

K.L.N. COLLEGE OF ENGINEERING
(An Autonomous Institution, Affiliated to Anna University, Chennai)
Autonomous Regulation - 2020
M.E. – POWER SYSTEMS ENGINEERING
Course Outcomes - R-2020
I - IV SEMESTER CURRICULUM

S.No	Semester	COURSE CODE	COURSE TITLE
1.	I	20PS101	Advanced Power System Analysis
2.		20PS102	Advanced Power System Operation and Control
3.		20PS103	Analysis and Computation of Electromagnetic Transients in Power Systems
4.		20PS104	System Theory
5.		20RM101	Research Methodology and IPR
6.		20PS1E2	Analysis and Design of Power Converters (PE – I)
7.		20AC102	Disaster Management (Audit course –I)
8.		20PS1L1	Power System Simulation Laboratory
9.	II	20PS201	Power System Dynamics
10.		20PS202	HVDC and FACTS
11.		20PS203	Advanced Power System Protection
12.		20PS204	Restructured Power System
13.		20PS2A2	Solar and Energy Storage Systems (PE – II)
14.		20PS2B3	Soft Computing Techniques (PE – III)
15.		20AC104	Value Education (Audit course –II)
16.		20PS2L1	Advanced Power System Simulation Laboratory
17.	20PS2L2	Technical Seminar	
18.	III	20PS3A2	Energy Management and Auditing (PE – IV)
19.		20PS3B1	Electric Vehicles and Energy Storage system. (PE – V)
20.		20OE306	Waste to Energy (OE-I)
21.		20PS3L1	Project Work Phase I
22.	IV	20PS4L1	Project Work Phase II

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Course Code & Course Name: 20PS101- ADVANCED POWER SYSTEM ANALYSIS				
Course	Course Outcome	Unit	CO	K-CO
20PS101.1	Apply the concepts of sparse matrix for large scale power system analysis	I	CO1	K3
20PS101.2	Apply Newton Raphson and Fast Decoupled Load Flow methods for solving load flow problem	II	CO2	K3
20PS101.3	Solve Optimal Power flow problem	III	CO3	K3
20PS101.4	Analyze Symmetrical fault using Zbus algorithm	IV	CO4	K4
20PS101.5	Solve unsymmetrical faults	IV	CO5	K3
20PS101.6	Analyze Transient stability of power systems	V	CO6	K4

CO-PO Mapping

Course ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
20PS101.1	3	2	1	-	-	-	-	-	-	-	-	3	-	-
20PS101.2	3	2	1	-	-	-	-	-	-	-	-	3	-	-
20PS101.3	3	2	1	-	-	-	-	-	-	-	-	3	-	-
20PS101.4	3	3	1	-	-	-	-	-	-	-	-	3	-	-
20PS101.5	3	2	1	-	-	-	-	-	-	-	-	3	-	-
20PS101.6	3	3	1	-	-	-	-	-	-	-	-	3	-	-
20PS101	3	2.33	1	-	-	-	-	-	-	-	-	3	-	-
20PS101	3	2	1	-	-	-	-	-	-	-	-	3	-	-

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Course Code & Course Name: 20PS102-ADVANCED POWER SYSTEM OPERATION AND CONTROL				
Course	Course Outcome	Unit	CO	K-CO
20PS102.1	Apply electrical engineering knowledge to calculate the values of load distribution parameters.	I	CO1	K3
20PS102.2	Analyze the static and dynamic model of Load Frequency Control in single and two area system	II	CO2	K4
20PS102.3	Analyze the problems associated with hydro thermal Scheduling for feasible load management	III	CO3	K4
20PS102.4	Solve unit commitment problems using various methods	IV	CO4	K3
20PS102.5	Solve economic dispatch problems using various methods	IV	CO5	K3
20PS102.6	Explain about the power system security factors and the algorithms used for optimal power flow	V	CO6	K2

Course ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
20PS102.1	3	2	1	-	-	-	-	-	-	-	-	3	-	-
20PS102.2	3	3	1	-	-	-	-	-	-	-	-	3	-	-
20PS102.3	3	3	1	-	-	-	-	-	-	-	-	3	-	-
20PS102.4	3	2	1	-	-	-	-	-	-	-	-	3	-	-
20PS102.5	3	2	1	-	-	-	-	-	-	-	-	3	-	-
20PS102.6	2	1	-	-	-	-	-	-	-	-	-	3	-	-
20PS102	2.83	2.17	0.83	-	-	-	-	-	-	-	-	3	-	-
20PS102	3	2	1	-	-	-	-	-	-	-	-	3	-	-

