normal and oblique incidences – Laws of reflection and refraction – Snell's law – Fresnel equation.

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Coulomb's law, Gauss's law and its applications, electric potential.
- ✓ Lorentz Force and its applications
- ✓ Torque and forces on magnetic dipoles
- ✓ Electromagnetic induction theory and various laws related to that
- ✓ Electromagnetic waves in vacuum and medium, various properties of em waves

**Suggested Readings:**

**(i) Text Book:**

Griffiths, D.J., Introduction to Electrodynamics, Prentice Hall of India (PHI) Learning Private Limited, 4th Edition, (2013).

**(ii) Reference Books:**

1. Agrawal, G.C. and Chopra, K.K. Electromagnetic theory, K. Nath & Co., Publisers, New Delhi, (2010).
2. Chakraborty, B. Principles of Electrodynamics, Books and Allied Publishers, Kolkata, (2002).

3. Jackson, J.D. Classical Electrodynamics, Wiley India Pvt. Ltd., New Delhi, 3rd Edition, Reprint, (2009).

**(iii) Web Sources:**

1. https://nptel.ac.in/courses/108/104/108104087/
2. https://nptel.ac.in/courses/115/104/115104088/
3. https://nptel.ac.in/courses/115/101/115101004/

---

**Title of the Course: Statistical Mechanics** **Semester: II**

**Course Code: LPPHCT23** **Contact Hours: 5hrs/w** **Credit: 4**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- understand the applications of ensembles and microstates and macrostates
- develop the knowledge in canonical ensembles
- acquire knowledge on various thermodynamic statistics
- describe transport equations and equilibrium process
- understand the applications of phase transitions

**Pre-Required knowledge:**

- ✓ Laws of thermodynamics, Heat as a form of energy
- ✓ Specific heat capacity, various state variables-Pressure, volume, temperature, entropy
- ✓ Probability and statistics

**Unit I: Basic concepts in classical statistics**

Phase space – Volume in Phase space – Density of distribution in phase space – General discussion of mean values (Ensemble averages) – Density of phase points in a classical ensemble – Statistical equilibrium – Thermal equilibrium – Microstates and Macro states – Stirling's approximation – Classical Maxwell-Boltzmann distribution law

**Unit II: Ensembles**

Microcanonical Ensembles – Perfect Gas in microcanonical ensemble – Gibbs paradox– Gibbs canonical Ensembles – Thermodynamics functions for Canonical

Ensemble - Partition Function and Properties -Perfect Monoatomic Gas in Canonical Ensemble - The grand canonical Ensemble – Comparison of ensembles.

**Unit III: Quantum statistics**

Bose-Einstein Statistics - Fermi-Dirac Statistics – Maxwell – Boltzmann Statistics – Evaluation of the constants α and β – Results and comparison of the three statistics – Eigen states and the Maxwell Boltzmann equation – Black body radiation and the Planck radiation law – Grand canonical ensemble and Quantum statistics.

**Unit IV: Transport and Nonequilibrium processes**

Derivation of Boltzmann transport equation for change of states without and with collisions Boltzmann Transport equation for Electrons and Lorentz solution – Chamber's Equation – Sommerfeld's Theory of Electrical Conductivity – Thermal Conductivity of Metals – Magnetoresistance-viscosity from Boltzmann equation – isothermal hall effect.

**Unit V: Phase Transitions**

Phase Transition – Phase Transitions of first and second kind – Critical Exponent – Yang and Lee theory –Phase Transition of second kind - The ISING Model - Bragg – Williams Approximation- One Dimensional ISING Model

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Phase space and ensembles
- ✓ Perfect Monoatomic Gas in Canonical Ensemble
- ✓ Black body radiation
- ✓ Isothermal hall effect.
- ✓ One Dimensional ISING Model

**Suggested Readings:**

**(i) Text Book:**

Gupta and Kumar, Statistical Mechanics, Prakathi Prakashan educational Publishers, Meerut, 28th edition, (2015).

**(ii) Reference Books:**


1. Reif, F., Fundamentals of Statistical and Thermal Physics, Paperback, SaratBook Distributors, (2010).
2. Laud, B.B Fundamentals of Statistical Mechanics Paperback , New Age International Private Limited, (2012).
3. Kittel, C. Elementary Statistical Physics, John Wiley & Sons, (2004).
4. Reif, F. Statistical and Thermal Physics, F.Reif, McGraw Hill, Fifth Edition, (2010).
5. Agarwal,B.K. & Eisner, M. Statistical Mechanics, Second Edition, NewAge International Private Limited, Delhi, (2016).


**(iii) Web Sources:**

1. https://nptel.ac.in/courses/115/106/115106126/
2. https://nptel.ac.in/courses/112/105/112105123/
3. https://nptel.ac.in/courses/127/106/127106135/
4. https://ocw.mit.edu/courses/physics/8-333-statistical-mechanics-i-statistical-mechanics-of-particles-fall-2013/

---

**Title of the Course: Laser Optics** **Semester: II**

**Course Code: LPPHDS21** **Contact Hours: 3hrs/w** **Credit: 3**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- develop theoretical knowledge in laser fundamentals
- understand the construction, working, advantages and disadvantages in various types of laser
- have indepth knowledge in various applications of laser
- have thorough understanding of applications of laser spectroscopy
- acquire knowledge in non-linear optics

**Pre-Required Knowledge:**

- ✓ Fundamentals of lasing action

- ✓ Various types of lasers
- ✓ Fundamentals of laser application

**Unit I:Laser Fundamentals**

Introduction to LASER, Principle and distinct properties, Directionality, Intensity, monochromaticity, coherence, population inversion, different methods of achieving population inversion, Einstein coefficients, rate equations, Two level, three level, and four level system, Q factor, resonating modes.

**Unit II: Types of Laser**

Solid state laser, Ruby LASER, Nd:YAG laser, excitation mechanism, applications, gas laser, He-Ne laser, $CO_2$ laser, Two modes of excitation, applications, semiconductor laser, GaAs laser, structural details, excitation mechanism, application, Dye laser, chemical laser, Hydrogen fluoride laser.

**Unit III: Applications of Laser**

Material processing – Lasers in Medicine – Light Detection and Ranging (LIDAR) – Optical communication – Optical Fiber – Step, Graded, single mode, multimode fibres – Optical communication systems – Advantages & Disadvantages - Holography – Laser Isotope separation – Laser induced fusion – Military applications.

**Unit IV: Advances in Laser Physics and Laser Spectroscopy**

Laser physics: Q-switching, mechanical, acousto-optic and electro-optic Q switches, Spectroscopy: Rayleigh and Raman scattering, Stimulated Raman effect, Hyper Raman effect, classical treatment, coherent anti stokes Raman scattering (CARS), photo-acoustic Raman spectroscopy (PARS).

**Unit V:Nonlinear Optics**

Harmonic generation, second harmonic generation, polarization in a non-linear optical medium, phase matching, third harmonic generation, optical mixing, parametric generation of light, self-focusing of light.

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Einstein coefficients, rate equations
- ✓ Ruby laser, Nd: YAG laser, excitation mechanism, applications, gas laser
- ✓ Laser induced fusion
- ✓ Photo Acoustic Raman Spectroscopy (PARS).
- ✓ Third harmonic generation

**Suggested Readings:**

**(i) Text Books:**


1. Laud, B.B. Lasers and Nonlinear Optics- B.B. Laud, New Age International (P) Ltd. Publisher, New Delhi, (2000).
2. Jain, V.K. Laser Systems and Applications, Narosa Publishing house Pvt. Ltd. New Delhi, 2013.


**(ii) Reference Books:**


1. Thyagarajan . K, Ajay ghatak, Laser fundamentals and applications, Laxmi publications, Second edition, (2019)
2. Senthil Kumar, G. Engineering Physics, VRB publishers Pvt. Ltd. New Delhi, (2008).
3. Planisamy, P.K., Semiconductor Physics and Optoelectronics, Scitech Publications (India) Pvt.Ltd, Chennai,(2003).


**(iii) Web Sources:**

1. https://ehs.msu.edu/_assets/docs/laser/laser-fundamentals-pt1-springer-2005.pdf
2. https://spie.org/education/education-outreach-resources/online-resources
3. https://www.journals.elsevier.com/optics-and-laser-technology
4. https://www.edx.org/learn/optics
5. https://ocw.mit.edu/resources/res-6-005-understanding-lasers-and-fiberoptics-spring-2008/laser-fundamentals-i/

---

| Title of the Course: Nano Physics | | Semester: II |
|---|---|---|
| Course Code: LPPHDS22 | Contact Hours: 3hrs/w | Credit: 3 |

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- develop theoretical knowledge in nano scale systems
- understand the applications of physical and chemical synthesis
- acquire knowledge in various methods of characterization
- describe the methods of lithography
- acquire the knowledge in nano particles and its applications

**Pre-Required Knowledge**:

- ✓ Fundamentals of nano structures
- ✓ X-ray production and basics of X-rays
- ✓ Semi conductor materials and their uses

**Unit I: Nano Scale Systems**

Introduction - energy and time scales - Quantum confinement of electrons in semiconductor - nano structures - Quantum confinement in 3D, 2D, 1D and zero dimensional structures - Surface effect and properties of nanostructures - Top-down and bottom-up approach.

**Unit II: Synthesis – Physical and Chemical Methods**

Ball milling - electro deposition - inert gas condensation technique - thermal evaporation - pulsed laser deposition - DC/RF sputtering - chemical vapor deposition (CVD) - Metal organic chemical vapor deposition (MOCVD).

**Unit III: Characterization Methods**

X-ray diffraction - Debye-Scherrer formula - dislocation density - micro strain - principle and application - transmission electron microscope (TEM) - scanning probe microscope - working principle and applications.

**Unit IV: Lithographic Methods**

Introduction – lithography – Photolithography - electron beam lithography - X-ray lithography - focused ion beam lithography - assembly of nanoparticles and nanowires.

**Unit V: Nanotechnology and Its Applications**

Applications of nano particles - quantum dots - nanotubes and nanowires for nano devices - single electron transistor - coulomb blockade effects in ultra-small metallic tunnel junction - solar cells, quantum dot based LED and transistors.

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Quantum confinement in 3D, 2D, 1D and zero dimensional structures,
- ✓ Ball milling, electro deposition, inert gas condensation technique
- ✓ X-ray diffraction, Debye-Scherrer formula
- ✓ Introduction, lithography. Photolithography
- ✓ Applications of nano particles

**Suggested Readings:**

**(i) Text Book**:

Nalwa, H.S. Hand book of Nanostructured Materials and Technology, Vol. 1-5, Academic Press, USA (2000).

**(ii) Reference Books:**

1. Pradeep, A text book of Nanoscience and Nanotechnology, McGraw hill education, (2012)
2. Nano technology: Principles and Practices, Springer International, Co-published with Capital Publishingcompany, New Delhi, 3rd Edition, (2015).
3. Gunzler, Hand Williams, A. Hand book of analytical techniques, Wiley, (2002).
4. Timp, G. Nanotechnology, Editor, AIP Press, Springer-verlog, New York, (1999).
5. Poole, C.P. Frank Jr. and Owens, J., Introduction to Nanotechnology, Wiley India Pvt.Ltd. New Delhi, Wiley Student Edition, reprint (2009).

**(iii) Web Sources:**

1. https://nptel.ac.in/courses/113/106/113106093/
2. https://nptel.ac.in/courses/118/106/118106021/

3. https://meddocsonline.org/ebooks/ebook-nanotechnology/Importance-Application-of-Nanotechnology_GP_11_06_2019.pdf
4. https://nanohub.org/

---

**Title of the Course: Acoustics** **Semester: II**

**Course Code: LPPHAE21** **Contact Hours: 2hrs/w** **Credit: 2**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- learn the acoustics intensity and wave equation
- understand the various modes of propagation of sound waves
- acquire knowledge on designing of acoustical architecture
- learn the underwater sound refraction
- understand the underwater transducers

**Pre-Required Knowledge:**

- ✓ Sound, wavelength, frequency
- ✓ Propagation of sound waves through various media
- ✓ Basic of ultrasonics

**Unit I: Plane Acoustic waves**

Introduction –wave equation-wave elements-speed of sound-acoustic intensity-sound energy density-specific acoustic impedance-sound measurements-resonance of air columns-Doppler effect

**Unit II: Spherical Acoustic waves**

Introduction-wave equation-wave elements-acoustic intensity and energy density-specific acoustic impedance-radiation of sound-source strength –radiation impedance.

**Unit III: Architectural Acoustics**

Introduction-Reverberation-noise insulation and reduction-sound absorption-sound distribution-Room acoustics.

**Unit IV: Underwater Acoustic**s

Introduction – underwater – sound – refraction – reverberation-ambientnoise - underwater transducers– cavitations.

**Unit V:Ultrasonics**

Introduction-wave types- ultrasonic transducers-piezoelectric transducers-Magneto strictive transducers-electromagnetic transducers-absorption-applications.

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Wave equation-wave elements
- ✓ Radiation of sound-source strength
- ✓ Reverberation-noise insulation and reduction
- ✓ Underwater sound-refraction
- ✓ Electromagnetic transducers

**Suggested Readings:**

**(i) Textbook:**

William W.S. Schaum's outline series theory and problems of acoustics-by William W. sets, McGraw- hill book company (1971)

**(ii) Reference Books:**


1. Kakhani, S.L., Hemrajani,Waves oscillations and Acoustics, 2nd edition, CBS Publishers & Distributors Pvt. Ltd. (2018).
2. Finch, R.D. Introduction to Acoustics, Pearsons International, (2005).
3. Everest F.A. & Pohlman, K.C. Master Handbook of Acoustics, 6th edition, McGraw Hill (2015).


**(iii) Web Sources:**

1. https://exploresound.org
2. https://nptel.ac.in/courses/105/107/105107156/
3. https://nptel.ac.in/courses/124/105/124105004/

---

**Title of the Course: Atomic Physics** **Semester: II**

**Course Code: LPPHAE22** **Contact Hours: 2hrs/w** **Credit: 2**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- learn various atomic theories and their experimental evidences, drawbacks and advantages
- understand the schrodinger wave equation and its applications
- understand the evaluation of integrals in helium atoms
- understand the quantum defect and fine structure
- understand the absorption spectroscopy and saturation spectroscopy

**Pre-Required Knowledge:**

- ✓ Spectrum of hydrogen
- ✓ Helium atoms
- ✓ Quantum defect

**Unit I: Early atomic physics**

Introduction- spectrum of atomic hydrogen – Bohz's theory – relative effects – Moseley and the atomic number – Radioactive decay – Einstein A and B co efficient – The Zeeman effect – experimental observation of Zeeman effects.

**Unit II: The hydrogen atom**

The Schrodinger equation – solution of the angular equation – solution of the radial equation – transitions – selection rules – integration with respect to $\Theta$ - parity – fine structure - spin election – The fine structure of hydrogen – The lamp shift.

**Unit III: The helium Atom**

The ground state of Helium – excited state of Helium – spin Eigen states – transitions in Helium – evolution of the integrals in Helium – Ground state – excited states in the direct integral - excited states in the exchange integral.

**Unit IV: The Alkalis**

Shell structure and the periodic table – The quantum defect – The central field approximation – numerical solution

of the Schrodinger equation – self consistent solutions – The spin orbit interaction in a quantum mechanical approach.

**Unit V: Doppler – Free laser spectroscopy**

Doppler broadening of spectral lines- the crossed beam method- saturated absorption spectroscopy- principle of saturated absorption spectroscopy- crossover resonances in saturation spectroscopy- two photon spectroscopy.

**Suggested Topics for Group Discussion/Presentation**:

- ✓ Radioactive decay
- ✓ The Schrodinger equation
- ✓ The ground state of Helium
- ✓ Shell structure and the periodic table
- ✓ Doppler broadening of spectral lines

**Suggested Readings:**

**(i) Text Book:**

Foot, C. J., Atomic Physics, Oxford Master Series in Physics, Oxford University Press, (2005).

