

**DEPARTMENT OF PHYSICS**  
**U.G. PROGRAMME**

**SYLLABUS**

**2016 – 2019 BATCH**

**VI SEMESTER**



**A. D. M. COLLEGE FOR WOMEN**  
**NAGAPATTINAM**

**SEMESTER VI**  
**CORE COURSE – XI**  
**NUCLEAR PHYSICS**

**Internal: 25**

**External : 75**

**Instruction Hours: 6**

**Exam Hours: 3**

**Credit: 6**

**Objective:**

To emphasize the understanding of nuclear forces and models, elementary particles and Accelerators.

**UNIT I General Properties of Nuclei and Nuclear Models** **18hrs**

Constituents of nuclei-Classification of nuclei - Nuclear mass and binding energy - Binding energy and stability of nucleus, Mass defect and Packing fraction, Binding fraction Vs Mass number curve - Nuclear size - Nuclear spin-nuclear energy levels - Nuclear magnetic moment --Parity of nuclei - Nuclear forces.

Nuclear Models - Liquid drop model, Semi-empirical mass formula - Shell model- Salient features of shell model.

**UNIT II Radioactivity** **18hrs**

Radioactive decay law-Half life and Average life - Activity or strength of a radio – sample - Successive transformation - Radioactive chain- Radioactive equilibrium - Radioactive dating -  $\alpha$ - decay - Geiger-Nuttall law - Tunnel effect - Gamow's theory of  $\alpha$  decay -  $\beta$ -decay - - Neutrino hypothesis - Properties of neutrino - Gamma rays-origin of the gamma rays - Internal conversion.

**UNIT III Particle Accelerators and Detectors** **18hrs**

Linear accelerator – Cyclotron – Betatron - Electron synchrotron - Accelerators in India.

Radiation Detectors - Ionisation Chamber - Proportional counter – G.M. Counter-Cloud chamber - Scintillation counter - Solid state track detector – Semiconductor detector.

**UNIT IV Nuclear Reactions and Nuclear Reactors** **18hrs**

Nuclear reactions - Types of nuclear reactions – Conservation laws in nuclear reactions -Energetic of nuclear reactions - Kinematics of nuclear reactions -Threshold energy of nuclear reactions - Solution of the Q- value equation - Cross-section of nuclear reactions.

Nuclear fission - fission of light nuclei - Prompt and delayed neutrons - Neutron speed , classifications - Nuclear chain reaction - Nuclear reactor - Types of reactor -Fission bomb - Nuclear power in India- Fusion-Thermonuclear reaction - Hydrogen bomb -Possibility of fusion reactor.

## **UNIT V Elementary Particles**

**18hrs**

Classification of elementary particles – Pions and Muons - K-mesons – Hyperons- Conservation laws - Exact laws - Approximate conservative laws- Fundamental interactions – Antiparticles -Resonance particles – Hyper-nucleus - Symmetry classification of elementary particles - Quark model.

### **Books for Study:**

1. M L Pandya& R. P .S .Yadav, *Elements of Nuclear Physics*,Kedar Nath & Ram Nath ,2000.
2. S. N. Ghoshal,*Nuclear Physics* , S. Chand & Co., Edition ,2003. –unit-(IV,III)

### **Books for Reference:**

- 1.K.Ilangovan, *Nuclear Physics,Unit-(I,II,V)*.
1. SatyaPrakash, *Nuclear Physics*, A Pragati Prakasan Publication, 2011.
2. Jahan Singh, *Fundamentals of Nuclear Physics*, A Pragati Publication, 2012.
3. D.C.Tayal, *Nuclear Physics*, Himalaya Publishing House, 2009.

**SEMESTER VI**  
**CORE COURSE XII -**  
**CLASSICAL AND QUANTUM PHYSICS**

**Internal: 25**

**Instruction Hours: 6**

**External : 75**

**Exam Hours: 3**

**Credit: 6**

**Objective:**

To know the facts and develop a unified and logical treatment of the subject matter with clarity and conciseness.

**UNIT I Fundamental Principles and Lagrangian Formulation 18hrs**

Mechanics of a particle and system of particles – Conservation laws – Constraints – Generalized coordinates – Principle of virtual work-D’ Alembert’s principle and Lagrange’s equation – Hamilton’s principle –Lagrange’s equation of motion .

