MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY BATHINDA-151001 (PUNJAB), INDIA

(A State University Estb. by Govt. of Punjab vide Punjab Act No. 5 of 2015 and Approved u/s 2(f) & 12 (B) of UGC; Member AIU)

Department: **ELECTRICAL ENGINEERING**
Giani Zail Singh Campus College of Engineering & Technology, MRSPTU

COs, POs, PSOs Mapping

Subject: Basics of Electrical Engg.	**Subject Code: BELEE0-101**	**Semester: 1st**
Credit: 4	**L T P 3 1 0**	**Duration: 42 Hrs.**

CO No.	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To understand and analyze basic DC and AC circuits	2	3										1			3
CO2.	To study the use and working principle of single phase transformers	2					3						1	3		
CO3.	To study the application and working principles of three phase and single phase induction motors.	2					3						1	3		
CO4.	To introduce to the components of low voltage electrical installations	2					3						1	3		

Subject: BASIC ELECTRICAL ENGINEERING LAB	**Subject Code: BELEE0-102**	**Semester: 1st**
Credit: 1	**L T P 0 0 2**	**Duration: 42 Hrs.**

COs	**Statement**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1.	Get an exposure to common electrical components and their ratings	2					3			2			1		3	
CO 2.	Make	2					3			2			1	2	3	

	electrical connections by wires of appropriate ratings															
CO 3.	Understand the usage of common electrical measuring instruments	2					3			2			1		3	
CO 4.	Understand the basic characteristics of transformers and electrical induction motors	2					3			2			1		2	3

Subject: ELECTRICAL CIRCUIT ANALYSIS	**Subject Code: BELES1-301**	**Semester: 3rd**
Credit: 4	**L T P 3 1 0**	**Duration: 60 Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Apply network theorems for the analysis of electrical circuits	1	3		2								1		3	1
CO2.	Obtain the transient and steady-state response of electrical circuits.	1	3		2								1		3	1
CO3.	Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).	1	3		2								1		3	1
CO4.	Analyze two-port circuit behavior	1	3		2								1		3	1

Subject: ANALOG ELECTRONIC CIRCUITS	Subject Code: BELES1-302	Semester: 3rd
Credit: 4	L T P 3 1 0	Duration: 45 Hrs.

Cos	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Understand the characteristics of transistors	2					1						1		3	
CO2.	Design and analyze various rectifier and amplifier circuits.	1	3	3			1						1	3	2	
CO3.	Design sinusoidal and non-sinusoidal oscillators.	1		3			1						1	3	2	
CO4.	Understand the functioning of OP-AMP and design OP-AMP based circuits	2		3			1						1	3	2	

Subject: ELECTRICAL MACHINES – I	Subject Code: BELES1-304	Semester: 3rd
Credit: 4	L T P 3 1 0	Duration: 60 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Understand the concepts of magnetic circuits.	3					1						1			1
CO2.	Understand the operation of D.C. machines	3					1						1	3		
CO3.	Analyze the differences in operation of different D.C. machine configurations.	1	3				1						1	3		

CO 4.	Analyze single phase and three phase transformer s circuits.	1	3				1						1		3	

Subject: ELECTRICAL MACHINES LAB - I	**Subject Code: BELES1-305**	**Semester: 3rd**
Credit: 1	**L T P 0 0 2**	**Duration: 42 Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To acquire skills to operate all types of D.C. machines.	3					3			1			1	3		1
CO2.	Ability to analyze the speed control methods and efficiency of DC machines	1	3			1	2			1			1	2	3	1
CO3.	To be able to compute efficiency and voltage regulation of transformers.	1	2				3			1			1	2	3	1

Subject: ELECTROMAGNETIC FIELDS	**Subject Code: BELES1-306**	**Semester: 3rd**
Credit: 4	**L T P 3 1 0**	**Duration: 60 Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To understand the basic laws of electromagneti sm.	3											1		1	1
CO2.	To obtain the electric and magnetic fields for simple configurations under static conditions	2	3										1		3	1
CO3.	To analyze time varying electric and magnetic fields.	2	3										1		3	1
CO4.	To understand	3	2		1								1		3	1