**(ii)Reference Book:**

Beiser, A. Concepts of Modern Physics. Mc Graw Hill, USA. (2016)

**(iii) Web Sources:**

1. https://nptel.ac.in/courses/115/101/115101003/
2. https://nptel.ac.in/courses/115/106/115106057/
3. https://ocw.mit.edu/courses/physics/8-421-atomic-and-optical-physics-i-spring-2014/
4. https://ocw.mit.edu/courses/physics/8-422-atomic-and-optical-physics-ii-spring-2013/video-lectures/lecture-1-introduction-to-atomic-physics/

---

| Title of the Course: Fiber Optic communications | | Semester: II |
|---|---|---|
| Course Code: LPPHSC21 | Contact Hours: - | Credit: 2 |

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- understand the ray theory and electromagnetic waves
- learn the principles of photo detection preparation of fiber
- acquire knowledge on the distribution systems and modulation
- understand the noise and detection and analog and digital system design
- understand the thermal and short noise

**Pre-Required knowledge:**

- ✓ Various phenomenon of propagation of electromagnetic waves
- ✓ Total internal reflection and modes of transmission of signlas
- ✓ Types of modulation

**Unit I: Optics Review and Light wave fundamentals**

Ray theory and applications- lenses – Imaging- numerical Aperture – Diffraction - Electromagnetic waves – Dispersion, pulse distortion, and information Rate – Polarization – Resonant cavities – Reflection at a plane boundary- Critical-Angle reflections.

**Unit II: integrated Optic waveguides**

Dielectric slab waveguide – Modes in the symmetric slab waveguide - Modes in the asymmetric slab waveguide – Coupling to the waveguide – Dispersion and distortion in the slab waveguide – Integrated Optic networks

**Unit III: Light Detectors, Couplers and Connectors**

Principles of Photo detection- Photomultiplier – semiconductor photodiode – PIN photodiode – Avalanche Photodiode – Connector Principles – Fiber and Preparation – Splices – Connectors – Source Coupling

**Unit IV : Distribution Systems and Modulation**

Distribution Networks – Directional Couplers – Star Couplers – Switches – Wavelength- Division Multiplexing – Light-Emitting-Diode Modulation and circuits - Analog Modulation Formats – Digital Modulation Formats – Optic Heterodyne Receivers

**Unit V: Noise and Detection and System Design**

Thermal and Short Noise – Signal-to-Noise Ratio – Error Rates – Additional Noise Contributors - Receiver Circuit Design - Analog system Design - Digital system Design.

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Lenses, diffraction and polarisation
- ✓ Waveguide, modes and coupling in waveguide
- ✓ Preparation of fibre, splices and connectors
- ✓ Distribution and various types of modulation
- ✓ Noise, signal to noise ratio, analog and digital system design

**Suggested Readings:**

**(i) Text Book:**

Joseph C. Palais, Fiber Optic Communications, 2nd Edition, Prentice-Hall International, Inc. (1988)

**(ii) Reference Book:**

Anuradha De, Optical Fibre and Laser Principles and Applications, 2nd edition, Reprint New Age International Publishers (2012).

**(iii) Web Sources:**

1. https://Fiberu.org
2. https://nptel.ac.in/courses/108/106/108106167/
3. https://ocw.mit.edu/resources/res-6-005-understanding-lasers-and-fiberoptics-spring-2008/fiberoptics-fundamentals/
4. https://www.digimat.in/nptel/courses/video/108104113/L01.html

---

**Title of the Course: Physics in Home Appliances** **Semester: II**

**Course Code: LPPHSC22** **Contact Hours: -** **Credit: 2**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- understand the basics of electric and electronics devices.
- know the functioning of microwave oven and heating appliances.
- acquire knowledge on the principles behind motorized appliances.
- learn the fundamentals of working principle of refrigerators and other cooling appliances.
- use effectively various appliances used for the measurement of current and voltages.

**Pre-Required knowledge:**

- ✓ Basics of current electricity and electronics.
- ✓ Principles of physics used in electric and electronic devices.
- ✓ Fundamentals of operation of appliances.

**Unit-I: Introduction to Electricity and Electronics**

Basic Electricity: Voltage, Current, Resistance, Impedance & Power factor- Transformers-Step – up & Step - down – Single phase & Three phase circuits - Fuse, Concept Of Earthing Electronics: Familiarization of electronic component Capacitor, Chokecoil, Diode, Transistor, Thyristor.

**Unit-II: Heating Appliances**

Electric stove - Electric Rice cooker - Toaster - Kettle - Coffee maker -Iron box –Immersion heater-Geyser-Hairdrier-Microwave oven.

**Unit-III: Motorized Appliances**

Electric fans- Mixer- Grinder/Blenders–Washing machine-Vacuum cleaner-Domestic water pump-Dish washer.

**Unit-IV: Refrigeration Appliances**

Refrigerator - Compressor – coolants-Automatic defrost circuits-Air coolers-Air conditioners.

**Unit-V: Other Appliances**

Lights- Incandescent Bulbs, Tubelight, CFL bulb–LED-Voltage stabilizer-Inverters–UPS Basic Equipment's for testing and servicing- Multimeter-Measurement of current, voltage and resistance – Checking transistors and diodes in circuit measurements-Soldering Iron-Flux-Lead.

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Circuits and fundamentals of heating appliances
- ✓ Basic functioning of motor appliances
- ✓ Presentation on refrigeration techniques and related appliances.
- ✓ Discussion on functioning of lights and usage of meters for various measurements
- ✓ Discussion about transistors

**Suggested Readings:**

**(i) Text book:**

Theraja, B.L &Theraja, A.K. A TextBook of Electrical Technology, S. Chand & Company Ltd., NewDelhi, India, (2005).

**(ii) Reference books:**

1. Eric Kleinert, Troubleshooting and Repairing major appliances, McGrawHill Professional, 3rd edition, (2012).
2. Shashi Bhushan Sinha, Handbook of Repair and Maintenance of Domestic Electronics Appliances, BPB Publications, India, (2016).

**(iii) Web Sources**:

1. https://pdhonline.com/courses/e419/e419content.pdf
2. https://www.danfoss.com/en-in/about-danfoss/our-businesses/cooling/the-fridge-how-it-works/
3. https://blog.epicvila.com/home-appliances-working-conditions/
4. https://www.youtube.com/watch?v=quVUNVN1rvc
5. https://www.youtube.com/watch?v=c5NeTnp_poA

---

| Title of the Course: General Physics Practical | | Semester: I & II |
|---|---|---|
| Course Code: LPPHCL21 | Contact Hours: 5hrs/w | Credit: 4 |

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- determine young's modulus of given medium by forming fringes.
- determine the dispersive power of the medium using spectrometer.
- demonstrate the application of numerical integration methods
- determine the various properties of given liquids using Ultrasonic Interferometer
- measure refractive index of the medium using spectrometer

**List of Experiments:**

1. Determine the Young's modulus of glass plate by forming Elliptical fringes
2. Determine the Young's modulus of glass plate by forming Hyperbolic fringes
3. Determine the Refractive index of a liquid using hollow prism
4. Determine the Dispersive Power of Liquids using hollow prism
5. Determine the Refractive index of a liquid using Laser source.
6. Determine the compressibility of different liquids using Ultrasonic Interferometer.
7. Write a C program to find the roots of the equation using fixed point iteration method.
8. Write a C program to find the roots of the equation using Bi-section method.
9. Write a C program to find the roots of the equation using Newton Raphson method.
10. Write a C program to find the roots of the equation using Secant method

11. Write a C program to find the roots of the equation using Successive approximation method.
12. Write a C program to solve the given set of equations using Gauss elimination method.
13. Write a C program to solve the given set of equations using Gauss seidal method
14. Write a program for Lagrange interpolation method and verify its output.
15. Write a program for Linear regression method and verify its output.
16. Write a program for Simpson's rule method and verify its output.

**Suggested Readings:**

**(i) Text Books**:


1. Rajaraman, V. Computer oriented Numerical methods, Prentice Hall of India Pvt.Ltd. New Delhi, 3rd edition, (2016).
2. Jain, M.K. Iyengar, S.K and Jain R.K. Numerical methods for Scientific and Engineering Computation, New Age International Publishers. 6th Edition, (2012).


**(ii) Reference Book:**


Conte, S.D. and Boor C.de. Elementary Numerical Analysis An Algorithmic Approach, McGraw Hill International Company, New York, 3rd Edition, (1983).


**(iii) Web Sources:**

1. Bisection Method | Lecture 13 | Numerical Methods for Engineers - Bing video
2. https://www.math.hkust.edu.hk/~machas/numerical-methods.pdf
3. https://nptel.ac.in/courses/111/107/111107105/https://vlab.amrita.edu/?sub=1
4. https://www.jnec.org/labmanuals/eep/se/sem2/SY%20P2%20NMP%20Lab%20manual.pdf

---

| Title of the Course: Electronics Practical | | Semester: I & II |
|---|---|---|
| Course Code: LPPHCL22 | Contact Hours: 5hrs/w | Credit: 4 |

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- characterize field effect transistor and will be able to use this to design amplifiers.
- design amplifiers and oscillators using uni-junction transistor.
- design, analyze the output and trouble shoot various electronic circuits using operational amplifier.
- design, analyze the output and trouble shoot various electronic circuits using Ic 555 timer circuits construct their own voltage regulator apparatus
- design and analyze the modulation circuit.

**List of Experiments:**

1. Study the duty cycle variation with respect to Rand C by forming square wave using IC555 timer.
2. Construct a Phase shift oscillator for a given frequency range.
3. Construct a Schmitt trigger circuit and calculate the hysteresis voltage.
4. Construct 4 bit binary adder and binary subtractor using IC 7483 and IC 7404.
5. Construct Dual power supply circuit using IC 7812 and IC 7912 and use the dual Power supply to construct differentiator and Integrator circuits using IC 741.
6. Study the characteristics of the given UJT(2N2646) and determine the intrinsic stand-off ratio for different $V_{B1B2}$ Voltages.
7. Construct Wein's bridge oscillator using transistor and determine its frequency.
8. Construct FET amplifier circuit and study its frequency response and to find the mid band gain.

9. Construct Amplitude Modulation circuit and find its percentage of modulation.
10. Construct a Mono-stable Multivibrator circuit using IC 555 timer.
11. Construct Astable Multivibrator circuit using IC 555 timer.
12. Construct a common drain amplifier using FET and measure its output impedance.
13. Verify the Characteristics of Silicon Controlled Rectifier (SCR)
14. Construct Miller integrator circuit and generate triangular wave form.
15. Construct a 3 bit Up-Down counter and study their wave form.
16. Construct a Mono-stable Multivibrator circuit using IC 741.
17. Construct a Voltage regulated power supply using IC 7805 and study its regulation properties.

**Suggested Readings:**

**(i) Text Book:**

Sedha, R.S. A text book of applied electronics, S.Chand & Co. Ltd. Revised edition, (2018).

**(ii) Reference Books:**

1. Jain, R.P. Modern Digital Electronics – Tata McGraw Hill, (2007).
2. Coughlin, R.F and Driscol, F.F. Op-Amp and linear integrated circuits. Prentice Hall of India, New Delhi, (1996).
3. Malvino, A. and Bates, D.J. Electronic Principles, McGraw Hill, 7th edition, (2007).
4. Mehta, V.K., Principles of Electronics, S.Chand and Company, 6th revised edition (2001).
5. Salivahanan, S. Suresh Kumar, N. & Vallavaraj, A. Electronic Devices And Circuits, Tata McGrow-Hill Publishing Company Limited, New Delhi, Tenth Reprint, (2003).

6. Gaykwad, R.A. Op-Amps and Linear Integrated Circuits, Pearson Education Pvt. Ltd., New Delhi, Seventh Indian Edition Reprint (2004).

**(iii) Web Sources:**

1. https://nptel.ac.in/courses/108/105/108105066/
2. https://nptel.ac.in/courses/117/103/117103063/
3. https://www.youtube.com/watch?v=6cq1DT-MQAE
4. https://www.youtube.com/watch?v=aZkxGz_gi4Q
5. https://www.vlab.co.in/broad-area-electronics-and-communications
6. https://newhorizonindia.edu/nhengineering/physics-lab-experiment/

---

**Title of the Course: Quantum Mechanics** **Semester: III**

**Course Code: LPPHCT31** **Contact Hours: 5hrs/w** **Credit: 5**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- understand the wave nature of matter
- solve the eigen value problems
- describe perturbation theories and their applications
- understand the applications of approximation methods, scattering methods
- have thorough understanding of relativistic wave equations and their solutions

**Per-Required Knowledge:**

- ✓ Special theory of relativity, Heisenberg uncertainty principle
- ✓ De Broglie wavelength, wave function
- ✓ Schrodinger weave equations

**Unit I: Quantum mechanics Basics**

Wave nature of Particles – Uncertainity Principle – The principle of Superposition – Wave Packet – Time dependent Schrodinger equation – Interpretation of wave function – Time independent Schrodinger equation.

Linear vector space – Linear Operator – Eigen functions and Eigen values – Hermitian operator – Postulates of Quantum mechanics – Dirac's notation – Equation of Motion – Momentum representation.

**Unit II: Eigen value problems and Angular momentum**

Square well potential with rigid walls – Square potential barrier – Alpha emission – Bloch waves in periodic potential – Kronig Penny Square well Periodic potential – Particle moving in a spherically symmetric potential - Hydrogen atom – The free particle (1D and 3D)

Angular Momentum Operators – Angular momentum Commutation relations – Eigen values and Eigen functions of $L^2$ and $L_z$ – Eigen values of $J^2$ and $J_z$ – Addition of Angular Momenta.

**Unit III: Perturbation theory**

Time Independent Perturbation theory – Non degenerate energy levels - Anharmonic Oscillator: First order correction – The ground state of Helium – Effect of Electric field on the ground state of hydrogen – Degenerate energy levels.

Time dependent Perturbation theory – First order perturbation – Harmonic Perturbation – Transition to continuum states – Selection Rules.

**Unit IV: Approximation methods and Scattering**

The Variational Principle - Variation method for excited states – The ground state of Helium –The WKB method – The connection formulas – validity of WKB method – Barrier Penetration – Alpha emission.

Scattering Cross section – Scattering amplitude – Partial waves – Scattering by a central potential: Partial wave analysis – The Born approximation – Validity of Born approximation.

**Unit V: Relativistic Wave Equations**

Klein – Gordon equation – Interpretation of Klein Gordon equation – Particle in a Coulomb field – Dirac's equation for a free particle – Dirac Matrices – Negative energy states – Spin of the Dirac particle.

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Time dependent and Time independent schrodinger wave equations, operators
- ✓ Particle in square well and symmetric potential.
- ✓ Ground states of Hydrogen and Helium
- ✓ Various approximation methods
- ✓ Dirac's equation for a free particle, matrices and spins

**Suggested Readings:**

**(i) Text Book:**

Aruldhas, G. Quantum Mechanics, Prentice Hall of India Private Limited, New Delhi, 2nd edition, (2008).

**(ii) Reference Books:**

1. Schiff, L. I. Quantum Mechanics, Tata McGraw – Hill Education Pvt. Ltd, New Delhi, 4th edition, 2014.
2. Mathews, P.M and Venkatesan, K. A text book of Quantum Mechanics, Tata McGraw Hill Publishing Company Limited, New Delhi, 24th reprint, (1978)
3. Thankappan,V.K. Quantum Mechanics, New age International (P) Limited, New Delhi 3rd edition, 2012.
4. Aruldas, G. Quantum Mechanics: 500 problems with solutions, Prentice Hall of India, New Delhi, 2010.

**(iii) Web Sources:**

1. https://www.youtube.com/watch?v=xnt2xSNRNn0
2. https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2016/video-lectures/
3. https://ocw.mit.edu/courses/physics/8-06-quantum-physics-iii-spring-2018/index.htm

---

**Title of the Course: Solid State Physics** **Semester: III**

**Course Code: LPPHCT32** **Contact Hours: 5hrs/w** **Credit: 5**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- ➢ have clear understanding on the theoretical aspects of crystal structures and their examples

- understand wave nature of matter and theory of x-ray diffraction
- have higher order skills on understanding thermal properties of solids
- decipher the theoretical knowledge on superconductivity of solids
- acquire the theory the origin of magnetic properties of materials

**Pre-Required Knowledge:**

- ✓ Thermal properties of solids, basics of X-ray diffraction, atomic structures
- ✓ De Broglie wavelength, Bragg's law of X-ray diffraction.
- ✓ Kinetic theory of molecules, specific heat capacities

**Unit I: Crystal Physics**

Lattice points and space lattice – The basis and crystal structure – Unit cells and lattice parameters – Unit cell versus primitive cell – Crystal systems – The bravais space lattices – two dimension & Three dimension – Metallic crystal structures - sc, bcc, fcc, hcp – with examples.

