

**DAY 1 : 16 April 2024**

0800 hrs Registration  
**0900 hrs Inauguration**  
 0900 hrs Lighting of the Lamp and Invocation  
 0900 hrs Welcome Address & Theme of Workshop  
 Dr TM Kotresh, OS & Director, DEBEL, DRDO, India  
 0915 hrs Inaugural Address  
 Dr Upendra Kumar Singh, DS & DG(LS), DRDO, India  
 0930 hrs Inaugural Address  
 Prof Robert Riener, President-ICORR, Sensory-Motor Systems, ETH, Zurich  
 0940 hrs Inaugural Address  
 Prof Arun Jayaram, Executive Director, Tech & Innovation Hub (tiHUB), Chicago, USA  
 0950 hrs Inaugural Address  
 Lt Gen JP Mathew, PVSM, UYSM, AVSM, VSM Chief of IDS to the Chairman Chiefs of Staff Committee (CISC), HQ IDS  
 1000 hrs Keynote address by Chief Guest  
 Dr Samir V Kamat, Secretary, DD R&D and Chairman, DRDO, India  
 1010 hrs Vote of Thanks  
 Dr Alka Chatterjee, Associate Director, DEBEL, DRDO, India  
 1020 hrs Interaction with Academia, Startups & Industry Partners

**1030 hrs High Tea**

**Session 1: Unlocking Exotech: Unveiling the Evolution of Exoskeleton**  
**(Session Chairs – Dr Upendra Kumar Singh, DS & DG-LS, Dr Venkatasubramanian Ganesan, NIMHANS)**

1130 hrs Lecture 1: Rehabilitation Robotics: Improving Everyday Human Functions  
 Prof Sunil Agarwal, Columbia Univ, USA (Online Mode)  
 1200 hrs Lecture 2: Rehabilitation Exoskeletons: Current Status, Challenges, and the Future  
 Prof Arun Jayaram, Executive Director, Tech & Innovation Hub, Chicago, USA  
 1230 hrs Lecture 3: DRDO Efforts in Augmentative Exoskeleton Technologies  
 Dr K Mohanavelu, Scientist, DEBEL, DRDO, India

**1300 hrs Lunch**

**Session 2: Human Biomechanics, Musculoskeletal Modelling & Simulation**  
**Session Chairs - Dr Jayanth S Sampath, Orthopaedic Surgeon, India & Prof Subendu Bhasin, IIT Delhi)**

1400 hrs Lecture 4: Biomechanical Considerations in Exoskeleton Design  
 Prof Sujatha Srinivasan, IIT Madras, India  
 1430 hrs Lecture 5: Rehab exoskeletons need to get simple, soft and lightweight  
 Prof Robert Riener, President-ICORR, Sensory-Motor Systems, ETH, Zurich  
 1500 hrs Lecture 6: Utility of Exoskeleton-based Devices for an Effective Rehabilitation of Soldiers with Spinal Cord Injuries: Road Ahead and Challenges for an Indigenized Solution  
 Dr (Lt Col) Vyom Sharma, Spine Surgeon, Indian Army, MH Khadki, AFMC, Pune, India

**1530 hrs Tea**

**Session 3: Requirements & Advancements in Exoskeleton – Global status**  
**(Session Chairs – Prof. Ahmed Chemori, France, Ashutosh Dutt Sharma, CEO, IHFC, IIT Delhi)**

1600 hrs Lecture 7: Sign language processing for rehabilitation exoskeleton applications  
 Prof Mathew Magimai Doss, Scientist, IDIAP, Martigny, Switzerland  
 1630 hrs Lecture 8: Exoskeleton Design using Musculoskeletal Modelling – Case Studies  
 Dr Divyaksh S Chander, AnyBody Technology A/S, Denmark (Online)  
 1700 hrs Lecture 9: Wearable exoskeletons to assist gait and balance  
 Prof Herman van der Kooij, University of Twente, Netherlands (Recorded Video)  
 Interaction with Industry & Demo of Exoskeletons (1730 onwards)

**1900 hrs Dinner**

**DAY 2 : 17 April 2024**

**Session 4: Requirements & Advancements in Exoskeleton – Global status**  
**(Session Chairs – Dr Suranjan Bhattacharji, Former Director, CMC Vellore, Brig Ajay Deep Sud, Commandant, Artificial Limb Centre (ALC), Pune)**

0900 hrs Lecture 10: Digital Twins for Advanced Back Support Exoskeletons for the Industry  
 Prof IR MI Refai, University of Twente, Netherlands  
 0930 hrs Lecture 11: Aerial Porter Exoskeleton Project Results  
 Prof Thomas Sugar, Arizona State University, USA (Recorded Video)  
 1000 hrs Lecture 12: Design challenges and role of orthotics in exoskeletons  
 Dr Soikat Ghosh Moulic, NHS Wales, UK

**1030 hrs Tea**

**Session 5: Bio-mimic Actuators and Control Strategies**  
**(Session Chairs – Mr Vijay Bhasker Reddy Seelam, Svaya Robotics, Prof Robert Riener, President-ICORR, Zurich)**

1100 hrs Lecture 13: Assistive Control of Wearable Exoskeletons for Rehabilitation Purposes  
 Prof Ahmed Chemori, University of Montpellier, France  
 1130 hrs Lecture 14: Challenges in human-guided learning for assistive robots  
 Prof Sylvain Calinon, Scientist, IDIAP, Martigny, Switzerland  
 1200 hrs Lecture 15: Improving Leg Exoskeletons: External Dynamics Dependent Gait Adaptation  
 Prof Vineet Vashista, IIT Gandhinagar, India  
 1230 hrs Lecture 16: Low-pressure pneumatic artificial muscle for Soft Lower Limb Exoskeleton  
 Dr Aman Arora, CSIR, Durgapur, India

**1300 hrs Lunch**

**Session 6: Exploring Exoskeletons: Neuro-muscular Sensing & Interface and Future Prospects**  
**(Session Chairs – Prof Arun Jayaram, USA, Dr SK Roy, IIT Delhi)**

1400 hrs Lecture 17: Restorative Brain-Computer Interfaces for controlling exoskeletons  
 Prof Nicole Wenderoth, Director, Neural Control of Movement Lab, ETH Zurich (Recorded Video)  
 1430 hrs Lecture 18: Neurophysiological mechanisms underlying movement intention and kinematics  
 Dr Suriya Prakash Muthukrishnan, Professor, AIIMS, New Delhi, India  
 1500 hrs Lecture 19: Futuristic Exoskeleton  
 Shri T Raghuram, Scientist, Joint Director, DEBEL, DRDO, India

**1530 hrs Tea**

**Brainstorming session on Roadmap for Rehabilitative, Industrial and Augmentative Exo**

1545 hrs – 1730 hrs  
 1. Status, Issues & Requirements in Exoskeleton Technology.  
 2. Challenges with respect to rehabilitation, industrial and Augmentative Exoskeleton.  
 3. Roadmap for the technological development of Exoskeleton.  
 4. Ecosystem with academia, Industry and clinician  
 5. Exoskeleton Society of India  
 Chair: Dr Upendra Kumar Singh, DS & DG(LS), DRDO  
 Co-Chair: Dr TM Kotresh, OS & Director, DEBEL, DRDO  
 Participants: Armed Forces, Industry, Hospital/ Clinicians, Academicians, Research centres  
 Vote of Thanks: Dr K Mohanavelu, Scientist, Joint Director, DEBEL, DRDO, India