	Maxwell's equation in different forms and different media															
CO5.	To understand the propagation of EM waves.	3	2		1								1		3	1

Subject: ENGINEERING MECHANICS	**Subject Code: BMECE0-001**	**Semester: 3rd**
Credit: 4	**L T P 3 1 0**	**Duration: 60 Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Kinematics of particles	2	3				1						1		3	1
CO2.	Co-planar and concurrent forces	2	3				1						1		3	1
CO3.	Solids mechanics	2	3				1						1		3	1
CO4.	Moment of inertia and center of gravity	2	3		1		1						1		3	1
CO5.	Role of friction in screw Jack and inclined planes	2	3	1	2		1						1		3	1

Subject: ENVIRONMENTAL SCIENCES	**Subject Code: BMNCC0-002**	**Semester: 3rd**
Credit: 0	**L T P 2_0_0**	**Duration: _ Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To identify global environmental problems arising due to various engineering/industrial and technological activities and the science behind these problems.	1	2		3		2	3					1		3	1
CO2.	To realize the importance of eco-system and bio-diversity for maintaining ecological balance	1	2				2	3					1	3		1
CO3.	To identify the major pollutants and abatement devices for environmental	1			3		2	3					1	3		1

	management and sustainable development															
CO4.	To estimate the current world population scenario and thus calculating the economic growth, energy requirement and demand.	1	2		3		2	3					1		3	1
CO5.	To understand the conceptual process related with the various climatologically associated problems and their plausible solutions.	1	2	3	3		2	3					1		3	1

Subject: DIGITAL ELECTRONICS	**Subject Code: BELES1-401**	**Semester: 4th**
Credit: 3	**L T P 3 0 0**	**Duration: 45 Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Understand working of logic families and logic gates.	3					1						1		3	1
CO2.	Design and implement Combinational and Sequential logic circuits.	2		3			1						1	3	2	1
CO3.	Understand the process of Analog to Digital conversion and Digital to Analog conversion	3					1						1		3	1
CO4.	Be able to use PLDs to implement the given logical problem	3		3			1						1	3		1

Subject: DIGITAL ELECTRONICS LAB	Subject Code: BELES1-402	Semester: 4th
Credit: 1	L T P 0 0 2	Duration: Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To give students a practical knowledge about various types of gates and verify their truth tables.	3					1			1			1	3		1
CO2.	To give students a working knowledge to connect digital circuits and verify their truth tables.	3					1			1			1	3		1
CO3.	To give students knowledge of working of different combinational and sequential circuits.	3					1			1			1	3		1

Subject: ELECTRICAL MACHINES –II	Subject Code: BELES1-403	Semester: 4th
Credit: 4	L T P 3 1 0	Duration: 60 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Understand the concepts of rotating magnetic fields	3	2										1		3	1
CO2.	Understand the operation of AC machines.	3	2				3						1	3		1
CO3.	Analyze performance characteristics of AC machines	2	3				1						1		3	1

Subject: ELECTRICAL MACHINE-II LAB	Subject Code: BELE1-413	Semester: 4th
Credit: 1	L T P 3 1 0	Duration: Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Obtain equivalent circuit parameters of single-phase and three-phase Induction motors	1	2	3						1			1		3	1
CO2.	Control speed of Induction motors by different methods	1	2	3		1	3			1			1	3		1
CO3.	Draw open and short circuit characteristics of three-phase alternator and V and inverted V curves of synchronous motor	1	2				3			1			1		3	1
CO4.	Find out voltage regulation of an alternator by different tests.	1	3				3			1			1		3	1
CO5.	Synchronize two or more 3-phase alternators.	1	2	2	2	1	3			1			1	3		1

Subject: POWER ELECTRONICS	Subject Code: BELES1-405	Semester: 4th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Understand the differences between signal level and power level devices	3	2				1						1	3		1
CO2.	Analyze controlled rectifier circuits.	2	3				3						1		3	1
CO3.	Analyze the operation of DC-DC choppers	2	3				3						1		3	1
CO4.	Analyze the operation of voltage source inverters.	2	3				3						1		3	1

