

# Study & Evaluation Scheme of

## Bachelor of Science (Hons) (Specialization in Physics/Chemistry/Mathematics) [Applicable for 2022-25]

Version 2022

[As per CBCS guidelines given by UGC]

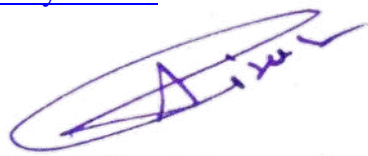


| Approved in BOS | Approved in BOF | Approved in Academic Council     |
|-----------------|-----------------|----------------------------------|
| 28-07-2022      | 20-08-2022      | 14-11-2022<br>Vide Agenda No.6.4 |

Quantum University, Roorkee

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Website: [www.quantumuniversity.edu.in](http://www.quantumuniversity.edu.in)



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## THIRD YEAR

## SEMESTER V

| Course Code | Category | COURSE TITLE          | L | T | P | C | Version | Course Prerequisite |
|-------------|----------|-----------------------|---|---|---|---|---------|---------------------|
| VP3501      | VAP      | Value Added Program V | 0 | 0 | 2 | 2 |         |                     |
| GP3501      | GP       | General Proficiency   | 0 | 0 | 0 | 1 |         |                     |
|             |          | <b>TOTAL</b>          | 0 | 0 | 2 | 3 |         |                     |

Contact Hours: 2 Hrs

## Specialization in Physics

| Course Code | Category | COURSE TITLE                 | L  | T | P | C  | Version | Course Prerequisite |
|-------------|----------|------------------------------|----|---|---|----|---------|---------------------|
| PH3502      | PC       | Solid State Physics          | 3  | 2 | 0 | 3  | 1.0     | PH3306              |
| PH3504      | PC       | Laser & Fiber Optics         | 4  | 0 | 0 | 4  | 1.0     |                     |
| PH3505      | PC       | Renewable Energy & Resources | 4  | 0 | 0 | 4  | 1.0     |                     |
| PH3541      | PC       | Solid State Physics Lab      | 0  | 0 | 2 | 1  | 1.0     | PH3207              |
|             | PE       | Program Elective I           | 4  | 0 | 0 | 4  |         |                     |
|             | PE       | Program Elective II          | 4  | 0 | 0 | 4  |         |                     |
| PH3570      | PC       | Project and Dissertation I   | 0  | 0 | 0 | 2  |         |                     |
| PH3571      | PC       | Seminar I                    | 0  | 0 | 2 | 1  |         |                     |
|             |          | <b>TOTAL</b>                 | 19 | 2 | 4 | 23 |         |                     |

Contact Hours: 25 Hrs

## List of Program Electives \*\*

\*\* A student in the 4<sup>th</sup> sem (before commencement of 1<sup>st</sup> Sessional exam of 4<sup>th</sup> sem) will opt for 8 credits of Program electives in the list of sem V. Written application to be given to the program coordinator

| Semester | Elective | S. NO. | Course Code | COURSE TITLE                         | L | T | P | C | Version | Course Prerequisite |
|----------|----------|--------|-------------|--------------------------------------|---|---|---|---|---------|---------------------|
| V        | I        | 1      | PH3511      | Digital Systems and Its Applications | 3 | 0 | 2 | 4 | 1.0     | PH3206              |
|          |          | 2      | PH3512      | Applications of Quantum Mechanics    | 4 | 0 | 0 | 4 | 1.0     | PH3409              |

|    |   |        |                              |   |   |   |   |     |        |
|----|---|--------|------------------------------|---|---|---|---|-----|--------|
| II | 1 | PH3513 | Astronomy and Astrophysics   | 3 | 2 | 0 | 4 | 1.0 | Nil    |
|    | 2 | PH3514 | Nuclear and Particle Physics | 3 | 2 | 0 | 4 | 1.0 | PH3306 |
|    |   | PH3515 | MOOC Course I                | 4 | 0 | 0 | 4 | 1.0 |        |

NOTE : The program electives may also be taken beyond the above list from the MOOC platforms as per the availability and prior approval of the Department before offering.

