SYLLABUS

FOR

SEMESTER FIFTH

Course Code	**PCCEE501**			**Semester**	**FIFTH**
Category	**Professional Core Course**				
Course Title	**Power System-1**				
Scheme & Credits	**L**	**T**	**P**	**Credits**	**Max Marks: 100**
	3	**1**	**0**	**4**	
Prerequisites	**Nil**				

Course Objectives:

1. Understand the concepts of power systems.
2. Understand the various power system components.
3. Understand the generation of overvoltages and insulation coordination.

Unit	Topics	No. of Hours
I	Introduction to Power Systems generation, transmission & distribution. Per unit representation of power system variables, Single line diagram, impedance and reactance diagram of a system, per unit calculations. Overhead line insulator types; pin, suspension, strain, shackle, guy etc. String efficiency & methods of equalizing potential drop over string of suspension insulators.	14
II	Transmission line parameters and their evaluations, types of overhead conductors with calculations of inductance and capacitance.	10
III	Models of short, medium and long transmission lines. Lossless transmission lines; electrical length of a line and its importance, Equivalent circuits of a transmission line, Applications of ABCD representation of Power System components, Power transfer capability of a transmission line, Skin, proximity and Ferranti effect.	10
IV	Mechanical Design of transmission line: Sag, span and tension calculations. Electric Power Transmission Towers. Classification of cables, Cable conductors, insulating materials, insulation resistance, electrostatic stress, grading of cables, capacitance calculation of single & mult-core cable, losses and current carrying capacity,cross bonding of cables.. Location of faults, methods of laying of underground cables.	15
V	Corona, Visual & critical voltages, corona loss, effect of corona on line design practical considerations. Element of AC distribution. Single fed, double fed and ring main distributor.	7
Total number of Hours		**56**

Textbooks:

S. No	Name of Book	Author	Publisher
1	Power System Analysis	J.J. Grainger and W.D Stevenson	Mcgraw hill
2	Electric Power Systems	B.W. Weedy and B.J.Cory	John Wiley and sons
3	Electric Power Systems	C.L. Wadhwa	New age international
4	Power System Engineering	Nagrath and Kothari	Tata Mcgraw hill
5	Power System Analysis	Hadi Saadat	McGraw Hill

Course Code	**PCCEE502**			**Semester**	**FIFTH**
Category	**Professional Core Course**				
Course Title	**Electrical Machines-II**				
Scheme & Credits	**L**	**T**	**P**	**Credits**	**Max Marks: 100**
	3	**1**	**0**	**4**	
Prerequisites	**Electrical Machines-1**				

Course Objectives:

1. Understand the concepts of rotating magnetic fields.
2. Understand the operation of ac machines.
3. Analyse performance characteristics of ac machines.

Unit	Topics	No. of Hours
I	Basic Concepts in A.C. Rotating Electrical Machines: The rotating magnetic field, Magneto-motive force and flux distribution, Induced voltage, Production of torque, Leakage fluxes, losses and efficiency	5
II	Three Phase Induction Motors: Construction, Types, Principle of operation of an induction motor,Cogging and crawling, Equivalent circuit, Torque/speed characteristics, Induction motor tests, Speed control, Principle of operation of Induction generator.	15
III	Single-Phase Motors: Types of single phase induction motors, Starting of single phase induction motors, analysis and testing of single phase induction motors, universal motor, Schrage motor, Applications of single phase motors.	8
IV	Synchronous Machines: Construction & Types, working principle, field and armature windings, Equivalent circuit, voltage regulation and its determination, Synchronous reactance, saturation effect, parallel operation, Two-axis theory.	15
V	Salient type machines, steady-state power-angle characteristics, Excitation systems, V-curves, synchronous capacitors,Hunting, synchronous Machine Transients, Analysis of sudden 3-phase short circuit, Transient power-angle characteristics.	13
Total Number of Hours		**56**

Textbooks:

S. No	Name of Book	Author	Publisher
1	Electric Machinery by Fitzgerald	Kingslay, Umans	T.M.Hill
2	Electric Machines	Nagrath and Kothari	T.M.Hill
3	Electrical Machines and Transformers	Geroge Mc Pherson	John Wiley
4	Electric Machinery Fundamentals	Chapman	T.M.Hill
5	Electric machinery and Transformers	Irving Kosow	Pearson
6	Alternating current machinery	Langsdorf	T.M.Hill

Course Code	**PCCEE503**			**Semester**	**FIFTH**
Category	**Professional Core Course**				
Course Title	**Microprocessors**				
Scheme & Credits	**L**	**T**	**P**	**Credits**	**Max Marks: 100**
	3	**1**	**0**	**4**	
Prerequisites	**Nil**				

Course Objectives:

1. Do assembly language programming.
2. Do interfacing design of peripherals.
3. Develop systems using different microcontrollers.

