

**E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI – 625 014.**

*(An Autonomous Institution – Affiliated to Madurai Kamaraj University)*

Re-accredited (**3<sup>rd</sup> Cycle**) with Grade **A+** & **CGPA 3.51** by NAAC

## **DEPARTMENT OF PHYSICS**



### **CBCS SYLLABUS**

### **BACHELOR OF SCIENCE**

**PROGRAMME CODE - P**

### **COURSE STRUCTURE**

(w.e.f. 2021 – 2022 Batch onwards)



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## **CRITERION - I**

### ***1.2.2 Details of Programmes offered through Choice Based Credit System (CBCS) / Elective Course System***

**Syllabus copies with highlights of contents focusing on  
Elective Course System**



#### **To be Noted:**

| <b>HIGHLIGHTED</b>  | <b>COURSE</b>   |
|---|-----------------|
|  | <b>Elective</b> |

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**CBCS**

**DEPARTMENT OF PHYSICS-B.Sc**  
**( w.e.f. 2021-2022 onwards)**

**COURSE STRUCTURE-SEMESTER WISE**

| Sem | Part | Subject code | Title of the paper  | Teaching hrs.(Per week) | Duration of exam (hrs) | Marks allotted |     |       | Credits |
|-----|------|--------------|---|-------------------------|------------------------|----------------|-----|-------|---------|
|     |      |              |   |                         |                        | C.A            | S.E | Total |         |
| V   | III  | 21P51        | <b>Core:</b> Atomic and Nuclear Physics                       | 4                       | 3                      | 25             | 75  | 100   | 4       |
|     | III  | 21P52        | <b>Core:</b> Programming with C                               | 4                       | 3                      | 25             | 75  | 100   | 4       |
|     | III  |              | <b>Elective –I</b>  | 4                       | 3                      | 25             | 75  | 100   | 4       |
|     |      |              | <b>Core:</b> Major Physics Practical – III                    | 3                       | -                      | -              | -   | -     | -       |
|     |      |              | <b>Core:</b> Major Electronics Practical – IV                 | 3                       | -                      | -              | -   | -     | -       |
|     |      |              | Major Elective –Project                                       | 2                       | -                      | -              | -   | -     | -       |
|     |      | 21AKP5       | <b>Allied II:</b> Inorganic, Physical and Medicinal Chemistry | 4                       | 3                      | 25             | 75  | 100   | 4       |
|     |      |              | <b>Allied II :</b> Practical II-Volumetric Analysis           | 2                       | -                      | -              | -   | -     | -       |
|     | IV   | 21SEP51      | <b>SBE:</b> Fibre optic communication                         | 2                       | 3                      | 25             | 75  | 100   | 2       |
|     |      | 214EV5       | Environmental studies   | 2                       | 3                      | 25             | 75  | 100   | 2       |
| VI  | III  | 21P61        | <b>Core:</b> Solid State Physics                              | 4                       | 3                      | 25             | 75  | 100   | 4       |
|     | III  | 21P62        | <b>Core:</b> Spectroscopy                                     | 4                       | 3                      | 25             | 75  | 100   | 4       |
|     | III  |              | <b>Elective –II</b>   | 4                       | 3                      | 25             | 75  | 100   | 4       |
|     |      | 21P61P       | <b>Core:</b> Major Physics Practical – III                    | 3                       | 3                      | 40             | 60  | 100   | 5       |
|     |      | 21P62P       | <b>Core:</b> Major Electronics Practical – IV                 | 3                       | 3                      | 40             | 60  | 100   | 5       |
|     |      |              | <b>Elective-III Project</b>                                   | 2                       | 3                      | 20             | 80  | 100   | 3       |
|     |      | 21AKP6       | <b>Allied II:</b> Analytical and Inorganic Chemistry          | 4                       | 3                      | 25             | 75  | 100   | 4       |
|     |      | 21AKP6P      | <b>Allied II:</b> Practical II-Volumetric Analysis            | 2                       | 3                      | 40             | 60  | 100   | 1       |
|     | IV   | 21SEP61      | <b>SBE:</b> Introduction to Microcontrollers 8051             | 2                       | 3                      | 25             | 75  | 100   | 2       |

|  |   |                           |  |   |   |    |    |     |   |
|--|---|---------------------------|--|---|---|----|----|-----|---|
|  |   | <b>214VE6</b>             | Value education                            | 2 | 3 | 25 | 75 | 100 | 2 |
|  | V | <b>215NS4/<br/>215PE4</b> | Extension Activities<br>NSS/Phy. Education | - | 3 | 25 | 75 | 100 | 1 |

