

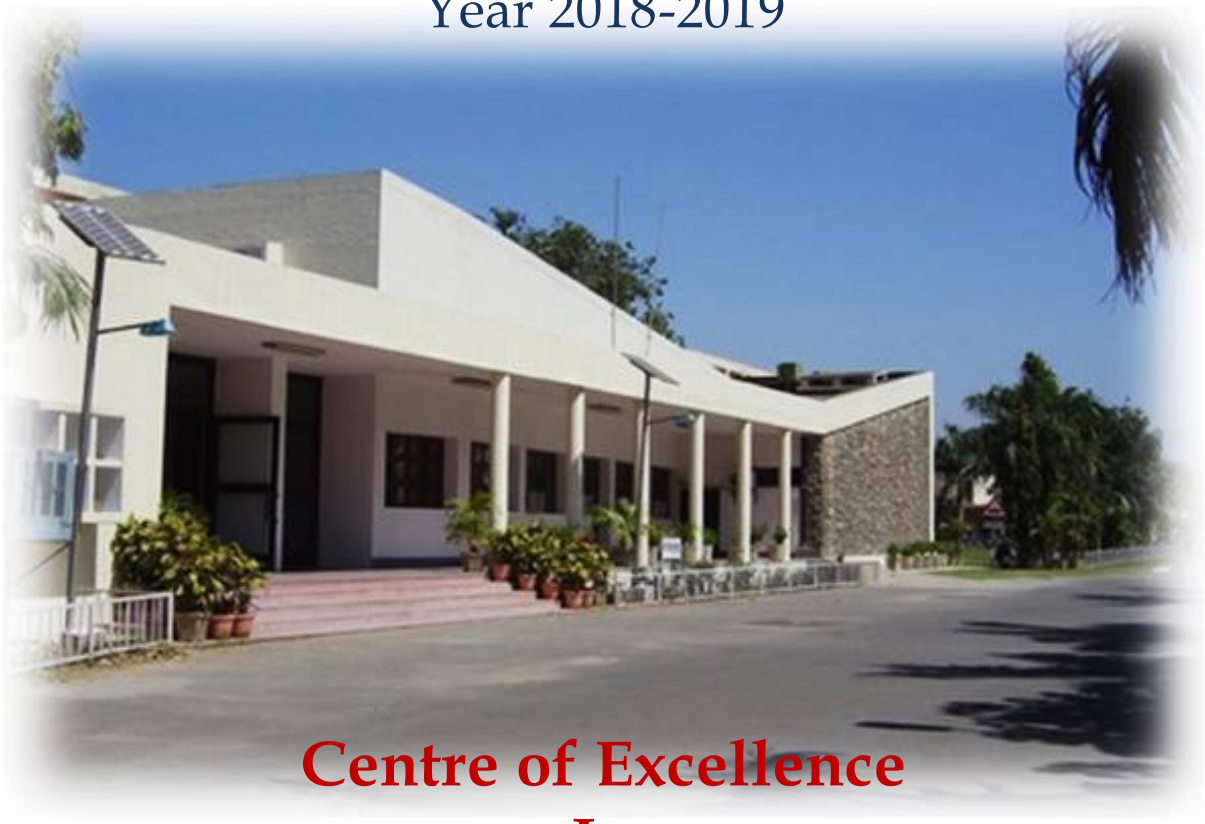
# Information Brochure

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Post Graduate Program

Master of Technology (Industrial Design)

Year 2018-2019



**Centre of Excellence  
In  
Industrial and Product Design**

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**PUNJAB ENGINEERING COLLEGE  
(Deemed to be University)  
Chandigarh, India**

## About CoE

Centre of Excellence in Industrial and Product Design has been set up in 2013 by NPIU, under Technical Education Quality Improvement Programme (TEQIP Phase -II), a World Bank Assisted Project in Technical Education with initial funding of Rs 5 Crores.