Subject: **POWER ELECTRONICS LAB**	Subject Code: **BELES1-406**	Semester: **4th**
Credit: **1**	**L T P 0 0 2**	Duration: **Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Students will be able to verify the characteristics of SCR and UJT and triggering pulses for them.	2	2							1			1		3	1
CO2.	They will be able to visualize and analyze the performance of various converter circuits.	2	3				3			1			1		3	1
CO3.	They will be able to control the speed of motors using thyristors	2	2		2	3	3			1			1	3		1

Subject: **Signals and Systems**	Subject Code: **BECES1-303**	Semester: **3rd**
Credit: **4**	**L T P 3 1 0**	Duration: **60 Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Understand the concepts of continuous time and discrete time systems	3	2										1		3	1
CO2.	Analyze systems in complex frequency domain.	2	3										1		3	1
CO3.	Understand sampling theorem and its implications.	2	2	3	2	2							1	3	2	1

Subject: POWER SYSTEMS - I	Subject Code: BELES1-501	Semester: 5th
Credit: 4	L T P 3 1 0	Duration: 60 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To choose working voltage and economic size of conductors for transmission and distribution systems	3	2		1		1	1					1	3		1
CO2.	To analyze performance of transmission lines and underground cables	1	3										1		3	1
CO3.	To select and design overhead line insulators and transmission lines.	1	2	3			1						1	3		1

Subject: CONTROL SYSTEMS	Subject Code: BELES1-502	Semester: 5th
Credit: 4	L T P 3 1 0	Duration: 60 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To do modeling of linear-time-invariant systems using transfer function and state-space representations	1	2	3	2	2							1		3	1
CO2.	To do the stability assessment for linear-time invariant systems	1	3	2	2	2							1		3	1
CO3.	To design simple feedback controllers.	1	2	3	2	2	2						1	3		1

Subject: Signals and Systems MICROCONTROLLERS AND PLC	Subject Code: BELES1-503	Semester: 5th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Know about the architecture, operation and instruction set of 8051 microcontroller	3											1	3		1
CO2.	Be able to do programming of 8051 microcontrollers	2		3									1		3	1
CO3.	Be able to Interface 8051 with peripheral devices.	2		3			3						1	3		1
	Be able to use PLCs.	1		3			3						1	3		1

Subject: POWER SYSTEMS – I LABORATORY	Subject Code: BECES1-303	Semester: 3rd
Credit: 1	L T P 0 0 2	Duration: Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Students will have more detailed insight about the need of various equipment used for transmission and distribution of power	3					3			1			1	3		1
CO2.	They will be able to draw performance characteristics of these equipment	2	3							1			1		3	1
CO3.	To practically compute parameters and performance of transmission lines and feeders	2	3							1			1		3	1

Subject: CONTROL SYSTEMS LABORATORY	Subject Code: BELES1-505	Semester: 5th
Credit: 1	L T P 0 0 2	Duration: 60 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To understand the basics of MATLAB software.	3								1			1		1	1
CO2.	To understand variety of control system strategies.	3	1				2			1			1		3	1
CO3.	To acquire skills to understand all types of control components.	3					2			1			1		3	1
CO4.	Ability to analyze the stability of control systems		3							1			1		3	1

Subject: MICROCONTROLLER AND PLC Lab	Subject Code: BELES1-506	Semester: 5th
Credit: 4	L T P 0 0 2	Duration: Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Become familiar with the microcontrollers and PLCs.	3					3						1	3		1
CO2.	Be able to write assembly language programs for various types of applications	2		3						1			1	3	2	1
CO3.	Become familiar with the use of PLCs in industry	2		3			3			1			1	3		1

Subject: ELECTRICAL DRIVES	Subject Code: BELED1-511	Semester: 5th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1.	To draw the characteristics of DC motors and induction motors.	2	3	1									1		3	1
CO 2.	To control the speed of DC motors using power electronic converters.	2		3		1	3						1	3		1
CO 3.	To use power electronic converters for induction motor speed control	2				1	3						1	3		1

Subject: **ELECTRICAL MACHINE DESIGN**	Subject Code: **BELED1-512**	Semester: **5th**
Credit: 3	**L T P 3 0 0**	**Duration: 45 Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Know the constructional features.	3					2						1	3		1
CO2.	Be able to evaluate performance characteristics of electrical machines	2	3				1						1		3	1
CO3.	Be able to carry out a basic design of an ac machine	2		3		2	2						1	3		1
CO4.	Be able to use software tools to do design calculations	2		3		2							1	3		1