**UNIT II Hamilton’s Formulation 18hrs**

Hamilton’s canonical equations of motion – Hamilton’s equations from variational principle –Principle of least action – Phase space – Generalized momentum – Cyclic coordinates –Conservation theorem for generalized momentum – Conservation theorem for energy

**UNIT III Dual Nature of Matter 18hrs**

De Broglie concept of matter waves – De Broglie wavelength – Wave velocity and group velocity for the De Broglie waves – Experimental study of matter waves – Davison and Germer experiment – G.P. Thomon’s experiment for verifying De Broglie relation – Heisenberg’s uncertainty Principle – Electron microscope – Gamma ray microscope.

**UNIT IV Basics of Quantum Mechanics 18hrs**

Basic postulates of wave Mechanics – Development of Schrödinger wave equation – Time independent and dependent forms of equations –Interpretation And Condition On wave function – Orthogonal and normalized wave function Eigen function and eigen values – Expectation values and Ehrenfest’s theorem.

**UNIT V Exactly Solvable Quantum Systems 18hrs**

Linear harmonic oscillator – Particle in a box –Rectangular barrier potential –Rigid rotator – Hydrogen atom.

**Books for study:**

1. S.L.Gupta., V. Kumar and H.V.Sharma, Pragathi Prakasan, *Classical Mechanics* Educational Publisher, Meerut, 25th edition, 2011. UNIT-(I,II)
2. Murughesan, R., *Modern Physics*, S.Chand & Co., New Delhi, 2006.UNIT(III,IV,V)

**Books for Reference:**

Arthur Beiser, *Concept of Modern Physics*: McGraw Hill Ed. V (1999).

1. H.Goldstein, *Classical Mechanics*, Narosa Book distributors, New Delhi 1980.
2. N.C.Rana and P.S.Joag, *Classical Mechanics*, Tata Mc Graw Hill, New Delhi 1991.
3. P M. Mathews and K. Venkatesan, *A Text Book of Quantum Mechanics* ,Tata McGrawHill, New Delhi, 1987.

## SEMESTER VI CORE COURSE XIII - MAJOR PRACTICAL IV

**Internal: 40**  
**External : 60**

**Instruction Hours: 5**  
**Exam Hours: 3**  
**Credit: 4**

**(Any Twelve Experiments)**

**Objective:**

To provide an indepth knowledge and skill in Electronics, C- Programming and Micro Processor.

### **SECTION – A**

**(Any Eight Experiments)**

1. Koenig's method – Uniform bending.
2. Spectrometer - Grating-minimum deviation method
3. Spectrometer – Grating - dispersive power.
4. M and H - Absolute determination using deflection and vibration magnetometer.
5. Potentiometer - High range Voltmeter calibration.
6. B.G. Absolute capacity of condenser.
7. Emitter follower amplifier - Frequency response.
8. Colpitt's oscillator using transistor.
9. Astable multi-vibrator using Transistor/op.amp
10. Flip Flop

### **SECTION – B**

**MICROPROCESSOR 8085.(Any Two)**

1. 8-bit addition and 8-bit subtraction.
2. 8-bit multiplication and 8-bit division.
3. Conversion from decimal to hexadecimal system.
4. Conversion from hexadecimal to decimal system.

### **SECTION- C**

**COMPUTER PROGRAMMING IN C (Any TWO)**

1. Find the arithmetic mean.
2. Find the median.
3. Find the mode.
4. To fit a Straight line.
5. To fit a Parabola curves.
6. To calculate simple correlation coefficient.
7. To calculate Rank correlation coefficient.

**SEMESTER VI**  
**MAJOR BASED ELECTIVE II**  
**MATERIAL SCIENCE**

**Internal: 25**

**External : 75**

**Instruction Hours: 5**

**Exam Hours: 3**

**Credit: 5**

**Objectives:**

To develop knowledge in material science and to understand the relationship between properties and material characteristics.

**UNIT I Crystal Structure**

**15hrs**

Types of crystals-space lattice-basis- unit cell and lattice parameters – Bravais lattices-Lattice planes and Miller indices-inter planar spacing in a cubic lattice-cubic lattice- SC – BCC – FCC- Sodium chloride and Diamond crystal structure – Bonding of solids (Ionic , Covalent , Metallic , Hydrogen).

