



## Centre for Advanced Studies

(A Research Driven Autonomous Government Institution)  
**Dr. A.P.J. Abdul Kalam Technical University Uttar Pradesh,**  
Formerly Uttar Pradesh Technical University  
Sec-11, Jankipuram Vistar, Lucknow, Uttar Pradesh, India  
PIN Code-226031

**Apply here for PhD application**

<https://erp.aktu.ac.in/WebPages/Public/EntranceExams/CASPHDADM/Instructions.aspx>

### **Notification for PhD Admissions open for the Academic Session 2019-20** **(Phase-II)**

The Centre for Advanced Studies is an in-campus institution of Dr. A.P.J. Abdul Kalam Technical University Uttar Pradesh, Formerly Uttar Pradesh Technical University. The centre has state of the art infrastructure, cutting edge lab facilities with high quality faculty and is a research based institution focussed in specialized areas and multi-disciplinary research.

Online applications are invited for Admission to full time PhD Programmes in for the semester beginning February 2020.

1. Computer Science and Engineering
2. Mechatronics
3. Nanotechnology

#### **Scholarship:**

All the admitted students are eligible for a monthly stipend of Rs. 40,000 per month (under DeenDayalUpadhyaya Quality Improvement Programme)\*.

\*Note: Subject to other terms & conditions as per PhD Ordinances of Centre for Advanced Studies and provisions in DDU Quality Improvement Program.

#### **Registration fee**

Please visit [www.aktu.ac.in](http://www.aktu.ac.in).

**The selection of candidates will be based on written examination followed by interview of written qualified candidates.**

#### **Eligibility Criterion**

S. No.	Course	Eligibility
1.	PhD – Computer Science & Engineering	M.Tech. in Computer Science & Engineering / Information Technology/ Electronics and Communication Engineering with First Division or equivalent CGPA

2.	PhD - Mechatronics	M.Tech. in Mechatronics/ Mechanical Engineering/ Electronics & Communication Engineering/ Manufacturing Technology/ Manufacturing and Automation/ Automation and Robotics/ Electronics Engineering/ Electrical & Electronics Engineering/ Electronics & Instrument Engineering/ Electrical Engineering/ with First Division or equivalent CGPA
3.	PhD - Nano Science & Technology	<p>*M.Tech. in Nanotechnology/ Aerospace Engineering/ Agriculture Engineering/ Biotechnology/ Computer Science and Information Technology/ Chemistry/ Electronics and Communication Engineering/ Electrical Engineering/ Instrumentation Engineering/ Metallurgical Engineering/ Petroleum Engineering/ Civil Engineering/ Physics/ Production and Industrial Engineering/ Textile Engineering and Fiber Science/ Polymer Science and Technology/ Food Technology/ Atmospheric/Oceanic Science and Technology/ Environmental Engineering/ Chemical Engineering/ Material Science/ Mechanical Engineering with First Division or equivalent CGPA.</p> <p># M.Sc. in Physics, Chemistry, Biology and Mathematics with First Division or Equivalent CGPA with valid GATE score.</p> <p><b>Note:</b> * Both B.Tech. – M.Tech. and B.Sc. – M.Sc. – M.Tech. combinations are eligible</p> <p># Pre-requisite course credit requirements will be different for M.Sc. qualified students</p>

**Note: For other details, please see PhD ordinances available on institute website.**

### **SYLLABUS for Ph.D Entrance Examination (2019-20)**

- There shall be a multiple choice objective nature test for such candidates who are seeking admission to the Ph.D. Programme of the Centre for Advanced Studies. Such candidates will have to appear in the paper for their domain knowledge test of various disciplines/subject areas.
- The syllabi for papers on respective subject domains shall be **as given below**. The paper shall be of **two-hour duration** and shall contain **100** multiple choice type questions from the subject area.

#### **1. Computer Science & Engineering**

As per GATE 2020 syllabus

#### **2. NANOTECHNOLOGY**

**General aptitude in RM (Research Methodology) and fundamentals/basics: in/of Nano Science and Nanotechnology as well as in/of the following topics.**

**Quantum Physics:** Basis of Quantum Physics, de Broglie's concept, operators, physical imperfection of wave function, normalised and orthogonal wave function, Heisenberg's uncertainty Principle.

**Solid State Physics:** Crystal structure, Bravais lattices and its basics, Miller indices, X-ray diffraction and Bragg's law, free electron theory of metals. Fermi energy and density of states, origin of energy bands, concept of holes and effective mass. Energy levels in One Dimension, Fermi-Dirac distribution, effect of Temperature on the Fermi-Dirac Distribution, free electron gas in three-dimension, crystal imperfections: Point imperfections - vacancy, substitution and interstitial impurity.