### Specialization in Chemistry

| Course Code | Category | COURSE TITLE               | L  | T | P | C  | Version | Course Prerequisite |
|-------------|----------|----------------------------|----|---|---|----|---------|---------------------|
| CY3501      | PC       | Organometallic Chemistry   | 3  | 1 | 0 | 4  | 1.0     | NIL                 |
| CY3502      | PC       | Heterocyclic Chemistry     | 3  | 0 | 0 | 3  | 1.0     | NIL                 |
| CY3503      | PC       | Chemical Kinetics          | 3  | 1 | 0 | 3  | 1.0     | NIL                 |
|             | PE       | Program Elective I         | 4  | 0 | 0 | 4  | 1.0     | NIL                 |
|             | PE       | Program Elective II        | 4  | 0 | 0 | 4  | 1.0     | NIL                 |
| CY3540      | PC       | Inorganic Chemistry Lab    | 0  | 0 | 2 | 1  | 1.0     | NIL                 |
| CY3541      | PC       | Heterocyclic Chemistry Lab | 0  | 0 | 2 | 1  | 1.0     | NIL                 |
| CY3570      | PC       | Project & Dissertation I   | 0  | 0 | 0 | 2  | 1.0     | NIL                 |
| CY3571      | PC       | Seminar I                  | 0  | 0 | 2 | 1  | 1.0     | NIL                 |
|             |          | TOTAL                      | 17 | 2 | 6 | 23 |         |                     |

Contact Hours: 25 Hrs

### List of Program Electives \*\*

\*\* A student in the 4<sup>th</sup>sem (before commencement of 1<sup>st</sup> Sessional exam of 4<sup>th</sup>sem) will opt for 8 credits of Program electives in the list of sem V. Written application to be given to the program coordinator

| SEM | Elective | S.NO | Course Code | COURSE TITLE    | L | T | P | C | Version | Course Prerequisite |
|-----|----------|------|-------------|-----------------|---|---|---|---|---------|---------------------|
|     |          | 1    | CY3511      | Green Chemistry | 4 | 0 | 0 | 4 | 1.0     | NIL                 |



  
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|     |    |   |        |                                   |   |   |   |   |     |     |
|-----|----|---|--------|-----------------------------------|---|---|---|---|-----|-----|
| Vth | I  | 2 | CY3517 | Environmental Chemistry           | 4 | 0 | 0 | 4 | 1.0 | NIL |
|     | II | 1 | CY3513 | Industrial Chemical & Environment | 4 | 0 | 0 | 4 | 1.0 | NIL |
|     |    | 2 | CY3514 | MOOC I                            | 4 | 0 | 0 | 4 | 1.0 | NIL |

NOTE : The program electives may also be taken beyond the above list from the MOOC platforms as per the availability and prior approval of the Department before offering.

### Specialization in Mathematics

| Course Code | Category | COURSE TITLE                | L  | T | P | C  | Version | Course Prerequisite |
|-------------|----------|-----------------------------|----|---|---|----|---------|---------------------|
| MA3501      | PC       | Linear Algebra              | 3  | 2 | 0 | 4  | 1.0     | MA3407              |
| MA3504      | PC       | Differential Geometry       | 3  | 2 | 0 | 4  | 1.0     | Nil                 |
| MA3505      | PC       | Operation Research          | 3  | 2 | 0 | 4  | 1.0     | Nil                 |
|             | PE       | Program Elective-I          | 4  | 0 | 0 | 4  | 1.0     | Nil                 |
|             | PE       | Program Elective-II         | 4  | 0 | 0 | 4  | 1.0     | Nil                 |
| MA3570      | P        | Project and Dissertation -I | 0  | 0 | 0 | 2  |         |                     |
| MA3571      | PC       | Seminar I                   | 0  | 0 | 2 | 1  | 1.0     | Nil                 |
|             | TOTAL    |                             | 17 | 6 | 2 | 23 |         |                     |