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Course Code & Course Name: 20PS103-ANALYSIS AND COMPUTATION OF ELECTROMAGNETIC TRANSIENTS IN POWER SYSTEMS				
Course	Course Outcome	Unit	CO	K-CO
20PS103.1	Demonstrate the travelling wave and Derive the travelling wave equation.	I	CO1	K3
20PS103.2	Discuss the over voltages due to lightning, switching and temporary conditions and also categorize the methods to mitigate it.	II	CO2	K2
20PS103.3	Analyze the various effects involving and methods to modeling of over head lines.	III	CO3	K4
20PS103.4	Describe the features, parameters and methods to modeling of underground cables.	IV	CO4	K2
20PS103.5	Discuss the salient features of a line parameter evaluation program and compute the line parameters by digital methods.	V	CO5	K2
20PS103.6	Demonstrate the case studies on simulation of various types of transients.	V	CO6	K3

Course ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
20PS103.1	3	2	1	-	-	-	-	-	-	-	-	3	-	-
20PS103.2	2	1	-	-	-	-	-	-	-	-	-	3	-	-
20PS103.3	3	3	1	-	-	-	-	-	-	-	-	3	-	-
20PS103.4	2	1	-	-	-	-	-	-	-	-	-	3	-	-
20PS103.5	2	1	-	-	-	-	-	-	-	-	-	3	-	-
20PS103.6	3	2	1	-	-	-	-	-	-	-	-	3	-	-
20PS103	2.5	1.66	1	-	-	-	-	-	-	-	-	3	-	-
20PS103	3	2	1	-	-	-	-	-	-	-	-	3	-	-

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Course Code & Course Name: 20RM101- RESEARCH METHODOLOGY AND IPR				
Course	Course Outcomes	Unit	CO	K-CO
20RM101.1	Explain the meaning of research problem, Sources of research problem, Scope and objectives	I	CO1	K2
20RM101.2	Analyze research related information.	II	CO2	K4
20RM101.3	Summarize the research ethics to Effective literature studies approaches, analysis and Plagiarism	III	CO3	K2
20RM101.4	Describe the Format of research proposal and presentation	IV	CO4	K2
20RM101.5	Describe the Nature of Intellectual Property and the process of Patents, Designs, Trade and Copyright.	V	CO5	K2
20RM101.6	Discuss the Patent Rights, Scope of Patent Rights. Licensing and transfer of technology	V	CO6	K2

Course ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
20RM101.1	2	1	-	3	-	-	-	-	-	-	2	-	-	-
20RM101.2	3	3	1	3	-	-	-	-	3	-	2	-	-	-
20RM101.3	2	1	-	3	-	3	-	-	-	3	2	-	-	-
20RM101.4	2	1	-	3	-	-	-	3	-	-	2	-	-	-
20RM101.5	2	1	-	3	-	-	-	-	-	-	2	-	-	-
20RM101.6	2	1	-	3	-	-	2	-	-	3	2	-	-	-
20RM101	2.16	1.33		3	-	3	2	3	3	3	2	-	-	-
20RM101	2	1	1	3	-	3	2	3	3	3	2	-	-	-

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Course Code & Course Name: 20PS1E2- ANALYSIS AND DESIGN OF POWER CONVERTERS				
Course	Course Outcomes	Unit	CO	K-CO
20PS1E2.1	Analyze various single phase power converters.	I	CO1	K4
20PS1E2.2	Analyze various three phase power converters	I	CO2	K4
20PS1E2.3	Design dc-dc converter topologies for a broad range of power conversion applications.	II	CO3	K3
20PS1E2.4	Design various power converter components	III	CO4	K3
20PS1E2.5	Explain about resonant DC –DC converters	IV	CO5	K2
20PS1E2.6	Design ac-ac converters for variable frequency applications	V	CO6	K3