**Electives**

Semester V (Elective I- Choose any one)

- |                      |         |
|----------------------|---------|
| 1. Electronics       | -21PE5A |
| 2. Numerical methods | -21PE5B |

Semester VI (Elective II- Choose any one)

- |   |          |
|---|----------|
| 1. Theoretical Physics                                    | -21PE6A  |
| 2. Applications of Electronic Devices and Instrumentation | -21PE6B  |
| Elective-III Project                                      | - 21PPR6 |

**Allied – Physics for Chemistry students  
CBCS**

| Class         | Sem | Sub Code      | Title of the paper                   | Teaching hrs(Per week) | Duration Of exam (hrs) | Marks allotted |     |       |         |
|---------------|-----|---------------|--------------------------------------|------------------------|------------------------|----------------|-----|-------|---------|
|               |     |               |                                      |                        |                        | C. A           | S.E | Total | Credits |
| III Chemistry | V   | <b>21AP3</b>  | Electricity and Electronics          | 4                      | 3                      | 25             | 75  | 100   | 4       |
|               |     |               | <b>Allied : Physics Practical-II</b> | 2                      | -                      | -              | -   | -     | -       |
| III Chemistry | VI  | <b>21AP4</b>  | Optics                               | 4                      | 3                      | 25             | 75  | 100   | 4       |
|               |     | <b>21AP4P</b> | <b>Allied : Physics Practical-II</b> | 2                      | 3                      | 40             | 60  | 100   | 1       |

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To introduce the fundamentals of

1. The various rectifiers and filters built of diodes and fundamentals of transistors
2. Operation of power Amps and Op Amps, Types of FETs and Oscillators
3. Sequential circuits their action and Converters

**Unit: I Diode Circuits and Transistor fundamentals**

The Half Wave Rectifier-The Full Wave Rectifier-The Bridge Rectifier-The Choke Input Filter-The Capacitor Input Filter-Clipppers and Limiters-Clampers-The Zener Diode-The Loaded Zener Regulator.

**Unit: II Power Amplifiers and FETs**

Darlington connections- Amplifier terms-Two load lines-Class A operation-Class B operation -FETs Basic ideas-Drain curves-The Transconductance curve-Biasing in the Ohmic region-Biasing in the active region- Transconductance-The Depletion mode MOSFET.

**Unit: III Operational Amplifiers and Oscillators**

Introduction to Op Amps-The 741 Op Amp-The Inverting Amplifier-The Non Inverting Amplifiers-Theory of Sinusoidal Oscillation-The Wein's bridge Oscillator-The Colpitt's Oscillator-The 555 timer-Astable operation of the 555 Timer.

**Unit: IV Digital Sequential Circuits**

Introduction-RS flip flops-Gated flip flop- D flip flop -JK flip flop-JK master slave flip flop -Types of Shift registers-Serial in Serial out-Serial in Parallel out.

**Unit: V Counters and converters**

Asynchronous counters-Synchronous counters-Decade counter-Variable resistor networks-Binary ladders-D/A converters-A/D converters.

**Text Books:**

1. Malvino .A.P, *Electronic Principles*, Tata Mc Graw Hill, New Delhi, Seventh Edition, 2002.

[UNITS: I, II, III]

2. Donald Mavino .A ,Leach .P, Saha Gautam, *Digital Principles and applications*, Tata Mc Graw hill, New Delhi, Sixth Edition, 2002. [UNITS: IV, V]

**Unit: I**            **Chapters**        **4.1,4.3-4.6, 4.10, 4.11, 5.1, 5.2**

**Unit: II**           **Chapters**        **11.4,-12.1-12.4, 13.1-13.6, 14.1**

**Unit: III**          **Chapters**        **18.1-18.4, 23.1, 23.2, 23.4, 23.7, 23.8**

**Unit: IV**          **Chapters**        **8.1, 8.2, 8.4, 8.5, 8.8, 9.1-9.3**

**Unit: V**           **Chapters**        **10.1, 10.3, 10.5, 12.1-12.4,12.6**

**Reference books:**

1. Chetan .D Pariksh, Christos Halkias, Jacob Millman, Millmans, *Integrated Electronics- Analog and digital Circuits and Systems*, Tata Mc Graw hill, New Delhi, Second Edition, 2012.

2. Ghosh .B, *Fundamental Principles of Electronics*, Arunabha Sen Books and Allied (p) Ltd, Kolkata, Second Edition, 2011.

3. Jose Robin .G, Ubaldraj .A, *Analog electronics and Digital Electronics*, Indira Publications, Marthandam, First Edition, 2008.