Subject: **ELECTROMAGNETIC WAVES**	Subject Code: **BELED1-513**	Semester: **5th**
Credit: 3	**L T P 3 0 0**	**Duration: 45 Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Provide solution to real life plane wave problems for various boundary conditions.	2	2		3		1						1		3	1
CO2.	Visualize TE and TM mode patterns of field distributions in a rectangular wave-guide	2	3		1								1		3	1
CO3.	Analyze wave-guides and understand radiation by antennas.	2	3		1	1	1						1		3	1

Subject: ECONOMICS FOR ENGINEERS	Subject Code: BECES1-303 BHSMC0-019	Semester: 5th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1.	Able to analyze the demand and supply conditions of the market and accordingly assess the position of a company	2	3	3			3					1	1	3	3	3
CO 2.	Understand the basic economic problems faced by the society and make effective decisions	2	2	3	3		3					1	1	3	3	3
CO 3.	Design competition strategies, which includes costing, pricing, product differentiation, and market environment according to the natures of products and the structures of the markets	2	2	3			3					1	1	3	3	3
CO 4.	Analyze the market competitions and design strategies accordingly	2	3	3			3					1	1	3	3	3

Subject: POWER SYSTEMS-II	Subject Code: BELES1-601	Semester: 6th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1.	Explain causes and effects of faults, components used for power system protection such as; isolators and fuses, relays, circuit breakers etc.	3	3		3		3						1	3	3	1
CO 2.	Classify types of relays and circuit breakers and explain their working principles and operation.	3	2				3						1	3		1
CO 3.	Protect transmission lines, feeders, bus bars, generator and	3		2			3						1	3		1

	transformer															
CO 4.	Develop concepts about the basic principles of static and digital protection.	2				3							1	3		1

Subject: ELECTRICAL MEASUREMENTS & INSTRUMENTATION	**Subject Code: BELES1-602**	**Semester: 6th**
Credit: 3	**L T P 3 0 0**	**Duration: 45 Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1.	To explain the constructional features, characteristics and operation of various measurement devices and transducers	3	2				1						1	3	2	1
CO 2.	To measure R, L and C using DC and AC bridges	1	2	3			1						1		3	1
CO 3.	To use CRO and instrument transformers for measurement and instrumentation purposes	1	2	3			1						1	3		1
CO 4.	To select transducers for different applications.	1	2	3			1						1	3		1

Subject: POWER SYSTEMS-II Lab	**Subject Code: BELES1-603**	**Semester: 6th**
Credit: 1	**L T P 0 0 2**	**Duration: Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To demonstrate operation of relays and circuit breakers	3								1			1	3		1
CO2.	To analyze various protection schemes in power system.	2	3				1			1			1	3	3	1
CO3.	To plot characteristics of various types of relays, circuit breakers and fuses	2	3				1			1			1		3	1

Subject: ELECTRICAL MEASUREMENTS & INSTRUMENTATION Lab	Subject Code: BELES1-604	Semester: 6th
Credit: 1	L T P 0 0 2	Duration: Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To apply the basic measurement techniques and use measuring instruments.	2	1	3			1						1	3	2	1
CO2.	To measure various electrical quantities using various types of meters.	2		3			1						1	3		1
CO3.	To practically use current and potential transformers, CRO and DSO	2		3			1						1	3		1

Subject: ELECTRICAL DESIGN & ESTIMATION LAB	Subject Code: BELES1-605	Semester: 3rd
Credit: 1	L T P 0 0 2	Duration: Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To estimate the cost of various types of electrical installations.	2	3				1			1			1	3	2	1
CO2.	To identify design goals and analyze possible approaches to meet given specifications with realistic engineering constraints.	2	3	3	3		2			3			1	3	3	1
CO3.	To use modern engineering software tools.	2				3							1		3	1
CO4.	To work amicably as a member of an engineering design team	2		3						3			1	3		1