Course ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
20PS1E2.1	3	3	1	-	-	-	-	-	-	-	-	-	3	-
20PS1E2.2	3	3	1	-	-	-	-	-	-	-	-	-	3	-
20PS1E2.3	3	2	1	-	-	-	-	-	-	-	-	-	3	-
20PS1E2.4	3	2	1	-	-	-	-	-	-	-	-	-	3	-
20PS1E2.5	2	1	-	-	-	-	-	-	-	-	-	-	3	-
20PS1E2.6	3	2	1	-	-	-	-	-	-	-	-	-	3	-
20PS1E2	2.83	2.17	0.83	-	-	-	-	-	-	-	-	-	3	-
20PS1E2	3	2	1	-	-	-	-	-	-	-	-	-	3	-

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Course Code & Course Name: 20AC102- DISASTER MANAGEMENT				
Course	Course Outcomes	Unit	CO	K-CO
20AC102.1	Classify different types of disaster, Types and Magnitude.	I	CO1	K2
20AC102.2	Demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response	II	CO2	K2
20AC102.3	Discuss and study the Disaster Prone Areas in India	III	CO3	K2
20AC102.4	Explain the standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.	IV	CO4	K2
20AC102.5	Evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives	V	CO5	K2
20AC102.6	Explain the Concept and Strategies of Disaster Mitigation	V	CO6	K2

Course ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
20AC102.1	1	-	-	-	-	1	-	-	-	2	-	-	-	-
20AC102.2	1	-	-	-	-	1	-	-	-	2	-	-	-	-
20AC102.3	1	-	-	-	-	1	-	-	-	2	-	-	-	-
20AC102.4	1	-	-	-	-	1	-	-	-	2	-	-	-	-
20AC102.5	1	-	-	-	-	1	-	-	-	2	-	-	-	-
20AC102.6	1	-	-	-	-	1	-	-	-	2	-	-	-	-
20AC102	1	-	-	-	-	1	-	-	-	2	-	-	-	-
20AC102	1	-	-	-	-	1	-	-	-	2	-	-	-	-

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Course Code & Course Name: 20PS1L1- POWER SYSTEM SIMULATION LABORATORY				
Course	Course Outcomes	Unit	CO	K-CO
20PS1L1.1	Solve the power flow problem using Newton-Raphson method and Fast decoupled method.	-	CO1	K3
20PS1L1.2	Solve the contingency of power system and economic dispatch	-	CO2	K3
20PS1L1.3	Demonstrate the switching surge using EMTP	-	CO3	K4
20PS1L1.4	Demonstrate the Simulation and Implementation of Voltage Source Inverter	-	CO4	K4
20PS1L1.5	Demonstrate the Digital Over Current Relay and Coordinate Relay	-	CO5	K4
20PS1L1.6	Solve the unit commitment problem using MATLAB	-	CO6	K3

Course ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
20PS1L1.1	3	2	1	-	-	-	-	-	-	-	-	3	2	2
20PS1L1.2	3	2	1	-	-	-	-	-	-	-	-	3	2	2
20PS1L1.3	3	2	1	-	-	-	-	-	-	-	-	3	2	2
20PS1L1.4	3	3	1	-	-	-	-	-	-	-	-	3	2	2
20PS1L1.5	3	3	1	-	-	-	-	-	-	-	-	3	2	2
20PS1L1.6	3	3	1	-	-	-	-	-	-	-	-	3	2	2
20PS1L1	3	2.33	1	-	-	-	-	-	-	-	-	3	2	2
20PS1L1	3	2	1	-	-	-	-	-	-	-	-	3	2	2

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Course Code & Course Name: 20PS203- ADVANCED POWER SYSTEM PROTECTION				
Course	Course Outcomes	Unit	CO	K-CO
20PS203.1	Explain over current and earth fault protection schemes using electro-magnetic relays	I	CO1	K2
20PS203.2	Design differential protection for Transformer	II	CO2	K3
20PS203.3	Design differential protection for busbar	II	CO3	K3
20PS203.4	Explain the distance and carrier protection of transmission lines.	III	CO4	K2
20PS203.5	Describe the various protection schemes of Alternator	IV	CO5	K2
20PS203.6	Discuss the digital over current, distance and differential protection of power system.	V	CO6	K2

