# Department of Electronics & Communication Engineering

(Brief report activities during COVID period

(22nd March to 31st July 2020) and planning for future)

## STC's/ Trainings organized: 21 (No of weeks 23)

STC's: 14

STC's with NIT: 02

Paid STC's/ Trainings/ Industry collaboration/ Consultancy: 05 (Including 2 programmes of **2-week duration**)

| S No. | Title of course conducted | O Plan No. | Dates | Coordinator(s) | No of persons trained | Remarks |
|-------|---------------------------|------------|-------|----------------|----------------------|---------|
| 1. | Latest Wireless and Computing Technologies | ICTO-07 | 14/04/2020 to 18/04/2020 | Dr Balwinder Singh and Mrs Garima Saini | 408 | |
| 2. | Low Power VLSI Design | ICTO-16 | 20.04.20-24.04.2020 | Dr. S S Gill and Dr. Balwinder Raj | 386 | |
| 3. | Image and Embedded Processing | ICTO-21 | 27.04.20 - 01.05.20 | Dr Amod Kumar and Dr Kanika Sharma | 310 | |
| 4. | Academic Leadership Enhancement in Technical Institutions | ICTO-51 | 04/05/2020 to 08/05/2020 | Dr S S Gill and Dr Balwinder Singh | 703 | |
| 5. | Image and Embedded Processing | ICTO-52 | 11.05.20 - 15.05.20 | Dr Amod Kumar and Dr Kanika Sharma | 712 | |
| 6. | Technological Interventions using Wireless Communication | ICTO-53 | 18/05/2020 to 22/05/2020 | Dr Balwinder Singh and Mrs Garima Saini | 728 | |
| 7. | Research Trends in VLSI Design | ICTO-54 | 25.05.2020-29.05.2020 | Dr. S S Gill and Dr. Balwinder Raj | 1026 | |
| 8. | VLSI Physical Design Techniques | ICTO-92 | 15.06.2020 TO 19.06.2020 | Dr. B. Raj and Dr. S. S. Gill | 154 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9. | Nanoscience for Engineering Applications | ICTO-89 | 22.06.2020 TO 26.06.2020 | Dr. B. Raj and Dr Piush Verma | 127 | Jointly with NIT Jalandhar |
| 10. | Advances in Antenna Design Techniques and Simulations using CST Studio Suite | ICTO-93 | 22/06/2020 to 26/06/2020 | Dr Balwinder Singh | 327 | Industry supported Fee paid by 360 candidates |
| 11. | Nanoelectronics Devices and Circuits Design | ICTO-100 | 06.07.2020 TO 10.07.2020 | Dr. B. Raj and Dr. S. S. Gill | 328 | |
| 12. | Internet of Things (A Project based learning through Virtual IoT Lab) | SP | 08.07.2020-19.07.2020 | Dr. S S Gill and Dr. Srinavasa KG | 150 | Collaborative with Industry Revenue generated Rs. 1.5 lakhs |
| 13. | Antenna Design Techniques and Software Simulations using HFSS | ICTO-111 | 13/07/2020 to 17/07/2020 | Dr Balwinder Singh | 193 | Industry supported Fee paid by 211 candidates |
| 14. | Advances in Electrical & Electronics Engineering | ICTO-112 | 18.07.2020 TO 22.07.2020 | Dr. B. Raj and Dr Piush Verma | 74 | |
| 15. | Basic MATLAB Programming | ICTO-116 | 20.07.20 - 24.07.20 | Dr Amod Kumar | 146 | |
| 16. | Artificial Intelligence and Machine Learning (A Project Based Learning) | SP | 22-07-2020 to 05-08-2020 | Dr. S S Gill and Dr. Srinavasa KG | 150 | Collaborative with Industry Revenue generated Rs. 1.5 lakhs |
| 17. | Image Processing using MATLAB | ICTO-117 | 27.07.20 - 31.07.20 | Dr Amod Kumar | 87 | |
| 18. | 5 Days Webinar series on 'Atma-Nirbhar Bharat: Transmutation from Privation to Exuberance' | ICTO-PDA-02 | 27/07/2020 to 31/07/2020 | Coordinator: Dr Rupinder Singh Co- Coordinator: Dr Balwinder Singh | 106 | |
| 19. | Artificial Intelligent and Its Applications | ICTO-107 | 27.07.2020 TO 31.07.2020 | Dr. B. Raj and Dr Piush Verma | 190 | Jointly with NIT Jalandhar |

