



भारतीय विज्ञान शिक्षा एवं अनुसंधान संस्थान तिरुपति

INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH TIRUPATI

- creating infinite possibilities...

BS-MS program

Curriculum and Courses

The BS-MS curriculum is organized around a credits based semester system with two semesters in each academic year. The emphasis is on concept based and enquiry driven education integrating teaching with research in an interdisciplinary manner .

The BS MS program offers basic courses in all Sciences for the first four semesters I-IV of the program. This is followed by advanced courses at MS level, in semesters V-VIII where students have the option to choose their courses based on their interest and inclination. In the final year, students do a research project leading to MS thesis.

The basic courses of 3 credits offered in semesters I-IV, have 3 contact hours per week, with two lectures and one tutorial session, while lab courses have one session of 3 hours per week.

ISERT follows an **open curriculum**, with students having the freedom of choosing their courses and planning their curriculum. The advanced courses 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. Courses with **3 credits** get 30 lectures/contact hours in one semester and they can be interdisciplinary or advanced or specialized in contents.

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 BS-MS Guidebook for details.

Basic Courses: Semesters I - IV

Biology

BIO110 - Basic Biology (0)

BIO111 - Foundations of Biology I: Basic Principles (3)

BIO112 - Biology Lab I: Basic Biology (3)

BIO121 - Introductory Biology II: Genetics and Molecular Biology (3)

BIO122 - Biology Lab II: Biochemistry and Molecular Biology (3)

BIO211 - Foundations of Biology III: Evolution and Ecology (3)

BIO213 - Biology for Society (3)

BIO221 - Introductory Biology IV: Biology of Systems (3)

Chemistry

CHM111 - General Chemistry (3)
CHM121 - Physical Chemistry (3)
CHM122 - Chemistry Lab I (3)
CHM211 - Inorganic Chemistry (3)
CHM212 - Chemistry Lab II (3)
CHM221 - Organic Chemistry (3)
CHM222 - Chemistry Lab III (3)

Mathematics

MTH110 - Basic Mathematics (0)
MTH111 - Discrete Mathematics (3)
MTH121 - Single Variable Calculus (3)
MTH122 - Linear Algebra and Applications (3)
MTH211 - Multivariable Calculus (3)
MTH221 - Probability and Statistics (3)
MTH222 - Basic Structures in Mathematics (3)

Physics

PHY111 - Foundations of Physics I: Mechanics (3)
PHY121 - Foundations of Physics II: Waves & Optics (3)
PHY122 - Physics Lab I (3)
PHY211 - Foundations of Physics III: Electricity and Magnetism (3)
PHY212 - Physics Lab II: Electricity, Magnetism and Optics (3)
PHY221 - Foundations of Physics IV: Quantum Physics (3)
PHY222 - Physics Lab III (3)

Humanities and Social Sciences

HSS110 - Functional English (0)
HSS122 - Critical Reading, Writing and Communication (2)
HSS221 - History of Science (2)

Inter-Disciplinary Courses

IDC111 - Mathematical Methods I (3)
CSA212 - Computational Methods (3)

Advanced Courses: Semesters V - VIII

Biology

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 & Techniques (3)
BIO341 - Cell Biology (3)
BIO410 - Semester Project (3)
BIO412 - Animal Developmental Biology (4)
BIO413 - Big Data in Biology (4)
BIO416 (CHM415) - Biophysical Chemistry (4)
BIO420 - Semester Project (3)
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 (3), (4)
BIO444 (CHM444) - Chemical Biology (3)
BIO445 - Advanced Neuroscience (3)

Chemistry

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)
CHM410 - Semester Project (3)
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)
CHM420 - Semester Project (3)
CHM421 - Quantum Chemistry II (4)
CHM422 - Organic Synthesis II (4)
CHM423 - Chemistry of d- and f-block Elements (4)
CHM432 (PHY432) - Materials Science (3)
CHM433 - Organic Spectroscopy (3)
CHM441 - Inorganic Spectroscopy (3)
CHM442 (PHY442) - Nanoscience (3)
CHM443 - Food Chemistry (3)

CHM444 (BIO444) - Chemical Biology (3)
CHM463 - Simulation and Modelling (3)
CHM464 - Astrochemistry (3)

Earth and Climate Science

ECS311 - Solid Earth Geophysics (4)
ECS321 - Introduction to Earth and Climate Science (4)
ECS410 - Semester Project (3)
ECS411 - Atmospheric Thermodynamics & Cloud Physics (4)
ECS412 - Advanced Mineral Sciences (4)
ECS420 - Semester Project (3)
ECS421 - Igneous Petrology (4)
ECS422 - Atmospheric Dynamics (4)

Mathematics

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)
MTH410 - Semester Project (3)
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)
MTH420 - Semester Project (3)
MTH421 - Commutative Algebra (4)
MTH422 - Fourier Analysis (4)
MTH423 - Algebraic Topology (4)
MTH424 - Partial Differential Equations (4)
MTH425 - Differentiable Manifolds and Lie Groups (4)

Physics

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)
PHY335 - Advanced Physics Lab I (3)
PHY341 - Fluid Dynamics (3)
PHY342 - Quantum Information (3)
PHY345 - Advanced Physics Lab II (3)
PHY410 - Semester Project (3)
PHY411 (CHM416) - Advanced Statistical Mechanics (4)
PHY413 - Atomic & Molecular Physics (4)
PHY415 - Advanced Physics Lab III (4)
PHY416 - Experimental Methods in Physics (4)
PHY417 - Computational Methods in Physics (4)
PHY420 - Semester Project (3)
PHY421 - Nuclear & Particle Physics (4)
PHY423 - Gravitation & Cosmology (4)
PHY424 - Advanced Condensed Matter Physics (4)
PHY425 - Advanced Physics Lab IV (4)
PHY433 - Quantum Field Theory (3)
PHY434 (CSA434, CHM434, ECS434) - Data Science I (3)
PHY439 (ECS439) - Complex Systems (3)
PHY441 - Photonics (3)
PHY443 - Soft Matter Physics (3)
PHY462 (CSA462, CHM462, ECS462) - Data Science II (3)