**Unit II: Wave Nature of Matter & X-Ray Diffraction**

The de Broglie Hypothesis – Relativistic Correction – Davisson-Germer Experiment – Heisenberg's Uncertainty Principle – X-Ray Diffraction – Bragg's Law – Bragg's X-Ray Spectrometer – Powder crystal method – Rotating crystal method – correction for Bragg's equation.

**Unit III: Thermal Properties of Solids**

Lattice Specific Heat – Classical theory – Einstein's Theory of Specific Heat – Debye's Theory – the vibrational modes of a continuous medium – density of vibrational modes – Debye's approximation – Highlights – Thermal behavior, Heat Capacity, Specific heat, Electronic Specific heat, Lattice vibrations, Internal energy.

**Unit IV: Superconductivity**

Mechanism of superconductors – Effects of magnetic field – A.C Resistivity – Critical currents – Meissner effect – Thermal properties – Entropy – Specific heat – Thermal

conductivity – Energy gap – Isotopic effect – Mechanical effects – Penetration depth – Type I and Type II superconductors – BCS theory – Quantum tunnelling – DC, AC Josephson effect.

**Unit V: Diamagnetism & Paramagnetism**

Magnetism – Diamagnetism – theory of diamagnetism – Paramagnetism –Langevin's classical theory of paramagnetism- Weiss theory of para magnetism- Quantum theory of paramagnetism - Cooling by Adiabatic demagnetization - Susceptibility of Para and Diamagnetic materials – Gouy method –Quincke's method.

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Concepts of crystal systems, bravais lattices, point group and space groups
- ✓ X-ray diffraction, X-ray spectrometer
- ✓ Lattice Specific Heat capacity, various modes of vibration of molecules in solids.
- ✓ Classifications and theory of type I and type II super conductors.
- ✓ Theory of para & dia magnetism, susceptibility.

**Suggested Readings:**

**(i) Text Book:**

Pillai, S.O., Solid State Physics, New Age International, New Delhi, (1994).

**(ii) Reference Books:**

1. Kittel, C. Introduction to Solid State Physics, Wiley Eastern Ltd., New Delhi, 7th Edition, (2011).
2. Gupta, S.L and Kumar, V.L., Solid State Physics, K.Nath & Co., Educational publishers, Meerut, (2004).
3. Saxena, B.S., Gupta, R.C. and Saxena, P.N. Fundamentals of Solid State Physics, Pragati Prakashan, Meerut, (1996).

**(iii) Web Sources:**

1. https://www.youtube.com/watch?v=wEu4w4jxq3o
2. https://www.youtube.com/watch?v=QeNNyKFiMJ8

3. https://www.youtube.com/watch?v=emRp_BEN_c4
4. https://nptel.ac.in/courses/115/105/115105099/

---

**Title of the Course: Molecular Spectroscopy** **Semester: III**

**Course Code: LPPHCT33** **Contact Hours: 5hrs/w** **Credit: 5**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- learn the techniques of microwave spectroscopy for characterization of molecules
- acquire knowledge on the techniques infra real spectroscopy and its applications
- decipher molecular structures using raman spectroscopy
- principles and instrumentation of electronic spectroscopy and delineating the structure of molecules
- know fundamental understanding of the nuclear magnetic resonance technique and its applications.

**Pre-Required Knowledge:**

- ✓ Chemistry of molecules
- ✓ Vibration, rotational, translational energies of molecules
- ✓ Electronic and molecular transitions

**Unit I: Microwave Spectroscopy**

Rotation of molecules – Rotational spectra – Diatomic molecules – Rigid Diatomic molecules – Intensities of spectral lines - non-rigid rotator- intensities of rotational spectral line – linear poly atomic molecules and symmetric top molecules- Techniques and Instrumentation – Chemical analysis by microwave spectroscopy.

**Unit II: Infra red Spectroscopy**

Energy of a diatomic molecule – simple harmonic oscillator – Anharmonic oscillator – diatomic vibrating rotator – vibrations of polyatomic molecules – fundamental vibrations and their symmetry – influence of rotations on the spectra of polyatomic molecules – linear molecules – symmetric top

molecules – skeletal vibrations-group frequencies-techniques and instrumentation – double and single beam operation.

**Unit III: Raman Spectroscopy**

Raman effect quantum theory and classical theories – Pure rotational Raman spectra: Linear molecules - symmetric top molecules – Vibrational Raman Spectra: Raman activity of vibrations – Rule of mutual exclusion – Polarization of Light and the Raman effect: Nature of polarized light – vibrations of spherical top molecules Determination of structure of molecules – Techniques and instrumentation - Advantages of Raman Spectroscopy over IR spectroscopy.

**Unit IV: Electronic spectroscopy of molecules**

Electronic Spectra of diatomic molecules: Born-Oppenheimer Approximation – Vibrational Coarse Structures – Intensity of Vibrational-Elecronic spectra - Frank-Condon principle –rotational fine structure- Fortat diagram – Electronic structure of diatomic molecules – molecular orbital theory – Electronic angular momentum in diatomic molecules-classification of states – Electronic spectra of polyatomic molecules – Chemical analysis by Electronic spectroscopy – Techniques and instrumentation.

**Unit V: Nuclear Magnetic Resonance spectroscopy**

The nature of spinning particles – Interaction between spin and a magnetic field –population of energy levels – Larmor precession and relaxation time – Fourier Transformspectroscopy in NMR – Multiple pulse FT: Spin-spin relaxation – Spin-Lattice relaxation

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Characterization of molecular nature using microwave spectroscopy
- ✓ Influence of rotations on the spectra of polyatomic molecules
- ✓ Raman effect quantum theory and classical theories
- ✓ Electronic spectra of polyatomic molecules
- ✓ Multiple pulse FT: Spin-spin relaxation

**Suggested Readings:**

**(i) Text Book:**

Banwell, C.N. and McCash, E.M. Fundamentals of Molecular Spectroscopy, Tata McGraw-Hill. publishing company Limited, New Delhi, 5th Edition, (2013).

**(ii) Reference Books:**


1. Aruldhas, G. Molecular Structure and Spectroscopy, Prentice Hall of India, New Delhi, 2nd Edition, (2007).
2. Chatwal, G.R., Anand, S.K., Arora, M. and Anand, S. Spectroscopy (Atomic and molecular), Himalaya Publishing House, Mumbai, (2009).
3. Straughan, B.P and Walker, S. Spectroscopy (Vol I, II & III), Chapman & Hall, (1976).


**(iii) Web Sources:**

1. https://ocw.mit.edu/courses/chemistry/5-80-small-molecule-spectroscopy-and-dynamics-fall-2008/video-lectures/
2. https://ocw.mit.edu/courses/chemistry/5-80-small-molecule-spectroscopy-and-dynamics-fall-2008/lecture-notes/
3. https://ocw.mit.edu/courses/chemistry/5-61-physical-chemistry-fall-2017/lecture-videos/spectroscopy-probing-molecules-with-light/

---

**Title of the Course: UGC- CSIR NET/SET Preparation General Paper** **Semester: III**

**Course Code: LPPHAE31** **Contact Hours: 2hrs/w** **Credit: 2**

---

**Course Learning Outcomes :**

**On completion of the course, the students are able to**

- equip themselves with the higher order mathematical concepts in physics
- learn the various dynamics in classical mechanics
- understand the concepts of electromagnetic theory

- have knowledge on basics of quantum mechanics and its applications
- develop problem solving skills in all core subjects.

**Pre-Required knowledge:**

- ✓ Basic mathematics, vectors, eigen values, differential calculus
- ✓ Newton's laws of motion, idea on various physical quantities
- ✓ Heat, temperature, fundamental laws in thermodynamics

**Unit I : Mathematical Methods of Physics**

Dimensional analysis - Vector algebra and vector calculus - Linear algebra, matrices, Cayley-Hamilton Theorem. Eigenvalues and eigenvectors - Linear ordinary differential equations of first order & second order - Special functions.

**Unit II : Classical Mechanics**

Newton's laws. Dynamical systems, Phase space dynamics, stability analysis Central force motions. Two body collisions -Scattering in laboratory and Centre of mass frames, Non- inertial frames.

**Unit III : Electromagnetic Theory**

Electrostatics : Gauss's law and it's applications, Laplace and Poisson equation, boundary value problems. Magnetostatics : Biot - savart law, Ampere's theorem. Electromagnetic induction. Scalar and vector potentials gauge invariance.

**Unit IV : Quantum Mechanics**

Wave-Particle duality.Schrodinger equation. Eigenvalue problems .Tunneling through a barrier .Wave - function in coordinate and momentum representations .Commutators and Heisenberg uncertainty principle.

**Unit V : Thermodynamics and Statistical Physics**

Laws of thermodynamics and their consequences. Thermodynamics potentials , Maxwell relations - chemical

potential-phase equilibria - Phase space, micro-and macro states. Microcanonical and grand canonical ensembles.

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Eigen vectors and eigen values, differential equations of various orders
- ✓ Theory of scattering, inertial and non-inertial frames
- ✓ Gauss's law and its applications, Biot-savart law and ampere's theorem
- ✓ Time dependent and time independent Schrodinger wave equations, Heisenberg Uncertainity principle
- ✓ Various laws of thermodynamics, Microcanonical and grand canonical ensembles

**Suggested Readings:**

**(i) Text Book:**

W. Melemnganba Chenglei, UGC- CSIRNET/SET – PHYSICAL SCIENCE ,Arihant Publications (India) Limited.(2017)

**(ii) Reference books:**

1. Dr. Surekha tomar ,UGC-CSIR NET/SET – PHYSICAL SCIENCE ,Upkar Prakashan Publications,(2018)
2. R. Nageshwara Rao, UGC- CSIR NET/SET – PHYSICAL SCIENCE ,.Khanna Publications.(2019)
3. Ram mohan pandey, UGC- CSIR NET/SET – PHYSICAL SCIENCE ,.pathfinder academy, (2020)

**(iii) Web Sources:**

1. https://www.csirnetphysics.in/p/hand-written-notes_28.html
2. https://www.mentorphysics.com/net-jrf-physics-notes/
3. https://physicaeducator.com/classnotes/

---

| Title of the Course: Molecular Biophysics | | Semester: III |
|---|---|---|
| Course Code: LPPHAE32 | Contact Hours: 2hrs/w | Credit: 2 |

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- understand basic building blocks of biomolecules in terms of three dimensional structures.
- study techniques and decipher structure of biomolecules with the help of spectroscopic techniques.
- have detailed understanding of applications of lasers and holographic techniques in biomedical imaging.
- know about laser applications in various fields
- understand the biophysical aspects of radiation therapy and imaging

**Pre-required knowledge:**

- ✓ Amino acids, proteins, amorphous and crystalline forms of solids
- ✓ Basic idea on cell structures and nucleic acids
- ✓ Basic knowledge on electromagnetic spectrum

**Unit I: Proteins**

Proteins : Amino acids – Structural Organization of Proteins – Globular and Fibrous Proteins – Dynamics of Protein-folding – Protein Engineering.

**Unit II: Nucleic Acids**

Nucleic Acids: Nucleic Acids – Principle of Base-pairing/Base stacking – Nucleic acid Families – Protein Ligand Interactions.

**Unit III: Separation and Spectroscopic Techniques**

Rayleigh Scattering – Diffusion – Sedimentation – Osmosis – Viscosity – Chromatography and Electrophoresis – Optical Activity – Absorption spectroscopy – UV, IR, Raman, ESR and Mossbauer Spectroscopy.

**Unit IV: Nuclear Magnetic resonance, Lasers and Holography**

One-dimensional – Multidimensional NMR Spectroscopy – Applications – Biomedical NMR. Lasers – Holography.

**Unit V: Radiation Biophysics**

Ionizing Radiation – Interaction of Radiation with Matter – Measurement of Radiation (Dosimetry) Radioactive Isotopes – Biological Effects of Radiation – Radiation Protection and Therapy.

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Structures of amino acid proteins and protein engineering
- ✓ Nucleic acid structures, Structure of RNA and DNA and protein ligand interactions
- ✓ Molecular separation techniques, absorption and Raman spectroscopy
- ✓ Theory of Nuclear magnetic resonance spectroscopy and its applications.
- ✓ Radiation physics

**Suggested Readings:**

**(i) Text Book:**

Narayanan, P., Essentials of Biophysics, New Age International Publishers, New Delhi, (1998).

**(ii) Reference Book:**

Pattabhi, V. and Gautham, N. Biophysics, Kluwer Academic Publishers, Narosal Publishing house, New Delhi, (2002).

**(iii) Web Sources:**

1. https://www.ucl.ac.uk/~ucapikr/biophysics.htm
2. https://www.youtube.com/watch?v=jFZHIPhmNTs
3. https://onlinecourses.nptel.ac.in/noc19_cy34/preview

---

**Title of the Course: Semiconductor Physics** **Semester: III**

**Course Code: LPPHSC31** **Contact Hours: -** **Credit: 2**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- ➢ understand the structural properties of semiconductors.
- ➢ learn electronics transition energy levels in semiconductors.

- acquire knowledge on the transport properties of electrons through the semiconductor materials.
- understand knowledge on junction formation in p-n junction diodes
- learn the principles of working of fet, types and their applications.

**Pre-Required Knowledge:**

- ✓ Crystalline and amorphous materials, concepts of lattices
- ✓ Atomic constituents and theories
- ✓ Idea on diffusion of particles through the medium and semiconductor materials.

**Unit I: Structural Properties of Semiconductors**

Introduction – crystal structure – Basic lattice types – Basic crystal structure – Notation - To Denote planes and points in a lattice : Miller Indices – artificial structure : Super lattices and Quantum wells – surfaces : ideal versus real.

**Unit II: Electronic levels in semiconductors**

Particles in an attractive potential bound states – electronic levels in a hydrogen atom – Electronics in a quantum well – Electrons in crystalline solids – Particle in a periodic potential : Blich theorem – Distribution function.

**Unit III : Charge transport in materials**

Charge Transport an overview – Transport and scattering – Quantum mechanics and Scattering of electrons velocity – Electric field relations in semiconductors – Drift and diffusion transport : Einstein's relation - Non-equilibrium distribution.

**Unit IV: Junctions in Semiconductors: *P-N*Diodes**.

P-N junctions in equilibrium – P-N diode under bias –Drift and diffusion currents in the biased diode – minority and majority currents in the P-N diode – Narrow diode current – Generation – Recombination currents.

**Unit V: Field Effect Transistors**

JFET and MESFET: charge control – The ohmic regime – a nearly Universal model for FET behavior: the saturation

regime - HFET's introduction – Modulation efficiency – polar materials – polar HFET structures.

**Suggested Topics for Group Discussion/Presentation:**

- Bravais lattices, Miller indices
- Various electronic energy levels and energy of electrons in various potential wells.
- Drift velocity of electrons and its quantum mechanics understanding
- P-N diode junction formation, recombination currents
- Principles of JFET, MESFET and HFET's

**Suggested Readings:**

**(i) Text Book:**

Semiconductor device physics and design – by Umesh K. Mishra and Jasprit Singh , University of California, Santa Barbara, CA, USA, Springer,(2018).

**(ii) Reference Book:**

Neamen, D.A. Semiconductor Physics and Devices-Basic Principles, 4th Edition, McGraw Hill, (2021)

**(iii) Web Sources:**

1. https://lecturenotes.in/subject/49/semiconductor-devices
2. https://www.iare.ac.in/sites/default/files/lecture_notes/semiconductors%20lecture%20notes%20(1)_0.pdf
3. https://www.youtube.com/watch?v=DK4tfiHPdvg
4. https://nptel.ac.in/courses/117/106/117106091/

---

**Title of the Course: Physics in some living systems Semester: III**

**Course Code: LPPHSC32 Contact Hours: - Credit: 2**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- understand the forces, equilibrium and stability of structures in human anatomy
- learn the physics behind various motions carried out in human body

- understand the physics of fluid dynamics and techniques in the measurement of blood pressure.
- acquire basic knowledge of heat and sound production in human body.
- learn physics of vision in humans.