| 20. | Finance and Procurement | CP | 27-07-2020-31-07-2020 | Dr. S S Gill and Dr. Srinavasa KG | 20 | Consultancy revenue generated Rs. 1 Lakh |
|---|---|---|---|---|---|---|
| 21. | Embedded World | ICTO-131 | 27-07-2020-31-07-2020 | Dr. Kanika Sharma | 43 | |

**Approximate number of persons trained: 6368**

*Probably the highest number of people trained per faculty in the Institute (6368/6= 1062 per faculty)*

**Approx. Revenue Generated (Consultancy/convenience/ course/Training Fee): 9 Lakhs**

## Research Contribution

**SCI/ SCI (E) indexed Publications: 05**

1. Girish Wadhwa, **Balwinder Raj**, "An Analytical Modeling of Charge Plasma based Tunnel Field Effect Transistor with Impacts of Gate underlap Region" Superlattices and Microstructures, Elsevier, Vol. 142, PP. 106512, June 2020.

2. Shailendra Singh, **Balwinder Raj**,"Modeling and Simulation analysis of SiGe hetrojunction Double GateVertical t-shaped Tunnel FET", Superlattices and Microstructures, Elsevier Volume 142, PP. 106496, June 2020.

3. Girish Wadhwa, Jeetendra Singh, **Balwinder Raj,** "Design and Investigation of Doped Triple Metal Double Gate Vertical TFET for performance Enhancement", Journal of Silicon, Springer, July 2020.

4. Shailendra Singh, **Balwinder Raj,** "Analytical Modeling and Simulation of SiGe heterojunction Dual Material Gate Vertical t-shaped Tunnel FET, Journal of Silicon, Springer, 2020.

5. Sunil Kumar, Balwant Raj and **Balwinder Raj**, "Dual-Material Gate-Drain Overlapped DG-TFET Device for Low Leakage Current Design", Journal of Silicon, Springer, May 2020.

**Scopus indexed Publications: 03**

1. Gurpurneet Kaur, **Sandeep Singh Gill,** Munish Rattan, "Whale Optimization Algorithm for Performance Improvement of Silicon-On-Insulator FinFET," International Journal of Artificial Intelligence (Scopus), Volume 18, Number 1, March 2020.

2. Parminder Kaur, Vikas Pandey and **Balwinder Raj,** "Comparative Study of Efficient Design, Control and Monitoring of Solar Power using IoT", Sensor Letter, ASP, 2020.

3. Sachin Kumar Verma, Shailendra Singh, GIRISH WADHWA and **Balwinder Raj,** "Detection of Biomolecules using Charge-Plasma based Gate Underlap Dielectric Modulated Dopingless TFET" Transactions on Electrical and Electronic Materials (TEEM), Springer, 2020.

**Other Referred Journals including UGC Care: 04**

1. Sameeksha Munjal, **Sandeep Singh Gill,** Gurpurneet Kaur, "Design of Ring Oscillator at 45NM Technology Using Fault Tolerant Delay Cell," International Journal of Scientific Research and Engineering Development (IJSRED), Volume 3, Issue-3, June 2020.

2. Vinod K, **Kanika Sharma,** "A Review on Different Cluster Head Selection Methods for Improving the Lifetime of Wireless Sensor Network", International Journal of Advance Computational Engineering and Networking (IJACEN) ISSN: 2320-2106, Volume-8, Issue-4, April 2020.

3. Jamal Kutty, **Kanika Sharma,** "Improved DV- Hop localization Algorithm for Wireless Sensor Networks', International Journal of Engineering and Advance Technology (IJEAT), Vol. 9, Issue 5, June 2020.

4. Roshan Lal, **Kanika Sharma,** "GAEER: Genetic Algorithm Based Energy Efficient Routing Protocol in Wireless Sensor Network", International Journal of Scientific and Technology Research (Scopus Listed with ISSN 2277-8616), Vol.9, Issue 6, June 2020.

