

| Centre For Advanced Electronics & Photovoltaic Engineering (CAEPE)                        |                                                |                                                                                                                                                                       |                                                                                                                               |                      |                           |                 |
|-------------------------------------------------------------------------------------------|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------|-----------------|
| International Islamic University Islamabad (IIUI)                                         |                                                |                                                                                                                                                                       |                                                                                                                               |                      |                           |                 |
| SERVICE MODEL: MACHINE EXPENDABLES AND CONSUMABLES SERVICE CONTRIBUTION (TESTING CHARGES) |                                                |                                                                                                                                                                       |                                                                                                                               |                      |                           |                 |
|                                                                                           | Name of Lab Incharge/Focal Person :            | Engr. Shoalb Alam                                                                                                                                                     | Position of Lab Incharge/Focal Person:                                                                                        | Laboratories Manager |                           |                 |
|                                                                                           | Email ID of Lab Incharge/Focal Person:         | <a href="mailto:aelp@iiu.edu.pk">aelp@iiu.edu.pk</a>                                                                                                                  | Phone & Cell# of Lab Incharge/Focal Person:                                                                                   | 051-9019927          |                           |                 |
|                                                                                           | Postal Address of Lab/Center:                  | CENTRE FOR ADVANCED ELECTRONICS & PHOTOVOLTAIC ENGINEERING (CAEPE)<br>GROUND FLOOR, SHARED BLOCK<br>INTERNATIONAL ISLAMIC UNIVERSITY, SECTOR H-10 ISLAMABAD, PAKISTAN |                                                                                                                               |                      |                           |                 |
| Measurement Analysis                                                                      |                                                |                                                                                                                                                                       |                                                                                                                               |                      |                           |                 |
| Electrical/Electronics/Charge Based                                                       |                                                |                                                                                                                                                                       |                                                                                                                               |                      |                           |                 |
| S.No.                                                                                     | Name of Equipment                              | Status (Operational)                                                                                                                                                  | Particulars of Tests                                                                                                          | Charges In PKR       |                           |                 |
|                                                                                           |                                                |                                                                                                                                                                       |                                                                                                                               | IIU Internal Users   | University Other Than IIU | Commercial Test |
| 1                                                                                         | NANO-CHIP Reliability Grade Hall Effect System | Operational                                                                                                                                                           | Hall effect measurement/Quick scan (At room temperature) (Mobility, Conductivity, Dopant type, Carrier concentration, Etc)    | 1600/- Per Sample    | 2000/-                    | 2500/-          |
| 2                                                                                         | NANO-CHIP Reliability Grade Hall Effect System | Operational                                                                                                                                                           | Hall effect measurement/Quick scan (At low temperature 77K) (Mobility, Conductivity, Dopant type, Carrier concentration, Etc) | 2000/- Per Sample    | 2200/-                    | 3500/-          |
| 3                                                                                         | Multi Head Probe Station/4 point probing       | Operational                                                                                                                                                           | Wafer or Circuit level Electrical Characterization (I-V, C-V, G-V, P-V measurements)                                          | 2800/- Per Sample    | 3000/-                    | 3200/-          |
| 4                                                                                         | ASMEC Electro-Physical Characterization System | Operational                                                                                                                                                           | Power/Energy Analysis                                                                                                         | 1500/- Per Sample    | 1800/-                    | 2200/-          |
| 5                                                                                         | ASMEC Electro-Physical Characterization System | Operational                                                                                                                                                           | Charge Analysis                                                                                                               | 1500/- Per Sample    | 1800/-                    | 2200/-          |
| 6                                                                                         | ASMEC Electro-Physical Characterization System | Operational                                                                                                                                                           | 2 point probing (Arrhenius Analysis/Activation Energy) (Under vacuum) (77K-500K)                                              | 3000/- Per Hour      | 3500/-                    | 4000/-          |
| 7                                                                                         | ASMEC Electro-Physical Characterization System | Operational                                                                                                                                                           | 2 point Probing (I-V Characterization) (Under vacuum) (Insitu thermal analysis 77k to 500k)                                   | 2500/- Per Hour      | 2800/-                    | 3000/-          |
