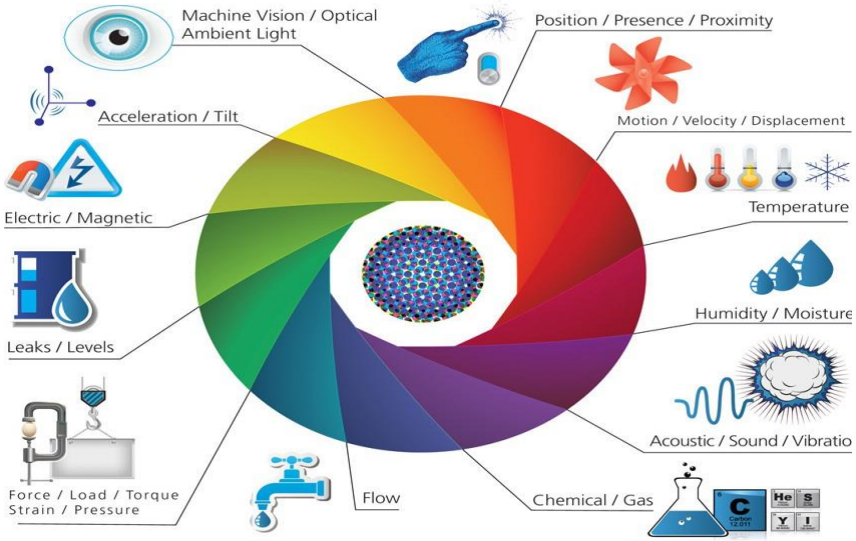
# NIELIT Ropar
# Deemed to be University

## MTech in IoT and Sensor Systems

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The NIELIT University M.Tech in IoT and Sensor Systems programme transforms education into the complex world of linked devices and data-driven decision-making. The programme goes beyond jargon to explore the fundamentals of IoT. It provides students with a solid foundation in computer science mathematics, including calculus, linear algebra, and discrete mathematics, to analyse complex data, optimise algorithms, and design efficient systems to handle immense amounts of data from sensors and interconnected devices.

The programme guarantees that theoretical knowledge is absorbed and confidently implemented in real-world situations through a holistic and personalised learning experience. Whether they're interested in machine learning's predictive capacity or data visualisation for real-time insights, students can customise their education through electives. Labs related to electives allow students to experiment and improve their skills.

Research Methodology and IPR help students conduct rigorous research and comprehend intellectual property rights in innovation. This foundation prepares students for their Mini Project, where they solve IoT and sensor system problems using theoretical and practical abilities. The programme introduces students to cutting-edge topics like cloud computing, distributed databases, knowledge discovery, and web analytics. Audit courses expose students to many subjects, and laboratories reinforce learning and abilities. The Dissertation phase in the latter semesters allows students to contribute meaningfully to the field by choosing an IoT and sensor systems subject of interest. This individual research allows students to shape this dynamic sector. Students can also choose an Industrial Project for industry experience.

NIELIT University knows that academic achievement is only part of the equation, thus it prepares students for the competitive world of IoT and sensor systems. Professional networking, career coaching, and industry placements and internships are available through the programme. Graduates are confident, skilled professionals ready to make a difference in the world of networked gadgets and data-driven decision-making.

## Program Educational Objectives (PEOs):

PEO1: Graduates will demonstrate expertise in the fundamental principles of IoT and Sensor Systems, including mathematical foundations, advanced data structures, and algorithms, preparing them to tackle complex challenges in the field.

PEO2: Graduates will be adept at applying their knowledge through practical applications, mini-projects, and an industrial project, fostering a spirit of innovation and the ability to contribute meaningfully to the industry.

PEO3: Graduates will embrace lifelong learning, adapting to evolving IoT trends, technologies, and methodologies for sustained professional development and growth in their careers.

PEO4: Graduates will uphold ethical standards, considering societal impacts, intellectual property rights, and responsibly contributing to social, environmental, and ethical considerations in the development and implementation of IoT solutions.

## Program Outcomes (POs):

PO1: Graduates independently solve complex challenges in IoT and Sensor Systems, showcasing research skills and proposing effective solutions.

PO2: Effective Communication: Proficient oral and written skills empower graduates to articulate technical concepts and collaborate effectively within interdisciplinary teams.

PO3: Continuous Learning: Graduates embrace lifelong learning, adapting to evolving IoT trends, technologies, and methodologies for sustained professional development.

PO4: Innovation and Research: Graduates contribute innovatively to IoT and Sensor Systems, applying advanced algorithms and AI, demonstrating research competence, and fostering technological advancements.