Contact Hrs: 25

### List of Program Electives \*\*

\*\* A student in the 4<sup>th</sup>sem (before commencement of 1<sup>st</sup> Sessional exam of 4<sup>th</sup>sem) will opt for 8 credits of Program electives in the list of sem V. Written application to be given to the program coordinator

|     | Course Code | Category | Elective | COURSE TITLE                      | L | T | P | C | Version | Course Prerequisite |
|-----|-------------|----------|----------|-----------------------------------|---|---|---|---|---------|---------------------|
| Vth | MA3511      | PE       | I        | Discrete Mathematics              | 4 | 0 | 0 | 4 | 1.0     | Nil                 |
|     | MA3515      | PE       | I        | Laplace & Fourier Transform       | 4 | 0 | 0 | 4 | 1.0     | Nil                 |
|     | MA3514      | PE       | II       | Scientific Computing Using Matlab | 4 | 0 | 0 | 4 | 1.0     | MA3207              |

|  |        |    |    |                     |   |   |   |   |     |     |
|--|--------|----|----|---------------------|---|---|---|---|-----|-----|
|  | MA3516 | PE | II | Static and Dynamics | 4 | 0 | 0 | 4 | 1.0 | Nil |
|  | MA3517 | PE | II | MOOC I              | 4 | 0 | 0 | 4 | 1.0 |     |

NOTE : The program electives may also be taken beyond the above list from the MOOC platforms as per the availability and prior approval of the Department before offering.

## SEMESTER VI

### Specialization in Physics

| Course Code | Category | COURSE TITLE                | L  | T | P | C  | Version | Course Prerequisite |
|-------------|----------|-----------------------------|----|---|---|----|---------|---------------------|
| PH3601      | PC       | Mathematical Physics II     | 3  | 1 | 0 | 3  | 1.0     | PH3307              |
| PH3602      | PC       | Statistical Mechanics       | 3  | 1 | 0 | 3  | 1.0     | PH3407              |
| PH3640      | PC       | Mathematical Physics II Lab | 0  | 0 | 2 | 1  | 1.0     |                     |
| PH3641      | PC       | Statistical Mechanics Lab   | 0  | 0 | 2 | 1  | 1.0     |                     |
|             | PE       | Program Elective III        | 4  | 0 | 0 | 4  |         |                     |
|             | PE       | Program Elective IV         | 4  | 0 | 0 | 4  |         |                     |
| PH3670      | PC       | Project and Dissertation II | 0  | 0 | 0 | 5  |         |                     |
| PH3671      | PC       | Seminar I                   | 0  | 0 | 2 | 2  |         |                     |
|             |          | <b>TOTAL</b>                | 14 | 2 | 6 | 23 |         |                     |

Contact Hours: 22 Hrs




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## List of Program Electives \*\*

\*\* A student in the 4<sup>th</sup>sem (before commencement of 1<sup>st</sup> Sessional exam of 4<sup>th</sup>sem) will opt for 8 credits of Program electives in sem V and 8 credits of PE in sem VI. Written application to be given to the program coordinator

| Semester | Elective | S. NO. | Course Code | COURSE TITLE                        | L | T | P | C | Version | Course Prerequisite |
|----------|----------|--------|-------------|-------------------------------------|---|---|---|---|---------|---------------------|
| VI       | III      | 1      | PH3611      | Analog Systems and its Applications | 4 | 0 | 0 | 4 | 1.0     | Nil                 |
|          |          | 2      | PH3616      | Medical Physics                     | 4 | 0 | 0 | 4 | 1.0     | Nil                 |
|          | IV       | 1      | PH3617      | Space Physics                       | 4 | 0 | 0 | 4 | 1.0     | Nil                 |
|          |          | 2      | PH3618      | Biological Physics                  | 4 | 0 | 0 | 4 | 1.0     | Nil                 |
|          |          |        | PH3619      | MOOC Course II                      |   |   |   |   | 1.0     |                     |

NOTE : The program electives may also be taken beyond the above list from the MOOC platforms as per the availability and prior approval of the Department before offering.