**Pre-required Knowledge:**

- ✓ Human anatomy, basic physics
- ✓ Laws of motions, gravity and properties of fluids
- ✓ Properties of light and lenses

**Unit I: Forces and human body**

Equilibrium and Stability-Equilibrium Considerations for the Human Body-Stability of the Human Body under the Action of an External Force-Skeletal Muscles-Levers-The Elbow-The Hip-The Back-Standing Tip-Toe on One Foot-Dynamic Aspects of Posture –Standing at an Incline-Friction at the Hip Joint-Spine Fin of a Catfish

**Unit II: Motions in human body**

Vertical Jump-Effect of Gravity on the Vertical Jump – Running High Jump –Range of a Projectile – Standing Broad Jump – Long Jump – Motion through Air – Energy Consumed in Physical Activity.

Forces on a Curved Path – A Runner on a Curved Track – Pendulum – Walking – Physical Pendulum - Speed of Walking and Running - Energy Expended in Running-Alternate Perspectives on Walking and Running-Carrying Loads.

**Unit III: Motion of Fluids and human body**

Force and Pressure in a Fluid - Pascal's Principle - Hydrostatic Skeleton - Archimedes' Principle –Power Required to Remain A float – Buoyancy of Fish - Surface Tension – Soil – Insect Loco motion on Water-Contraction of Muscles–Surfactants.

Viscosity and Poiseuille's Law - Turbulent Flow-Circulation of the Blood- Blood Pressure-Control of Blood Flow- Energetics of Blood Flow- Turbulence in the Blood -

Arteriosclerosis and Blood Flow – Power Produced by the Heart – Measurement of Blood Pressure.

**Unit IV: Sound / Heat and human body**

Energy Requirements of People - Energy from Food - Regulation of Body Temperature - Control of Skin Temperature – Convection – Radiation – Radiative Heating by the Sun – Evaporation – Resistance to Cold – Heat and Soil**.**

Properties of Sound - Hearing and the Ear - Bats and Echoes - Sounds Produced by Animals – Acoustic Traps – Clinical Uses of Sound-Ultrasonic Waves

**Unit V: Optics / Electricity and human body**

Vision-NatureofLight-StructureoftheEye-Accommodation- Eye andthe Camera LensSystemof the Eye - Reduced Eye - Retina - Resolving Power of the Eye - Threshold of Vision - Vision and the Nervous System - Defects in Vision - Lens for Myopia - Lens for Presbyopia and Hyperopia –Extensionof Vision – The Nervous System – Electricity in the Bone – Electric Fish

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Dynamic Aspects of Posture
- ✓ Effect of Gravity on the Vertical Jump
- ✓ Pascal's Principle
- ✓ Control of Skin Temperature
- ✓ Resolving power of the eye, vision system and electricity produced in bones

**Suggested Readings:**

**(i) Text book:**

Herman, I.P. Physics of human body, 2nd edition, Springer, Heidelberg, Germany (2016).

**(ii) Reference book:**

Paul Davidovits, Physics in Biology and Medicine, 3rd Edition, Academic press (2008).

**(iii) Web Sources:**

1. https://www.youtube.com/watch?v=gPQAl1Csg1g
2. https://nptel.ac.in/courses/112/106/112106248/
3. https://www.ks.uiuc.edu/Services/Lectures/PhysicsOfTheBody/

---

**DEPARTMENT OF ENGLISH - PG-CBCS -LOCF**

**(For those who join in June 2022)**

**Title of the Course: English For Career Development (NME)** **Semester: III**

**Course code: LPENNM31** **Contact hours: 5hrs/w** **Credits: 4**

**Course Learning Outcomes:**

On completion of the course, the students are able to

- have the comprehensive understanding of the language ability required in the competitive examination
- effectively use the vocabulary for the fluent and accurate communication
- exercise their grammatical competence in their communications
- confidently meet the job interview requirements
- practise the proficient language skills in all Professional and social interactions

**Pre-required knowledge:**

- Use of Basic Grammar for Job
- Communicative English for Career
- Writing Skills for Job Purposes

**Unit I**

Situational Grammar, Tenses, Voices, Prepositions, Articles

**Unit II**

Sentence Completion

One word Substitution

Homonyms

Phrasal Verbs

**Unit III**

Reading Comprehension

Analogy

Jumbled Sentence

Errors and How to avoid them

**Unit IV**

Job Application and Preparing a CV

Expansion of Idea

Report Writing

Essay Writing

**Unit V**

Interview

Group Discussion

Tips for taking Exam

**Suggested Topics for presentation:**

- Application process for various jobs
- Providing strategies for identifying the jobs
- Preparing resume for professional jobs
- Writing a clear and concise formal letter
- Developing interview skills

**Suggested Readings:**

**i)Text Book:**

Bhatnagar, R. P. *English for Competitive Examinations,* Madras: Laxmi Publication, 2009.

**ii)Reference Books:**

1. Sharma,Manish.ITI*Employability Skills*.Neelkand publishers,2016.
2. Dixit,Shilpi.*EmployabilitySkills.*BFC Publications,2021.
3. Dhanavel,S.P.*English and Soft Skills.* Orient Blackswan,2011.

**iii)Web Source:**

1. https://www.coursera.org/learn/careerdevelopment
2. https://www.my.mooc.com/en/mooc/english-for-careerdevelopment
3. https://www.naukri.com/learning/english-for-careerdevelopmentcourse-couri202

---

**DEPARTMENT OF HISTORY – PG - CBCS – LOCF**

(For those who join in June 2022)

Course Title : Indian History for Competitive Exams (NME) Semester: III

Course code: LPHSNM31 Contact Hours: 5 Credits: 4

**Course Learning Outcomes:**

**On completion of this course, the students are able to**

- understand the Indus Valley Civilisation.
- explain the administration of Mughals.
- analyse the causes and result of 1857 Mutiny.
- describe the salient features of Constitution of India.
- asses the current events in India and abroad.

**Pre- required knowledge:**

- Topics of competitive exams.
- Need of General Knowledge.
- Importance of Competitive exams.

**Unit I : Ancient Indian History**

Sources, - Indus Valley Civilization- Vedic Period - Mauryan Dynasty Buddhism and Jainism- Guptas.

**Unite II: Medieval Indian History**

Advent of Islam- Establishment of Delhi Sultanate – Mughals and Marathas- Advent of Europeans-Expansion and consolidation of British Rule- Social Reforms-Religious Movements.

**Unite III: Indian National Movement**

1857 Revolt - Indian National Congress -– Gandhian Era – Role of Tamil Nadu in Freedom Struggle.

**Unit IV: Indian Polity**

Constitution of India-Preamble- Salient Features - Fundamental Rights and Duties - Panjayat Raj - Center and State Relation- Emergency Provisions- Election Commission- Amendments.

**Unit V: Current Events**

Profile of States - Defense - National Security and Terrorism, NGO - Eminent Persons and Places- Sports - Books and Authors-Cultural Panorama – Historical Events in India – Covid 19 .

**Suggested topics for group discussion and presentation:**

- Mauriyan Administration.
- Establishment of Delhi Sultanate.
- Indian National Movement.
- Emergency Provisions.
- Covid 19

**Suggested Readings:**

**Text Books:**


1. Ishwari Prasad, History of Medieval India, The Indian Press Ltd., Calcutta, 2006.
2. BipinCandra, History of Modern India, Orient Blackswan Publication, Hydrabad, 2009.


**Reference Books:**


1. NilakandaSastri, K. A. History of South India, Oxford Publication, Calcutta, 1982.
2. Basham, A.L. Wonder that was India, Rupa and Co Publisher, Delhi, 1967.
3. Bipan Chandra, Modern India, NCERT, New Delhi, 2005.
4. India and the contemporary World- I and II, NCERT, New Delhi.2000
5. Indian History, Part I,II, and III, NCERT, New Delhi,2007.

**Web Sources:**

- www.clearIAS.com
- www.jagranJosh.com
- www.UPSC.gov.in

---

**DEPARTMENT OF ECONOMICS – PG – LOCF**

**(For Those Who Join in June, 2022)**

| | | |
|---|---|---|
| Title of the Course: Economics for Competitive Examinations (NME) | | Semester: III |
| Course Code: LPECNM31 | Contact Hours: 5hrs/w | Credits: 4 |

**Course Learning Outcomes**

On completion of the course, the students are able to

- Grasp the measures of Economic development and role of NITI Aayog
- Acquire the Skill of analysing the Government policies on poverty and population growth.
- Evaluate India's trade policy and gain knowledge on IMF, IBRD and ADB.
- Analyse the working of Indian Money Market.
- Understand the issues in the Indian Federal system and competently appear for Competitive examinations.

Pre- required Knowledge

- Economic growth, Economic development and Economic Planning.
- Absolute Poverty Vs Relative Poverty.
- Internal trade Vs International trade.
- Indian Financial Market:Meaning and Structure.
- Direct tax, Indirect tax and Non-tax Revenue.

**Unit I: Economic Development and Planning**

National Income – Various Committees on National Income estimation – Measures of Economic Development(PQLI, HDI, HPI and GDI) – National Income as a measure of welfare – Green Revolution and agriculture

development- History of Economic Planning in India – Planning Commission Vs NITI Aayog – India's role in BRICS.

**Unit II: Population and Poverty**

Population growth in India – Demographic features of India - India's Population Policy – Report of Lakdawala, Tendulkar and Rangarajan Committees on Poverty (Salient Points only) – Poverty Eradication Programme (IRDP, PMGAY, MGNREGA).

**Unit III: International Trade Policy and Institutions**

India's Trade Policy – Special Economic Zones – Foreign Investment Policy – Foreign Exchange Rate Policy – FEMA – Globalisation and WTO – International Financial Institutions: IMF, IBRD and ADB.

**Unit IV: Indian Money Market**

Money Market: Features and instruments – Banking Sector Reforms – Primary Market Reforms – Inflation and controlling measures in India

**Unit V: Federal Financial System in India**

Federal Structure – Consolidated and Contingency Funds of India – Public Account – Centre – State Financial Relation – Finance Commission – GST and GST Council - Fiscal Sector reforms in India – State Finances – Fiscal Responsibility and Budget Management (FRBM) Act - Local Finances.

**Suggested topics for group discussion/ Presentation**

- NITI Aayog differs from Planning Commission in terms of composition and powers.
- Poverty estimation suffers from various methodological issues.
- International Monetary Fund (IMF) provides international liquidity.
- Indian Banking Sector reform measures are based on Basel- III norms.
- State governments are suspicious of the motives of the government of India in raising and sharing of tax revenues with them.

**Suggested Readings**

**Text Books**

Ramesh Singh( 2019), Indian Economy for Civil services, Universities and other Examinations, McGraw Hill Education, New Delhi.

Misra and Puri, (2019), Sectoral Problems Of Indian, Economy, Himalayas Publishing House.

Rudder Datt and Sundaram, (2018), Indian Economy, S. Chand, New Delhi.

**Reference Books**

1. Francis Cherunilam, (2019) International Trade and Export Management, Himalaya Publishing House.
2. Uma kapila (Ed.) (2018), Indian Economy since independence, Academic Foundation, New Delhi, 29 th edition.
3. Gupta. K. R and Manoranjansharma (2018) , Indian Economic Policies and Data McGraw Hill Publications.
4. Abhijit, V. Banerjee et al. (2017), poverty and income distribution I India, juggernaut, New Delhi.
5. Prakash B.A ( 2009) , The Indian Economy since 1991, Edited Book, Pearson Education New Delhi.
6. Iswar C. Dhinkara, (2009) , The Indian Economy: Environment and Policy, Sultan Chand and Co.
7. Manmohan Agarwal and Amit shovon Toy, (2007) ,Globalisation and the Millinnium Development Goals, Orient Black Swan, Hyderabad.
8. Brahmananda, P. R, and V. R. Panchmuki (Eds) (2001), Development Experience in the Indian Economy: Inter-state Respective, Bookwell, Delhi.
9. Ahuluwalia, I. J and I. M. D. Little ( Eds) , (1999), India's Economic Reforms and Development, oxford Universities Press, New Delhi.
10. Agarwal, A.N, (1981), Indian Economy, Vishwa prakashan, New Delhi.

**Web Sources**

https://www.vedantu.com/commerce/national-income

https://en.m.wikipedia.org/wiki/Demographics_of_India

https://en.m.wikipedia.org/wiki/Federation

---

**DEPARTMENT OF COMMERCE - PG - CBCS - LOCF**

(For those who join in June 2022)

**Title of the Paper: Entrepreneurship Development (NME) Semester: III**

**Course Code: LPCONM31 Contact Hours: 5hrs/w Credit: 4**

**Course Learning Outcome:**

On completion of the course, the students are able to

- know the factors affecting entrepreneurial growth.
- identify the problems faced by women entrepreneurs.
- identify the various institutional support to the entrepreneur.
- advocate for subsidy and incentives to be received from the Government.
- prepare the project reports.

**Pre-required knowledge:**

- ✓ Entrepreneurial venture
- ✓ Scope for women entrepreneurship
- ✓ Financial assistance from government

**Unit- I: Introduction to Entrepreneurs**

Entrepreneur - Definition - Concept - Characteristics - Qualities - Classification of entrepreneurs - Entrepreneur Vs Manager - Role of Entrepreneurs in the economic development -- Factors affecting entrepreneurial growth. **Entrepreneurship**- Concept - Distinction between Entrepreneur and Entrepreneurship

**Unit- II: Women Entrepreneurs**

Introduction - Definition - Problems - Suggestions to overcome - Government steps towards Women Entrepreneurs - Institutions support to women Entrepreneurs in India.

**Entrepreneurship Development Programmes (EDP)**:

Meaning - Objectives - Stages in EDP- Pre-training Stage - Training phase - Post Training - Evaluation and Feedback of EDP.

**Unit- III : Assistance to Entrepreneurs:**

Financial and Non-Financial Institutions - TIIC and SFC - DIC - SIDBI - SIDCO - Commercial Banks.

**Unit- VI : Incentives and Subsidies:**

Incentives and subsidies of State and Central Govt - Objectives -Aims - Tax Concession - Assistance to MSME's - Backward areas - Industrial Estates

**Unit-V : Project Report:**

Meaning - Steps - Contents - Reasons for failure of a Project Report – Format – Guidelines.

**Suggested Topics/Practical Exercises:**

The learners are required to

- ✓ list the various factors affecting entrepreneurial growth.
- ✓ explain the steps to overcome the problem face by women entrepreneur.
- ✓ name any two financial institutions supporting entrepreneurs to grow in Tamilnadu.
- ✓ cite examples for the growth of business using Seed Capital Assistance / Scheme.
- ✓ draw a project report for a new business concern.

**Suggested Readings:**

**(i) Text Books**

1. Gupta.C.B. (2018). Entrepreneurship Development. New Delhi: Sultan Chand and Sons.
2. Gordon. E. and Dr. Natarajan. K. (2020). Entrepreneurship Development. Mumbai: Himalaya Publising House.

**(ii) Reference Books**


1. Gupta . C.B.& Srinivasan. N.P. (2018), Entrepreneurship Development. New Delhi: Sultan Chand and Sons.
2. Khanka S.S. (2018) Entrepreneurial Development. New Delhi: S.Chand & Company Ltd..
3. Kanishka Bedi. (2012). Management and Entrepreneurship, New Delhi: Oxford University Press.


**(iii) Web-Sources:**

**1. www.tiic.in**

**2. www.sidco.in**

3. www.dic.in

---

**DEPARTMENT OF MATHEMATICS – PG – CBCS - LOCF**

(For those who join in June 2022)

Title of the Course: Mathematics for Competitive Examinations (NME) Semester: III

Course Code: LPMSNM31 Contact Hours : 5hrs/w Credits: 4

**Course Learning Outcomes:**

On completion of the course, the students are able to

- formulate the problem quantitatively
- recall appropriate arithmetical methods to solve the problem
- demonstrate various principles involved in solving mathematical problems.
- evaluate various real life situations by resorting to analysis of key issues and factors
- develop various mathematical skills to solve the problems

**Pre-required Knowledge:**

- ✓ Addition and subtraction
- ✓ multiplication and division
- ✓ product tables

**Unit I:Quantitative Aptitude - I**

HCF and LCM of numbers-Decimal Fractions – Simplification - Average-Problems on numbers-Problems on ages.