Subject: INDUSTRIAL ELECTRICAL SYSTEMS	Subject Code: BELED1-611	Semester: 6th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1.	To represent the electrical wiring systems for residential, commercial and industrial consumers with standard symbols and drawings, SLD	3					1						1	3		1
CO 2.	To explain various components of industrial electrical systems.	3					1						1	3		1
CO 3.	To analyze and select the proper size of various electrical system components	2	2	3			2						1	3	3	1

Subject: NON-LINEAR & DIGITAL CONTROL SYSTEMS	Subject Code: BELED1-612	Semester: 6th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Represent discrete LTI systems	3											1		3	1
CO2.	Analyze stability of open loop and closed loop discrete-time systems		3										1		3	1
CO3.	Design and analyze digital controllers		2	3			2						1	3	3	1
CO4.	Design state feedback and output feedback controllers			3			2						1	3		1

Subject: COMPUTER ARCHITECTURE	Subject Code: BELED1-613	Semester: 6th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1.	Organize a modern computer system and be able to relate it to real examples	2		3			1						1	3	2	1
CO 2.	Write efficient programs in assembly language of the 8086 family of microprocessors	2		3									1	2	3	1
CO 3.	Develop the programs in assembly language for 80286, 80386 and MIPS processors in real and protected modes.	2		3		1							1	2	3	1

Subject: COMPUTATIONAL ELECTROMAGNETICS	Subject Code: BELED1-614	Semester: 6th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Explain the basic concepts of electromagnetics	3											1		3	1
CO2.	Use computational techniques for electromagnetic fields	2	3										1		3	1
CO3.	Apply the techniques to simple real-life problems	2		3			1						1	3		1

Subject: WIND & SOLAR ENERGY SYSTEMS	Subject Code: BELED1-621	Semester: 6th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To explain the basics of wind power generation	3					1						1		3	1
CO2.	To elaborate the basics of solar power generation	3					1						1		3	1
CO3.	To interpret the network integration issues and the power electronic interfaces for wind and solar generation	2	3	2	3		1						1	3		1

Subject: HVDC TRANSMISSION SYSTEMS	Subject Code: BELED1-622	Semester: 6th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1.	To know the advantages of DC transmission over AC transmission	3											1		3	1
CO 2.	To explain the operation of Line Commutated Converters and Voltage Source converters	3	1										1		3	1
CO 3.	To apply control strategies used for HVDC transmission system	2		3			1						1	3		1
CO 4.	To improve power system stability using HVDC system	2		3	2		1						1	2	3	1

Subject: EHVAC TRANSMISSION SYSTEMS	Subject Code: BELED1-623	Semester: 6th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To explain the advantages of EHVAC Transmission and problems associated with it.	3	1				1						1		3	1
CO2.	To examine the reactive parameters of lines and use methods of voltage control	2	2	3			2						1	1	3	2
CO3.	To compute the voltage gradients of conductors and explain the associated bad effects of corona.	2	3		2		1	1					1		3	1

Subject: FACTS DEVICES IN TRANSMISSION & DISTRIBUTION NETWORKS	Subject Code: BELED1-624	Semester: 6th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To analyze the characteristics of AC transmission	2	3										1		3	1
CO2.	To explain the effect of shunt and series reactive power compensation	2	3										1		3	1
CO3.	To apply FACTS devices to control power flow and to improve power quality	2		3	2		2						1	3		1

Subject: Signals and Systems INTRODUCTION TO INDUSTRIAL MANAGEMENT	Subject Code: BELES1-606	Semester: 6th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Understand the theories and principles of modern management	3					2					1	1	3	3	1
CO2.	Apply the concepts to the management of organizations in private and public sector	2		3			3					3	1	3		1
CO3.	Plot and analyze inventory control models and techniques.	2	3				1						1	3	3	1
CO4.	Understand JIT, MRP and Six Sigma	3					1						1		3	1

Subject: POWER SYSTEM ANALYSIS	Subject Code: BELES1-701	Semester: 7th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Develop per unit system models of synchronous machines, transformers, transmission lines and static loads for power system studies	2		3									1		3	1
CO2.	Perform load flow studies by using bus admittance matrix	2	3		1								1		3	1

	and to do fault analysis by bus impedance matrix															
CO3.	Compare features of Gauss-Siedel, Newton-Raphson and Decoupled methods of load flow analysis.	2	3										1		3	1
CO4.	Analyze the effect of symmetrical and unsymmetrical faults on power system	2	3		3		1						1	2	3	1
CO5.	Analyze the effect of small and large disturbances on power system stability	2	3		3		1						1	2	3	1

