अंतर-विश्वविद्यालय त्वरक केंद्र

INTER-UNIVERSITY ACCELERATOR CENTRE

अरूणा आसफ अली मार्ग, नई दिल्ली – 110 067

Aruna Asaf Ali Marg, New Delhi-110067

वेबसाईट/website:www.iuac.res.in

पाठ्यक्रमसमय-सारणी/Course Schedule

छमाही-I:Semester-I:अगस्त–दिसंबर, 2026 /August-December 2026

एडवांस्ड क्लासिकल एण्ड क्वांटम मैकेनिक्स, एक्सपेरिमेंटल फ़िज़िक्स, एक्सेलरेटर फ़िज़िक्स/

Advanced Classical & Quantum Mechanics, Experimental Physics, Accelerator Physics

Inter-University Accelerator Centre (IUAC) conducts specialized lecture courses for Ph.D (Physics). Programme at the Centre. The programme is divided into three periods with each period having two/three course modules. Students doing Ph.D (Physics) and interested young faculty members from any University, College or Research Institute pursuing Ph.D (Physics) Degree may attend the lectures for the modules of their interest.

The minimum qualification required to attend the course work is M.Sc.(Physics). Some financial assistance towards travel and accommodation will be available for a Limited number of cases. Those who have registered for Ph.D. on or after 1st July 2024 may apply with their biodata, research interest and a recommendation letter (which is compulsory) from their Ph.D Guide/Supervisor.

The Registration will open from 25th June, 2026

For Registration, please scan the code or click the link:
https://gate.iuac.res.in/iuac_forms/index.php/web_panel/home/iuac_course_module

For any query:
E-Mail: academic@iuac.res.in/programphdteaching@gmail.com

	Period	CourseModule		Lecturer
1.	21st July–12th Sept., 2026	611A	Advanced Classical Mechanics	Dr. Sugam Kumar IUAC
		626B	Accelerators and their Applications	Dr. Ambuj Tripathi, IUAC
		617C	Vacuum Techniques	Dr. Anup Choudhury, IUAC
		617B	Signal Processing	Dr.Akhil Jhingan, IUAC
2.	14th Sept – 31st Oct, 2026	617A	Detectors & Transducers	Dr P. Sugathan, IUAC
		626A	Ion Sources	Mr. Sunil Ojha, IUAC
		617D	Data Acquisition System	Er. E.T. Subramaniam/ Ms. Mamta Jain, IUAC
3.	1st Nov- 12th Dec, 2026	611B	Advanced Quantum Mechanics	Prof. Ajit Mohan Srivastava, IOP
		626D	Cryogenics and Superconductivity	Dr. Soumen Kar, IUAC
		617E	Engineering Drawing	Er.ThomasVarughese IUAC/ Er. Rajeev Ahuja
		626C	Beam Optics and Beam Transport	Dr. N. Madhavan, IUAC

611 ADVANCEDCLASSICAL&QUANTUMMECHANICS

611A ADVANCED CLASSICAL MECHANICS: Particle motion in 1, 2 & 3 dimensions; conservation laws; non-inertial frames,Generalizedcoordinates;Lagrangianmethodsandexamples;twobodyproblem;boundstatesandscattering,Smalloscillations; Hamiltonianformalism;canonicaltransformations;Hamilton-Jacobitheory,Specialrelativityandrelativistickinematics.

611BADVANCEDQUANTUMMECHANICS: One-dimensionalSchrödingerequation;particleinasquarewellpotential;boundstates;transmission and reflection from step potentials; W.K.B. method for bound states; tunnelling, harmonic oscillator; operatormethod of solution. Two-level and other finite-dimensional Hilbert space problems. Threedimensional Schrödinger equation,angularmomentum,algebraofangularmomentum;squarewellin3dimensions;hydrogenatom.Perturbationtheory.Atomsin electricmagneticfields;spin-orbitcoupling;scatteringtheory,GeneralSymmetriesinnucleiwithspecialreferencetoisospinandparity.

617 EXPERIMENTALPHYSICS

617A DETECTORS & TRANSDUCERS: Energy loss of charged particles in matter; range & straggling, energy, position & timedetection for charged particles with solid state detectors, gas detectors - ionization chamber, multi-wire proportional counter;Interaction of radiation with matter; semi-conductor gamma detector, scintillation detectors, channel electron multipliers andmicro-channelplates.Particleidentificationtechniques&timeofflight.

617BSIGNALPROCESSING: Transmissionlines,impedancematching;Noise,filters,pre-amplifiers,amplifiers,pole-zerocancellation, Base line restoration, Pile up rejection, introduction to NIM Standards. Timing measurement, Leading edge andconstantfractiondiscriminators,coincidencemeasurements,gates,Time-amplitudeconverter, analog-digitalconversion.

617CVACUUMTECHNIQUES: Basicelementsofvacuumscience,viscousandmolecularflow,conductance, pumpingspeedetc. Displacement&containmentpumps,Designofultrahighvacuumsystem,vacuummeasurementsystem,vacuummeasurementgauges,Control&interlocksystem,Leakdetectiontechniques.

617D DATA ACQUISITION SYSTEM: Data collection using CAMAC and VME; Hardware conditions and configurations; Eventmodedatacollectionandmultidimensionalhistograms;Softwareconditions;Analysisofexperimentaldataandextractionofphysicsresults; Availableopensourcesoftware.

617EENGINEERINGDRAWING: Projections,Sectionaldrawing,Representationoffasteners,Tolerance,Welding&drawing.Practicaldemonstrationoffabricatingavacuumcomponent.

626 ACCELERATORPHYSICS

626A ION SOURCES: Production of charged particles, space charge limitation; extraction & focusing geometries, positive andnegative ion sources, radio frequency sources, penning ionization source, Duoplasmatron, sputter ion source, ECR source(roomtemperatureandsuperconducting).

626B ACCELERATORS & THEIR APPLICATIONS: Electrostatic accelerators - Cockroft-Walton, Van-de-Graaff, Principle of tandemaccelerator,Pelletronaccelerator;Pulsedacceleratorscyclotron,synchrotron;Radiofrequencylinearaccelerators;Superconducting linac, Radio frequency quadrupole; Drift tube linac; Storage rings; Future trends. Trace element analysis:various methods, RBS - measurement of elemental ratios & concentrations, channelling RBS, ERDA - depth resolution &sensitivity, high resolution sub monolayer thickness studies, Nuclear Reaction Analysis (NRA), Particle Induced Xrayemission(PIXE)studies,AcceleratorMassSpectrometry(AMS),Medicalapplicationsof accelerators.

626C BEAM OPTICS AND BEAM TRANSPORT: Motion of charged particles in electric and magnetic fields; Phase space longitudinal and transverse, and Liouville's theorem, Focusing devices: Einzel lens, solenoid magnet, quadrupole; magneticandelectricsectorfields;Matrixmethod,Aberrations,Designofabeamlineforbeamtransport Computersimulations.

626D CRYOGENICS & SUPERCONDUCTIVITY: Introduction to cryogenics and its application to accelerators, achieving lowtemperature, liquefaction ofgases;Basicthermodynamicprocesses,variousthermodynamiccycles,commercialliquifiers/refrigeration, critical components. Heat transfer at low temperature: conduction, convection, radiation processes,insulation, LN2 / LHe storage vessels, cryostat design - properties of materials at low temperature, heat load calculation;Basic superconductivity, superconducting magnet; Cryogenic instrumentation - temperature sensor, liquid helium / nitrogen level, flow sensors.