**Conference papers: 04**

1. Gurpurneet Kaur, **Sandeep Singh Gill,** Munish Rattan, "Design and Performance Analysis of FinFET Based SRAM Cell Stability," International Conference on Sustainable Development through Engineering Innovations (SDEI), Springer, scheduled to be held from 17 - 19 September, 2020 at Guru Nanak Dev Engineering College, Ludhiana (Punjab), India **(Accepted).**

2. Shailendra Singh, **Balwinder Raj,** "T-Shaped Heterojunction Vertical Tunnel Field-Effect Transistor for Low Power Applications", (Paper ID: CCSP_2019_NITJ_VLSI_14), International Conference on Communication Computing, NIT Jalandhar, 23-24 July 2020.

3. Girish Wadhwa, **Balwinder Raj,** "Design and Analysis of Dopingless TFET Biosensor for high performance", (Paper ID: CCSP_2019_NITJ_VLSI_16), International Conference on Communication Computing, NIT Jalandhar, 23-24 July 2020.

4. Rachit Manchanda, **Kanika Sharma,** "SSDA: Sleep Scheduled Data Aggregation in Wireless Sensor Network- based Internet of Things", International Conference on Data Analytics and Management, An Indo-European Conference (ICDAM-2020), Organized jointly by Jan Wyzykowski University, Poland and B.M Institute of Engineering and Technology, India on 18th June 2020.

**Book Chapters: 03**

1.  Rekha Devi and **Sandeep Singh Gill,** "Carbon Nano Tube-Based Sensor Design for NEMS/MEMS Applications," Major Applications of Carbon Nanotube Field-Effect Transistors (CNTFET), Pages: 17, DOI: 10.4018/978-1-7998-1393-4.ch003, **IGI Global.**

2.  Gurpurneet Kaur, **Sandeep Singh Gill,** Munish Rattan, "Impact of High-K Gate Dielectric and Work functions Variation on Electrical Characteristics of VeSFET", Part of the Advances in Intelligent Systems and Computing book series (AISC, volume 1141), **Springer.**

3.  Jeetendra Singh, Balwant Raj and **Balwinder Raj,** Conduction Mechanism and Performance Evaluation of Nanoscale Semiconductor Devices, "Book: Nanotechnology: Advances and Real-Life Applications, CRC Press, **Taylor & Francis,** Chapter 9, PP.109-130, July 2020.

## Research Projects

**Applied For: 02 under SERB/DST**

**1. Project Title**: *Nanoscale Tunnel FET based Low Power SRAM Cell Design*
Amount: 60.50 Lakhs
Funding agency: SERB-DST under SUPRA Scheme
**PI: Dr. Sandeep Singh Gill**
**Co-PI: Dr. Balwinder Raj**

**2**. **Project Title:** *Mathematical Modeling and Simulation of Memristor for Memory Cell Design*
Amount: 22 Lakhs
Funding agency: SERB-DST under MATRICS Scheme
**PI: Dr. Balwinder Raj**

Transfer for NITJ: 01 (under process) **(Dr. Balwinder Raj)**

**ATAL FDP: 01 (sanctioned)**

ATAL FDP on 'Flexible and Wearable Antennas: Recent Advancements, Fabrication Techniques and Applications' from 12-10-2020 to 16-10-2020 **(Coordinator: Dr Balwinder Singh)**

## Faculty Upgradation

**PhD Awarded to Faculty: 01 (Dr. Garima Saini)**

Besides this faculty members have attended various conferences/capacity building programmes/ STCs.