**Unit II: Quantitative Aptitude – II**

Percentage-Profit and loss-Ratio and proportion-Partnership-Simple interest-Compound interest.

**Unit III: Quantitative Aptitude - III**

Time and work-Time and distance-Problems on trains-Alligator or mixture.

**Unit IV: Quantitative Aptitude and logic**

Calendar – Clocks – Stock and shares - Odd man out and series.

**Unit V: Reasoning**

Verbal and non-verbal reasoning- verbal Reasoning – Analogy - Mathematical operations – Inserting the character. Non-Verbal Reasoning – Analytical Reasoning

**Suggested Topics for Group Discussion/ Presentations:**

1. Simplification
2. Simple and compound interest
3. Problems on trains
4. Stock and shares
5. Non-verbal reasoning

**Suggested Readings:**

**(i) Text Books:**

1. R.S. Agarwal, Quantitative Aptitude for Competitive Examinations Revised and Enlarged edition, S.Chand Publications, New Delhi, Reprint 2007.
2. R.S. Agarwal, Verbal and Non-Verbal reasoningS.Chand Publications, New Delhi,Reprint 2009.

Unit I: Book1: Section 2,3,4,6,7& 8.

Unit II: Section 10,11,12,13,21 & 22.

Unit III: Section 15,17,18& 20.

Unit IV: Section 27,28,29 & 35.

Unit V: Book 2:Part I – Section I- 2,13 &16. Part II – Section – 4

**(ii) Reference books:**


1. R.Gupta, Quantitative Aptitude, Unique Publishers Pvt. Ltd, 2013.
2. Arora. P.N. and Arora. S., Quantitative Aptitude Mathematics, Volume-1
   S Chand & Company Ltd., New Delhi, 2009.
3. Kothari. C.R., Quantitative Techniques,Vikas Publishing House Pvt. Ltd., New Delhi, 1989.
4. Srinivasan. T.M., Perumalswamy. S. and Gopala Krishnan. M.D., Elements of Quantitative Techniques, Emerald Publishers, Chennai, 1985**.**


**(iii) Web Resources:**

1. https://mathematician0.weebly.com/
2. https://youtu.be/rHzggZDdtc4
3. https://youtu.be/ZADjT-wsQJw
4. https://youtu.be/ETiRE7N7pEI
5. https://www.youtube.com/watch?v=tnc9ojITRg4&list=PLpyc33gOcbVA4qXMoQ5vmhefTruk5t9lt

---

**DEPARTMENT OF CHEMISTRY – PG – CBCS-LOCF**

(For those who join in June 2022)

**Title of the paper: CHEMISTRY FOR ALL (NME)** **Semester: III**

Course Code:LPCHNM31 Contact Hours: 5hrs/w Credits: 4

**Course Learning Outcomes:**

On completion of the course, the students are able to

- ✓ know the basic chemistry involving types of elements and chemical reactions.
- ✓ study different concepts of acids and bases and various chemical processes
- ✓ gain awareness on Pollution and types of pollution

- ✓ know the details of plastics, glass, cement, types of fuels
- ✓ gain knowledge in vitamins, food adulterants and Classificationand biological functions of antibiotics

**Pre-Required Knowledge**

- ✓ Properties of Metals and non-metals
- ✓ Isotopes, Isobar and isotones
- ✓ Stability of Colloidal solution
- ✓ Thermosetting and thermoplastics
- ✓ Green house effect and global warning

**Unit I: BASIC CHEMISTRY- I**

Elements – atoms and molecules – Metals and non metal – metaolloid, alloy, ore and minerals - Chemical formulae and symbols – Important basic terms such as pressure, volume, atomic mass, molecular mass, temperature, atomic number – Types of chemical reactions (exothermic and endothermic, Physical and chemical changes, oxidation and reduction) – ideal and real gas - Important laws of Chemistry ( Boyle's law, Charle'slaw, Hess's law, Grahams law of diffusion, Beer's law, Henry's law, Faraday's law, Law of conservation of matter or energy).

**Unit II: BASIC CHEMISTRY- II: (Only elementary idea can be given)**

Different concepts of Acids and Bases (Arrhenius, Bronsted and Lewis) – pH concept (no calculation) – Water – Hard and soft water - Chemical nature of metals- Steel and iron (no manufacture) – heat treatment of steel – Solutions and their types (True, Colloidal and suspension) – uses of colloidal solution – Buffer solution – Nuclear Chemistry – isotopes and radioactivity Definitions of some important chemical processes (Haber's, Contact's, Ostwald's, Processes)

**Unit III: ENVIRONMENTAL CHEMISTRY**

Pollution and types of pollution – Composition of atmosphere – Major regions of atmosphere and their characteristics – Elementary idea of Green house effects and

Acid rain – Air pollution – Control of air pollution and their harmful effects – CFC, Global warming, substitute for CFC (Just name only)-Water pollution – Dissolved oxygen – BOD, COD and TDS (elementary idea only)

**Unit IV: CHEMISTRY IN SERVICE OF MAN –I: (Only elementary idea can be given)**

Plastics – Classification with examples – Polymer (natural and synthetic) – Soaps and Glass – Annealing of glass – Cement – Constituents and setting and hardening of cement – Rubber – Types with examples and vulcanization of rubber-Corrosion of metal – prevention – Lubricants (definition and classification) – Fuel – Classification with suitable examples - calorific value – LPG and Rocket fuel.

**Unit V: Chemistry in service of man –II: (Only elementary idea can be given)**

Food adulterants – common food adulterants and their harmful effects and tests to identify them– Classification and biological functions of Vitamins A, B6, B12, C, D, E and K (structural elucidation not required) – Classification and biological functions of antibiotics – penicillin, chloroamphenicol, streptomycin and tetracycline.

**Suggested Topics For Group Discussion/ Presentations**

- ✓ Metals and nonmetal
- ✓ Steel and iron
- ✓ Green house effects
- ✓ vulcanization of rubber
- ✓ organic and Inorganic pesticides

**Suggested Readings**

**Text Books:**


1. A Text book of Environmental Chemistry, O.D.Tyagi, M. Mehra, Anmol Publication, 1990.
2. Puri, Sharma and Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2004
3. Puri, Sharma and Pathania, Principles of Inorganic Chemistry, Vishal Publishing Co., 2004

**Reference Books:**


1. Applied Chemistry, K. BagawathiSundari, MJP Publishers, Chennai – 2006.
2. General Studies Manual, The TMH Publishers, 2008
3. Basic concepts of chemistry (HB) by Pegasus sold by Amazon Asia-Pacific Holdings Private Limited, 2018.


**Websites and e-Learning Sources:**

1. https://youtu.be/eJXL0IrbtqE
2. https://2012books.lardbucket.org/pdfs/beginning-chemistry.pdf
3. https://youtu.be/J0v3stz7izA
4. https://youtu.be/EyBkPwsRY2E
5. https://youtu.be/yU3GwJu_yNA
6. https://youtu.be/uMBeXHnWhsE
7. https://youtu.be/lUg7r7fu_eo
8. https://youtu.be/eJXL0IrbtqE

---

**DEPARTMENT OF BOTANY - PG - CBCS - LOCF**

**(For those who join in June 2022)**

**Title of the Course: Plants and Human Welfare (NME)** **Semester: III**

**Course Code: LPBYNM31** **Contact hours: 5hrs/w** **Credit:4**

**Course Learning Outcomes:**

On completion of the course, the students are able to

- acquire knowledge on Plants as food
- understand the cultivation of mushrooms.
- recognize the need of plant drugs.
- familiarize with the wood and its types.
- come to know about the Organic farming.

**Pre-required knowledge:**

- Plant groups
- Raw drugs
- Farming techniques

**Unit I: Plants as food**

Importance of plant genetic resources and utilization. Present status of resources in India. Agricultural, vegetable, horticultural and medicinal plants. Higher plants as food - Cereals- Rice, Pulses- Pigeon pea.

**Unit II: Cultivation of mushrooms – *Pleurotus***

General characters of mushroom – present status of the mushroom industry in India common edible and non-edible mushrooms. Nutritive and Energy value of edible mushrooms.

**Unit III: Biological Drugs**

Brief history and scope of raw drugs of plant origins. Definition, herbals, classification and description. Classification of vegetable drugs. Biological sources of drugs.

**Unit IV: Timbers**

Structure of wood, sap wood – heart wood transition, properties of wood (Physical, chemical & mechanical). Dendrochronology and its significance. Commercial uses of woods of South India - Teak (*Tectona grandis*), Neem (*Azadirachta indica*).

**Unit V: Organic farming**

Organic farming, vermin-composting. Leguminous plants in green manuring. Biofertilizer -*Rhizobium* and Blue green algae (*Nostoc*); Biopesticides: *Bacillus thuringiensis*.

**Suggested Topics for Seminar/Presentation/Group Discussion**:

- Plants as food
- Recent methods for mushroom cultivation
- Biological sources of drugs
- Dendrochronology and its significance
- Techniques of vermicomposting and Methods of organic farming

**Suggested Readings:**

**Text Books:**

1. Albert F. Hill. (1952). Economic Botany. Tata McGraw-Hill Publishing Company Ltd., New Delhi.

2. PradeepSachdeva. (2014). A Naturalists Guide to the Trees & Shrubs of India. *Prakash books* Publishers, Chennai. ISBN: 978817599408.
3. Board Eiri (2008) Hand Book of Tree Farming. *Engineers India Research Institute Publishers*. New Delhi.
4. Suman, B.C. & Sharma, V.P. (2007). Mushroom cultivation in India. *DayaPublishingHouse*, Delhi.

**Reference Books**

1. Dorian Q. Fuller, Eleni Asouti.(2008)Trees and Woodlands of South India. *Munshiram Manoharlal Publishers*. New Delhi. ISBN: 9788121512145.
2. Sanjay Tiwari, and Nikhil Devasar. (2019). 100 Indian Trees: The Big Little Nature Book. *DK India publishers*, New Delhi.
3. NeginhalS.G. (2020). Forest Trees of South India. *Notion Press publishers*, Chennai.
4. Diego Cunha Zied, Arturo Pardo-GimAcnez. (2017). Edible and Medicinal Mushrooms: Technology and Applications. *John Wiley & Sons*.
5. Kochhar, S.L. (1981). Economic Botany in the Tropics. *McMillan India Ltd*., Madras.
6. Mukharjee, S.K. (1969). Survey of Plants of India. Bull. *Botanical Survey India*, 11(3): 217-223.
7. Sambamurthy, A.V.S.S. and N.S. Subramaniyam. (1989). A Textbook of Economic Botany. *Wily Eastern Ltd*., New Delhi.
8. Albert E Hill and O P Sharma (1996). Economic Botany. *Tata McGraw Hill Co. Ltd*., New Delhi.
9. Anonymous. (1948-1976). The Wealth of India - A Dictionary of Indian Raw Materials and Industrial Products. Vol. I to X. *Publication and Information Directorate, CSIR*, New Delhi.

**Web Sources:**

1. https://byjus.com/biology/food-sources-animal-plant-products/

2. https://foodplantsinternational.com/
3. https://namyco.org/mushroom_cultivation_resources.php
4. https://www.fs.fed.us/wildflowers/ethnobotany/medicinal/index.shtml

---

**DEPARTMENT OF PHYSICS – PG – CBCS - LOCF**

**(For those who join in June 2022)**

**Title of the Course: Physics for Competitive Examinations (NME)** **Semester: III**

**Course Code: LPPHNM31** **Contact Hours: 5hrs/w** **Credit: 4**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- understand various systems of units and newton's laws of motion
- acquire the basic knowledge on gravitation
- understand the various aspects in electrostatics and electricity
- have knowledge on various properties of light
- understand the electronic devices, circuits and various number systems

**Pre-Required Knowledge:**

- ✓ Gravitational force, acceleration due to gravity mass and other physical quantities
- ✓ Heat, energy, temperature, basic mathematics, basic ideas on charge and current
- ✓ Elementary idea on planetary systems and space

**Unit I: Systems of Units and Newton's Laws**

System of units S.I.- Fundamental units- derived units – Dimension of physical quantity – uses of dimensional equations – limitation of dimensional analysis. Force and inertia, Newton's first law of motion – momentum – second law of motion – conservation of linear momentum – Newton's Third law of motion – friction – laws of limiting friction – static and dynamic friction.

**Unit II: Gravitation**

Gravitation-Kepler's law of planetary motion – universal law of gravitation – acceleration due to gravity – variation of 'g' at poles – equator – Altitude – depth – rotation of earth – difference between mass and weight – Inertial mass and gravitational mass –Satellite – Orbital velocity – escape velocity – Rocket.

**Unit III: Electrostatics and Electricity**

Charge and fields – Coulomb's law – electric field due to a point charge – Gauss law – Application of Gauss law – Electric field due to parallel sheet of charge – Electric potential –Potential due to a point charge – Capacitor – Principle of a capacitor – Capacitance of a parallel plate capacitor –Effect of dielectric on capacitance – current and resistance – Electric current –Current density – Expression for current density – Ohm's law and electrical conductivity – Kirchoff's law – Application of Kirchhoff's law to Wheatstone network and measurement of resistance.

**Unit IV: Optics and Sound**

Light – Reflection of light – Laws of reflection – Refraction of light – Laws of reflection – Dispersion visible range dual nature – Total internal reflection – Laser – Interaction of light with matter – Population inversion - Applications of laser. Simple Harmonic motion – Progressive wave properties – stationary waves – properties – ultrasonic – Properties and applications.

**Unit V: Electronics**

Difference between conductor, insulator and semiconductor using band theory – Intrinsic and extrinsic semiconductor – semiconductor diode –diode as a rectifier – Photo diode – LED – Zener diode as a voltage regulator – Number system – Binary, octal, Hexadecimal – Inter conversion – Cray code – exes 3 code , ASCII code – Basic gates – De-Morgan's theorem – Universal gates – Binary addition –Binary subtraction – 2's complement method - 1's complement method – binary multiplication – binary division.

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Newton's laws of motion, concept of friction and its associated quantities
- ✓ Newton's law of Gravitation-Kepler's law of planetary motion,
- ✓ Electrostatics force, Electric field, electric potential, capacitors. Ohm's law Kirchoff's law
- ✓ Various properties of light, laser fundamentals and applications, Ultrasonics and applications.
- ✓ Various types of semiconductor devices, binary number systems

**Suggested Readings:**

**(i) Text Books:**


1. Murugeshan, R. Mechanics, Properties of matter and sound. For Bsc ancillary physics, Reprint (2016).
2. Murugeshan, R. Optics, Spectroscopy and Modern Physics, For Bsc ancillary physics, 1st edition (2017).
3. Murugeshan, R. Electricity and electronics, for B.Sc Ancillary Physics, 1st edition, (2014).


**(ii) Reference Book:**


Halliday, D. Resnick, R and Walker, J. Principle of Physics, International Student version, Wiley India Private Ltd., 9th edition, reprint (2012).


**(iii) Web Sources:**

1. https://www.khanacademy.org/science/physics
2. https://ocw.uci.edu/courses/physics_3a_basic_physics.html
3. https://www.concepts-of-physics.com/dr-hc-verma/videos.php#hc-verma-videos-on-mechanics

---

**DEPARTMENT OF STATISTICS – PG (SF) – CBCS – LOCF**

(For those who join in June 2022)

**Non – Major Elective**

| | | |
|---|---|---|
| **Title of the Course: Statistical Methods** | | **Semester: III** |
| **Course Code: LPSTNM31** | **Contact Hours: 5** | **Credits: 4** |

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- apply various techniques measures of central tendency in distribution.
- demonstrate the knowledge of using various distributions for statistical analysis.
- gain knowledge of exponential curve for real world problems.
- develop the concepts of correlation and regression.
- apply the basic concepts of various index numbers method.

**Pre Required Knowledge:**

- ✓ Basic knowledge of Mean, Median and Mode.
- ✓ Fundamental ideas of the straight line.
- ✓ Apply the Simple index numbers.

**Unit I: Measures of Central Tendency**

Arithmetic mean – Geometric mean – Harmonic mean – Median – Mode.

**Unit II: Measures of Dispersion**

Range – Quartile deviation – Average deviation – standard deviation.

**Unit III: Curve Fitting**

Scatter diagram – Principle of least squares – Fitting a straight – Fitting a second degree parabola – Fitting the exponential curve – Reduction to the linear form.