**UNIT II Mechanical Behavior Of Materials**

**15hrs**

Different mechanical properties of engineering materials – creep – Fracture- technological properties – factors affecting mechanical properties of material-Heat treatment-cold and hot working-types of mechanical tests- metal forming process- deformation of metals-Deformation of crystals and polycrystalline materials.

**UNIT III Super Conducting Materials**

**15hrs**

Superconductivity – Properties-Meissner's effect- London equations - types of superconductors Type I and Type II –High temperature superconductors -Josephson effects and its applications – SQUIDS - Applications of superconductor- BCS Theory( Basic Idea).

**UNIT IV Nano Materials**

**15hrs**

Types of nano materials 1D ,2D ,&3D -Properties of nanomaterials (size dependent) - synthesis of nanomaterials- Fullerenes-Application of nanomaterials – Carbon nanotubes- Fabrication and structure of carbon nano tubes - Properties of carbon nanotubes (Mechanical and Electrical) - Applications of CNT's.

**UNIT V Smart Materials**

**15hrs**

Metallic glass and its applications — Fiber reinforced metals – SAW Materials and its applications – Biomaterials – Ceramic-Nuclear engineering materials-Nanophase materials - SMART materials- Conducting polymers- Optical materials - Fiber optic materials and their applications.

**Books for study:**

1. M.Arumugam, *Material science*, Anuradha publishers, 1990.
2. Manasi karkare-nanotechnology Fundamentals and Applications, I.K International house publishing, 2011.

**Books for Reference:**

1. V. Raghavan, *Material Science and Engineering* , Printice Hall India., 2004.
2. V. Rajendran, *Material Science*, Tata McGraw Hill Ltd, New Delhi, 2001.

**SEMESTER VI**  
**MAJOR BASED ELECTIVE III**  
**COMMUNICATION PHYSICS**

**Internal: 25**  
**External : 75**

**Instruction Hours: 6**  
**Exam Hours: 3**  
**Credit: 6**

**Objective:**

To promote scientific temper among students and update the basic functioning of various communication systems.

**UNIT I Radio transmission and reception** **18hrs**

Transmitter-modulation-need for modulation- types of modulation-amplitude,frequency and phase modulation- modulation factor-sideband frequencies in AM wave-limitations of amplitude modulation - frequency modulation-block diagram of AM and FM Transmitter. Receiver- demodulation-AM & FM radio receivers-super heterodyne radio receiver.

**UNIT II Fiber Optic Communication** **18hrs**

Introduction –structure of optical fiber –total internal reflection in optical fiber – principal and propagation of light in optical fiber - acceptance angle - numerical aperture – types of optical fibers based on material – number of modes – refractive index profile - fiber optical communication system (block diagram) - fiber optic sensors – Temperature sensor – fiber optic endoscope.

**UNIT III Radar Communication** **18hrs**

Basic radar system -Radar range –Antenna scanning – Pulsed radar system - A-Scope- Plan position indicator- Tracking radar- Moving target indicator- Doppler effect-MTI Principle-CW Doppler Radar- Frequency modulator CW Radar.

**UNIT IV Satellite Communication** **18hrs**

Introduction – history of satellites – satellite communication system – satellite orbits – classification of satellites – types of satellites – basic components of satellite communication – constructional features of satellites- multiple access – communication package – antenna-power source – satellite foot points- satellite communication in India.

**UNIT V Mobile Communication** **18hrs**

GSM – mobile services- concept of cell – system architecture – radio interface – logical channels and frame hierarchy – protocols – localization and calling – Handover- facsimile (FAX) – application – VSAT (very small aperture terminals) – Modem – IPTV (internet protocol television ) – Wi-Fi - 3G ,4G (Basic ideas only).

**Books for Study:**

1. Metha V.K., *Principles of Electronics*, S. Chand & Company Ltd., 2013
2. Anokh Singh and Chopra A.K., *Principles of communication Engineering*, S. Chand & Company PVT. Ltd., 2013.
3. Mani I. P., *A text book of Engineering Physics*, Dhanam Publications, Chennai-42, 2014.

**Books for Reference:**

1. Poornima Thangam I, *Satellite communication*, Charulatha Publications, 2012.
2. Dennis Roddy and John Coolen, *Electronic Communication*, PHI, 1990.
3. William C.Y. lee, *Cellular telecommunication* (second edition), Tata Mcgraw hill, 1991.

