**KAHM UNITY WOMEN’S COLLEGE, MANJERI**

**DEPARTMENT OF PHYSICS**

**CERTIFICATE COURSE -2022**

**SYLLABUS**

**PHYCC01 - CERTIFICATE COURSE ON “MATHEMATICAL FORMULATION OF QUANTUM MECHANICS”**

**CERTIFICATE COURSE ON “MATHEMATICAL FORMULATION OF QUANTUM MECHANICS”**

**COURSE DESCRIPTION**

**(Brief description of course stating the need and scope of the course)**

**PHYCC01:MATHEMATICAL FORMULATION OF QUANTUM MECHANICS**

Credit: 1Course Duration: 30 hrs.

**OBJECTIVES:**

1. To understand the mathematical tools that facilitated the development of quantum Mechanics.
2. To understand how the theories and methods of mathematics are used to get information from microscopic world.

**COURSE OUTCOME:**

CO1

CO2

CO3

CO4 …..

**Unit 1**:(12 hrs).

De Broglie hypothesis – Wave Function - Probability amplitude– Heisenberg uncertainty principle –- Schrodinger equation – Operators, eigen values and eigen functions – well behaved wave function – Expectation values – Postulates of Quantum Mechanics -Applications – Free particle, Particle in a box (one dimension) - Schrodinger equation in spherical polar coordinates – Hydrogen atom wave functions – Quantum Numbers.

**Unit 2:**(18 hrs).

Linear Vector Spaces - Hilbert Space; Dimension and Basis of a Vector Space; Square Integrable Functions; Wave Functions; Dirac's Bra and Ket notation; Schwarz Inequality. Operators- Adjoint of an Operator; Hermitian Operators; Unitary Operators; Commutator Algebra; Commutator of Operators and Uncertainty Relation; Functions of Operators; Eigenvalues and Eigenvectors of an Operator. Representation in Discrete Bases- Matrix Representation of Bras, Kets and Operators; Change of Bases and Unitary Transformations; Matrix Representation of the Eigenvalue Problem. Representation in Continuous Bases- Position and Momemtum Representations and relation between them.

**REFERENCES:**

1. **Modern Physics, 2nd Edn. – Kenneth S. Krane – John Wiley & sons**
2. **Concepts of Modern Physics, 7th Edn. – Arthur Beiser – Tata McGraw-Hill**
3. **Quantum mechanics: Concepts & Applications by Zettilli N, Second Edition, Wile**

**\*\*STRATEGIES FOR INSTRUCTION**

**\*\*(Offline/online/ both - % of classes engaged in online & offline**

**Online platforms that can be adopted – Moodle, Google meet, google classromm,etc.**

**Lecture/Hands-on training/demonstration/workshop/visit/case studies/peer learning Flipped classroom/group discussion/book/article review…..)**

**EVALUATION & GRADING**

**SCHEME OF EVALUATION**

|  |  |  |  |
| --- | --- | --- | --- |
| **METHOD OF EVALUATION** | | | |
| **Assessment Methods** | **Criteria** | **Marks** | **Weightage** |
| Formative Assessment (FA) | Attendance | 4 | 25% |
| Assignment/Project/Activities/Reports | 6 |
| Summative Assessment (SA)\* | Test Paper | 30 | 75% |
|  | Total | 40 | 100 |

**(\*Summative Assessment – Internal/External Evaluation)**

**ATTENDANCE**

|  |  |
| --- | --- |
| **Attendance** | **Marks** |
| 90-100% | 4 |
| 85-89.9% | 3 |
| 80-84.9% | 2 |
| 75-79.9 | 1 |
| <75% | 0 |

**GRADING POLICY**

|  |  |
| --- | --- |
| **Grade** | **Percentage of total marks (FA+SA)** |
| A | 80% & above |
| B | 60-79.9% |
| C | 50-59.9% |
| D | 40-49.9% |
| **Not qualified** | **<40%** |