**Applied Chemistry:** Structure of solids, symmetry concepts, crystal structure. Preparative methods and characterization of inorganic solids. Crystal defects and non-stoichiometry. Interpretation of phase diagrams, phase transitions. Kinetics of phase transformations, structure property correlations in ceramics, glasses, polymers. Composites and nanomaterials. Basic concepts in biomaterials science, concept and assessment of biocompatibility of biomaterials, examples of some important metallic biomaterials, bio-ceramics and bio-composites

**Electricity and Magnetism:** Coulomb's law, Gauss's law. Electric field and potential. Electrostatic boundary conditions, conductors, capacitors, dielectrics, dielectric polarization, volume and surface charges, electrostatic energy. Biot-Savart law, Ampere's law, Faraday's law of electromagnetic induction Maxwell's equations and static and time varying equations, Poynting's theorem, Lorentz Force and motion of charged particles in electric and magnetic fields, Clausius-Mossotti relation. Fundamentals about dia-, para- and ferromagnetism, Langevin's theory of Para magnetism, Curie's law.

**Materials and their properties:** Different types of materials: Metals, Semiconductors, Composite materials, Ceramics, Alloys, Polymers. Chemical Bonding-Atomic Bonding in solids, Types of bond: Metallic, Ionic, Covalent and van der Waals bond; Hybridisation; Molecular orbital theory;

Electrochemistry fundamentals

o *Mechanical Properties:* Stress-strain response of metallic, ceramic and polymer materials, yield strength, tensile strength and modulus of elasticity, toughness, plastic deformation, fatigue, creep and fracture,

o *Electronic Properties:* Free electron theory, Fermi energy, density of states, elements of band theory, semiconductors, Hall effect, dielectric behaviour, piezo, ferro, pyroelectric materials,

o *Magnetic Properties:* Origin of magnetism in metallic and ceramic materials, paramagnetism, diamagnetism, ferro and ferrimagnetism,

o *Thermal Properties:* Specific heat, thermal conductivity and thermal expansion, thermoelectricity,

o *Optical Properties:* Refractive index, absorption and transmission of electromagnetic radiation in solids, electrooptic and magneto-optic materials, spontaneous and stimulated emission, gas and solid-state lasers

**Fabrication:** Nanoparticles Synthesis-Carbon Nanotubes, Metal nanoparticles, Q-Dots, Nanowires Thin films synthesis-Chemical Vapor Deposition, Physical Vapor Deposition, Self-Assembly, Lithography-Optical & Electron Lithography, Resists.

**Characterization:** Electron microscopes, scanning electron microscopes, transmission electron microscope, scanning probe microscopy, atomic force microscopy, scanning tunneling microscope, Spectroscopy- FTIR, UV-Vis, Raman.

**Electronics:** Intrinsic and extrinsic Semiconductors. Fermi level. p-n junctions, transistors, semiconductor; diodes; solar cell fundamentals

### 3. MECHATRONICS

**Engineering Mechanics:**Free-body diagrams and equilibrium; trusses and frames; kinematics and dynamics of particles and of rigid bodies in plane motion; impulse and momentum (linear and angular), collisions.

**Machine Design:**Design for static and dynamic loading; failure theories; fatigue strength and the principles of the design of machine elements such as bolted, riveted and welded joints; shafts, gears, rolling and sliding contact bearings, brakes and clutches, springs,Cams, gears and gear trains

**Heat-Transfer:**Modes of heat transfer; one dimensional heat conduction, resistance concept and electrical analogy, heat transfer through fins; heat transfer correlations for flow over flat plates and through pipes.

**Engineering Materials:**Structure and properties of engineering materials, phase diagrams, heat treatment, stress-strain diagrams for engineering materials.

**Joining Processes:**Principles of welding, brazing, soldering and adhesive bonding.

**Metrology and Inspection:**Limits, fits and tolerances; linear and angular measurements; comparators.

#### **Basic Electronics:**

Conductors, insulators, semi-conductors, Passive components used in Electronics, Transformers, semi-conductors, Transistors, Silicon controlled rectifiers (SCR), Integrated Circuits (IC), Digital Circuits. Diodes, Electrical Elements, Energy bands in intrinsic and extrinsic, mobility and resistivity; P-N junction, Zener diode, BJT, MOS capacitor, MOSFET, LED, photo diode and solar cell.

#### **Electrical and Mechanical Actuators:**

Drives, Spindle drives, feed drives, AC and DC motors, Stepper motors, Servo motors, Servo-principle, Drive protection, Pascal Law, Pneumatic and hydraulic actuators etc.

**Sensors and Transducers:** Potentiometer, Variable-Inductance Transducer, Variable-Capacitance Transducers, Piezoelectric Sensors, Strain Gauges, Torque sensors, Tactile sensing, Ultra sonic sensors, Thermo fluid sensors, Digital transducers.

#### **Digital Hardware and Microcontrollers:**

Number systems and codes, Microcontrollers: Architecture, microprocessor, memory,

#### **Control Systems**

Basic control system components; Feedback principle; Transfer function; Block diagram representation, stability, Fuzzy logic control, digital control.

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Admission Incharge  
Centre for Advanced Studies  
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