The Centre has the mission to encourage, facilitate interdisciplinary and **collaborative research** in an environment that enables a 'love for science, technology and discovery' so that it can develop high quality research leading to products & solutions to address the needs of industry and healthcare providers. The Centre's aspiration to create relevant research that addresses current challenges, resulting in innovative solutions which can be implemented, is underpinned by partnering with leading organisations for its **research activities** such as PGIMER Chandigarh, INTEL Technologies Bangalore. Real time studies are being carried out to collect data, conduct surveys, which contribute towards understanding of the problems and issues affecting stakeholders.

The Centre is developing as a resource centre so as to become a preferred destination for industry, healthcare providers to carry out sponsored research, train & develop professional talent, proficient in the areas of ergonomics and design. The Centre runs educational and training programmes, performs outreach activities in collaboration with other academic institutions organizations such as PGIMER Chandigarh, IIT Mumbai, NITIE Mumbai

## Faculty Members

| S. No. | Name                                  | Designation                   | Field of Specialization  |
|--------|---------------------------------------|-------------------------------|--|
| 1      | Dr. Parveen Kalra<br>Ph.D.            | Professor &<br>Coordinator    | CAD/CAM & Robotics,<br>FEM, Human<br>Engineering, Additive<br>Manufacturing  |
| 2      | Dr. Neelam R.<br>Prakash<br>Ph.D.     | Professor &<br>Co-coordinator | Digital System Design,<br>VLSI Design, Healthcare<br>Technologies  |
| 3      | Dr. Sanjeev Kumar<br>Ph.D.            | Professor &<br>Co-coordinator | Manufacturing,<br>Mechanical Metallurgy,<br>Material Science   |
| 4      | Dr. Jagjit Singh<br>Randhawa<br>Ph.D. | Assistant<br>Professor        | Human Engineering,<br>Rapid Prototyping,<br>Welding Engineering  |
| 5.     | Dr. Rakesh Sharma                     | Adjunct<br>Faculty            | Innovation and Ventures  |
| 6.     | Dr. Chetan Mittal                     | Adjunct<br>Faculty            | Biomedical<br>instrumentation and<br>Design of medical<br>devices  |
| 7.     | Dr. Rakesh Kumar<br>Sen               | Adjunct<br>Faculty            | Health Care & Design<br>Applications   |
| 8.     | Sh. Mandeep<br>Chhatwal               | Adjunct<br>Faculty            | Industrial Engineering,<br>Healthcare with focus on<br>Commercialization,<br>Technology Transfer,<br>Promotion of Start-ups. |

## Vision

CoE I&PD (Centre of Excellence in Industrial and Product Design) will establish itself as a global resource centre in the areas of Industrial and Product design.

## Mission

CoE I&PD will be offering quality solutions in the areas of ergonomics and design to address the needs of industry and medical organizations.

CoE I&PD will be a preferred destination for industry, research and medical organizations to locate the best professional talent, proficient in the areas of ergonomics and design.

## Thematic Area(s)

- Ergonomics
- Design Applications in Medical Sciences and Industry

## Laboratories

### Human Engineering Laboratory

The Human Engineering laboratory is well-equipped to carry out experimentation and research work in the areas of whole body and hand arm vibration exposure, anthropometry, seat design, ergonomic evaluation of industrial systems and consumer products. The main equipment in the laboratory includes the following:-

- Portable EMG system
- Biopac MP-45 system for EDA, PPG measurement
- Portable physiological monitoring system
- Kinect V2 IR, Intel Real sense Cameras
- Whole body and Hand arm vibrations analysis kit, Electronic dynamometer, Electronic pinchmeter
- Pressure mapping system (seat and back)
- Delmia Human software
- Anthropometric kit
- Oxygen analyser
- EEG-EMG system