Course ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
20PS202.1	2	1	-	-	-	-	-	-	-	-	-	3	-	-
20PS202.2	3	2	1	-	-	-	-	-	-	-	-	3	-	-
20PS202.3	3	2	1	-	-	-	-	-	-	-	-	3	-	-
20PS202.4	2	1	-	-	-	-	-	-	-	-	-	3	-	-
20PS202.5	2	1	-	-	-	-	-	-	-	-	-	3	-	-
20PS202.6	2	1	-	-	-	-	-	-	-	-	-	3	-	-
20PS202	2.33	1.33	1	-	-	-	-	-	-	-	-	3	-	-
20PS202	2	1	1	-	-	-	-	-	-	-	-	3	-	-

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Course Code & Course Name: 20PS2A2 – SOLAR AND ENERGY STORAGE SYSTEMS				
Course	Course Outcome	UNIT	CO	K-CO
20PS2A2.1	Explain the basic characteristics and properties of solar cells	I	CO1	K2
20PS2A2.2	Develop basic knowledge on Power conditioning units	II	CO2	K3
20PS2A2.3	Analyze MPPT algorithms for PV system.	II	CO3	K4
20PS2A2.4	Discuss the design issues for central power stations and grid connected PV systems	III	CO4	K2
20PS2A2.5	Explain the various types of energy storage systems used in solar PV system	IV	CO5	K2
20PS2A2.6	Classify different applications of solar energy systems	V	CO6	K2

K Level Note:	<i>Apply (PO1-K3), Analyze (PO2-K4), Design (PO3-K5), synthesis (PO4-K6)</i>													
Course ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
20PS2A2.1	2	1	-	-	-	-	-	-	-	-	-	2	3	-
20PS2A2.2	3	2	1	-	-	-	-	-	-	-	-	2	3	-
20PS2A2.3	3	3	1	-	-	-	-	-	-	-	-	2	3	-
20PS2A2.4	2	1	-	-	-	-	-	-	-	-	-	2	3	-
20PS2A2.5	2	1	-	-	-	-	-	-	-	-	-	2	3	-
20PS2A2.6	2	1	-	-	-	-	-	-	-	-	-	2	3	-
20PS2A2	2.33	1.5		-	-	-	-	-	-	-	-	2	3	-
20PS2A2	2	2	1	-	-	-	-	-	-	-	-	2	3	-

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Course Code & Course Name: 20AC104- VALUE EDUCATION				
Course	Course Outcomes	UNIT	CO	K-CO
20AC104.1	Explain the knowledge of self-development	I	CO1	K2
20AC104.2	Illustrate the importance of Human values	II	CO2	K2
20AC104.3	Discuss love for nature and discipline	II	CO3	K2
20AC104.4	Develop the overall personality	III	CO4	K2
20AC104.5	Explain association and cooperation, self awareness on self destructive habits.	III	CO5	K2
20AC104.6	Describe the importance of character	IV	CO6	K2

Course ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
20PS2B3.1	-	-	-	-	-	-	-	-	2	2	-	-	-	-
20PS2B3.2	-	-	-	-	-	-	-	-	2	2	-	-	-	-
20PS2B3.3	-	-	1	-	-	-	-	-	2	2	-	-	-	-
20PS2B3.4	-	-	-	-	-	-	-	2	2	2	-	-	-	-
20PS2B3.5	-	-	1	-	-	-	-	-	2	2	-	-	-	-
20PS2B3.6	-	-	-	-	-	-	-	-	3	2	-	-	-	-
20PS2B3	-	-	-	-	-	-	-	2	2.17	2	-	-	-	-
20PS2B3	-	-	1	-	-	-	-	2	2	2	-	-	-	-

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Course Code & Course Name: 20PS2L1 - Advanced Power System Simulation Laboratory				
Course	Course Outcomes	UNIT	CO	K-CO
20PS2L1.1	Solve the Small-signal stability of Single machine-infinite bus system and Multi-Machine using classical machine model	-	CO1	K3
20PS2L1.2	Solve the Load flow and transient of two-bus system with STATCOM	-	CO2	K3
20PS2L1.3	Calculate the Available Transfer Capability of an existing load flow program	-	CO3	K4
20PS2L1.4	Demonstrate the variable speed wind energy conversion system- DFIG and PMSG	-	CO4	K4
20PS2L1.5	Compute the harmonic indices generated by a rectifier feeding a R-L load	-	CO5	K3
20PS2L1.6	Design and demonstrate active filter for mitigating harmonics	-	CO6	K4

