IKG Punjab Technical University

Teaching Scheme

for

PhD Coursework

ELECTRICAL ENGINEERING

2020 & onwards

Ph.D Course work structure and criteria for assessment

(Reference IKGPTU/REG/NF/2172, dated 27/07/2021)

Sr. No.	Nature of Course	Name of Course	Credits	Hours per Week	Maximum Marks	External Marks	Internal Marks	External Assessment	Internal Assessment
1	Core	Research Methodology	4	4	100	60	40	3 hours exam	MSTs, Assignment/ presentation
2	Core	Subject related theory paper	4	4	100	60	40	3 hours exam	MSTs, Assignment/ presentation
3	Core	Presentation/ Seminar	3	3	75	0	75	--	Seminar and technical report writing
4	Inter-disciplinary	Elective	4	4	100	60	40	3 hours exam	MSTs, Assignment/ presentation
5	For all streams	Research publication and Ethics	2	2	50	30	20	3 hours exam	MSTs, Assignment/ presentation
Total			**17**	**17**	**425**	**210**	**215**	--	--

w.e.f: Batch 2020

Core-List of Subject related theory paper	
1.	Power System Engineering
2.	Power Electronics
3.	Electrical Drives Engineering
4.	Energy Management Engineering
5.	Microelectronics and Control Systems
6.	Advanced Relaying and Protection
7.	Digital System Design
8.	Modelling and Analysis of Dynamic Systems
9.	Bio Medical Signal Processing
10.	Sensors and Applications
11.	Scientific and Analytical Instrumentation
12.	Renewable Energy Resources

w.e.f: Batch 2020

Elective-List of Interdisciplinary Course	
1.	Signal Processing
2.	Communication Systems
3.	VLSI Design and Embedded Systems
4.	Linear Algebra
5.	Sensors for Ranging and Imaging

w.e.f: Batch 2020

Program Outcomes of Ph.D-Electrical Engineering

w.e.f: Batch 2021

The scholars who successfully completes their PhD programme in Electrical Engineering will be able to:

PO 1: Perform an advanced research theory based, practiced and analyze the existing research of key thrust areas.

PO 2: Competent to undertake a novel work using modern engineering tools for creating a positive impact towards the welfare and betterment of society.

PO 3: To demonstrate the leadership skills in the chosen research domain and communicates effectively both in oral and written formats to a diverse audience.

PO 4: Knowledge enhancement, positive impact toward the welfare and betterment of society and contribute to nation building.

Course Outcomes of Ph.D Course Work	w.e.f: Batch 2021
CORE COURSES	
1.	**Research Methodology**
	CO1: for a basic framework of research process. CO2: analyze and interprets the various research designs and techniques CO3: understand and apply ethical dimensions of conducting applied research and carrying inter-disciplinary research.
2.	**Power System Engineering**
	CO1: to understand the applications of various compensation devices CO2: Apply the concept of FACTS controllers in advanced hybrid power research using modern engineering tools CO3: Study and analyze the stability under varying transient conditions
3.	**Power Electronics**
	CO1: present the concepts of typical power electronic circuits: topologies and control. CO2: converter analysis, modeling, design and control of converters to different applications using modern engineering tools. CO3: design the controller for varied systems of engineering
4.	**Electrical Drives Engineering**
	CO1: Understand the design, function, operation and control of all major components of a typical electric drive CO2: To develop the applications of multilevel inverter and its topologies in advanced research CO3: Understand the non-linear induction motor drives for various diverse applications
5.	**Energy Management Engineering**
	CO1: Apply the concept of energy audit in the industry and extend to society for energy management awareness CO2: Start the consultancy on energy management and engineering CO3: Analyze and interprets the various lighting systems and HVAC systems
6.	**Microelectronics and Control Systems**
	CO1: Design the optimal control for various diverse applications in advanced research CO2: Learn the various filtering techniques by applying digital signal processing in power system applications CO3: Interprets and compare the stability concept of various non-linear systems using engineering softwares
7.	**Advanced Relaying and Protection**
	CO1: Learn to differentiate the unit and non-unit system of protection schemes CO2: Analyze and apply the various protection schemes for under various applications of thrust areas of research