## VI Semester

### Part – V: GENDER STUDIES

Internal Marks : 25

Instruction Hrs : 1

External Marks: 75

Credit : 1

Total Marks : 100

Exam Hrs : 3

#### Objectives

- ❖ To make boys and girls aware of each others strengths and weakness.
- ❖ To develop sensitivity towards both genders in order to lead an ethically enriched life.
- ❖ To promote attitudinal change towards a gender balanced ambience and women empowerment.

#### Unit – I

**Concepts of Gender** : Sex-Gender-Biological Determinism-Patriarchy-Feminism-Gender Discrimination-Gender Division of Labour –Gender Stereotyping-Gender Sensitivity-Gender Equity-Equality-Gender Mainstreaming-Empowerment.

#### Unit – II

**Women’s Studies Vs Gender Studies** : UGC’s Guidelines-VII to XI Plans-Gender Studies: Beijing Conference and CEDAW-Exclusiveness and Inclusiveness.

#### Unit – III

**Areas of Gender Discrimination** : Family - Sex Ratio – Literacy – Health – Governance -Religion Work Vs Employment – Market – Media – Politics – Law – Domestic Violence – Sexual Harassment – State Policies and Planning.

#### Unit – IV

**Women Development and Gender Empowerment** : Initiatives – International Women’s Decade – International women’s Year – National Policy for Empowerment of Women – women Empowerment Year 2001 – Mainstreaming Global Policies.

#### Unit – V

**Women’s Movements and Safeguarding Mechanism** : In India National / State Commission for Women (NCW) – All Women Police Station- Family Court – Domestic Violence Act – Prevention of Sexual Harassment at Work Place Supreme Court Guidelines – Maternity Benefit Act – PNDDT Act – Hindu Succession Act 2005 – Eve Teasing Prevention Act – Self Help Groups – 73<sup>rd</sup> and 74<sup>th</sup> Amendment for PRIS.



## REFERENCES

- Bhasin Kamala, Understanding Gender : Gender Basics, New Delhi: women Unlimited, 2004
- Bhasin Kamala, Exploring Masculinity: Gender Basics, New Delhi: women Unlimited, 2004
- Bhasin Kamala, What is Patriarchy?: Gender Basics, New Delhi: women Unlimited, 1993
- Pernau Margrit, Ahmad Imtiaz, Reifeld Hermut (ed.,) Family and Gender : Changing Values in Germany and India, New Delhi : Sage Publications, 2003
- Agarwal Bina, Humphries Jane and Robeyns Ingrid (ed.,) Capabilities, Freedom, and Equality: Amartya Sen's Work from a Gender Perspective, New Delhi : Oxford University Press, 2006
- Rajadurai.S.V, Geetha.V. Themes in Caste Gender And Religion, Tiruchirappalli : Bharathidasn University, 2007
- Misra Geetanjali, Chandiramani Radhika(ed.,) Sexuality, Gender and Rights: Exploring Theory and Practice in South and Southeast Asia, New Delhi: Sage Publication,2005
- Rao Anupama (ed.,) Gender & Caste : Issues in Contemporary Indian Feminism, New Delhi: Kali for Women, 2003
- Saha Chandana, Gender Equity and Gender Equality: Study of Girl Child in Rajasthan, Jaipur: Rawat Publications,2003
- Krishna Sumi,(ed.,) Livelihood and Gender: Equity in Community Resource Management, New Delhi: Sage Publication, 2004
- Paludi.A.Michele(ed.,), Praeger Guide to the Psychology of Gender, London: Praeger Publisher, 2004
- Wharton.S.Army, The Sociology of Gender: An Introducion to Theory and Research, USA: Blackwell Publilshing, 2005.
- Mohanty Manoranjan(ed.,) Class, Caste, Gender: Readings in Indian Government and Politics- 5, New Delhi: Sage Publications, 2004.
- Arya Sadhna, Women, Gender Equality and the State, New Delhi: Deep & Deep Publications, 2000
- Mishra.O.P, **Law Relating to Women & Child**, Allahbad: Central Law Agency, 2001
- Chari Leelavathi, Know Your Rights, Madras; Tamilnadu Social Welfare Board, 1987
- Bhattacharya Malini, Sexual Violence and Law Kolkata; West Bengala Commission for Women, 2002
- Sexual Harassment at the workplace – A Guide, New Delhi; Sakshi, 1999.