PO5: Ethical Responsibility: Graduates uphold ethical standards, respecting intellectual property, considering societal impacts, and responsibly contributing to social, environmental, and ethical considerations.

# Course Curriculum

## FIRST YEAR

## SEMESTER-1

| S. No. | Course Code | Subject | Periods | | | Credit |
|---|---|---|---|---|---|---|
| | | | L | T | P | |
| 1 | ICL101 | RESEARCH METHODOLOGY AND IPR | 2 | 0 | 0 | 2 |
| 2 | ISL101 | IOT FUNDAMENTALS AND ARCHITECTURE | 3 | 0 | 0 | 3 |
| 3 | ISL102 | PRINCIPLES OF SENSORS AND SIGNAL CONDITIONING | 3 | 0 | 0 | 3 |
| 4 | ISLXXX | DISCIPLINE ELECTIVE-1 | 3 | 0 | 0 | 3 |
| 5 | ISLXXX | DISCIPLINE ELECTIVE-2 | 3 | 0 | 0 | 3 |
| 6 | ICL102 | AUDIT COURSE | | | | |
| .7 | ISP101 | IOT FUNDAMENTALS AND ARCHITECTURE LAB | 0 | 0 | 2 | 2 |
| 8 | ISP102 | PRINCIPLES OF SENSORS AND SIGNAL CONDITIONING LAB | 0 | 0 | 2 | 2 |
| | | **Total** | 14 | 0 | 4 | 18 |

## FIRST YEAR
## SEMESTER-2

| S. No. | Course Code | Subject | Periods | | | Credit |
|---|---|---|---|---|---|---|
| | | | L | T | P | |
| 1 | ISL201 | INDUSTRIAL INTERNET OF THINGS | 3 | 0 | 0 | 3 |
| 2 | ISL202 | WIRELESS SENSORS NETWORK | 3 | 0 | 0 | 3 |
| 3 | ISL03X | DISCIPLINE ELECTIVE-3 | 3 | 0 | 0 | 3 |
| 4 | ISL04X | INDUSTRY ELECTIVE-1 | 3 | 0 | 0 | 3 |
| 5 | ISL203 | MINI PROJECT | 0 | 0 | 4 | 2 |
| 6 | ACL 103 | AUDIT COURSE | | | | |
| 7 | ISP201 | SYSTEM DYNAMICS AND CONTROL SYSTEMS LAB | 0 | 0 | 2 | 2 |
| 8 | ISP202 | DATA ACQUISATION LAB | 0 | 0 | 2 | 2 |
| | | **Total** | 12 | 0 | 8 | 18 |

## SECOND YEAR
## SEMESTER-3

| S. No. | Course Code | Subject | Periods | | | Credit |
|---|---|---|---|---|---|---|
| | | | L | T | P | |
| 1 | MTIS301 | MOOCS | _ | _ | _ | 2 |
| 2 | MTIS302 | INTERNSHIP | _ | _ | _ | 4 |
| 3 | MTIS351 | DISSERTATION PHASE-1 | 0 | 0 | 20 | 12 |
| | | **Total** | 0 | 0 | 20 | 16 |

## SEMESTER-4

| S. No. | Course Code | Subject | Periods | | | Credit | Evaluation Scheme | | | | | Subject Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Theory | | | Practical | | |
| | | | L | T | P | | CT | TA | ESE | TA | ESE | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | MTIS351 | DISSERTATIO N PHASE-2 | 0 | 0 | 36 | 18 | _ | _ | _ | 200 | 400 | 600 |
| | | **Total** | 0 | 0 | 36 | 18 | _ | _ | _ | **200** | **400** | **600** |

## DISCIPLINE ELECTIVE-1
## (FIRST YEAR, SMESTER-1)

| S. No. | COURSE CODE | COURSE NAME | L-T-P | HOURS | CREDIT |
|---|---|---|---|---|---|
| 1 | MTIS011 | IOT APPLICATIONS AND WEB DEVELOPMENT | 3-0-0 | 3 | 3 |
| 2 | MTIS012 | REAL TIME EMBEDDED SYSTEMS DESIGN AND ANALYSIS | 3-0-0 | 3 | 3 |
| 3 | MTIS013 | FLEXIBLE AND PRINTED ELECTRONICS | 3-0-0 | 3 | 3 |
| 4 | MTIS021 | BIOMEDICAL SENSORS | 3-0-0 | 3 | 3 |
| 5 | MTIS022 | CHEMICAL AND ENVIRONMENTAL SENSORS | 3-0-0 | 3 | 3 |
| 6 | MTIS023 | RF AND MICROWAVE SENSORS | 3-0-0 | 3 | 3 |
| 1 | MTIS031 | DEEP LEARNING — AN APPROACH TO ARTIFICIAL INTELLIGENCE | 3-0-0 | 3 | 3 |
| 2 | MTIS032 | ARTIFICIAL NEURAL NETWORK AND MACHINE LEARNING | 3-0-0 | 3 | 3 |
| 3 | MTIS033 | CLOUD AND FOG COMPUTING | 3-0-0 | 3 | 3 |