**Conferences Attended**

1.  International eConference on Innovation Infrastructure Development in India: Issues, Challenges and Way-foreword, organized by Innovation Society India in association

with Amity College - Florida (USA) and International Association of Research Scholars (IARS), 8 May 2020. **(Dr. Balwinder Raj)**

**STCs Attended**

1. STC on "Quantum and Energy Materials: Potential & Applications" (ICTO-45) conducted by NITTTR Chandigarh from 18 to 22 May 2020. **(Dr. Balwinder Raj)**

2. "Capacity Building Program" 'Module 3' (ICTO-70) conducted by NITTTR Chandigarh from 26 to 30 May 2020. **(Dr. Balwinder Raj)**

3. Capacity Building Program" 'Module 3' (ICTO-70) conducted by NITTTR Chandigarh from 26 to 30 May 2020 under NITTT. **(Dr. Garima Saini)**

4. Attended STC on Inter NITTTR Capacity Building Workshop "Module-6" conducted by NITTTR Chennai from 09 to 13 June 2020. **(Dr. Balwinder Raj)**

5. Online Training Programme on "Managing Virtual Classrooms and Online Teaching" organized by College Development Council, Panjab University Chandigarh during 3rd - 4th July, 2020. **(Dr. Balwinder Raj)**

6. CPSC's Online Regional Program on "Strengthening TVET Instructional Management System" organized by *Colombo Plan Staff College* Philippine held from 13-17 July 2020. **(Dr. Balwinder Raj)**

7. Attended two Capacity Building Module Training programmes (Module 5 and Module 7) **(Dr.Balwinder Singh)**

8. Attended 04 different webinars/online trainings organized by industries/ institutions **(Dr.Balwinder Singh)**

9. Attended Capacity Building programme for Module 6 by NITTTR, Chennai. **(Dr. Sandeep Singh Gill)**

10. Attended and Capacity Building Programme for Module 7, Creative Problem solving, innovation and meaningful R&D **(Dr. Kanika Sharma)**

11. Attended National Seminar on Wireless Communication and Commercialization of Technology organized under twinning arrangement by University Institute of Engineering and Technology, Panjab University, Chandigarh and Government College of Engineering and Technology, Jammu sponsored by: TEQIP-3 held on 30th April 2020. **(Dr. Garima Saini)**

12. Attended webinar on Teaching and Learning Modes post COVID-19 conducted by Punjabi University Chandigarh held on 29th April 2020. **(Dr. Garima Saini)**

13. Training for Radar Cross Section SIMULATION USING HFSS conducted by Ansys, IEEE Bangalore section, APS MTT- S Bangalore Joint chapter and Entuple technologies attended for research activity to be conducted **(Dr. Garima Saini)**

14. Attended One-week STC on "Metamaterials and its Application" conducted by IEEE Antenna & propagation chapter Jaipur in association with IEEE Rajasthan subsection, GWEC Ajmer from 27$^{th}$ July 2020 t0 31$^{st}$ July 2020. **(Dr. Garima Saini)**

## Lectures delivered outside NITTTR

1. **Delivered lecture on "Digital Library" in STC organized** Society of Materials and Mechanical Engineers (SOMME) Bathinda, Punjab (India) **on 02 June 2020. (Dr. Balwinder Raj)**

2. **Delivered lecture on "**Nanoelectronic Devices: Problems and Possible Solutions**" in online STC organized by** in department of ECE from ARASU ENGINEERING COLLEGE, Kumbakonam, Tamil Nadu, **on 04 Aug 2020. (Dr. Balwinder Raj)**

3. Delivered 2 Expert Lectures for the participants of webinars outside NITTTR **(Dr.Balwinder Singh)**

## Lab Manuals Developed: 03

Lab Manual for 'Digital Image Processing' **(Dr. Amod Kumar)**

Lab Manual for 'Digital Signal Processing' **(Dr. Amod Kumar)**

Lab Manual for 'Programming of Arduino using TINKERCARD' **(Dr. Kanika Sharma)**

**M.Tech (Regular & Modular):** All the teachers of the Department were involved in the PG courses during this period.

# Planning for the next two years (August 2020 to July 2022)

**STC's planned per semester:**

24 academic + 03 in collaboration with Industry + 01 Skill based

**Academic Programmes being run/ Proposed:**

**M.Tech:** ECE (Regular & Modular)

ECE (Artificial Intelligence)

**Course Proposed under NSQF:** PG diploma in Embedded systems& IOT

**Courses Proposed under Deemed to be university:** PG Diploma in Reconfigurable Electronics; Smart & Flexible Electronics; Rehabilitation Engineering

**Courses Proposed for online instruction to PU:** Master's/ PG Diploma in AI, Master's/ PG Diploma in Reconfigurable Electronics with exit options as per PU policy.

