



भारतीय विज्ञान शिक्षा एवं अनुसंधान संस्थान तिरुपति

INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH TIRUPATI

- creating infinite possibilities...

## Integrated PhD program

### Curriculum and Courses

The Integrated PhD curriculum has course work for the first four semesters or two years followed by research work in the remaining semesters. The course work follows a credits based semester system with two semesters in each academic year. The courses offered to Integrated PhD students are of two types, with 4 credits and 3 credits, and they can be lecture /lab(experimental/computer) courses. The ones with **4 credits** course are core courses having 40 lectures /contact hours in one semester. They are aimed at providing basic and in depth understanding of the subject. The courses with **3 credits** get 30 lectures/contact hours in one semester and they can be interdisciplinary or advanced or specialized in contents. In addition a few **Modular Courses**, are offered which are advanced courses of 2 credits, meant to impart focused training and skill development in specialized topics required for research students.

The courses offered with their codes, names and credits (in brackets)are listed below. The details of courses offered like contents, assessment pattern, and books for study and reference will be provided before the start of each semester. Students can also refer to the IPhD Guidebook for details.

#### Integrated PhD- Courses offered

##### Biology

- BIO302 - Semester Project (3)
- BIO308 - General Biology (2)
- BIO309 - Evolution and Ecology (4)
- BIO311 - Introductory Immunology (4)
- BIO313 - Evolution (4)
- BIO315 - Molecular Plant Physiology (4)
- BIO316 - Neurobiology (4)
- BIO318 - Genetics (4)
- BIO319 - Behavioural Ecology (4)
- BIO321 - Microbiology (4)
- BIO322 - Biochemistry (4)
- BIO324 - Animal Physiology (4)
- BIO325 - Cancer Biology (4)
- BIO327 - Advanced Ecology (4)
- BIO328 - Advanced Molecular Biology (4)
- BIO337 - Pandemics-Disease and Prevention (3)
- BIO339 (CHM332) - Separation Science and Techniques (3)

BIO341 - Cell Biology (3)  
BIO401 - Semester Project (5)  
BIO402 - Semester Project (18)  
BIO412 - Animal Developmental Biology (4)  
BIO413 - Big Data in Biology (4)  
BIO416 (CHM415) - Biophysical Chemistry (4)  
BIO423 - Applied Plant Biology (4)  
BIO427 - Bioinformatics Lab (4)  
BIO431 (CHM431) - Fluorescence in Biology (3)  
BIO433 - Plant Stress Biology for Sustainable Agriculture (3)  
BIO435 - Infection Biology (3)  
BIO441 - Biophysics (3)  
BIO442 - Elements of Structural Biology (4)  
BIO444 - Chemical Biology (3)  
BIO445 - Advanced Neuroscience (3)  
BIO524 - Genome Editing (2)  
BIO525 - Communicating Biology (2)

## **Chemistry**

CHM301 - Lab Rotation (3)  
CHM302 - Lab Rotation (4)  
CHM311 - Quantum Chemistry I (4)  
CHM312 - Physical Organic Chemistry (4)  
CHM313 - Main Group Chemistry (4)  
CHM315 - Forensic Science (4)  
CHM321 - Statistical Thermodynamics (4)  
CHM322 - Organic Synthesis I (4)  
CHM323 - Organometallic Chemistry (4)  
CHM325 - Chemical Kinetics and Surface Chemistry (4)  
CHM326 - Electrochemistry (4)  
CHM331 - Solid State Chemistry (3)  
CHM332 (BIO339) - Separation Science & Techniques (3)  
CHM401 - Lab Rotation (7)  
CHM402 - Lab Rotation (5)  
CHM411 - Molecular Symmetry and Spectroscopy (4)  
CHM412 - Medicinal Chemistry (4)  
CHM413 - Bio-Inorganic Chemistry (4)  
CHM414 - Transition Metal Chemistry (4)  
CHM415 (BIO416) - Biophysical Chemistry (4)  
CHM416 (PHY411) - Advanced Statistical Mechanics (4)  
CHM421 - Quantum Chemistry II (4)  
CHM422 - Organic Synthesis II (4)  
CHM423 - Chemistry of d- and f-block Elements (4)  
CHM431 (BIO431) - Fluorescence in Biology (3)  
CHM432 (PHY432) - Materials Science (3)  
CHM433 - Organic Spectroscopy (3)  
CHM441 - Inorganic Spectroscopy (3)  
CHM442 - Nano Science (3)  
CHM443 - Food Chemistry (3)  
CHM444 - Chemical Biology (3)  
CHM463 - Simulation and Modelling (3)  
CHM464 - Astrochemistry (3)  
CHM521 - NMR Spectroscopy in Structural Analyses (2)