## Specialization in Chemistry

| Course Code | Category | COURSE TITLE                              | L  | T | P | C  | Version | Course Prerequisite |
|-------------|----------|---|----|---|---|----|---------|---------------------|
| CY3602      | PC       | Instrumental Methods of Chemical Analysis | 3  | 1 | 0 | 4  | 1.0     |                     |
| CY3603      | PC       | Thermo Chemistry And Chemical Equilibrium | 3  | 1 | 0 | 4  | 1.0     | NIL                 |
|             | PE       | Program Elective III                      | 4  | 0 | 0 | 4  | 1.0     | NIL                 |
|             | PE       | Program Elective IV                       | 4  | 0 | 0 | 4  | 1.0     | NIL                 |
| CY3671      | PC       | Seminar II                                | 0  | 0 | 2 | 2  | 1.0     | NIL                 |
| CY3670      | PC       | Project & Dissertation II                 | 0  | 0 | 0 | 5  | 1.0     | NIL                 |
|             |          | <b>TOTAL</b>                              | 14 | 2 | 2 | 23 |         |                     |

Contact Hours: 18Hrs

## List of Program Electives \*\*

\*\* A student in the 4<sup>th</sup>sem (before commencement of 1<sup>st</sup> Sessional exam of 4<sup>th</sup>sem) will opt for 8 credits of Program electives in sem V and 8 credits of PE in sem VI. Written application to be given to the program coordinator

\*\*\*MOOC course needs prior approval of the Department Coordinator

| SEM  | Elective | S.NO | Course Code | COURSE TITLE                       | L | T | P | C | Version | Course Prerequisite |
|------|----------|------|-------------|------------------------------------|---|---|---|---|---------|---------------------|
| VIth | III      | 1    | CY3611      | Molecules of Life                  | 4 | 0 | 0 | 4 | 1.0     | NIL                 |
|      |          | 2    | CY3612      | Biochemistry                       | 4 | 0 | 0 | 4 | 1.0     | NIL                 |
|      | IV       | 1    | CY3613      | Research Methodology For Chemistry | 4 | 0 | 0 | 4 | 1.0     | NIL                 |
|      |          | 2    | CY3614      | MOOC II                            | 4 | 0 | 0 | 4 | 1.0     | NIL                 |

NOTE : The program electives may also be taken beyond the above list from the MOOC platforms as per the availability and prior approval of the Department before offering.

### Specialization in Mathematics

| Course Code | Category     | COURSE TITLE                   | L         | T        | P        | C         | Version | Course Prerequisite |
|-------------|--------------|--------------------------------|-----------|----------|----------|-----------|---------|---------------------|
| MA3601      | PC           | Partial Differential Equations | 4         | 2        | 0        | 4         | 1.0     | MA3207,MA3107       |
| MA3604      | PC           | Theory of Complex Analysis     | 3         | 2        | 0        | 4         | 1.0     | MA3306              |
|             | PE           | Program Elective-III           | 4         | 0        | 0        | 4         | 1.0     | Nil                 |
|             | PE           | Program Elective-IV            | 4         | 0        | 0        | 4         | 1.0     | Nil                 |
| MA3670      | PC           | Project and Dissertation -II   | 0         | 0        | 0        | 5         |         |                     |
| MA3671      | PC           | Seminar II                     | 0         | 0        | 0        | 2         | 1.0     | Nil                 |
|             | <b>TOTAL</b> |                                | <b>15</b> | <b>4</b> | <b>0</b> | <b>23</b> |         |                     |

Contact Hrs: 19

### List of Program Electives \*\*

\*\* A student in the 4<sup>th</sup>sem (before commencement of 1<sup>st</sup> Sessional exam of 4<sup>th</sup>sem) will opt for 8 credits of Program electives in sem V and 8 credits of PE in sem VI. Written application to be given to the program coordinator  
MOOC course needs prior approval of the Department Coordinator

| Course Code | Category | Elective | COURSE TITLE | L | T | P | C | Version | Course Prerequisite |
|-------------|----------|----------|--------------|---|---|---|---|---------|---------------------|
| MA3611      | PE       | III      | Metric Space | 4 | 0 | 0 | 4 | 1.0     | MA3306              |