**Unit IV: Correlation and Regression**

Karl Pearson's method – Regression – Angle between the regression lines – Standard error of estimate – Rank correlation – Spearman's rank correlation.

**Unit V: Index Numbers**

Use of index numbers – Types of index numbers – Construction of index numbers – Simple index numbers – weighted index numbers – The tests for a good index number – Chainbase index numbers.

**Suggested Topics for Group Discussion/ Presentation**

- ✓ Arithmetic Mean, Median and Mode.
- ✓ Range and Quartile deviation.
- ✓ Reduction to the linear form.
- ✓ Rank correlation and Spearman's Rank Correlation.
- ✓ Simple index numbers and weighted index numbers.

**Suggested Readings:**

**i) Text Book:**

1. T. Sankaranarayanan, Joseph A. Mangaladoss, Statistics and its Applications, Seventh Edition, Presi – Persi Publications, 1994.

   Unit I : Chapter 2

   Unit II : Chapter 3

   Unit III : Chapter 5

   Unit IV : Chapter 6

   Unit V : Chapter 9

**ii) Reference Books:**


**1.** S. Arumugam and A. Thangapandi ISAAC, Statistics, New Gamma Publications, 2006**.**

2. R. S. N. Pillai and V. Bagavathi, Statistics, S. Chand, 2002.

3. J. K. Sharma, Business Statistics, Pearson Education, 2004.

4. S. P. Gupta, Elementary Statistical Methods, Sultan Chand & Sons, 2009.


**iii) Web Sources:**

1. http://www.zstatistics.com/

2. https://youtu.be/eLRfRLsYN0A
3. https://youtu.be/cieQc7SWszM
4. https://youtu.be/3Grc9nVymm0
5. https://youtu.be/rEAgERuKIsM

---

**Title of the Course: Nuclear and particle physics** **Semester: IV**
**Course Code: LPPHCT41** **Contact Hours: 5hrs/w** **Credit:5**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- understand the theoretical aspects of nuclei of atoms.
- acquire knowledge on the theoretical models pertaining to nuclear forces,
- have theoretical understanding of alpha, beta and gamma decays and their applications
- acquire indepth knowledge on various nuclear models
- have clear understanding of physics of elementary particles

**Pre-Required Knowledge:**

- ✓ Structure and constituents of nuclei. Concept of Nuclear force, Einstein's mass energy relationship
- ✓ Alpha, Beta and Gamma rays, artificial and natural radio-activities
- ✓ Nuclear models, elementary particles basics.

**Unit I: General Properties of Nuclei**

Nuclear size – Nuclear mass radius – Charge radius – electron scattering experiment and charge density formula – Determination of radial parameter: mirror nuclei and muonic methods - Nuclear mass – Bainbridge's mass spectrograph – mass defect and packing fraction – binding energy curve and stability – Angular momentum - magnetic dipole moment-electric quadrupole moment - methods of determination of both magnetic and electric moments – parity of nuclei.

**Unit II: Nuclear Forces**

Ground state of deuteron – Simple theory – Approximate and exact solutions – Deuteron radius – Spin dependence – excited states of deuteron – Non Central forces – Tensor forces – Quadrupole moment of deuteron – magnetic moment – Saturation character - Exchange forces - Meson theory of nuclear forces.

**Unit III: Alpha, Beta and Gamma decays**

Range of alpha particles – Geiger Nuttall law – Theory of emission of alpha particles – Gamow's theory of alpha decay- Beta decay processes – beta ray spectra – explanation of continuous spectrum - Energy balance in beta decay- Fermi's theory- Curie Plots – Life time - Selection rules – Non conservation of parity – Gamma ray properties – Multiple order of gamma radiations and selection rules- Internal conversion – Nuclear isomerism – Mossbauer effect.

**Unit IV: Nuclear models**

Liquid drop model – Semi empirical mass formula – applications – magic numbers - Nuclear shell model- Spin-orbit coupling - Meyer Jensen Shell model – filling up of nuclear shell levels - Collective model.

**Unit V: Elementary particle physics**

Classification of particles – fundamental interactions among particles – Quantum numbers specifying states of particles – conservation laws in production and decay processes – Symmetries and conservation laws - SU(2) and SU(3) symmetry groups - Gell-Mann and Neuman classification of elementary particles – Quark model.

**Suggested Topics for Group Discussion/Presentation**:

- ✓ Methods of determination of electric and magnetic moments, other basic properties of nuclei
- ✓ Concept of ground and excited states of deuteron and meson theory of nuclear forces.
- ✓ Theory of production of alpha, beta and gamma particles through radio active decay.

- ✓ Theory of various nuclear models and their drawbacks, nuclear shells filling
- ✓ Various types of classification of elementary particles and their conservation laws governing them, Quark model

**Suggested Readings:**

**(i) Text Book:**

Satya Prakash, Nuclear Physics and Particle Physics, Sultan Chand & Sons, Educational Publishers, New Delhi, 1st Edition, (2014).

**(ii) Reference Books**:


1. Devanathan, V. Nuclear Physics, Narosa Publishing house Pvt. Ltd. New Delhi. 2nd edition, (2016).
2. Tayal, D.C. Nuclear Physics,.Himalaya Publishing House, New Delhi,5th edition. (2015).
3. Segre, E. Nuclei and Particle Physics, W.A.Benjamin Inc. Publishers, Massachusetts, USA, 2nd edition (1977).
4. Cohen, B.L. Concepts of Nuclear Physics, Tata Mc Graw Hill Publishing Company Ltd. New Delhi, (1971).


**(iii) Web Sources:**

1. https://ocw.mit.edu/courses/physics/8-701-introduction-to-nuclear-and-particle-physics-fall-2020/video-lectures/
2. http://www-pnp.physics.ox.ac.uk/~barra/teaching/subatomic.pdf
3. https://nptel.ac.in/courses/115/103/115103101/

---

**Title of the Course: Microprocessor** **Semester: IV**

**Course Code: LPPHCT42** **Contact Hours: 5hrs/w** **Credit:5**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- ➢ understand the hardware of 8085 system
- ➢ develop the data transfer operations
- ➢ understand the applications of register pairs in 16 bit instructions

- develop the applications of interrupts
- understand the applications of data converters

**Pre –Required Knowledge:**

- ✓ Memory devices
- ✓ Programmable Interrupts
- ✓ Arithmetic and logic Operations.

**Unit I: Hardware of Intel 8085 Based System**

Organization of microprocessor based system - microprocessor, memory, I/O devices, System bus -Intel 8085 Programming model - 8085 Hardware model - 8085 Bus organization - address bus, data bus , control bus, Internal data operations and 8085 registers - peripheral or externally initiated operations - pin configuration of 8085.

**Unit II: Introduction to 8-Bit Instructions**

Data transfer operations - addressing modes - program to transfer data from register to output - program to transfer data to control output device - Arithmetic operations - program using addition and increment - program for subtraction of two unsigned numbers - Logic operations - Branch operations.

**Unit III: Introduction to 16-Bit Instruction**s

16-bit arithmetic instructions - 16-bit data transfer to register pairs - data transfer from memory to microprocessor - data transfer from microprocessor to memory or directly into memory - Arithmetic operations related to 16 bits or register pairs - logic operations such rotate and compare - program for sorting numbers stored in memory.

**Unit IV: Interrupts and interfacing Data Converters**

The 8085 Interrupt - RST instructions - Multiple interrupts and priorities - 8085 vectored Interrupts - 8259A Programmable Interrupt Controller - Direct Memory Access(DMA) - - Interfacing an 8 bit D/A Converter with the 8085 - Interfacing 8 bit A/D Converter using the Interrupt.

**Unit V: Programmable interface devices**

Basic concepts– 74LS245 as programmable transceiver – Programmable device with status register – programmable

devices with handshake signals - 8155 as Multipurpose programmable device – 8155 timer as a square wave generator – Interfacing I/O devices with multiple addresses – 8279 as programmable keyboard/display interface – 8254 as programmable interval timer – programming for counter.

**Suggested Topics for Group Discussion/Presentation:**

- ✓ System bus
- ✓ Data transfer operations
- ✓ 16-bit arithmetic instructions
- ✓ 8259A Programmable Interrupt Controller
- ✓ Square wave generator

**Suggested Readings:**

**(i) Text Book:**

Ramesh S. Gaonkar, Microprocessor architecture programming and applications with the 8085, Penram International Publishing (India) Private Limited., 5th Edition, (2009).

**(ii) Reference Books:**

1. Badri Ram, Advanced microprocessors and interfacing,McGraw hill education,(2017)
2. Vijayendran, V. Fundamentals of microprocessors 8085: Architecture and Programming Interfacing– Viswanathan printers and publishers, Chennai, (2009).
3. Ram, B. Fundamentals of microprocessors and microcontrollers, DhanpatRai publication, 8th Edition, (2012).

**(iii) Web Sources:**

1. https://nptel.ac.in/courses/108/105/108105102/
2. https://nptel.ac.in/courses/108/103/108103157/
3. https://www.vssut.ac.in/lecture_notes/lecture1423813120.pdf

---

| Title of the Course: Thin Films and Crystal Growth | | Semester: IV |
|---|---|---|
| Course Code: LPPHCT43 | Contact Hours:5hrs/w | Credit:5 |

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- understand various theories on nucleation in crystals
- acquire indepth knowledge on solution growth techniques
- learn the principles of gel growth techniques
- apply and demonstrate melt and vapor growth technique of crystallization
- learn thin films deposition techniques and their applications

**Pre-Required Knowledge:**

- ✓ Crystalline and amorphous forms of solids
- ✓ Molecular understanding of crystal growth
- ✓ Various crystal systems and the physics of thin films

**Unit I: Basics of Crystal Growth**

Introduction-Nucleation-Theories of Nucleation –Classical theory of nucleation –Gibbs Thomson equation for Vapor – Modified Thomson's equation for Melt-Gibbs Thomson equation for Solution-Energy formation of a Nucleus- spherical and cylindrical nucleus.

**Unit II: Solution growth techniques**

Low temperature solution growth: solution - solubility and super solubility - expression of super saturation - Miers T-C diagram - constant temperature bath and crystallizer - seed preparation and mounting - slow cooling and solvent evaporation method – Sankar Narayanan-Ramasamy method of crystal growth.

**Unit III: Gel growth techniques**

Principles - various types - structure of gel - importance of gel - experimental procedure - chemical reaction method - single and double diffusion method - chemical reduction method - single and double diffusion method - complexion and

de-complexion method - advantage of gel method - semi-organic crystal formation by gel growth method.

**Unit IV: Melt and Vapor Growth Techniques**

Melt technique: Bridgeman & related technique – Container Selection – Crystal Pulling - Crystal Pulling Technique : Czochralski technique - experimental arrangement – Practice of Crystal pulling - Vapor technique: Physical vapor deposition - chemical vapor deposition - chemical vapor transport

**Unit V: Thin Film Deposition Techniques**

Thin film crystallization - Thin film structure - Crystal system and symmetry - Thin films - Introduction to vacuum technology - deposition techniques - physical methods - resistive heating - electron beam gun - laser gun evaporation and flash evaporations – sputtering - reactive sputtering - radio frequency sputtering - radio frequency sputtering - co-evaporation technique - chemical methods - spray pyrolysis.

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Theories of Nucleation
- ✓ Miers T-C diagram
- ✓ chemical reaction method
- ✓ Crystal Pulling Technique
- ✓ Thin film crystallization

**Suggested Readings:**

**(i) Text Books:**

1. Santhana Raghavan, Ramasamy,P. Crystal Growth Processes and Methods, KRU Publications , Kumbakonam, (2003).
2. Goswami, A. Thin film fundamentals, New age International (P) Ltd, New Delhi, 1996.

**(ii) Reference Books:**

1. Brice, J.C., Crystal growth processes, John Wiley & Sons, New York, (1986).

2. Willard, H.H., Merrit, L.L., Dean, J.A. and Settle, F.A., Instrumental methods of analysis, CBS Publishers and Distributors, New Delhi, (1981).

**(iii) Web Sources:**

1. https://www.acadpubl.eu/hub/2018-119-12/articles/2/489.pdf
2. https://application.wiley-vch.de/books/sample/352732514X_c01.pdf
3. https://www.ch.ntu.edu.tw/~sfcheng/HTML/material94/Crystal_growth.pdf

---

**Title of the Course: Renewable Energy Sources** **Semester: IV**
**Course Code: LPPHDS41** **Contact Hours: 4hrs/w** **Credit:3**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- understand the fundamentals of conventional and non-conventional energy sources
- have thorough understanding of solar energy and its storage and conversion
- acquire clear understanding of various energies such as wind, biomass energies and their applications.
- know and apply the use of geothermal energy and ocean energy for generating power
- have clear understanding of promising emerging technologies for the energy storage and production of power

**Pre-Required Knowledge:**

- ✓ Basics of Solar energy, wind energy, thermal energy
- ✓ Green Houses effect
- ✓ Current trends in energy sources

**Unit I: Introduction to energy sources**

Classification of Energy sources –Consumption trend of Primary energy sources – Importance of Non- conventional sources – Common forms of energy – Advantages and

disadvantages of conventional energy sources – salient features of non-conventional energy sources – Environmental aspects of energy – Environment – Economy energy and sustainable development – Energy densities – World energy status - Indian scenario – Principles of energy conservation.

**Unit II: Solar energy, collectors and applications**

Solar energy – Measurements of solar radiation – Pyranometer - Pyrheliometer – Solar radiation data – Solar radiation geometry – solar collectors – classifications – Liquid flat plate collector – Flat plate air heating collector – Evacuated tube collector – various parabolic collectors – solar water heater – solar industrial heating systems – Box type solar cooker – parabolic dish type – advanced solar cooker – Solar green house. – Solar photo voltaic systems - Solar cells fundamentals, classification and characteristics – modules, panel and array construction.

**Unit III: Wind Energy and Biomass energy**

Origin of winds – Nature of winds – Wind Turbine Siting – Major applications of wind power – Wind turbine tiers and their construction – Wind energy conversion systems – Wind Diesel Hybrid system – Effects of wind speed and grid condition – wind energy storage – Environmental aspects – Photosynthesis process – Usable forms of Biomass, their composition and Fuel properties – Biomass resources – Biomass Conversion Technologies – Biomass gasification – Liquefaction – Biomass to Ethanol Production.

**Unit IV: Geothermal Energy and Ocean Energy**

Geo thermal energy - Applications **–** Origin and Distribution of Geothermal energy – Types of Geothermal resources – analysis of geothermal resources – exploration and development of geothermal resources – environmental consideration. Ocean Energy- Tidal energy – Wave energy – Ocean thermal energy – origin and characteristics of resources – conversion technology.

**Unit V: Emerging Technologies**

Fuel cell – Potential applications – Classification of fuel cells – phosphoric acid fuel cell (PAFC) – Alkaline Fuel cell

(AFC) – Polymer Electrolytic Fuel Cell (PEMFC) or Solid Polymer Fuel Cell (SPFC) - Fuels for fuel cells – characteristics of fuel cells – Fuel cell power plant - Hydrogen energy – Properties, Production and storage – Delivery – conversion applications and safety issues - Magneto Hydrodynamic power conversion Basic principle – Generator-Advantages and disadvantages – Thermo electric power conversion – generator - thermionic power conversion.

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Primary energy sources
- ✓ Solar energy and its applications
- ✓ Conversion Technologies in Biomass
- ✓ Geo thermal energy and its applications
- ✓ Alkaline Fuel cell (AFC), polymer electrolytic cells, solid state fuel cells

**Suggested Readings:**

**(i) Text Book:**

Khan, B.H., Non-conventional energy resources, Tata Mc Graw Hill Education Private Limited, New Delhi, 2nd Edition. 6th reprint, (2011).

**(ii) Reference Books:**

1. Rai, G.D., Non – Conventional Sources of energy, Khanna Publishers, New Delhi, (2000).
2. Rai, G.D., Solar energy utilization,G.D.Rai, Khanna Publishers, New Delhi, (1998).
3. Mital, K.M., Non – Conventional energy systems, Wheeler Publishing, (1997).