Subject: INTRODUCTION TO INDUSTRY 4.0	**Subject Code: BELES1-702**	**Semester: 7th**
Credit: 2	**L T P 2 0 0**	**Duration: 45 Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Understanding about the emerging demands of the industry	3	2				3						1	3		1
CO2.	To develop an insight about the better human-machine interface	2	2			2	3						1		3	1

Subject: POWER SYSTEM ANALYSIS LAB	**Subject Code: BELES1-703**	**Semester: 7th**
Credit: 3	**L T P 0 0 2**	**Duration: Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Ability to develop software programs for bus matrices	1		3		2							1		3	1
CO2.	Capability to develop or use software programs for load flow analysis	1	2	3	2	2	1						1		3	1
CO3.	Ability to compute fault currents	1	3		2		1						1		3	1

Subject: MINOR PROJECT	Subject Code: BELES1-704	Semester: 7th
Credit: 2	L T P 0 0 4	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Student will be able to apply the theoretical and practical knowledge gained so far, by taking up the study in the form of a project work			3	2	1	1			3		3	1	3		1
CO2.	This study is expected to provide a good initiation for the students in R&D work			3	2	1	1			3		3	1		3	1

Subject: HIGH VOLTAGE ENGINEERING	Subject Code: BELED1-711	Semester: 7th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Knowledge of generation and measurement of DC, AC, & Impulse voltages	3											1	3		1
CO2.	Knowledge of tests on HV equipment and on insulating materials as per the standards	3					3						1	3		1
CO3.	Knowledge of how over-voltages arise in a power system and protection against these over-voltages.	3	3	3			3						1	3	2	1

Subject: ELECTRICAL & HYBRID VEHICLES	Subject Code: BELED1-712	Semester: 7th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Develop mathematical models to describe vehicle performance	2		3									1		3	1
CO2.	Analyze fuel efficiency of hybrid and electric drive trains	2	3				2	1					1		3	1
CO3.	Control various types of drives.	2		3	3		3						1	3		1
CO4.	Analyze different types of energy storage systems	2	3				2						1	2	3	1

CO5.	Select the size of a drive system and Implement energy management strategies	2		3	3		3	1					1	3		1

Subject: INTRODUCTION TO DIGITAL PROTECTION	**Subject Code: BELED1-713**	**Semester: 7th**
Credit: 3	**L T P 3 0 0**	**Duration: 45 Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To classify relays, such as; electromechanical, static and numerical relays and describe their merits and de-merits	3	3				2						1	3		1
CO2.	To explain the need of numerical relaying algorithms.	2	3										1		3	1
CO3.	To explain the basic block diagram of a digital protection system	3	2										1		3	1
CO4.	To interface elements with microprocessor to develop digital relays	3		3	2		3						1	3		1

Subject: DIGITAL SIGNAL PROCESSING	**Subject Code: BELED1-714**	**Semester: 7th**
Credit: 3	**L T P 3 0 0**	**Duration: 45 Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To represent signals mathematically in discrete-time, and in the frequency domain and analyze them using Z-transform	2	3	3									1		3	1
CO2.	To implement Discrete Time Systems using the Discrete-Fourier Transform (DFT) and the FFT algorithms.	2		3									1		3	1
CO3.	To design digital filters for various applications	2		3		1	3						1	3		1
CO4.	To apply digital signal processing for the analysis of real-life signals	2	3	3		1	1						1	3	3	1

Subject: PROJECT MANAGEMENT & ENTREPRENEURSHIP	Subject Code: BHSMC0-024	Semester: 7th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Understand project characteristics and various stages of a project	3	3				1					3	1	3	2	1
CO2.	Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.	3	3			1	3					3	1	3	2	1
CO3.	Know the parameters to assess opportunities and constraints for new business ideas	3			3		2					3	1	3	2	1
CO4.	Understand the systematic process to select and screen a business idea	3	2	3			2					3	1	3	2	1
CO5.	Understand various funding opportunities available for start-up and new ventures	3	2	1			3					3	1	3	2	1

