SCADA SYSTEM AND APPLICATIONS

III Semester: EPS								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
BPSC26	**Elective**	3	0	0	3	30	70	100
Contact Classes: 45	**Total Tutorials: Nil**	**Total Practical Classes: Nil**				**Total Classes: 45**		

I. COURSE OVERVIEW:

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 other industries.

II. COURSE OBJECTIVES:

The students will try to learn:

I. The fundamentals of SCADA systems including its architecture, components and communication protocols.
II. The control aspects of power system network and energy management using automation.
III. The substantial applications of SCADA systems and analyze industrial problems from an automation perspective.

III. COURSE OUTCOMES:

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

MODULE –I: INTRODUCTION TO SCADA AND PLC (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

MODULE –II: SCADA SYSTEM COMPONENTS (09)

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

MODULE –III:SCADA ARCHITECTURE AND COMMUNICATION (09)

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.

MODULE –IV: OPERATION AND CONTROL (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.

MODULE –V: SCADA APPLICATIONS (09)

SCADA Applications: Utility applications, transmission and distribution sector operations, monitoring, analysis and improvement, industries, oil, gas and water, case studies, implementation, simulation exercises. Control of generation, models of power system elements, single area and two area block diagrams, generation control with PID controllers, implementation of Automatic Generation control (AGC), AGC feature

V. 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", Newness Publications, Oxford, UK,2004.

VI. Reference Books:

1. William T. Shaw, "Cyber Security for SCADA systems", Penn Well Books,2006.
2. David Bailey, Edwin Wright, "Practical SCADA for industry", Newness,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.

VII. 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.

VIII. 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.