**(iii) Web Sources:**

1. https://nptel.ac.in/courses/121/106/121106014/
2. https://nptel.ac.in/courses/108/108/108108078/
3. https://lecturenotes.in/subject/57/non-conventional-energy-systems-nces

---

**Title of the Course: Astronomy and Astrophysics** **Semester: IV**

**Course Code: LPPHDS42** **Contact Hours:4hrs/w** **Credit:3**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- understand birth of astronomy and various aspects related to this
- acquire knowledge on the origin of universe and various optical instruments.
- understand various aspects of stellar evolution
- understand the reactions happening inside the stars and related terms.
- understand the entire aspects of cosmology

**Pre-Required Knowledge:**

- ✓ Basic knowledge on planetary system and our Sun
- ✓ Fundamental concepts of star formations and black holes, distances in light years
- ✓ Newton's laws of gravitation, laws of thermodynamics

**Unit I: Basics of Astronomy**

Birth of Modern Astronomy- Kepler's laws –-Newtonian gravitation – seasons – eclipses-tides-precession – solar family - Celestial coordinate system -(Sun – Earth system, Galactic Coordinate system)

**Unit II: Observational astronomy and origin of Universe**

Astronomical observations – Light and telescopes-Types of telescopes-reflector type -refractor type- Sun and Solar System - Sun - structure – sun spots – Solar system – planets – comets

**Unit III: Stellar Evolution**

Stellar distance – Stellar magnitudes – evolution stages of stars –- main sequence stars-Star formation - Stellar Magnitudes - Classification of stars - H-D Classification - Saha Equation of ionization - Hertz sprung – Russel (H-R) diagram Gravitational energy -Virile theorem - Equation of stellar structure and evolution - Pre- main sequence - jeans criteria

for star formation - fragmentation and adiabatic contraction - Evolution on the main sequence - Post main sequence evolution

**Unit IV: Nuclear reactions in Stars**

Thermonuclear reactions in stars - pp chains and CNO cycle - Solar Neutrino problem - subsequent thermonuclear reaction - helium burning and onwards - nucleosynthesis beyond iron - r- and –s-processes-Qualitative discussion on: Galaxies- Nebulae – Quasars- Brown dwarfs - Red Giant Stars - Nova, Supernova.

**Unit V: Cosmology**

Classes of galaxies –Cosmological principle – the big bang – expanding universe – steady state universe – evidences for Einstein's gravitation - Newtonian theory of stellar equilibrium, White Dwarfs, Electron degeneracy and equation of States, Chandrasekhar Limit, Mass – Radius Relation of W.D. Neutron Stars, Spherically symmetric distribution of perfect fluid in equilibrium. Tolman – Oppenheimer – Volk off (TOF) equation, Mass – Radius relation of N.S. Pulsars, Magnetars, Gamma ray bursts - Black holes, Collapse to a black hole (Oppenheimer and Snyder ), event horizon, Singularity

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Kepler's laws of planetary motion.
- ✓ Types of telescopes and Sun related terms
- ✓ Stellar magnitudes, evolution stages of stars.
- ✓ Theory of Nuclear reaction mechanism inside the stars
- ✓ Big bang theory and formation of galaxies and various types of stars

**Suggested Readings:**

**(i) Text Books:**

1. Inbanatha, S.S.R. Introduction to Astronomy for Beginners, 1st edition, (2019). [text book for Unit I and Unit II]

2. Baidyanath, B. An Introduction to Astrophysics – Prentice Hall of India, 2nd Edition, (2010).[text book for Unit-III,IV & V]

**(ii) Reference Books:**

1. Barbieri, C and Bertini. I, Fundamentals of Astronomy, CRC Press,

Second edition (2021).

2. Abhyankar, K.D., Astrophysics : Stars and Galaxies, University press (2001)
3. Jain, P. Introduction to Astronomy and Astrophysics – CRC Press, (2015).
4. Pasachoff, J.M. Astronomy: From the earth to the Universe, Saunders College Publishing, (2006).
5. Moche, D.L. Astronomy – A self-teaching guide, John Wiley & Sons Inc. (2015).

**(iii) Web Sources:**

1. https://nptel.ac.in/courses/115/105/115105046/
2. https://ocw.mit.edu/courses/physics/8-282j-introduction-to-astronomy-spring-2006/readings/
3. https://www.youtube.com/watch?v=zG-yjmKN1xM

---

**Title of the Course: Applied Electronics** **Semester: IV**

**Course Code: LPPHSE41** **Contact Hours: 2hrs/w** **Credit:2**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- learn the current and voltages in dc circuits
- understand principles behind various switching actions
- acquire knowledge on thyristors fundamentals and their applications
- design and implement amplifiers
- learn principles of feedback amplifiers and their designing.

**Pre-Required Knowledge:**

- ✓ Basic knowledge on current and voltages

- ✓ Fundamentals of electric and electronic devices
- ✓ Semi conductors fundamentals

**Unit I: DC Resistive circuits**

Introduction – Current Direction and voltage polarity– voltage notation-voltage division rule- series voltage divider- 'Opens' and Shorts in series circuits - 'Opens' and Shorts parallel circuits- current division rule.

**Unit II: Circuit control and protective Devices**

Switching actions- Type of Switches- Fuses – Fuses Ratings- Circuit Breaker- Relays- Classification of relays- Electromagnetic relays – Printed Circuit Board - (PCB) – Types – Board construction - Steps involved in the Development of the PCB – Advantages.

**Unit III: Thyristors**

Introduction – Types – Silicon controlled Rectifiers (SCR) – SCR Biasing, operation – V-I characteristics of SCR – Triac –Triac operation – V-I characteristics of Triac – Different between SCR and Triac- Diac- V-I characteristics of Diac – Silicon controlled switch (SCS)- SCS operation, application.

**Unit IV: Tuned voltage Amplifiers**

Introduction – Parallel Resonant circuits – Bandwidth and Sharpness of Resonance – Single tune voltage amplifier- Frequency response of single tuned voltage amplifier – limitation – double – tuned voltage amplifier – Frequency response of double tuned voltage amplifier – stagger tuned voltage amplifier

**Unit V: Feedback Amplifiers**

Principle of Feedback Amplifier – advantages and disadvantages of negative feedback- gains stability– increase bandwidth – Types of feedback connection – voltage series, voltage shunt, current series, current shunt feedback connection – negative feedback in multistage amplifiers**.**

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Series circuits, Parallel circuits and their voltage division rule

- ✓ Fundamentals of Printed Circuit Boards and their types of construction
- ✓ Diac, Triac, SCR –characteristics and their applications
- ✓ Frequency response of singly and doubly tune feedback amplifiers
- ✓ Principles of feedback amplifiers and types of feedback

**Suggested Readings:**

**(i) Text Book:**

Sedha, R.S. A text book of applied electronics, S.Chand & Co. Ltd. Revised edition, (2018).

**(ii) Reference Books:**


1. Jain, R.P. Modern Digital Electronics – Tata McGraw Hill, (2007).
2. Coughlin, R.F and Driscol, F.F. Op-Amp and linear integrated circuits. Prentice Hall of India, New Delhi, (1996).
3. Malvino, A. and Bates, D.J. Electronic Principles, McGraw Hill, 7th edition, (2007).
4. Mehta, V.K., Principles of Electronics, S.Chand and Company,6th revised edition (2001).
5. Salivahanan, S. Suresh Kumar, N. & Vallavaraj, A. Electronic Devices And Circuits, Tata McGrow-Hill Publishing Company Limited, New Delhi, Tenth Reprint, (2003).
6. Gaykwad, R.A. Op-Amps and Linear Integrated Circuits, Pearson Education Pvt. Ltd., New Delhi, Seventh Indian Edition Reprint (2004).


**(iii) Web Sources:**

1. https://nptel.ac.in/courses/108/105/108105066/
2. https://nptel.ac.in/courses/117/103/117103063/

---

| Title of the Course: Modern Optics | | Semester: IV |
|---|---|---|
| Course Code: LPPHSE42 | Contact Hours: 2hrs/w | Credit: 2 |

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- learn the phenomenon of polarization using vector, matrix representations
- understand the principles behind coherence and interference and the techniques of interferometers
- apply the theory of propagation of light through solid medium
- understand the classical and quantum theories , radiation of light.
- understand the atomic spectra quantum mechanics and fine structure

**Pre-Required Knowledge:**

- ✓ Reflection, Refraction, interference and polarization of light
- ✓ Mathematics of Wave equations, permittivity of dielectric medium
- ✓ Properties of Radiation of electromagnetic wave, atoms and electronic levels

**Unit I: The Vectorial Nature of Light**

General marks- energy flow the pointing vector- Linear polarization- circular and elliptic polarization- matrix representation of polarization- the jones calculus- reflection and refraction at a plane boundary- Fresnel's equation.

**Unit II: Coherence and Interference**

The principle of linear super position- young's experiment- the Michelson interferometer – theory of practical coherence- visibility of fringes coherence- time and coherence length- spectral resolution of a finite wave train.

**Unit III: Optics of Solids**

General remarks- macroscopic field and Maxwell equation- the general wave equation- propagation of light in

the isotropic dielectrics dispersion- propagation of refraction at the boundary of an absorbing medium.

**Unit IV: Thermal Radiation and Light Quanta**

Thermal radiation- Krichhoff's law- Black body radiation- Modes of electromagnetic radiation in the cavity- classical theory of blackbody radiation- the Rayleigh jeans formula- Quantization of cavity radiation- photon statistics.

**Unit V: Optical Spectra**

Elementary theory of Atomic spectra - quantum mechanics- the Schrödinger equation- quantum mechanics of the hydrogen atom- radiative transitions and selection rules- fine structure of spectrum lines- electron spin

**Suggested Topics for Group Discussion/Presentation:**

- ✓ Linear polarization, reflection and refraction at plane boundary, theory of Fresnel's equation
- ✓ Theory, construction and working of Michelson interferometer
- ✓ Propagation of light in dielectrics and refraction at the boundary
- ✓ Classical and Quantum theory of Black body radiation
- ✓ Elementary theory of Atomic spectra, radioactive transitions and selection rules

**Suggested Readings:**

**(i) Text Book:**

Fowles, G.R. Introduction to Modern Optics, Dover edition, General Publishing company, Toronto, Canada (1989).

**(ii) Reference Book:**

Guenther, B.D. Modern optics simplified, paperback edition, Oxford University Press (2019)

**(iii) Web Sources:**

1. https://nptel.ac.in/courses/115/105/115105104/

---

**Title of the Course: Advanced Physics Practical** **Semester: III & IV**

**Course Code: LPPHCL41** **Contact Hours:5hrs/w** **Credits:4**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- analyze the various operations of registers.
- evaluate properties of multiplexer.
- experimentally determine the operation of counters.
- write and execute various Programs for microprocessor.
- evaluate the spectrum obtain in powder photograph technique.

**List of Experiments:**

1. Interpretation of Weissenberg photograph – determination of cell constants and index of powder photograph
2. Interpretation of X – Ray powder photograph - determination of cell constants and index of powder photograph.
3. Interpretation of powder spectrum - determination of cell constants.
4. Write assembly language program for Addition of two 8 bit numbers using 8085 instruction set..
5. Write assembly language program for Subtraction of two 8 bit numbers using 8085 instruction set..
6. Write assembly language program for Multiplication of two 8 bit numbers using 8085 instruction set..
7. Write assembly language program for Division of two 8 bit numbers using 8085 instruction set..
8. Write assembly language program for find Largest and smallest numbers using 8085 instruction set..
9. Write assembly language program to Arrange a set of numbers in Ascending and Descending order using 8085 instruction set...
10. Write assembly language program for moving a block of data using 8085 instruction set..
11. Verify the Proper operation of a Multiplexer circuit.

12. Verify the Proper operation of a De-Multiplexer circuit.
13. Construct a four bit Ripple counter and study its operation.
14. Study the operation and characteristics of a shift register and to modify into ring counter.
15. Construct a counter to count numbers from a decade scalar using IC 7490 – MOD 'n' counter.
16. Construct an Encoder circuit and to transform a decimal number into binary code(BCD).

**Suggested Readings:**

**(i) Text Books:**


1. Ramesh S. Gaonkar, Microprocessor architecture programming and applications with the 8085, Penram International Publishing (India) Private Limited., 5th Edition, (2009).
2. Salivahanan, S. and Arivalagan, S. Digital circuits and Design, Vikas Publishing house Pvt. Ltd. 3rd edition, (2007), Reprint(2010)..


**(ii) Reference Books:**


1. Badri Ram, Advanced microprocessors and interfacing,McGraw hill education,(2017)
2. Vijayendran, V. Fundamentals of microprocessors 8085: Architecture and Programming Interfacing– Viswanathan printers and publishers, Chennai, (2009).
3. Ram, B. Fundamentals of microprocessors and microcontrollers, DhanpatRai publication, 8th Edition, (2012).
4. Jain, R.P. Modern Digital Electronics – Tata McGraw Hill, (2007).
5. Malvino, A. and Bates, D.J. Electronic Principles, McGraw Hill, 7th edition, (2007).
6. Salivahanan, S. Suresh Kumar, N. & Vallavaraj, A. Electronic Devices And Circuits, Tata McGraw Hill (2005)

**Web Sources:**

1. https://nptel.ac.in/courses/108/105/108105102/
2. https://nptel.ac.in/courses/108/103/108103157/
3. https://www.vssut.ac.in/lecture_notes/lecture1423813120.pdf
4. http://vlabs.iitb.ac.in/vlabs-dev/labs_local/microprocessor/labs/explist.php
5. https://vlab.amrita.edu/?sub=1&brch=189

---

**Title of the Course: Project work/ Dissertation** **Semester: III&IV**

**Course Code: LPPHPJ41** **Contact Hours: 4hrs/w** **Credit: 4**

**Course Learning Outcomes:**

**On completion of the course, the students are able to**

- create Innovative thoughts in Research Works
- make New Ideas in various Research Fields
- understand the Basic Characteristics in Research Work
- develop the fresh piece of knowledge in Research Works
- write research articles

**General Instructions:**

1. Each Student will be allotted a Project Guide from the faculty of the Department Concerned.
2. After the completion of the project work, the student has to submit four copies of project with report carrying his/her project report.
3. Project work will be evaluated by both the external and the internal (Project Guide) for the maximum of 100 marks in total on the scale of the maximum of 50 marks for the internal and the external each.
4. Viva voce will be conducted by the panel comprising HOD, External examiner and Project guide for the maximum of 100 marks in total on the scale of the maximum of 50 marks for the internal and the external each.

---

## RULES AND REGULATIONS FOR THE PROJECT / DISSERTATION WORK (UG, PG AND M.PHIL)

- Research supervisors will be allotted to the students / scholars by the respective Department.
- Research topic shall be chosen by the student / scholar in consultation with his/ her research supervisor.
- Every department has to maintain the year-wise list of project works carried out by the students. Research works done by the students / scholars of the previous batches should not be repeated by the students / scholars of the current academic year.
- The general structure of the project report is given below.

  Title page with college emblem

  Research supervisor's certificate

  Student's declaration counter signed by Research Supervisor and the HOD

  Student's Acknowledgement

  Contents

  List of Tables if any

  Introduction

  Review of Literature

  Materials and Methods

  Results and Discussion

  Summary of Findings and Conclusion

  Bibliography

  Annexure
- Four copies of the project repot should be submitted, typed in A4 Paper in Times New Roman with the font size of 12 and 1.5 line spacing.

**SARASWATHI NARAYANAN COLLEGE**

(Autonomous Institution – Affiliated to Madurai Kamaraj University)

(Reaccredited with $B^{(2.78)}$ Grade by NAAC in the second cycle)

**MADURAI -22**

**EVALUATION METHOD UNDER CBCS- LOCF**

**CONTINUOUS INTERNAL ASSESSMENT (CIA)**

Internal assessment is based on the continuous evaluation of performance of the students in each semester. Internal mark is awarded to each course in accordance with the following guidelines.

**UNDER GRADUATE, POST GRADUATE AND M.PHIL:**

1. Internal test will be conducted for the maximum of 60 marks and converted to 15 marks.
2. Two internal tests will be conducted and the average of marks secured in the two tests will be taken as the Final Internal Test mark.
3. The distribution of Internal Assessment marks is given below.

| **THEORY** | | | **PRACTICAL** | | |
|---|---|---|---|---|---|
| Test | - | 15 | Record Note | - | 10 |
| Seminar | - | 5 | CIA | - | 15 |
| Quiz | - | 5 | Model Exam | - | 15 |
| | | --- | | | --- |
| Internal Maximum | - | 25 | Internal Maximum | - | 40 |

4. There is no Cumulative Internal Assessment (CIA) for Self Learning. Courses, Add on Certificate / Diploma Programmes and Part-1 subjects other than Tamil.