8th Sem

Subject: GENERATION & ECONOMICS OF ELECTRIC POWER	Subject Code: BELES1- 801	Semester: 8th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Students will be able to differentiate among types of loads and related terminology	2	3				1						1		3	1
CO2.	They will be able to estimate various costs involved in the power plants and tariffs imposed on different categories of consumers	2	3				3					2	1	3	2	1
CO3.	They can select the size and location of a power plant	2		3	2		3	2				2	1	3		1
CO4.	They will be enabled to co-operate hydro and steam power plants	2		3	2		3	2				2	1	3	2	1

Subject: MAJOR PROJECT	Subject Code: BELES1 - 802	Semester: 8th
Credit: 8	L T P 0 0 8	Duration: Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Student will be trained to apply the theoretical knowledge and practical experience gained so far, by conducting the study in the form of a project work.		1	3	2		1			3	2	2	1	3		1
CO2.	Students will get a good training in R&D work and technical leadership		1	3	2		1			3		2	1		3	1

Subject: ELECTRICAL ENERGY CONSERVATION & AUDITING	Subject Code: BELED1- 811	Semester: 8th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To do management and audit of energy.	3	2		1	1	3	3				1	1	3	2	1
CO2.	To calculate different types of losses and hence evaluate and improve energy efficiency of electrical systems	2	3	3	3		3	3				1	1	3	2	1
CO3.	To evaluate performance and efficiency of HVAC systems, fans, blowers, pumps, compressed air systems and cooling towers	2	3		3		3	3				1	1	3	2	1

Subject: **POWER SYSTEM DYNAMICS & CONTROL**	Subject Code: **BELED1- 812**	Semester: **8th**
Credit: 3	**L T P 3 0 0**	**Duration: 45 Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	To evaluate the impact of stability on the operation and control of power system	2	3		2		3						1		3	1
CO2.	To analyze linear dynamical systems and can apply numerical integration methods	2	3	3		3							1		3	1
CO3.	To model different power system components for the study of stability	2		3		3							1		3	1
CO4.	To use methods to improve stability	2		3			3						1	3		1

Subject: **CONTROL SYSTEMS DESIGN**	Subject Code: **BELED1- 813**	Semester: **8th**
Credit: 3	**L T P 3 0 0**	**Duration: 45 Hrs.**

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Design classical control systems in time domain.	2		3		1	1						1	3		1
CO2.	Design classical control systems in frequency domain.	2		3		1	1						1	3		1
CO3.	Design controller structures (P, PI, PID, compensators).	2		3		1	1						1	3		1
CO4.	Examine the controllability & observability and can design controllers using state-space approach	2		3	3	1	1						1	3	3	1

Subject: ADVANCED ELECTRIC DRIVES	Subject Code: BELED1- 814	Semester: 8th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Understanding about the control of power converters and their control methods	3	2	**3**	3								1	3	2	1
CO2.	Control power converters for controlling AC drives	3		3	3	**3**	3						1	3		1
CO3.	Apply the various control techniques for induction motor drives and synchronous motor drives	3		3	**3**	**3**	3						1	3		1
CO4.	Control motion using digital signal processors	3				3	3						1	3		1

Subject: RESTRUCTURING OF POWER INDUSTRY	Subject Code: BELED1- 815	Semester: 8th
Credit: 3	L T P 3 0 0	Duration: 45 Hrs.

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	Students will be enabled to identify the need of restructuring and deregulation of power industry	**3**	**3**				3						1	3		1
CO2.	They will be able to manage congestion of transmission network.	**3**			3		**3**					1	1	3	2	1
CO3.	They will be able to estimate pricing of transmission network	**2**	**3**	2			**3**					1	1	3	2	1
CO4.	Define and describe the Technical and Non-technical issues in restructured power industry	3			3		3	1					1	2	3	1

Enter Correction levels 1, 2 or 3 as defined below:

1. Slight (Low) - upto 30% 2. Moderate (Medium) – above 30% and upto70% 3. Substantial (High) – above 70%