4. Rohit Mehtha, V.K. Mehtha, *Principles of electronics*, S. Chand And company Ltd, New Delhi, Eleventh Edition,2012

5. Santhiram Kal, *Basic Electronics, Devices circuits and IT fundamentals*, PHI Learning Private Learning, New Delhi, First Edition, 2010.

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1. To introduce the fundamentals of Solving different kinds of problems occurs in computer applications using Numerical Methods.
2. To study the various numerical methods to solve the Mathematical equations.
3. To know the basic concepts differentiation and integration.
4. To obtain the knowledge about differential equations.

**Unit- I****Theory of Equations and Root of Equations**

Introduction –Formation of Equations – Relation between Roots and Coefficients– Errors in numerical computation method - Order of convergence - Iterative method -Successive approximation method - Bisection method – Method of false position.

**Unit- II****Simultaneous equations**

Newton Raphson method - Gauss elimination method – Gauss Jordan method – Gauss Seidel Iteration method (problems only).

**Unit- III****Interpolation**

Newton's interpolation formulae – Central difference interpolation formula (problems only) – Lagrange's interpolation.



**Unit- IV****Numerical Differentiation and Integration:**

Newton's forward and backward difference formulae – Numerical integration – Trapezoidal rule – Simpson's 1/3 rule (problems only).

**Unit- V****Differential equations**

Numerical solution of ordinary differential equations – Taylor's series method- Euler's method – Runge kutta method ( $2^{\text{nd}}$  &  $4^{\text{th}}$  order) (problems only).

Text Book:

1. Arumugam .S, Thangapandi Issaac .A, Somasundaram .A, *Numerical methods*, Scitech Publications (India) PVT Ltd, Chennai, 2002.

|                  |                 |                               |
|------------------|-----------------|-------------------------------|
| <b>Unit: I</b>   | <b>Chapters</b> | <b>1.1-1.3, 3.1, 3.2, 3.4</b> |
| <b>Unit: II</b>  | <b>Chapters</b> | <b>4.3, 4.4, 4.8</b>          |
| <b>Unit: III</b> | <b>Chapters</b> | <b>7.1-7.3</b>                |
| <b>Unit: IV</b>  | <b>Chapters</b> | <b>8.1-8.2, 8.5</b>           |
| <b>Unit: V</b>   | <b>Chapters</b> | <b>10.1-10.4</b>              |

**Reference Books:**

1. Kandasamy P, Thilagavathy K Gunarathy K, *Numerical Methods*, S.Chand and Company Ltd, New Delhi, Third Edition. 2003.
2. Dr.Vedamurthy V.N, Dr.Iyengar.N.Ch.S.N , *Numerical Methods*, Vikas Publishing House PVT Ltd, Chennai 2008.
3. Rao V. Dukkipati, *Numerical Methods*, New Age International (p) Limited, Publishers, New Delhi, First Edition, 2010.
3. Sastry .S.S, *Introductory Methods of Numerical Analysis*, Prentice Hall Of India Private Ltd, New Delhi, 2008.
4. Singaravelan, *Numerical Methods*, Meenakshi Agency, Channai, Sixth Edition, 2008.

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To familiarize the students with

1. The Principles of Fibre Optic communication
2. Various systems and components
3. Some devices and applications in the Fibre optic communication.

**Unit: I****Introduction to fibre optic communication:**

Introduction – Advantages of optical fibre communication-Types of optical fibres- Numerical Aperture of optical fibre- Fibre bundles and cables- Fibre strength- Fibre optical properties.

**Unit: II****Fibre optical source devices:**

Types of optical sources- operation principle in LED and Laser- External Quantum Efficiency of LED- LED modulation Bandwidth- Coupling of LEDs with fibre – Edge Emitting LEDs.

**Unit: III****Fibre optical communication components:**

Introduction- Coupling components for optical Fibres- Modulation methods and modulators- switches- Transmitters- receivers- Optical amplifiers.

**Unit: IV****Fibre optical communication systems:**

Elementary fibre optic communication systems- Wavelength division multiplexing- optical Time Division multiplexing- Data buses.

**Unit : V****Fibre optical networks:**

Local Area network system- FDDI- SONET and SDH Networks- ISDN,BISDN and High speed Networks- Microwave technology Applications of Light wave systems.