Unit	Topics	No. of Hours
I	Detailed introduction & overview of Microprocessor. 8085 mp Architecture:Pin diagram, detailed internal architecture, Flag Register,data bus, address bus, multiplexing and demultiplexing of address/data lines, control bus, control and status signals	14
II	Instruction cycle,T-states (clock cycles), machine cycles,instruction formats,Instruction Set and Programming Techniques: Different addressing modes, complete description of all instructions , programming examples,Timing diagram of machine cycles and instructions, Stacks and subroutine,Delays & Delay routine	14
III	Interrupts: Concept of interrupts, priority of interrupts signals, software generated interrupts and hardware generated interrupts.	12
IV	Interfacing:Memory mapped I/O, I/O mapped I/O,Memory interfacing, Basic interfacing concepts, Interfacing peripheral devices, 8259A programmable interrupt controller and its interfacing ,Programmable peripheral interface (8255) and its interfacing,Multi-purpose programmable device (8155), The 8254 programmable interval timer,Direct memory access and DMA controller (8237),8155 Programmable I/O and Timer	10
V	Introduction to 8086 mp	6
Total number of Hours		**56**

Textbooks:

S. No	Name of Book	Author	Publisher
1	Microprocessor Architecture Programming and Applications with the 8085	Ramesh S. Gaonkar.	Prentice hall
2	Microprocessors and Programmed Logic	K.L. Short	Prentice hall
3	Microprocessors: Theory and Applications (Intel and Motorola)	M. Rafiquzzaman	Prentice hall

Course Code	**OEC1EE504**			**Semester**	**FIFTH**
Category	**Open Elective Course**				
Course Title	**Communication Systems**				
Scheme & Credits	**L**	**T**	**P**	**Credits**	**Max Marks: 100**
	2	**1**	**0**	**3**	
Prerequisites	**Nil**				

Course Objectives:

1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth.
2. Analyze the behavior of a communication system in presence of noise.
3. Investigate pulsed modulation systems and analyze their system performance.
4. Analyze different digital modulation schemes and can compute the bit error performance.

Unit	Topic	No. of Hours
I	Introduction to Fourier series and Fourier transform, properties of Fourier Transform, Modulation theorem, amplitude spectrum of special signals viz. Pulse train and pulse waveform, etc. Introduction to Communication System, basic elements of Analog and digital Communication system, Importance/Application of Communication System in Electrical Engineering.	6
II	Modulation, Need of Modulation. AM, DSB/SC, SSB, VSB, etc : Introduction, waveforms, mathematical expressions, Generation, Detection and Application.	7
III	Angle modulation, types, NBFM, WBFM, PM: Introduction, waveforms, Mathematical expressions, Generation and Detection and Application. Comparison of Different Modulation Schemes.	7
IV	AM and FM transmitters, Radio Receivers – AM & FM, (Block diagram). Noise Analysis: Noise, types, Performance of AM & FM Systems in presence of noise, Threshold in AM & FM Demodulators, Pre- emphasis, and De-emphasis in FM Systems	10
V	Digital Communication: Sampling, Quantization, Quantization noise, Coding, Pulse code Modulation; Differential PCM, ADPCM, Relative advantages and dis- advantages.Delta modulation. PWM & PPM. Digital Modulation Techniques: ASK, FSK, PSK,QPSK, DPSK, GPSK etc. QAM, Constellation diagram	12
Total number of Hours		**42**

Textbooks:

S. No	Name of Book	Author	Publisher
1	Electronics communication System	G. Kennedy	Mcgraw hill education (India) Ltd
2	Principles of Communication system	Taub and Shelling	Mcgraw hill education Pvt Ltd
3	Communication system	S. Haykins	Willey India Pvt Ltd

Course Code	OEC2EE504			Semester	FIFTH
Category	Open Elective Course				
Course Title	Thermal Engineering				
Scheme & Credits	L	T	P	Credits	Max Marks: 100
	2	1	0	3	
Prerequisites	Nil				

Course Objectives:

1. After completing this course, the students will get a good understanding of various practical power cycles and heat pump cycles.
2. They will be able to analyze energy conversion in various thermal devices such as combustors, air coolers, nozzles, diffusers, steam turbines and reciprocating compressors
3. To analyze the performance of steam turbines