## **Mathematics**

MTH302 - Semester Project (4)  
MTH311 - Group Theory (4)  
MTH312 - Real Analysis (4)  
MTH313 - Topology (4)  
MTH314 - Linear Algebra (4)  
MTH321 - Rings and Modules (4)  
MTH322 - Complex Analysis (4)  
MTH323 - Calculus on Manifolds (4)  
MTH324 - Measure Theory and Integration (4)  
MTH331 - Elementary Number Theory (3)  
MTH341 - Elementary Differential Geometry (3)  
MTH342 - Introduction to Classical Groups (3)  
MTH401 - Semester Project (4+4)  
MTH402 - Semester Project (4)  
MTH411 - Fields and Galois Theory (4)  
MTH412 - Functional Analysis (4)  
MTH413 - Introduction to Algebraic Topology (4)  
MTH414 - Ordinary Differential Equations (4)  
MTH415 - Representation Theory of Finite Groups (4)  
MTH421 - Commutative Algebra (4)  
MTH422 - Fourier Analysis (4)  
MTH423 - Algebraic Topology (4)  
MTH424 - Partial Differential Equations (4)  
MTH425 - Differentiable Manifolds and Lie Groups (4)  
MTH611 - Algebra I (4)  
MTH612 - Analysis I (4)  
MTH613 - Topology I (4)  
MTH621 - Algebra II (4)  
MTH622 - Analysis II (4)  
MTH623 - Topology II (4)  
MTH627\* - Differential Geometry (4)

## **Physics**

PHY302 - Semester Project (4)  
PHY311 - Classical Mechanics (4)  
PHY312 - Electrodynamics (4)  
PHY313 - Quantum Mechanics I (4)  
PHY314 - Mathematical Methods in Physics (4)  
PHY315 - Astrophysics (4)  
PHY321 - Quantum Mechanics II (4)  
PHY322 - Statistical Thermodynamics (4)  
PHY323 - Optics (4)  
PHY324 - Solid State Physics (4)  
PHY326 - Nonlinear Dynamics (4)  
PHY331 - Electronics (3)  
PHY341 - Fluid Dynamics (3)  
PHY342 - Quantum Information (3)  
PHY345 - Advanced Physics Lab II (3)  
PHY401 - Semester Project (6)  
PHY402 - Semester Project (4)  
PHY411 (CHM416) - Advanced Statistical Mechanics (4)  
PHY413 - Atomic & Molecular Physics (4)

PHY416 - Experimental Methods in Physics (4)  
PHY417 - Computational Methods in Physics (4)  
PHY421 - Nuclear & Particle Physics (4)  
PHY422 - Atomic & Molecular Physics (4)  
PHY423 - Gravitation & Cosmology (4)  
PHY424 - Advanced Condensed Matter Physics (4)  
PHY425 - Advanced Physics Lab IV (4)  
PHY432 (CHM432) - Materials Science (3)  
PHY433 - Quantum Field Theory (3)  
PHY434 (CSA434) - Data Science I (3)  
PHY439 - Complex Systems (3)  
PHY441 - Photonics (3)  
PHY442 - Nanoscience (3)  
PHY443 - Soft Matter Physics (3)  
PHY462 (CSA462) - Data Science II (3)