**Text Book:**

1. D.C.Agarwal, *Fibre Optic Communication* , S.Chand & Company Pvt. Ltd , New Delhi, Fifth edition, 2002.

|                  |                |                           |
|------------------|----------------|---------------------------|
| <b>Unit: I</b>   | <b>Chapter</b> | <b>1.1,1.2, 1.4 to1.8</b> |
| <b>Unit: II</b>  | <b>Chapter</b> | <b>2.1 to 2.6</b>         |
| <b>Unit: III</b> | <b>Chapter</b> | <b>5.1 to 5.6, 5.10</b>   |
| <b>Unit: IV</b>  | <b>Chapter</b> | <b>1.3, 6.6 to 6.8</b>    |
| <b>Unit: V</b>   | <b>Chapter</b> | <b>6.9 to6.12, 6.14</b>   |

**Reference Books:**

1. Anuradha D , *Optical Fibre And Laser*, New Age International (p) Ltd, New Delhi, Second Edition, 2009.
2. Govind Agrawal .P, *Fibre Optic Communication Systems* ,Wiley India (p) Ltd ,New Delhi, Third Edition, 2007.
3. MukundaRao .M, *Optical communication*, Universities Press (India) Pvt Ltd, Hyderabad, First Edition, 2000.
4. Sarkar C.K, sarkar D.K , *Optoelectronics And Fibre Optics Communication*, New Age International (p) Ltd , New Delhi, First Edition 2001.
5. Subir Kumar Sarkar, *Optical Fibre and Fibre Optic Communication System*, S. Chand & Company Ltd , New Delhi, First Edition , 1997 .

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To familiarize the students with

1. Basic concept of quantum idea.
2. Dual nature of microscopic particles.
3. Theory of relativity and its consequences.

**Unit-I Classical Mechanics**

Conservative Forces-Conservation theorem for energy of a particle-Mechanics of a system of particles-Degrees of Freedom – Constraints- Types of Constraints -Generalized co-ordinates- Transformation Equations - D'Alembert's Principles-Lagrangian Functions-Lagrange's Equation of Motion - Derivation of Lagrange's Equation of Motion -Application of Lagrange's Equation- Simple Pendulum – Compound Pendulum - The Atwood's Machine - The Hamiltonian Function H -Hamiltonian equation with derivation.

**Unit-II Statistical Mechanics**

Microscopic and Macroscopic descriptions-Ensembles- Phase space-Micro and Macro states- Thermodynamic probability- Boltzmann's theorem on entropy and probability –Derive the Boltzmann relation connecting entropy and Probability-Fundamental postulates of statistical mechanics-Maxwell-Boltzmann distribution law-Application of Maxwell-Boltzmann distribution law to an ideal gas-Maxwell-Boltzmann velocity distribution law.

**Unit-III Quantum Statistics of particles**

Introduction-Quantum statistics of identical particles - Bose-Einstein distribution law-Application of B.E Statistics- Planck's law of radiation-deduction-Wien's and Rayleigh-Jean's

law-Fermi Dirac Distribution Law – Application of Fermi Dirac Statistics-Comparison of three statistics.

#### **Unit-IV Wave Mechanics**

Introduction- The De-Broglie wavelength- Davisson and Germer's Experiment- G.P.Thomson's experiment- Wave velocity of De-Broglie waves- Group velocity of De-Broglie waves- Expression for Group velocity- Relation between group velocity and wave velocity-Heisenberg's Uncertainty principle.

#### **Unit-V Relativity**

Frames of reference-Galilean transformation equation-Michelson Morley experiment- Postulates of Special theory of Relativity-Lorentz transformation equations-Derivation of the Lorentz transformation equations - Einstein's Mass- Energy Relation- Relation between the total energy, rest energy and the Momentum.

#### **Text book:**

1. R. Murugesan, *Theoretical physics*, First Edition, S.Chand & Company, New Delhi, 2004.

**Unit: I Chapters 1.1-1.8, 1.14-1.20, 1.24-1.26**

**Unit: II Chapters 2.1-2.2,2.4-2.9,2.11,2.12**

**Unit: III Chapters 2.13-2.24**

**Unit: IV Chapters 3.9, 3.10, 3.12-3.18**

**Unit: V Chapters 4.1-4.6, 4.11, 4.12**

#### **Reference Books:**

1. Beiser, Shobhit Mahajan, S.Rai Choudhury, *Concepts of Modern Physics*, Tata MC Graw Hill Education Private Limited, New Delhi, Sixth Edition, 2012.
2. Herbert Goldstein, *Classical Mechanics*, Narosa Publishing house Pvt Ltd, New Delhi, Second Edition, 2001.
3. Murray R.Spiegel, *Theory and Problems of Theoretical Mechanics*, Tata MC Graw Hill Education Private Limited, Sixth Edition, New Delhi, 2012.
4. Panat .P.V, *Thermodynamics and Statistical Mechanics*, Narosa Publishing house Pvt Ltd, New Delhi, Second Edition, 2011.
5. Thankappan .V.K, *Quantum Mechanics*, New Age International (P) Ltd, New Delhi, Second Edition, 2012.