Unit	Topics	No. of Hours
I	THERMODYNAMICS: System and Surroundings, Zeroth Law, Temperature Scales, Equation of the state,First law, Steady flow, Isochoric, Isobaric, isothermal, adiabatic and polytropic processes. Properties of steam, Second law, Entropy change, Reversible Irreversible processes, Carnot's Cycle, Rankine Cycle, Modified Rankine Cycle, and Flow through nozzle.	14
II	STEAM TURBINE: Impulse turbine, velocity and pressure compounding , work output, Losses and efficiency, Reaction turbine, work output, losses and efficiency, degree of reaction, Modern steam power cycles, Regenerative and Reheat cycles, Governing of steam Turbines, Fields of Application.	10
III	I.C. ENGINES: Otto, Diesel and Dual cycles, Magneto and battery ignition, detonation and pre-ignition,Octane Number, Draught, Diesel knock, Cetane Number, various I.C engines fuels, Carburetion and Injection , Lubrication, Cooling, Governing of I.C Engines, Fields of Application.	10
IV	GAS TURBINES: Present status and future trends, Basic types and Cycles, Thermal refinements, jet propulsion, fields of Application.	8
Total number of Hours		**42**

Textbooks:

S. No	Name of Book	Author	Publisher
1	Steam Turbine Performance and Economics	Bartlett	McGraw Hill
2	Steam Turbine Theory and Practice	Kearton Pitman	CBS Publishers
3	Theory and Design of steam and Gas turbine	Loe	McGraw Hill
4	Gas Turbines Theory and Practice	Cohn and Rogers	Pearson
5	Turbo machines	Yahya	McGraw Hill

Course Code	OEC3EE504			Semester	FIFTH
Category	Open Elective Course				
Course Title	Digital Signal Processing				
Scheme & Credits	L	T	P	Credits	Max Marks: 100
	2	1	0	3	
Prerequisites	Nil				

Course Objectives:

1. To make students familiar with the most important methods in DSP, including digital filter design, transform-domain processing
2. To make students familiar with the importance of Signal Processing.
3. To make students aware about the meaning and implications of the properties of systems and signals.

Unit	Topics	No. of Hours
I	Discrete Time Signals & Systems: Sequences, & sequence operations, Discrete-time systems. Linear Time – Invariant systems, impulse response, causality, stability. Frequency-Domain Representation of Discrete-Time signals and systems, Fourier Transforms, properties, theorems.	7
II	Sampling of Continuous – Time Signals: Periodic sampling, frequency- domain representation of sampling, reconstruction of signals, discrete-time processing of continuous –time signals, continuous –time processing of Discrete-time signals, changing the sampling rate.	10
III	Transform Analysis of Linear time Invariant Systems: Z- Transform, Region of Convergence, properties, Inverse Z-Transform, Frequency Response of LTI systems, system functions, linear constant coefficient, difference equations FIR and IIR systems, Frequency Response.	10
IV	Structure of Discrete-Time Systems: Block Diagram Representation of linear constant-coefficient Difference equations, signal flow graph representation. Basic structures for IIR systems, Transposed forms, Basic network structures for FIR systems.	8
V	Filter Design Techniques: Design of Discrete-Time IIR filters from continuous – Time filters. Impulse invariance, bilinear transformation. Butterworth Chebyshev, Eliptic Approximation, low pass, high pass, band-pass and Band-stop filters, design of FIR filters by windowing. Kaiser, Hamming, Hamming windows.	7
Total number of Hours		**42**

Textbooks:

S. No	Name of Book	Author	Publisher
1	Discrete Time Signal Processing.	A.V Oppenheim and R. W Schafer	Prentice hall
2	Digital Signal Processing Principles, Algorithms and Applications.	John G. Proakis & D.G Manolavis	Prentice hall
3	Introduction To Digital Signal Processing.	J.R Johnson	Prentice hall
4	Theory and Application of Digital Signal Processing.	L.R Rabinder and B. Gold	Prentice hall

Course Code	**PCCEE505**			**Semester**	**FIFTH**
Category	**Professional Core Course**				
Course Title	**Power Electronics**				
Scheme & Credits	**L**	**T**	**P**	**Credits**	**Max Marks: 100**
	3	**1**	**0**	**4**	
Prerequisites	**Solid State devices, Circuit Analysis and Electrical Machines**				

Course Objectives:

1. Understand the differences between signal level and power level devices.
2. Analyse the operation of controlled rectifier circuits, DC-DC choppers & voltage source inverters for different types of Loads.