Course ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
20PS2L1.1	3	2	1	-	2	2	-	2	-	-	2	3	2	2
20PS2L1.2	3	2	1	-	2	2	-	2	-	-	2	3	2	2
20PS2L1.3	3	3	1	-	2	2	-	2	-	-	2	3	2	2
20PS2L1.4	3	3	1	-	2	2	-	2	-	-	2	3	2	2
20PS2L1.5	3	2	1	-	2	2	-	2	-	-	2	3	2	2
20PS2L1.6	3	3	1	-	2	2	-	2	-	-	2	3	2	2
20PS2L1.1	3	2.5	1	-	2	2	-	2	-	-	2	3	2	2
20PS2L1.2	3	3	1	-	2	2	-	2	-	-	2	3	2	2

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Course Code & Course Name: 20PS2L2 -TECHNICAL SEMINAR				
Course	Course Outcome	UNIT	CO	K-CO
20PS2L2.1	Develop a thought process for presentation		CO1	-
20PS2L2.2	Communicate effectively through oral presentation		CO2	-
20PS2L2.3	Effectively write technical reports		CO3	K4
20PS2L2.4	Analyze the other points of view thereby encouraging the team work		CO4	-
20PS2L2.5	Analyze the current developments in the power systems.		CO5	K3
20PS2L2.6	Apply the principles of Ethics and Respect in interaction with others.		CO6	-

Course ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
20PS2L2.1				-	-	-	1	3	1	-	-	-	-	-
20PS2L2.2				-	-	-	1	3	1	-	-	-	-	-
20PS2L2.3	3	3	1	-	-	-	1	3	1	-	-	2	2	2
20PS2L2.4				-	-	-	1	3	1	-	-	-	-	-
20PS2L2.5	3	3	1	2	-	-	1	3	1	-	2	2	2	2
20PS2L2.6				-	-	-	1	3	1	3	-	-	-	-
20PS2L2					-	-	1	3	1			-	-	-
20PS2L2					-	-	1	3	1				-	-

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Course Code & Course Name: 20PS3A2 - ENERGY MANAGEMENT AND AUDITING				
Course	Course Outcome	Unit	CO	K-CO
20PS3A2.1	Select the parameters based on location for energy audit process	I	CO1	K3
20PS3A2.2	Analyze the load curve and load duration curve for energy management and cost reduction	II	CO2	K4
20PS3A2.3	Calculate the energy consumption of equipments	III	CO3	K3
20PS3A2.4	Measure and Analyze the energy consumption of equipments with suitable meters to identify energy loss and theft	IV	CO4	K4
20PS3A2.5	Design lighting system to utilize optimum energy	V	CO5	K3
20PS3A2.6	Analyze the cogeneration for energy management and cost reduction	V	CO6	K4

Course ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
20PS3A2.1	3	2	1	-	-	-	-	-	-	-	-	3	-	3
20PS3A2.2	3	3	1	-	-	-	-	-	-	-	-	3	-	3
20PS3A2.3	3	2	1	-	-	-	-	-	-	-	-	3	-	3
20PS3A2.4	3	3	1	-	-	-	-	-	-	-	-	3	-	3
20PS3A2.5	3	2	1	-	-	-	-	-	-	-	-	3	-	3
20PS3A2.6	3	3	1	-	-	-	-	-	-	-	-	3	-	3
20PS3A2	3	2.5	1	-	-	-	-	-	-	-	-	3	-	3
20PS3A2	3	3	1	-	-	-	-	-	-	-	-	3	-	3

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Course Code & Course Name: 20PS3B1-ELECTRIC VEHICLES AND ENERGY STORAGE SYSTEM				
Course	Course Outcome	UNIT	CO	K-CO
20PS3B1.1	Explain the operation of Electric vehicles and various energy storage technologies for electrical vehicles	I	CO1	K2
20PS3B1.2	Explain the Architecture of EVs and Power Train Components	II	CO2	K2
20PS3B1.3	Explain the Control of DC drives	III	CO3	K2
20PS3B1.4	Describe the Control of AC drives	III	CO4	K2
20PS3B1.5	Explain about various types of Battery energy storage system	IV	CO5	K2
20PS3B1.6	Describe the Alternative energy storage system	V	CO6	K2

