SCADA SYSTEM AND APPLICATIONS

PEC-V: EPS

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
BPSB22	**Elective**	3	-	-	3	30	70	100

Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 45

I. COURSEOVERVIEW:

This course provides an exposure to technology of automation and control as widely seen across a typical power system network. It contains a wide range of topics from typical SCADA system Architecture, Communication requirements, Desirable Properties of SCADA system, features and other devices used for interfacing with real time systems. The course also includes the applications of SCADA systems in monitoring, control and management of energy in transmission and distribution networks of a power system and otherindustries.

II. COURSE OBJECTIVES:

This course should enable the students to:
I.   Understand what is meant by SCADA and itsfunctions.
II.   Explain SCADA communication to get an insight into itsapplication.

III. COURSEOUTCOMES:

After successful completion of the course, students will be able to:		
CO 1	**Demonstrate** the basic functionality, merits and demerits of PLC and SCADA systems for supervisory control of an industrial system	Understand
CO 2	**Develop** the ladder diagram and functional block diagrams for interfacing PLC with SCADA system.	Apply
CO 3	**Identify** the typical components of SCADA systems used for interfacing with real time systems	Apply
CO 4	**Analyze** the different types of architectures and communication technologies ofa typical SCADA system	Analyze
CO 5	**Make use of** SCADA systems for controlling, security and energy management of a power system networks	Apply
CO 6	**Appraise** the superiority of SCADA systems in operation, controlling, and monitoring of oil, gas, water and power industries.	Evaluate

IV. SYLLABUS

UNIT-I	INTRODUCTION TO SCADA AND PLC	Classes: 09

Data acquisition system, evaluation of SCADA, communication technologies, monitoring and supervisory functions; PLC: Block diagram, programming languages, ladder diagram, functional block diagram, applications, interfacing of PLC with SCADA.

UNIT-II	SCADA SYSTEM COMPONENTS	Classes: 10

Industries SCADA system components: Schemes, remote terminal UNIT (RTU), intelligent electronic devices(IED), communication network, SCADA server, SCADA / HMI systems.

UNIT-III	SCADA ARCHITECTURE AND COMMUNICATION	Classes: 08

SCADA architecture: Types, advantages and disadvantages of each system, single unified standard architecture-IEC 61850.

SCADA Communication: Various industrial communication technologies, wired and wireless methods, fiber optics, open standard communication protocols.

UNIT-IV	OPERATION AND CONTROL	Classes: 09

SCADA Operation and Control: Operation and control of interconnected power system, automatic substation control, SCADA configuration, energy management system, system operating states, system security, state estimation UNIT.

UNIT-V	SCADA APPLICATIONS	Classes: 09

SCADA Applications: Utility applications, transmission and distribution sector operations, monitoring, analysis and improvement, industries, oil, gas and water, case studies, implementation, simulation exercises.

Text Books:

1. Stuart A. Boyer: "SCADA-Supervisory Control and Data Acquisition", Instrument Society of America Publications, USA, 2004.
2. Gordon Clarke, Deon Reynders: "Practical Modern SCADA Protocols: DNP3, 60870.5 and Related Systems", Newnes Publications, Oxford, UK, 2004.

Reference Books:

1. William T. Shaw, "Cyber Security for SCADA systems", Penn Well Books, 2006.
2. David Bailey, Edwin Wright, "Practical SCADA for industry", Newnes, 2003.
3. Sunil S Rao, "Switchgear and protections", Khanna Publications, 2nd Edition, 2000.
4. Michael Wiebe, "A guide to utility automation: AMR, SCADA, and IT systems for Electric Power", PennWell1999.

Web References:

1. https://www.as.wiley.com/WileyCDA/WileyTitle/productCd-1118634039.html.
2. https://www.academia.edu/3409546/Power_Electronics_Application_in_Renewable_Energy_System.
3. https://www.springer.com/us/book/9788132221180.
4. https://www.springer.com/us/book/9781447151036.

E-Text Books:

1. https://www.ijtra.com/view/role-of-power-electronics-in-non-renewable-and-renewable-energy-systems.pdf.
2. https://www.nitgoa.ac.in/News_files/STC.pdf.
3. https://www.jee.ro/covers/art.php?issue=WN1438788776W55c22ca867606.
4. https://www.magnelab.com/wp-content/uploads/2015/01/Role-of-power-electronics-in-renewable-energy-systems.pdf.