**No of PhD students to be enrolled over the next two years:** 20 (Subject to availability of slots)

**Activity -VIII for In-house Product Development (1st April, 2020 to 31st March, 2022)**

| Sr. No. | Module Name | Tentative Time |
|---|---|---|
| 1. | IOT based automation of NITTTR electrical appliances. Long term **multiple product** project with the help of PG students. | 2 years August 2020 to July 2022 |
| 2. | UV based decontamination system | 1 year January 2021 to December 2021 |
| 3. | AI based Application development. Long Term **multiple product** project with the involvement of PG students | August 2020 to July 2022 |

## Activity III: Rural Development

| S. No. | Name of the Faculty member | Technology Innovation (Technology/ Research Project… ) | Employment Generation (Skill development/ Instructional resources/ Digital education & training/ Curriculum development/ Village industry/ Digital marketing…) | Information Dissemination and Awareness (Website/App/ Digital & other information resources development… ) | Any other |
|---|---|---|---|---|---|
| 1. | Dr Balwinder Singh | Promotion of E tools for teaching learning | Digital education & training for rural areas | Videos | - |
| 2. | Dr. Garima Saini | Technology Research Project for Rural Development | In consultation with rural department | - | - |
| 3. | Dr.Amod Kumar | - | Microsoft Office skill training in rural areas | - | - |

## Activity VII: Instructional Material

| S No. | Name of Programme/Project | Long term/Short Term | Type of Instructional Material | Coordinator(s) | Time Period | Expectation during four quarters of six months each (4 Nos) for a total period of next 2 years |
|---|---|---|---|---|---|---|
| 1. | Artificial Intelligence | Long Term | Lab Manual | S S Gill Balwinder Raj | One year | August 2020 to July 2021 |
| 2. | VLSI Design | Long Term | Lab Manual | Balwinder Raj | One year | August 2020 to July 2021 |
| 3. | Digital System Design | Long Term | Lab Manual | Kanika Sharma | One Year | August 2020 to July 2021 |
| 4. | D Ec Lecture Series | Long Term | Video Lecture MOOCs format | Balwinder Singh | 6 Months | August 2020 to December 2020 |
| 5. | E Learning Lecture Series | Long Term | Video Lecture MOOCs format | Balwinder Singh | 6 Months | January 2021 to July 2021 |
| 6. | Digital Signal Processing | Short Term | PowerPoint Presentation | Amod Kumar | 2 months | October - November 2020 |
| 7. | Digital Signal Processing | Short Term | Lab Manual | Amod Kumar | 2 months | October - November 2020 |
| 8. | Digital Image Processing | Short Term | PowerPoint Presentation | Amod Kumar | 2 months | February-March 2021 |
| 9. | Digital Image Processing | Short Term | Lab Manual | Amod Kumar | 2 months | February-March 2021 |
| 10. | Natural Language Processing | Long Term | E content | Amod Kumar Kanika Sharma | 6 months | July-December, 2021 |

| | | | | Balwinder Raj | | |
|---|---|---|---|---|---|---|
| 11. | Artificial Intelligence Applications in Electronics | Long Term | Video Films MOOCs Format | S S Gill Balwinder Raj | 1 year | August 2020-July 2021 |
| 12. | New Radio Technology | Long Term | Video Films MOOCs format | Garima Saini | 6 months | January 2021 to July 2021 |
| 13. | Embedded Systems | Long Term | Video Films MOOCs Format | Kanika Sharma | 6 months | January 2021 to July 2021 |
| 14. | Embedded Processors | Long Term | Video Films MOOCs Format | Kanika Sharma | 6 months | August 2021 to December 2021 |
| 15. | 5G Architecture | Long Term | Video Films MOOCs Format | Garima Saini | 6 months | August 2021 to December 2021 |
| 16. | Latest Wireless and Communication Technology | Long Term | Video Films MOOCs Format | Garima Saini | 6 months | January 2022 to July 2022 |