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To expose the student to

1. Electronic Instrumentation of Various measuring instruments.
2. Working and types of various electronic meters.

**Unit-I Electronic Instruments**

Electronic instruments- Multimeter- Applications of Multimeter- Sensitivity of multimeter- Merits and Demerits of multimeter- Meter protection- Electronic Voltmeters - Vacuum tube voltmeter (VTVM)- Applications of VTVM- Merits and Demerits of VTVM- Cathode Ray Oscilloscope-Cathode Ray Tube- Deflection sensitivity of CRT- Various control of CRO- Applications of CRO.

**Unit- II Recorders**

Introduction- Strip Chart Recorder- Galvanometer Type Recorder-Circular chart Recorder- X-Y Recorder- Magnetic Recorders- Frequency Modulation (FM) recording - Digital data recording.

**Unit -III Silicon Controlled Rectifier**

Introduction -Silicon Controlled Rectifier (SCR) - Working of SCR- Equivalent circuit of SCR- Important terms- V-I characteristics of SCR- Applications of SCR- SCR as Static contactor – SCR for power control - Light activated SCR.

**Unit –IV      Power electronics**

Introduction -Power electronics- The Triac- Triac Construction- Triac Operation-Triac Characteristics-Applications of Triac- The Diac-Application of diac-Uni-junction Transistor (UJT) - Equivalent circuit of a UJT-Characteristics of UJT- Advantages of UJT- Applications of UJT – UJT relaxation oscillator.

**Unit- V      Integrated circuits**

Introduction-Integrated circuit- advantages and disadvantages of integrated circuits- IC classifications- Fabrication of components on monolithic IC- Simple monolithic IC's- IC packings-IC symbols- Scale of integration- Some circuits using ICs- OP Amp: Inverting and Non- inverting – Voltage follower – OP-Amp Integrators and Differentiators.

**Text Books:**

1. Mehta, Rohit Mehta V.K., *Principles of electronics*, 2013, S. Chand & co Limited, Ram Nagar, New Delhi, Eleventh Edition, 2008 [UNIT -I,III,IV,V]
2. Kalsi .H.S, *Electronic Instrumentation*, Tata Mc Graw-Hill Publishing Company Limited, New Delhi, Third Edition, 2003. [UNIT -II]

**Unit: I      Chapter 22.1 – 22.10, 22.13-22.15, 22.19, 22.20**

**Unit: II      Chapter 12.1 – 12.3, 12.5 – 12.9**

**Unit: III      Chapter 20.1 – 20.5, 20.12, 20.13**

**Unit: IV      Chapter 21.1-21.3, 21.5, 21.6, 21.8-21.15**

**Unit: V      Chapter 23.1, 23.2, 23.4, 23.6-23.11, 25.15, 25.24, 25.26, 25.27, 25.34**

**Reference Books:**

1. Albert D. Helfrick, William D.cooper, *Modern Electronic Instrumentation and Measurement techniques*, PHI Learning Private Limited, New Delhi, Third Edition, 2011.
2. Basudev Ghosh, *Fundamental Principles of Electronics*, Books and Allied (p) Ltd, Kolkata, Second Edition, 2011.
3. Jose Robin .G, Ubald Raj .A, *Basic Electronics and Applied Electronics*, Indira Publication, Martha dam, Sixth Edition, 2004.
4. Prithwiraj Purkait, Budhaditya Biswas, Santanu Das, Chiranjib Koley, *Electrical and Electronics Measurements and Instrumentation*, PHI Learning Private Limited, New Delhi, Third Edition, 2013.
5. Rangan C.S, Sarma G.R, Mani .VSV, *Instrumentation Devices & systems*, Tata McGraw-Hill Education, Private Limited, New Delhi, Second Edition, 2012.

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**(w.e.f. 2021-2022 onwards)**

**Elective –III Project**

**Title of the Paper : Project**

**Semester : VI**

**Contact Hours: 2**

**Subject Code : 21PPR6**

**Credits : 3**

Students have to carry out Project Works under the guidance of the members of the Physics Department during V and VI semester 2 hours per week. PROJECT Work may be chosen in any field in Physics. Each batch will complete the project work in the month of February and submit their report in March. It will be duly signed by the project guide and the HOD of Physics. It will be evaluated 80 marks for external examiner and 20 marks for internal examiner. The viva on project work will be conducted during the Practical Examination at the end of VI semester. The viva on project will be conducted jointly by Guide, External Examiner HOD and the members of staff.