| 8                                                                                         | ASMEC Electro-Physical Characterization System | Operational                                                                                                                                                           | 2 point Probing (G-V characterization) (Under Vacuum) (Insitu thermal analysis 77k to 500k)                                   | 2500/- Per Hour      | 2800/-                    | 3000/-          |
| 9                                                                                         | ASMEC Electro-Physical Characterization System | Operational                                                                                                                                                           | C-V Characterization (Pulse and line scanned) (Under Vacuum) (Insitu thermal analysis 77k to 500k)                            | 3000/- Per Hour      | 3200/-                    | 3800/-          |
| 10                                                                                        | ASMEC Electro-Physical Characterization System | Operational                                                                                                                                                           | Charge-Deep Level Transient Spectroscopy (Q-DLTS) (Under Vacuum) (Insitu thermal analysis 77k to 500k)                        | 3500/- Per Hour      | 4000/-                    | 4500/-          |
| 11                                                                                        | ASMEC Electro-Physical Characterization System | Operational                                                                                                                                                           | Photo-stimulated Internal Field Transient Spectroscopy (PIFTS) (Under Vacuum) (Insitu thermal analysis 77k to 500k)           | 3000/- Per Hour      | 3500/-                    | 4000/-          |
| 12                                                                                        | ASMEC Electro-Physical Characterization System | Operational                                                                                                                                                           | I-V Characterization (Room temperature scan)                                                                                  | 1500/- Per Sample    | 1800/-                    | 2000/-          |
| 13                                                                                        | ASMEC Electro-Physical Characterization System | Operational                                                                                                                                                           | G-V characterization (Room temperature scan)                                                                                  | 1500/- Per Sample    | 1800/-                    | 2000/-          |
| 14                                                                                        | ASMEC Electro-Physical Characterization System | Operational                                                                                                                                                           | C-V Characterization (Room temperature scan)                                                                                  | 1500/- Per Sample    | 1800/-                    | 2000/-          |
| 15                                                                                        | ASMEC Electro-Physical Characterization System | Operational                                                                                                                                                           | Charge-Deep Level Transient Spectroscopy (Q-DLTS) (Room temperature scan)                                                     | 2000/- Per Sample    | 2300/-                    | 2600/-          |
| 16                                                                                        | ASMEC Electro-Physical Characterization System | Operational                                                                                                                                                           | Photo-stimulated Internal Field Transient Spectroscopy (PIFTS) (Room temperature scan)                                        | 1800/- Per Sample    | 2000/-                    | 2200/-          |
| 17                                                                                        | Hot Chuck                                      | Operational                                                                                                                                                           | I-V Characterization (Non-Vacuum) (300k to 900k)                                                                              | 1500/- Per Hour      | 2000/-                    | 2500/-          |
| 18                                                                                        | Hot Chuck                                      | Operational                                                                                                                                                           | G-V characterization (Non-Vacuum) (300k to 900k)                                                                              | 1500/- Per Hour      | 1800/-                    | 2000/-          |
| 19                                                                                        | Hot Chuck                                      | Operational                                                                                                                                                           | C-V Characterization (Non-Vacuum) (300k to 900k)                                                                              | 1500/- Per Hour      | 2000/-                    | 2500/-          |
| 20                                                                                        | ASMEC Electro-Physical Characterization System | Operational                                                                                                                                                           | I(t) Transient behavior of Device w.r.t electric Current                                                                      | 1500/- Per Sample    | 1800/-                    | 2000/-          |
| 13                                                                                        | Femto-meter                                    | Operational                                                                                                                                                           | Extremely low current analysis for variable application                                                                       | 1500/- Per Sample    | 1800/-                    | 2000/-          |
| Process Fabrication & Deposition                                                          |                                                |                                                                                                                                                                       |                                                                                                                               |                      |                           |                 |
| S.No.                                                                                     | Name of Equipment                              | Status (Operational)                                                                                                                                                  | Particulars of Tests                                                                                                          | IIU Internal Users   | University Other Than IIU | Commercial Test |
| 14                                                                                        | Atomic Layer Nano-Master Deposition System     | Operational                                                                                                                                                           | Metal Deposition using boat and crucible (Physical Vapour Deposition)                                                         | 10,500/- Per Run     | 13000/-                   | 15000/-         |

| 15                                         | MEMS Grade Spin Coating, Baking and Stirring             | Operational          | Spin Deposition Coating                                                                                                              | 1200/- Per Run for Half an Hour | 1500/-                    | 1800/-         |