- Jack Software
- Portable Gait System

### Prototyping Laboratory

The prototyping laboratory has equipments for additive manufacturing based on extrusion and polyjet technologies. It also has facilities for conversion of CT scan images to 3D models, measurement of physiological parameter monitoring and design and fabrication of PCBs. The facilities in this laboratory are being used for development of products for medical applications, assembly tools and workplace organisational aids. Equipment in the laboratory includes the following:-

- 3D scanners and software
- MIMICS Innovation suite (Mimics, 3-matic and Magics RP software)
- Fused Deposition Modeling (FDM) : Fortus 400 MC (Small)
- Polyjet Prototyping Machine : EDEN 260V
- Haptic Freeform Device
- NI Simulator, NI DAQ cards and Data logger cards
- Lab VIEW
- Controllers, sensors and actuators
- Altium software
- PCB prototyping machine

### PEC-Intel Embedded System Laboratory

This embedded system laboratory has equipments for development of embedded systems based on Intel atom boards. The facilities in this laboratory are being used for development of products for medical applications and workplace organisational aids. Equipment in the laboratory includes the following:-

- Intel Galileo Board
- Intel Atom Boards
- E- Health kit
- Sensors



## About the Program

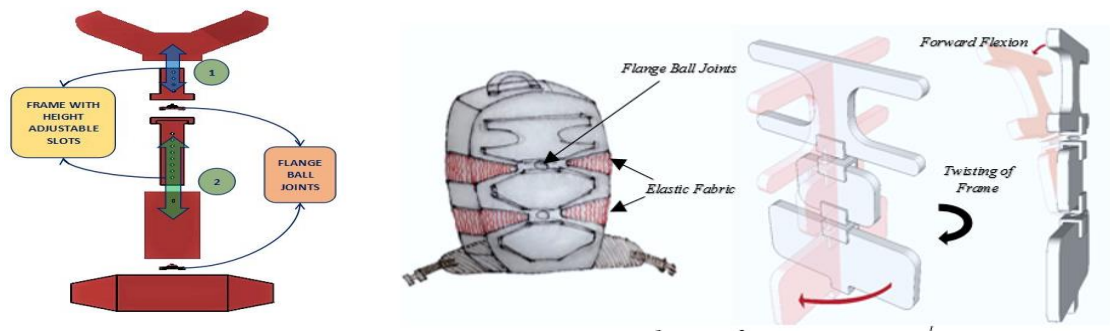
Centre of Excellence runs a Master's program in Industrial Design as a self-supporting interdisciplinary programme. This Master's programme provides in depth knowledge of human engineering, design processes and latest design tools like 3D scanning, rapid product development, high performance visualization etc. Availability of well-trained graduates in industrial design would result in upgradation of quality of engineering design, design materials and also result in environmentally sound and socially & culturally relevant designs. The duration of this programme for regular students is two years.

## Master of Technology (Industrial Design) Structure

| Semester - I   | Semester - II   |
|--|---|
| Internet of Things   | Design of Experiments & Research Methodology          |
| Machine Learning   | Product Design and Development                        |
| Communication Skills   | Applied Ergonomics                                    |
| Management Entrepreneurship and IPR  | Elective-III (E3)                                     |
| Professional Ethics  | Elective-IV (E4)                                      |
| Creative Engineering Design  | Open Elective   |
| Product Form and Design  | Mini Project/Pre Dissertation                         |
| Elective-I(E1)   |   |
| Elective-II(E2)  |   |
| Engineering Mathematics (EM)   |   |
| <b>Summer Term</b>   |   |
| Student Exchange Programme   |   |
| Industrial Visit (one or two week of Visit, Submission and presentation of visit report) |   |
| Semester - III   | Semester - IV   |
| Dissertation/Industry Project  | Dissertation/Industry Project                         |
| <b>List of Electives</b>   |   |
| Interaction Design   | Usability Engineering                                 |
| Advanced CAD   | CAD Applications in Medical Sciences                  |
| Physiological Signals Acquisition and Processing - I                                     | Physiological Signals Acquisition and Processing - II |
| Designs of Mechanical Assemblies - I   | Designs of Mechanical Assemblies - II                 |
| Finite Element Analysis  | Finite Element Analysis Applications                  |
| Robot Mechanics  | Industrial Robotics                                   |
| Mechatronics System Design - I   | Mechatronics System Design - II                       |
| Design Management  | Business Strategies                                   |
| Business Model Innovation  | Business Model Design                                 |
| Occupational Biomechanics - I  | Occupational Biomechanics - II                        |
| Venture Development  |   |