Course ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
20PS3B1.1	2	1	-	-	-	-	-	-	-	-	-	3	2	2
20PS3B1.2	2	1	-	-	-	-	-	-	-	-	-	3	2	2
20PS3B1.3	2	1	-	-	-	-	-	-	-	-	-	3	2	2
20PS3B1.4	2	1	-	-	-	-	-	-	-	-	-	3	2	2
20PS3B1.5	2	1	-	-	-	-	-	-	-	-	-	3	2	2
20PS3B1.6	2	1	-	-	-	-	-	-	-	-	-	3	2	2
20PS3B1	2	1	-	-	-	-	-	-	-	-	-	3	2	2
20PS3B1	2	1	-	-	-	-	-	-	-	-	-	3	2	2

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Course Code & Course Name: 20OE306- WASTE TO ENERGY				
Course	Course Outcome	Unit	CO	K-CO
20OE306.1	Discuss the different types of bio-mass resources.	I	CO1	K2
20OE306.2	Describe the process of Pyrolysis for manufacturing of fuels in the form of solid, liquid and gases from the bio-mass.	II	CO2	K2
20OE306.3	Compare different types of Gasifiers used to produce producer gas with its construction, advantages and disadvantages.	III	CO3	K2
20OE306.4	Describe the construction, design and operation of various types of bio-mass combustors	IV	CO4	K2
20OE306.5	Analyze the cost-benefit of various biomass energy conversion processes.	V	CO5	K4
20OE306.6	Describe the biochemical conversion process of bio-mass for producing bio-gas.	V	CO6	K2

K Level Note:	<i>Apply (PO1-K3), Analyze (PO2-K4), Design (PO3-K5), synthesis (PO4-K6)</i>													
Course ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
20OE306.1	2	1	-	-	-	-	-	-	2	2	2	-	2	2
20OE306.2	2	1	-	-	-	-	-	-	2	2	2	-	2	2
20OE306.3	2	1	-	-	-	-	-	-	2	2	2	-	2	2
20OE306.4	2	1	-	-	-	-	-	-	2	2	2	-	2	2
20OE306.5	3	3	1	-	-	-	-	-	2	2	2	-	2	2
20OE306.6	2	1	-	-	-	-	-	-	2	2	2	-	2	2
20OE306	2.16	1.33	1	-	-	-	-	-	2	2	2	-	2	2
20OE306	2	1	1	-	-	-	-	-	2	2	2	-	2	2

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Course Code & Course Name:20PS3L1- PROJECT WORK PHASE I			
Course	Course Outcome	CO	K-CO
20PS3L1.1	Apply critical and creative thinking in the design of engineering projects, Plan and manage the time effectively	CO1	K3
20PS3L1.2	Apply Engineering knowledge to solve the power system problems	CO2	K3
20PS3L1.3	Use fundamental knowledge and skills in engineering and apply it effectively on a project and design and develop a functional product prototype.	CO3	K3
20PS3L1.4	Undertake an engineering project under mentorship and timely reflect on his own and peers' technical and non-technical learning	CO4	-
20PS3L1.5	Orally present and demonstrate your product to peers, academics, general and industry community	CO5	-
20PS3L1.6	Effectively work as an individual to manage projects	CO6	-

K Level Note:	<i>Apply (PO1-K3), Analyze (PO2-K4), Design (PO3-K5), synthesis (PO4-K6)</i>													
Course ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
20PS3L1.1	3	3	3	3	3	3	3	-	3	3	-	3	3	3
20PS3L1.2	3	3	3	3	3	3	3	-	3	3	-	3	3	3
20PS3L1.3	3	3	3	3	3	3	3	-	3	3	-	3	3	3
20PS3L1.4	3	3	3	3	3	3	3	-	3	3	-	3	3	3
20PS3L1.5	3	3	3	3	3	3	3	3	3	3	-	3	3	3
20PS3L1.6	-	-	-	-	-	-	-	-	3	3	3	3	3	3
20PS3L1									3	3		3	3	3
20PS3L1									3	3		3	3	3

