

## NIRMA UNIVERSITY

<b>Institute:</b>	Institute of Technology
<b>Name of Programme:</b>	B. Tech in Electronics and Instrumentation Engineering
<b>Course Code:</b>	2EIDE06
<b>Course Title:</b>	Soft Sensors
<b>Course Type:</b>	( <input type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course/ <input checked="" type="checkbox"/> <b>Departmental Elective</b> / <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/ <input type="checkbox"/> Any other)
<b>Year of introduction:</b>	2023-2024

### Credit Scheme

L	T	Practical component				C
		LPW	PW	W	S	
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### Course Learning Outcomes (CLO):

At the end of the course, students will be able to -

1. explain the methods for soft sensor design
2. select appropriate model structure of soft sensor
3. model fault detection and diagnosis in industrial process
4. design soft sensor for industrial applications.

### Syllabus:

**Total Teaching hours: 45**

Unit	Syllabus	Teaching hours
Unit-I	<b>Introduction</b> Soft Sensor, types of soft sensor's design approaches	04
Unit-II	<b>Applications of Soft Sensors</b> Back-up of measuring devices, reducing the measuring hardware requirements, real-time estimation for monitoring and control	06
Unit-III	<b>Soft sensor design</b> Identification of variables, data selection and filtering, model structure selection, model validation, multivariate statistical techniques, artificial intelligent techniques.	12

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Unit-IV	<b>Choice of the model structure</b> Static models, Linear dynamic models, Soft computing identification strategies, methods for input and regressor selection.	07
Unit-V	<b>Applications of soft sensors in fault detection and diagnosis</b> Basic terminology in fault detection and diagnosis, an overview of fault detection and diagnosis, model based fault detection, fault models, fault detection approaches, symptom analysis and fault diagnosis, hybrid approaches to industrial fault detection and diagnosis	08
Unit-VI	<b>Case studies</b> Case studies related to soft sensor design for refineries, chemical plants, cement kilns, food processing industries, power plants, urban and industrial pollution monitoring and civil engineering	08

**Self-Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Suggested List of**

**Experiments:**

**Suggested Readings/**

**References:**

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**References:**

1. Luigi Fortuna, Salvatore Graziani, Alessandro Rizzo, Maria G. Xibilia, Soft sensors for monitoring and control of industrial processes, Springer.
2. Pablo Antonio Lopez Perez, Ricardo Aguilar Lopez, Ricardo Femat, Control in Bioprocessing: Modelling, estimation and the use soft sensors, Wiley.
3. Rajamani Doraiswami, Maryhelen Stevenson, Chris Diduch, Identification of physical systems: Applications to condition monitoring, fault diagnosis, soft sensor and controller design, Wiley

**Suggested Case List:**

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**L= Lecture, T=Tutorial, P= Practical, C= Credit**

**w.e.f. academic year 2023-24 and onwards.**