## Major Ongoing Research

### 1. Project Title-Design of an Internal frame for School Backpacks



**Research Collaborator-**National Institute of Industrial Engineering, Mumbai

### 2. Project Title-

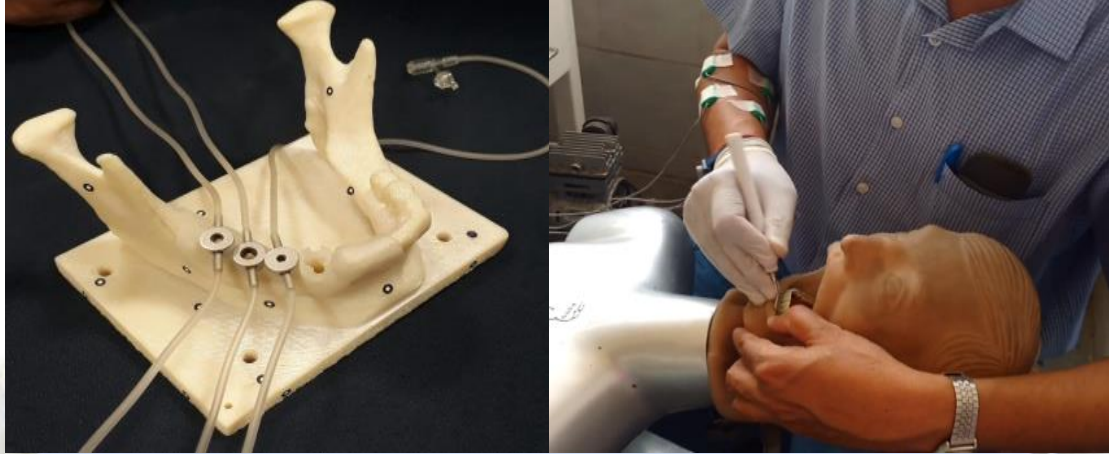
- Customized Design of Ankle Foot Orthosis
- Design of Patient Specific Maxillofacial Implants, Templates and Cutting Guides
- Pain Management Through Neuro Signal Tracking



**Research Collaborator-** PGIMER, Chandigarh

### 3. Project Title-

- Development Of Dental Drill Guides For Improved Cooling At Drilling Site
- Ergonomic Evaluation Of Scaling Tool Handles



**Research Collaborator-**Dr. Harvansh Singh Judge Institute of Dental Science and Hospital, Panjab University, Chandigarh

### 4. Project Title- Mental Health Assessment Using Physiological Signals



**Research Collaborator-** Government Hospital, Sector 6, Panchkula



# Publications

## JOURNALS (SCI)

### 2014-15

1. Laddi Amit, Prakash Neelam, Kumar Amod, "Quality Evaluation of Black CTC Teas based upon Seasonal Variation", International Journal of Food Science and Technology, Publisher: Institute of Food Science and Technology (U.K.), Wiley, Volume 49, Issue 2, pages 493–500, February 2014.
2. Laddi A, Prakash NR, Sharma S, Kumar A, Kapur, P "Significant physical attributes affecting quality of Indian black (CTC) tea", Journal of Food Engineering, Volume 113, Issue 1, Pages 69-78, November 2012.
3. Banga Harish Kumar, Kalra Parveen, Belokar R.M., Madan Rajesh, "Fabrication and stress analysis of ankle foot orthosis with additive manufacturing", Rapid Prototyping Journal , Volume 7, Issue 1, Page 1, February 2017.