	CO3: To extend the development of prototypes of supervisory control schemes in research work
8.	**Digital System Design**
	CO1: To apply concepts and methods of digital system design techniques CO2: To understand the principle of operation of sequential machines CO3: To analyze and interprets the design of combinational and sequential digital systems for diverse applications of power systems
9.	**Modelling and Analysis of Dynamic Systems**
	CO1: Perform systematic choices of ideal elements for modeling a real dynamic system with mechanical, thermal, fluid and electrical elements and their interactions CO2: Develop the differential equations that describe the input/output behavior of a dynamic system CO3: Compute the input/output transfer function of a dynamic system for its analysis
10.	**Bio Medical Signal Processing**
	CO1: To understand the concept of nervous system and apply in neural networks. CO2: To analyze the research based non-electrical parameters and use in algorithms using modern engineering tools. CO3: Understand and interprets the principle of operation of biotelemetry systems and its applications.
11.	**Sensors and Applications**
	CO1: Gain the basic idea of measurements, characteristics and the errors associated with measurements and apply in advanced research meaningful for society CO2: Demonstrate the concept of resistive sensors which can be employed for real life applications CO3: Realize the concept of reactive sensors employed for real life applications
12.	**Scientific and Analytical Instrumentation**
	CO1: learn the basic concept of qualitative and quantitative analysis of a given sample. CO2: Learn various spectroscopic techniques with its instrumentation and apply in inter-disciplinary research. CO3: impart the concept of separation science and its application.
13.	**Renewable Energy Resources**
	CO1: Apply the basic properties of different renewable sources of energy and technologies using modern engineering tools CO2: Knowledge of the main elements of technical systems designed for utilization of renewable sources of energy CO3: Understand the advantages and disadvantages of different renewable sources of energy
14.	**Presentation/ Seminar**

	CO1: To identify an area of research and demonstrate the ability to present the latest carried work and explains its societal benefits CO2: To ably link the carried study with its economic analysis and demonstrate its relative merits CO3: To ably carry forward its study using modern engineering softwares

ELECTIVE COURSE	
1.	**Signal Processing**
	CO1: Interpret, represent and process discrete/digital signals and systems CO2: Thorough understanding of frequency domain analysis of discrete time signals CO3: Ability to design & analyze DSP systems like FIR and IIR Filter
2.	**Communication Systems**
	CO1: Analyse communication systems in both the time and frequency domains. CO2: Describe the principles of amplitude modulated and angle modulated communication systems CO3: Describe the principles of various digital modulation systems and their properties
3.	**VLSI Design and Embedded Systems**
	CO1: Learn IC and ASIC Technology CO2: Understand the detailed working of combinational circuits CO3: Express the functioning of sequential circuits
4.	**Linear Algebra**
	CO1: acquire basic knowledge of matrix theory CO2 comprehend basic concept of vector space and linear transformation CO3 apply the knowledge of linear algebra in engineering problems
5.	**Sensors for Ranging and Imaging**
	CO1: Understand the constraints and limitations of a given ISM system in a given application CO2: Compare, contrast and select the most appropriate sensor modality CO3: Prepare a detailed sensor system specification

	COs w.e.f: Batch 2021	POs
1.	**Research Methodology**	
	CO1: for a basic framework of research process. CO2: analyze and interprets the various research designs and techniques CO3: understand and apply ethical dimensions of conducting applied research and carrying inter-disciplinary research.	PO 1: Perform an advanced research theory based, practiced and analyze the existing research of key thrust areas. PO 3: To demonstrate the leadership skills in the chosen research domain and communicates effectively both in oral and written formats to a diverse audience.
2.	**Power System Engineering**	
	CO1: to understand the applications of various compensation devices CO2: Apply the concept of FACTS controllers in advanced hybrid power research using modern engineering tools CO3: Study and analyze the stability under varying transient conditions	PO 2: Competent to undertake a novel work using modern engineering tools for creating a positive impact towards the welfare and betterment of society. PO 4: Knowledge enhancement, positive impact toward the welfare and betterment of society and contribute to nation building.
3.	**Power Electronics**	
	CO1: present the concepts of typical power electronic circuits: topologies and control. CO2: converter analysis, modeling, design and control of converters to different applications using modern engineering tools. CO3: design the controller for varied systems of engineering	PO 1: Perform an advanced research theory based, practiced and analyze the existing research of key thrust areas. PO 2: Competent to undertake a novel work using modern engineering tools for creating a positive impact towards the welfare and betterment of society.
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5.	**Energy Management Engineering**	
	CO1: Apply the concept of energy audit in the industry and extend to society for energy management awareness	PO 2: Competent to undertake a novel work using modern engineering tools for creating a positive impact towards

	CO2: Start the consultancy on energy management and engineering CO3: Analyze and interprets the various lighting systems and HVAC systems	the welfare and betterment of society. PO 3: To demonstrate the leadership skills in the chosen research domain and communicates effectively both in oral and written formats to a diverse audience. PO 4: Knowledge enhancement, positive impact toward the welfare and betterment of society and contribute to nation building.
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14.	**Presentation/ Seminar**	
	CO1: To identify an area of research and demonstrate the ability to present the latest carried work and explains its societal benefits CO2: To ably link the carried study with its economic analysis and demonstrate its relative merits CO3: To ably carry forward its study using modern engineering softwares	PO 1: Perform an advanced research theory based, practiced and analyze the existing research of key thrust areas. PO 3: To demonstrate the leadership skills in the chosen research domain and communicates effectively both in oral and written formats to a diverse audience. PO 4: Knowledge enhancement, positive impact toward the welfare and betterment of society and contribute to nation building.