5. Internal marks for those UG, PG and M.Phil. students who have to Repeat the Semester (RS) for want of attendance should be marked “AA” in the foil card.
6. There is no minimum mark for Internal assessments marks for all the UG, PG and M.Phil. Programmes.
7. Internal test for improvement of marks is not allowed under any circumstances
8. Special Internal Assessment tests for the absentees may be conducted on genuine reasons with the prior approval of HOD, Dean and Principal. Such tests may be conducted before the commencement of the Summative Examinations.

## SUMMATIVE EXAMINATIONS (SE)

1. Summative Examinations for all the UG, PG and M.Phil. Programmes are conducted in November and April for the Odd and the Even semesters respectively.
2. Question paper setting along with the scheme of valuation is purely external for all the UG, PG and M.Phil. Programmes.
3. The office of the CEO is conferred with the right of choosing the Question Paper Setters and the External Examiners from the Panels suggested by the Boards of Studies of Programmes offered by the respective Department and approved by the Academic Council of the College. The question papers set for the Summative Examinations will be finalised by the Scrutiny Committee constituted by the office of the COE.
4. Practical Examinations will be conducted by the External Examiner and the course teacher, who will act as the Internal Examiner. In the absence of course teacher / External Examiner, HOD will act as the Internal Examiner / External Examiner.
5. The marks scored by the students in the External Examinations in Self Learning Courses and Add – on Courses will be converted to 100 for each course.
6. The theses submitted by the M.Phil. scholars after the conduct of Awards Committee meeting can be valued and the Viva-Voce Examinations can be conducted. The Principal is empowered to declare the results and it can be ratified in the next Awards Committee meeting.

**Knowledge levels for assessment of Outcomes based on Blooms Taxonomy**

| S. No | Level | Parameter Description | Description |
|---|---|---|---|
| 1 | K1 | Remembering | Remembering It is the ability to remember the previously learned |
| 2 | K2 | Understanding | The learner explains ideas or Concepts |
| 3 | K3 | Applying | The learner uses information in a new way |
| 4 | K4 | Analysing | The learner distinguishes among different parts |
| 5 | K5 | Evaluating | The learner justifies a stand or decision |
| 6 | K6 | Creating | The learner creates a new product or point of view |

**WEIGHTAGE OF K–LEVELS IN QUESTION PAPER**

| | K-LEVELS (Cognitive Level) | | | | | Total |
|---|---|---|---|---|---|---|
| | K1 | K2 | K3 | K4 | K5/ K6 | |
| **SUMMATIVE EXAMINATIONS– 75 Marks Pattern** | 21 | 30 | 18 | 18 | 13 | 100 |
| **SUMMATIVE EXAMINATIONS–50 Marks Pattern** | 24.5 | 24.5 | 17 | 17 | 17 | 100 |
| **CONTINUOUS INTERNAL ASSESSMENT(CIA)** | 24 | 26 | 14 | 25 | 11 | 100 |

| QUESTION PATTERN FOR SUMMATIVE EXAMINATIONS<br>For those who join in June 2022<br>UG and PG<br>(Language Courses, Core Courses, Discipline Specific Electives, Generic Elective Courses, Non-Major Electives(PG)) | |
|---|---|
| **TOTAL MARKS 75** | |
| **SECTION–A**(Answer all questions)<br>**I. Choose the correct answer (FIVE questions – ONE question from each unit)**<br>(Q.No.1-5)-All questions are at K2 level<br>**II. Fill in the blanks (FIVE questions - ONE question from each unit)** (5x1=5)<br>(Q.No.6-10)-All questions are at K1 level | **10** |
| **SECTION-B**<br>**Answer all questions not exceeding 50 words each**.<br>**ONE set of questions from each unit**<br>**Q. No. : 11 to 15** (5x2=10)<br>K2 level – 2 Questions<br>K3 level – 1 Question<br>K4 level –1 Question<br>K5/K6 level – 1 Question | **10** |
| **SECTION-C-Either/or type**<br>**Answer all questions not exceeding 200 words each**. **ONE set of questions from each unit. Q. No. : 16 to 20** (5 x5=25)<br>K1 level – 1 Question<br>K2 level – 2 Questions<br>K3 level – 1 Question<br>K4 level – 1 Question | **25** |

| | |
|---|---|
| **SECTION-D-Answer any THREE questions not exceeding 400 words each.**<br>**ONE question from each unit.**<br>**Q. No. : 21 to 25** (3x10=30)<br>K1 level – 1 Question<br>K2 level – 1 Question<br>K3 level – 1 Question<br>K4 level – 1 Question<br>K5/K6 level – 1 Question | **30** |
| **Total** | **75** |

| QUESTION PATTERN FOR SUMMATIVE EXAMINATIONS<br>For those who join in June 2022<br>UG and PG<br>(Skill Enhancement Courses, Self Learning Courses, Non Major Electives (UG)and Part V Courses (except NCC)) | |
|---|---|
| **TOTAL MARKS 50** | |
| **SECTION–A**(Answer all questions)<br>**I. Choose the correct answer (FIVE questions – ONE question from each unit)** (5x1=5)<br>(Q.No.1-5)-All questions are at K2 level<br>**II. Fill in the blanks (FIVE questions – ONE question from each unit)** (5x1=5)<br>(Q.No.6-10)-All questions are at K1 level | **10** |
| **SECTION-B**<br>**Answer all questions not exceeding 50 words each. ONE set of question from each unit**<br>**Q. No. : 11 to 15**<br>(5x2=10)<br>K1 level – 1 Question<br>K2 level – 1 Question<br>K3 level – 1 Question<br>K4 level – 1 Question<br>K5/K6 level – 1 Question | **10** |
| **SECTION-C**<br>**Answer any THREE questions not exceeding 400 words each. ONE question from each unit**<br>**Q. No. : 16 to 20** (3x10=30)<br>K1 level – 1 Question<br>K2 level – 1 Question<br>K3 level – 1 Question<br>K4 level – 1 Question<br>K5/K6 level – 1 Question | **30** |
| **Total** | **50** |

| QUESTION PATTERN FOR INTERNAL ASSESSMENT (CIA)<br>For those who join in June 2022 UG and PG | |
|---|---|
| **TOTAL MARKS 60** | |
| **SECTION–A**(Answer all questions)<br>**I. Choose the correct answer** (5 x 1 = 5)<br>(Q.No.1-5)-All questions are at K2 level<br>**II. Fill in the blanks** (5 x 1 = 5)<br>(Q.No.6-10)-All questions are at K1 level | **10** |
| **SECTION-B**<br>**Answer all questions not exceeding 50 words each.**<br>**ONE set of question from each unit** (4 x 2 = 8)<br>Q.No. 11 – K2 level<br>Q.No. 12 – K3 level<br>Q.No. 13 – K3 level<br>Q.No. 14 – K5/ K6 level | **8** |
| **SECTION-C-Either/or type**<br>(**Answer all questions not exceeding 200 words each**. (3 x 6 = 18)<br>Q.No. 15 – K3 level<br>Q.No. 16 – K4 level<br>Q.No. 17 – K5/K6 level | **18** |
| **SECTION-D**<br>**Answer any TWO questions not exceeding 400 words each.** (2 x 12 = 24)<br>Q.No. 18 – K1 level<br>Q.No. 19 – K2 level<br>Q.No. 20 – K4 level | **24** |
| **Total** | **60** |

**QUESTION PATTERN FOR SUMMATIVE EXAMINATIONS**

**For those who join in June 2022 UG and PG**

**(Language Courses, Core Courses, Discipline Specific Electives, Generic Elective Courses, Non-Major Electives (PG))**

| **DURATION:3HRS** | | | **MAXMARKS:75** | | | |
|---|---|---|---|---|---|---|
| **K-LEVELS** / SECTIONS | **K1** | **K2** | **K3** | **K4** | **K5 / K6** | **TOTAL MARKS** |
| **SECTION A** (Answer all questions, each question carries One Mark) | 5 | 5 | | | | **10** |
| **SECTION B** (Answer all questions, each question carries TWO Marks, ONE question from Each unit) | | 4 | 2 | 2 | 2 | **10** |
| **SECTION C** (Answer all questions- Either/or type-ONE Question from each unit) | 5 | 10 | 5 | 5 | | **25** |
| **SECTION D** (Answer anyTHREE questions, ONE question from each unit, each question carries TEN Marks) | 10 | 10 | 10 | 10 | 10 | **30** |
| **TOTAL** | 20 | 29 | 17 | 17 | 12 | **75** |

**QUESTION PATTERN FOR SUMMATIVE EXAMINATIONS**

**For those who join in June 2022**

**UG and PG**

**(Skill Enhancement Courses, Self Learning Courses, Non Major Electives (UG)and Part V Courses (except NCC))**

| **DURATION:2HRS** | | | **MAX MARKS:50** | | | |
|---|---|---|---|---|---|---|
| **K-LEVELS** / SECTIONS | **K1** | **K2** | **K3** | **K4** | **K5/ K6** | **TOTAL MARKS** |
| **SECTION A** (Answer all questions, each question carries One Mark) | 5 | 5 | | | | **10** |
| **SECTION B** (Answer all questions, each question carries TWO Marks, ONE question from Each unit) | 2 | 2 | 2 | 2 | 2 | **10** |
| **SECTION C** (Answer any THREE questions, ONE question from each unit, each question carries TEN Marks) | 10 | 10 | 10 | 10 | 10 | **30** |
| **TOTAL** | 17 | 17 | 12 | 12 | 12 | **50** |

| BLUE PRINT OF QUESTION PAPER FOR INTERNAL ASSESSMENT (CIA) | | | | | | |
|---|---|---|---|---|---|---|
| **DURATION:2HRS** | | | **MAX MARKS:60** | | | |
| **K-LEVELS** / SECTIONS | **K1** | **K2** | **K3** | **K4** | **K5/ K6** | **TOTAL MARKS** |
| **SECTION A** (Answer all question. Each question Carries **ONE** Mark) | 5 | 5 | | | | **10** |
| **SECTION B** (Answer all questions. Each question carries **TWO** Marks) | | 2 | 4 | | 2 | **8** |
| **SECTION C** (Answer all questions- Either/or type -Each question carries **SIX** Marks) | | | 6 | 6 | 6 | **18** |
| **SECTION D** (Answer any TWO questions. Each question carries **TWELVE** Marks) | 12 | 12 | | 12 | | **24** |
| **TOTAL** | 17 | 19 | 10 | 18 | 8 | **60** |

## VALUATION

1. Central valuation system is adopted.
2. Single Valuation system is followed for UG, PG and M.Phil. theory examinations. The valuation is done by the external examiners only.
3. UG and PG Practical Examinations are valued by both Internal and External Examiners.
4. Any discrepancy in the question paper should be brought to the notice of the Controller of Examinations by the respective Course Teacher through the Head of the Department within five days from the date of examination.

## DECLARATION OF RESULTS

1. The total credit should not exceed 140 for UG Programmes and 90 for PG Programmes, excluding the credits earned for additional credit courses. This is applicable to the students migrating from other colleges also.
2. The students migrating from other colleges have to appear for the Summative Examinations conducted by the college for non-equivalent theory and practical courses. Mark scored by such a student in the Summative Examinations conducted by the previous college shall be converted to 100 if it is less than 100 for any equivalent course.
3. The students who repeat the semester have to appear not only for Summative Examinations but also for internal tests. The Internal marks scored by such students in their previous attempts shall stand invalid.
4. Results will be published within 20 days from the date of completion of all the Examinations.
5. Results will be declared as per the norms given in the following table in consultation with the Awards Committee.

**Maximum and Passing Minimum Marks**

| Course | External Exam (SE) | | Aggregate Marks (CIA + SE) | |
|---|---|---|---|---|
| | Passing Minimum | Maximum Mark | Passing Minimum | Maximum Mark |
| UG (Theory) | 27 | 75 | 40 | 100 |
| UG – NME / SEC / Part V (except NCC) | 18 | 50 (converted to 75 marks) | 40 | 100 |
| UG – SLC | 20 | 50 | 40 | 100 |
| UG (Practicals) | 21 | 60 | 40 | 100 |
| UG Project | 18 | 50 | 40 | 100 |
| PG (Theory) | 34 | 75 | 50 | 100 |
| PG (Practicals) | 27 | 60 | 50 | 100 |
| PG (Project) | 23 | 50 | 50 | 100 |
| M.Phil. (Theory) | 34 | 75 | 50 | 100 |
| **M.Phil. Project** | | | | |
| 1. Dissertation | 50 | **100** (Internal 50 + External 50) | - | - |
| 2. Viva – Voce | 50 | **100** (Internal 50 + External 50) | - | - |

## REVALUATION AND SUPPLEMENTARY EXAMINATIONS

1. Students can apply for Revaluation within 10 days from the date of the publication of the results.
2. Final year students of UG and PG Programmes can appear for Supplementary Examinations for the arrear papers of only the V and VI Semesters of UG Programmes and III and IV Semesters of PG Programmes. Students having the maximum of three arrear papers alone are eligible for Supplementary Examinations.
3. Absentees in the Summative Examinations are not eligible to apply for the Supplementary Examinations.
4. Supplementary Examinations will be conducted every year in the month of July.

## ATTENDANCE

1. Students with the minimum of 75% of attendance (68 days out of 90 days) in a semester are permitted to appear for the summative examinations.
2. Students who do not have the minimum attendance should go for condonation.
3. Students who do not have the minimum attendance of 20 hrs for Certificate Programme and the minimum attendance of 20 hrs for each course in Diploma Programme will not be permitted to appear for the summative examinations.

The following are the regulations for grant of condonation.

| Attendance | Condonation Fee | Authority to Consider | Nature of Penalty |
|---|---|---|---|
| 65% - 74% (59-67 days) | Rs.500/- | Head of the Department | As decided by the HOD |
| 50% - 64% (58-45 days) | Rs.1000/- | Principal and the Examination Committee | Application for exemption to be made on prescribed form with the specified remarks of the Principal |
| < 50% (Below 45 days) | To repeat the whole semester | ----- | ----- |

## EXAMINATION RULES AND REGULATIONS

1. Students without hall ticket and identity card are not permitted to appear for the examinations.
2. Possession of materials in any form for copying is strictly prohibited in the examination hall.
3. Students indulging in any form of malpractices in the examination are liable for severe punishment.
4. Students are not allowed into the examination hall after 30 minutes of the commencement of the examination.
5. Students should not write their names or any other identification marking except their register number in the answer scripts.
6. Students who have discontinued the Degree Programme are not permitted to write the summative examinations.

7. Students who have not completed the theory and practical courses during the Programme of their study are allowed to appear for the Summative Examinations in the same syllabi up to a period of three years from the year of the completion of Programme. However, after the completion of three years, they have to appear for the summative examinations for the equivalent course in the current syllabi only. The equivalence of a course is to be decided by the respective HOD, Dean, the Controller of Examinations and the Principal. This is also applicable to those students who repeat the semester.

## PENAL ACTIONS FOR VARIOUS FORMS OF MALPRACTICES IN THE SUMMATIVE EXAMINATIONS

| Sl. No. | Malpractice | Penal Action |
|---|---|---|
| 1 | In Possession of Materials relevant to the examination concerned | Cancellation of that particular paper. |
| 2 | Copied from materials in his/her possession | Cancellation of all papers of that semester |
| 3 | Copied from neighbours | Cancellation of all papers including arrear papers of that semester<br>Cancellation of that particular paper of the candidate who helped for copying |
| 4 | Copied by exchanging answer script between neighbours | Cancellation of all papers of the candidates who exchanged their answer scripts |
| 5 | Misbehaviour in the examination hall | Cancellation of that particular paper |
| 6 | Copying and Misbehaviour in the examination hall | Cancellation of all papers of that semester and debarring the candidate from appearing for the next semester examination. |
| 7 | Insertion of answer sheets which were previously stolen and written | Cancellation of all papers of that semester and debarring the candidate from appearing for the next semester examination. |
| 8 | Impersonation in the examination | Cancellation of all papers of that semester and recommending dismissal from the college. |