### 2016-17

1. Gupta Ishant, Kalra Parveen, Iqbal Rauf, "Gait Parameters in School Going Children Using a Marker-Less Approach", Journal of Biosciences , Volume 111, Issue 10, November 2016.
2. Meena, V.K., Kumar, M., Pundir, A., Kalra, P. & Sinha, R.K. "Musculoskeletal-based finite element analysis of femur after total hip replacement", Journal of Engineering in Medicine Volume 230, Issue 5, Pages 553-560, June 2016.
3. Laddi, A. & Prakash, N.R., "An augmented image gradients based supervised regression technique for iris center localization", Multimedia Tools and Applications, Volume 76, Issue 5, Pages 7129-7139
4. Gupta Ishant, Kalra Parveen, Iqbal Rauf, "Postural angles and spatiotemporal responses to load carrying in school children using different backpack loading systems", Volume 29, Issue 10, June 2017.

## INTERNATIONAL CONFERENCES

### 2014-15

1. Seth S, Dondapati R S, Kalra P, "Effect of varying inter-implant distance in a two implant-three prosthetic unit dental system; A finite element analysis study", Proceedings of 8<sup>th</sup> European Modelling Symposium on Computer Modelling and Simulation ,UKSim-AMSS, EMS 2014.
2. Kaushal Ishaan, Kanda Rajesh and Kalra Praveen, "Measurement of muscle fatigue using Electromyography". Proceeding of HWWE International Ergonomics Conference on, 2014.

3. Gupta Ishant and Kalra Parveen, "MQEC- AN evaluation method for Lifting Techniques in SMEs" Proceedings of HWWE International conference on industrial engineering and ergonomics, 2014.
4. Laddi Amit and Prakash R Neelam, "Comparative Analysis of Unsupervised Eye Center Localization Approaches", Proceedings of IEEE International Conference on Signal Processing, Computing and Control (ISPCC), 2015.
5. Laddi Amit and Prakash R Neelam, "Supervised Approach for Eye Center Localization under Unconstrained Environments", Proceedings of 2nd International Conference on Communication Systems - 2015 (ICCS - 2015), October 18-20, 2015
6. Gupta Ishant, Kalra Parveen, "MQEC- An assessment tool for analyzing manual material lifting techniques", Proceedings of HWWE International Ergonomics Conference, 2014

#### 2015-16

1. Kumar Rajesh, Kalra Parveen and Lall A.K., "Mental Fatigue Quantification by Physiological and Neurophysiological Techniques: An Overview", HWWE 2015 conference, IIT Mumbai.
2. Kumar Rajesh, Kalra Parveen and Lall A.K., Co-existence of muscle fatigue, mental fatigue and mental burnout during manual handling of low load at high frequency in the industry: A survey and analysis HWWE 2015 Conference, IIT Mumbai.
3. Kumar Sanjeev, Singh Rupinder "Mathematical Modelling for Surface Hardness in FDM assisted Vacuum Moulding of Al-SiC metal matrix Composite " Proceedings of GS International Conference Additive Manufacturing Society of India, 7-8 September, 2015.
4. Dhama S.S., Sharma A, Kumar. R, Kalra Parveen "Gesture based control of a simulated robot manipulator" Proceedings of ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, 2015.
5. Laddi A., Prakash N R, "Comparative analysis of unsupervised eye center localization approaches" Proceedings of ISPCC, International conference on signal processing, computing and control, 2015.
6. Dhama SS, Sharma A, Kumar R, Kalra P "Gesture Based Control of a Simulated Robot Manipulator" Proceedings of ASME International Design Engineering Technical Conferences, 2015
7. Kumar R, Kalra P, Lall AK "Co-existence of muscle fatigue, mental fatigue and possibility of mental burnout during manual handling of low load at high frequency in the industry: A survey and analysis" Proceedings of International HWWE Ergonomics Conference, 2015.