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Course Code & Course Name:20PS4L1- PROJECT WORK PHASE II			
Course	Course Outcome	CO	K-CO
20PS4L1.1	Apply critical and creative thinking in the design of engineering projects, Plan and manage the time effectively	CO1	K3
20PS4L1.2	Apply Engineering knowledge to solve the power system problems	CO2	K3
20PS4L1.3	Use fundamental knowledge and skills in engineering and apply it effectively on a project and design and develop a functional product prototype.	CO3	K3
20PS4L1.4	Undertake an engineering project under mentorship and timely reflect on his own and peers' technical and non-technical learning	CO4	-
20PS4L1.5	Orally present and demonstrate your product to peers, academics, general and industry community	CO5	-
20PS4L1.6	Effectively work as an individual to manage projects	CO6	-

Course ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
20PS4L1.1	3	3	3	3	3	3	3	-	3	3	-	3	3	3
20PS4L1.2	3	3	3	3	3	3	3	-	3	3	-	3	3	3
20PS4L1.3	3	3	3	3	3	3	3	-	3	3	-	3	3	3
20PS4L1.4	3	3	3	3	3	3	3	-	3	3	-	3	3	3
20PS4L1.5	3	3	3	3	3	3	3	3	3	3	-	3	3	3
20PS4L1.6	-	-	-	-	-	-	-	-	3	3	3	3	3	3
20PS4L1									3	3		3	3	3
20PS4L1									3	3		3	3	3

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PROGRAM OUTCOMES (POs)

The Graduate Attributes of PG programmes of the NBA are as following:

1. **Scholarship of Knowledge** Acquire in-depth knowledge of specific discipline or professional area, including wider and global perspective, with an ability to discriminate, evaluate, analyze and synthesize existing and new knowledge, and integration of the same for enhancement of knowledge.
2. **Critical Thinking** Analyze complex engineering problems critically, apply independent judgment for synthesizing information to make intellectual and/or creative advances for conducting research in a wider theoretical, practical and policy context.
3. **Problem Solving** Think laterally and originally, conceptualize and solve engineering problems, evaluate a wide range of potential solutions for those problems and arrive at feasible, optimal solutions after considering public health and safety, cultural, societal and environmental factors in the core areas of expertise.
4. **Research Skill** Extract information pertinent to unfamiliar problems through literature survey and experiments, apply appropriate research methodologies, techniques and tools, design, conduct experiments, analyze and interpret data, demonstrate higher order skill and view things in a broader perspective, contribute individually/in group(s) to the development of scientific/technological knowledge in one or more domains of engineering.
5. **Usage of modern tools** Create, select, learn and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities with an understanding of the limitations.
6. **Collaborative and Multidisciplinary work** Possess knowledge and understanding of group dynamics, recognize opportunities and contribute positively to collaborative-multidisciplinary scientific research, demonstrate a capacity for self-management and teamwork, decision-making based on open-mindedness, objectivity and rational analysis in order to achieve common goals and further the learning of themselves as well as others.
7. **Project Management and Finance** Demonstrate knowledge and understanding of engineering and management principles and apply the same to one's own work, as a member and leader in a team, manage projects efficiently in respective disciplines and multidisciplinary environments after consideration of economical and financial factors.
8. **Communication** Communicate with the engineering community, and with society at large, regarding complex engineering activities confidently and effectively, such as, being able to comprehend and write effective reports and design documentation by adhering to appropriate standards, make effective presentations, and give and receive clear instructions.

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9. Life-long Learning Recognize the need for, and have the preparation and ability to engage in life-long learning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.

10. Ethical Practices and Social Responsibility Acquire professional and intellectual integrity, professional code of conduct, ethics of research and scholarship, consideration of the impact of research outcomes on professional practices and an understanding of responsibility to contribute to the community for sustainable development of society.

11. Independent and Reflective Learning Observe and examine critically the outcomes of one's actions and make corrective measures subsequently, and learn from mistakes without depending on external feedback.

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1. Ability to apply knowledge of Electrical Power System principles and techniques for power system operation, control and applications, economical operation and state of art techniques to protect Power System (

PSO2. Ability to develop steady-state and dynamic models of various Power System components to perform system studies for generation and transmission system expansion planning.

PSO3. Ability to analyze various electricity market models with distributed energy resources and demand response management and to incorporate interdisciplinary knowledge to address the recent problems in the electrical power industry.