|--------------------------------------------|----------------------------------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------|----------------|
| 16                                         | Electro-Chemical Impedance Spectroscopy                  | Operational          | Impedance spectroscopy (Potentiostat/Galvostat)                                                                                      | 1500/- Per Sample               | 1800/-                    | 2100/-         |
| 17                                         | Fume Hood Wet Bench                                      | Operational          | Sample Cleaning                                                                                                                      | 900/- Per Run for Half an hour  | 1300/-                    | 1600/-         |
| 18                                         | Hot Plate                                                | Operational          | Sample Baking/contact Sintering                                                                                                      | 800/- Per Run for Half an hour  | 1000/-                    | 1500/-         |
| 19                                         | Fume Hood Wet Bench                                      | Operational          | Sample Chemical Etching                                                                                                              | 1800/- Per Run for Half an hour | 2000/-                    | 2500/-         |
| 20                                         | Rapid thermal Furnace                                    | Operational          | RTA/Furnace Annealing                                                                                                                | 2000/- Per Run                  | 2500/-                    | 3000/-         |
| 21                                         | Rapid thermal Furnace                                    | Operational          | Rapid thermal Oxidation                                                                                                              | 2500/- Per Run                  | 3000/-                    | 3500/-         |
| 22                                         | Rapid thermal Furnace                                    | Operational          | Rapid thermal Nitridation                                                                                                            | 3500/- Per Run                  | 4000/-                    | 4500/-         |
| 23                                         | Magnetron Plasma Sputtering Coater                       | Operational          | Deposition Sputtering (Magnetron) Dual Mode both DC and RF                                                                           | 8500/- Per Run                  | 10,000/-                  | 13,000/-       |
| 24                                         | Mask Aligner                                             | Operational          | Photo-lithography (Depends upon the nature of application availability of the mask and over all experimentation)                     | 6000/- Per Sample               | 8000/-                    | 10,000/-       |
| 25                                         | Electro Spinning & Electro Spraying                      | Operational          | Electro Spinning & Electro Spraying of nano layers, fibers and materials for versatile applications                                  | 3500/- Per Sample               | 4000/-                    | 4500/-         |
| 26                                         | Plasma Enhanced Chemical Vapor Deposition (PECVD) System | Operational          | Deposition (PECVD)                                                                                                                   | 7500/- Per Run                  | 8500/-                    | 10,000/-       |
| <b>Magnetic</b>                            |                                                          |                      |                                                                                                                                      |                                 |                           |                |
| 27                                         | Vibrating Sample Magnetometer                            | Under Commissioning  | Magnetic Measurements                                                                                                                | 6000/-                          | 7000/-                    | 8000/-         |
| <b>Structural Morphology &amp; Imaging</b> |                                                          |                      |                                                                                                                                      |                                 |                           |                |
| S.No.                                      | Name of Equipment                                        | Status (Operational) | Particulars of Tests                                                                                                                 | IIU Internal Users              | University Other Than IIU | Comercial Test |
| 28                                         | Atomic Force Microscopy                                  | Operational          | Atomic Scale Microscopy measurements AFM and STM Mode                                                                                | 4800/- Per Sample               | 5500/-                    | 7000/-         |
| 29                                         | Scanning Electron Microscopy                             | Operational          | Scanning Electron Microscopy (BSE, EDX and Imaging down to Sub-micron level)                                                         | 6000/- Per Sample               | 7500/-                    | 9000/-         |
| 30                                         | X-Ray Diffraction System                                 | Operational          | Diffraction scan (Indices, planes, Material composition analysis)                                                                    | 4000/- Per Sample               | 5000/-                    | 6000/-         |
| 31                                         | High Resolution Thickness Profiling                      | Operational          | Thickness Profiling of the surface down to nm through stylus scanning                                                                | 2500/- Per Sample               | 3000/-                    | 3500/-         |
| <b>Optical</b>                             |                                                          |                      |                                                                                                                                      |                                 |                           |                |
| 32                                         | Spectroscopic Ellipsometer                               | Operational          | Spectroscopic Ellipsometry (Full Scan SE) (Refractive index, Extinction coefficient, dielectric Coefficient, Thickness of the layer) | 3500/- Per Sample               | 4000/-                    | 5000/-         |
| 33                                         | Photoluminescence System (PLS)                           | Operational          | Photoluminescence System (PLS) (Optical bandgap, defects mapping) Low temperature analysis                                           | 3000/- Per Sample               | 4000/-                    | 5000/-         |
| <b>Solar Cell/PV Evaluation</b>            |                                                          |                      |                                                                                                                                      |                                 |                           |                |
| S.No.                                      | Name of Equipment                                        | Status (Operational) | Particulars of Tests                                                                                                                 | IIU Internal Users              | University Other Than IIU | Comercial Test |
| 34                                         | Sun Simulator Class AAA                                  | Operational          | Sun Simulator test, Efficiency of the cells along with the packing fraction, electrical analysis, etc                                | 2000/- Per Sample               | 2500/-                    | 3500/-         |