#### 2016-17

1. Sharma Vivek, Prakash. R. Neelam, Kalra Parveen "EDA Wavelet Features as Social Anxiety Disorder (SAD) Estimator in Adolescent Females" Proceedings

- of 5<sup>th</sup> International IEEE Conference on Advances in Computing, Communications and Informatics (ICACCI), pp 1854-55, 2016.
2. Kalra Prerita, Sharma Vivek "Correlation of Heart Rate Variability with Mental Fatigue" Proceedings of 14<sup>th</sup> International HWWE Conference on Humanizing Work and Work Environment, 2016.
  3. Banga K. Harish, Kalra Parveen, Belokar R M, Kumar Rajesh "3D Scanning and Rapid Prototyping of Foot Drop Patient's Leg" Proceedings of 14<sup>th</sup> International HWWE Conference on Humanizing Work and Work Environment, 2016.
  4. Rathi Robin, Kant Suman, Singh Jagjit ""An ergonomic assessment of commercial aircraft Airbus 300", Proceedings of 14<sup>th</sup> International HWWE Conference on Humanizing Work and Work Environment, 2016.
  5. Gupta I, Kalra P, Iqbal R "Comparison of Gait parameters between school children studying in day school and boarding school by using Kinect V2", Proceedings of 14<sup>TH</sup> International HWWE Ergonomics Conference, 2016
  6. Sharma V, Prakash NR, Kalra P "EDA wavelet features as Social Anxiety Disorder (SAD) estimator in adolescent females" Advances in Computing, Communications and Informatics (ICACCI), Proceedings of IEEE Conference, 2016
  7. Bhatia Amit, Kalra Parveen, Singh J "Ergonomic Design of Trowel Handle" Proceedings of 14<sup>TH</sup> International HWWE Ergonomics Conference, 2016.
  8. Gupta Ishant, Kalra Parveen, Iqbal Rauf "To evaluate the causes of low back pain among school children" Proceedings of 1st National Conference on Enhancing National Competitiveness Role of Industrial Engineering and Technology Management, National Institute of Industrial Engineering, Mumbai , pp(148-152), 2016.
  9. Bhatia Vibha, Bhatia Amit, Kalra Parveen, Singh J, Datta Rahul "Ergonomic Evaluation and Customized Design of Toothbrush Handle" Proceedings of ICoRD International Conference on Research into Design, pp. (205-217), 2017
  10. Gupta Ishant, Kalra Parveen, Iqbal Rauf "Physiological Effects of Backpack Packing, Wearing and Carrying on School Going Children", Proceedings of ICoRD, International Conference on Research into Design, pp. (813-822), 2017

## Patents Filed

| Patent Filed  | Application No |
|---|----------------|
| Surgical guide with improved external irrigation for dental implant surgery | 201711028565   |
| Design of Universal osteotomy guide   | 201711028402   |
| Customized 3-part Immediate Dental Implant.                                 | 201711032686   |
| An Internal Backpack frame based on spinal kinematics                       | 201711028564   |

## Details of Pre-surgical planning/Surgical assistance provided to PGIMER

| Surgery                      | Technique  | Number of Cases |
|------------------------------|--|-----------------|
| Mandible Reconstruction      | 3D reconstruction and 3D printing of templates for surgery | 12              |
| Maxilla Reconstruction       | 3D reconstruction and 3D printing of templates for surgery | 4               |
| Orbital Floor Reconstruction | Preoperative adaptation of plates using prototype          | 3               |
| Frontal Bone Reconstruction  | 3D printing template for mesh plate bending                | 1               |
| Crouzon and Apert Syndrome   | Surgery planning- 3D Printing of template                  | 3               |
| Mucormycosis                 | 3 D design and fabrication of Zygomatic implant            | 1               |



## Collaborations with Industries and Research Institutions / Organizations



*Employment opportunities exists in some of the collaborating Industries*

## Contact us

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