## INDUSTRIAL ELECTIVE

| S. No. | COURSE CODE | COURSE NAME | L-T-P | HOURS | CREDIT |
|---|---|---|---|---|---|
| 1 | MTIS041 | INDUSTRIAL IOT FOR SMART CITIES | 3-0-0 | 3 | 3 |
| 2 | MTIS042 | IOT SECURITY AND TRUST | 3-0-0 | 3 | 3 |
| 3 | MTIS043 | AUTOMOTIVE SENSORS AND IN-VEHICLE NETWORKING | 3-0-0 | 3 | 3 |

# Walkthrough of IoT & Sensor System Lab

**Objectives:**

Internet of Things is a technological revolution, which is totally a dynamic in nature. It has been converging multiple technologies creating new dimension of services that improves the quality of life of consumers and productivity of enterprises.

The main objective of an IoT lab is to explore the many applications of sensors and "smart" objects. IoT labs have many sensors to explore a variety of applications.

The IoT lab is equipped with Arduino, Raspberry Pi and NodeMCU ESP 8266 in addition to wi-fi, BLE, shields and other connectivity modules. Lot many sensors in the lab to explore myriad of applications. The campus is equipped with 24x7 wired and wireless internet connectivity.

1. **Raspberry Pi:**

The Raspberry Pi is a small, low-cost computer that is about the size of a debit card. It has a processor, memory, and graphics driver, and can connect to a TV or computer desktop using a keyboard and mouse. The Raspberry Pi can browse the internet, stream HD video, and do word processing, spreadsheets, and gaming, just like a desktop computer. It can also communicate with the outside world and has been used in many digital maker projects, such as weather stations, music machines.

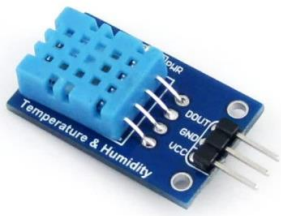
2. **Arduino Uno:**


Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator.

3. **NodeMCU ESP 8266**

NodeMCU ESP8266 is an open-source Lua based firmware and development board specially targeted for IoT based applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems and hardware which is based on the ESP-12 module, and like this, it can also be programmed using Arduino IDE and can act as both WiFi Hotspot or can connect to one. It has one Analog Input Pin, 16 Digital I/O pins along with the capability to connect with serial communication protocols like SPI, UART, and I2C.

4. **DHT Sensor**

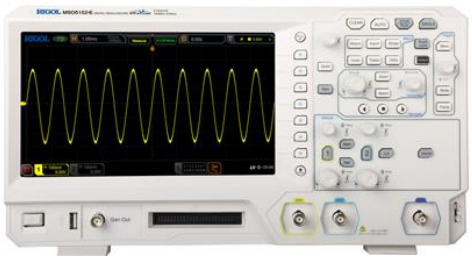



The DHT11 is a commonly used Temperature and humidity sensor that comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data.

5. **Ultrasonic Sensor**


Ultrasonic sensors are electronic devices that determine a target's distance. They work by emitting ultrasonic sound waves and converting those waves into electrical signals. Furthermore, ultrasonic travel at a faster rate than audible sounds. Therefore, ultrasonic sensor work involves sound waves to find the distance to an item.

**6. Digital Oscilloscope**



A digital storage oscilloscope (DSO) is an oscilloscope which stores and analyses the input signal digitally rather than using analog techniques. It is now the most common type of oscilloscope in use because of the advanced trigger, storage, display and measurement features which it typically provides.

**7. GSM Interface**

SIM900A Modem can work with any GSM network operator SIM card just like a mobile phone with its own unique phone number. SIM900A GSM/GPRS modem is plug and play modem with RS232 serial communication supported. Hence Advantage of using this modem will be that its RS232 port can be used to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed. SIM900 modem supports features like voice call, SMS, Data/Fax, GPRS etc.