Unit	Topic	No. of Hours
I	Review of power semiconductor switching devices, Diode, Thyristors, MOSFET, IGBT and modern devices, characteristics and applications, Introduction to Turn-ON/Turn-OFF mechanism of switching devices, Gate-drive circuits, Switching-aid circuits, protection, Heat sink design.	14
II	Single phase half wave and full wave rectifiers (uncontrolled, semi controlled, controlled) with passive loads, performance analysis. Three-phase half wave and full wave rectifiers (uncontrolled, semi controlled, controlled) with passive loads, performance analysis. effect of source inductances	16
III	Single -phase inverter : single phase half and full bridge inverter with passive loads, performance analysis. Three-phase inverters: 180 degree conduction and 120 degree conduction, introduction to voltage control and harmonic reduction methods in inverters.	14
IV	AC Voltage Controllers Introduction-Principle of AC voltage control (On-Off control, Phase control) Single-Phase controllers (Analysis for different types of load)-evaluation of performance parameters . Introduction to Cycloconverters	6
V	DC-DC converters; buck, boost and buck-boost converters	6
Total No. of Hours		**56**

Textbooks:

S. No	Name of Book	Author	Publisher
1	Fundamental of Power Electronics	Robert Erickson, D. Maksimovic	Springer
2	Power Electronics, Circuits, Devices and Applications	Muhammad H. Rashid	PEI
3	Power Electronics	P. S. Bhimra	Khanna
4	Power Electronics - converters, Applications and Design	Ned Mohan, T. M.Undeland,W.P. Robbins	Wiley

Course Code	**PCCEE502L**			**Semester**	**FIFTH**
Category	**Professional Core Course**				
Course Title	**Electrical Machines-II Lab**				
Scheme & Credits	**L**	**T**	**P**	**Credits**	**Max Marks: 100**
	0	**0**	**2**	**1**	
Prerequisites	**Nil**				

S. No.	Experiment
1	To study the different parts of an Induction motor.
2	To determine the equivalent–circuit parameters of a 3 -f Induction motor by (i) No load test (ii) Blocked rotor test
3	To determine the Torque / speed characteristics of a 3-f Induction motor
4	To study the speed control of an Induction motor by pole-changing method
5	To study the speed control of an Induction motor by varying voltage
6	To study the speed control of an Induction motor by changing rotor resistance
7	To Study of the construction of a synchronous machine
8	To obtain the OCC and SCC of a synchronous machine by Synchronous impedance method
9	To find voltage regulation of an alternator by actual loading
10	To obtain the V-curves and inverted V-curves of a synchronous motor
11	To conduct slip-test on a salient-pole synchronous machine and hence determine its direct and quadrature – axis reactances

Course Code	**PCCEE503L**			**Semester**	**FIFTH**
Category	**Professional Core Course**				
Course Title	**Microprocessors Lab**				
Scheme & Credits	**L**	**T**	**P**	**Credits**	**Max Marks: 100**
	0	**0**	**2**	**1**	
Prerequisites	**Nil**				

S. No.	Experiment
1	Microprocessors (8085) training kit and its working.
2	Programs related to data transfer between registers, between registers and memory.
3	Programs related to logic instructions.
4	Programming techniques with additional instructions, looping, counting and indexing.
5	i) To develop a program to add two double byte numbers. ii) To develop a subroutine to add two floating point quantities.
6	i) To develop program to multiply two single byte unsigned numbers, giving a 16 bit product ii) To develop subroutine which will multiply two positive floating point numbers
7	To write program to evaluate P* Q*+R* & S are 8 bit binary numbers.
8	To write a program to divide a 4 byte number by another 4 byte number.
9	To write a program to divide an 8 bit number by another 8 bit number upto a fractional quotient of 16 bit.
10	Write a program for adding first N natural numbers and store the results in memory location X.
11	Write a program which decrements a hex number stored in register C. The Program should half when the program register reads zero.
12	Write a program to introduce a time delay of 100 ms using this program as a subroutine display numbers from 01H to OAH with the above calculated time delay between every two numbers.
13	N hex numbers are stored at consecutive memory locations starting from X. Find the largest number and store it at location Y.
14	Interfacing concepts. Switch and LED interfacing. Square wave generation.
15	ADC interfacing.
16	Interface a display circuit with the microprocessor either directly with the bus or by using I/O ports. Write a programme by which the data stored in a RAM table is displayed.

Course Code	**PCCEE505L**			**Semester**	**FIFTH**
Category	**Professional Core Course**				
Course Title	**Power Electronics Lab**				
Scheme & Credits	**L**	**T**	**P**	**Credits**	**Max Marks: 100**
	0	**0**	**2**	**1**	
Prerequisites	**Nil**				

S. No.	Experiment
1	To obtain the VI characteristics of an i. SCR ii. Triac
2	To study various triggering circuits
3	To obtain the UJT characteristics
4	To study the operation of a Line Synchronised UJT Relaxation Oscillator.
5	To study illumination control using SCR.
6	To study a half wave gate controlled rectifier using one SCR.
7	To study single phase half controlled, full wave rectifiers.
8	To study various techniques of forced commutation of an SCR.
9	To study the speed control of a DC shunt motor using a single phase bridge converter.
10	To study generation of SPWM modulation
11	To study following choppers i. Buck converter ii. Boost converter iii. Buck-Boost converter
12	To simulate power electronic converters using MATLAB