**8. Practical Project Experiments:**

I. Setting up of Raspberry Pi and connect to a network.

II. Familiarization with GPIO pins and control

III. hardware through GPIO pins.

IV. Speed Control of motors using PWM with python programming.

V. Use sensors to measure temperature, humidity, light and distance.

VI. Web based hardware control

VII. Connect IOT devices through cloud using IoT protocol such as MQTT.

VIII. Controlling IoT devices using Arduino.

IX. Create Wireless network of sensors using Zigbee.

# Job Roles

In every area where there are internet-connected sensors, IoT technologists will be in high demand. Here are a few common roles in the IoT field today.

- Applications Engineer- IoT mbed
- Azure Cloud Architect (IoT)
- Big Data Lead (IoT)
- C++ Software Developer (Smart Lighting IoT)
- Chief IoT Officer
- Connected Spaces IoT Consultant
- Data Engineer Sensors and IoT Applications
- Data Scientist – IoT
- Development Engineer, Mobile (IoT PaaS)
- Director of DevOps – Sensors, Analytics, and IoT
- IoT Developer
- IoT Infrastructure Architect
- IoT Solutions Architect
- IoT System Administrator
- Java Developer (IoT & M2M)
- Product Manager – IoT Smart Cities
- Research Director – Information Assurance and IoT Security
- Segment Marketing Manager – IoT Technologies
- Senior Mobile QA Engineer (IoT, PaaS)
- Technician IoT Devices Support
- Test Engineer
- Vulnerability Cyber Engineer

## Top Recruiters

There are demands for engineering graduates in several domains including the private and public sector. Several companies recruit engineers in various capacities. Here are some examples of top companies recruiting M.Tech graduates:

- Boat
- Cadence
- Intel
- Siemens
- Accenture Services
- Amazon
- Apple
- Flipkart
- Goldman Sachs
- Google
- HCL Technologies
- Hindustan UniLiver Ltd
- Honeywell
- HSBC
- IBM Global Services
- ICICI
- Infosys Technologies
- IoT Cloud Software Developer

## Number of seats : 18

## Eligiblity Criteria:

For Gate Passed Candidates: For admission to M. Tech.in IoT & Sensor Systems candidate must have passed GATE paper. in EC/EE/IN/MECH.

For Non-Gate Candidates: For admission to M. Tech.in IoT & Sensor Systems candidate must have passed B.E./B.Tech. in Electronics and Communication Engineering/ Electronics and Instrumentation Engineering/ Information Communication Technology /Electronics and Computer Engineering/ Electrical and Electronics Engineering/ Electrical Engineering or equivalent degree in Engineering with 50% (45% for SC/ST & Disabled Persons Categories) marks.

### Reservation Policy

i. Seats are reserved as per Govt. of India Rules, AICTE and/or University Approval.
ii. A quota of 15 % is reserved for the SC candidates, 7.5% for ST candidates, 27% for Other Backward Classes and 10% for Economic Weaker Section (EWS):
iii. Candidates selected against the quota for persons with disabilities (5%) as per PWD Act 1995 are placed in the appropriate category viz.SC/ST/OBC/General candidates

depending upon the category to which they belong in the roster meant for reservation of SCs/STs/OBCs.

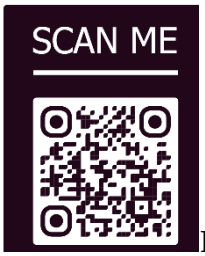
## Hostel Facilities

NIELIT Ropar provides in-campus hostel accommodation for both boys and girls separately with a total capacity of 160 seats in each hostel with modern amenities. The hostels are secured by round-the-clock security guards at the entry gates.

## Other Facilities

- NKN Connectivity
- 24x 7 Wi-Fi Campus
- IEEE Online Access
- Shodh Ganga Access
- ACM Online Access

## Location and How to reach?




**Please scan the code above to get the location detail wrt to NIELIT Ropar Campus**

## By Auto / Taxi from Ropar Bus Stand

*https://maps.app.goo.gl/eEcEqsxMyetwy5AA6*

## By Auto /Taxi from Ropar Railway station

*https://maps.app.goo.gl/sf5pjKz3eiLWYRqi8*

## By Airport

*https://maps.app.goo.gl/53SosBhBckNDXMdH8*

The nearest Airport is Shaheed Bhagat Singh International Airport which is situated at 55 kms away from the NIELIT Ropar Campus. One can reach the venue by hiring a taxi from the airport.

## Important Dates

To be added later on

## Important Contact Details