III Year – I SEMESTER

L	T	P	C
4	0	0	3

POWER SYSTEMS–II

Preamble:

This course is an extension of power systems–I course. It deals with basic theory of transmission lines modeling and their performance analysis. Transient in power system, improvement of power factor and voltage control are discussed in detail. It is important for the student to understand the mechanical design aspects of transmission lines, cables, insulators. These aspects are also covered in detail in this course.

Learning Objectives:

- To compute inductance/capacitance of transmission lines and to understand the concepts of GMD/GMR.
- To study the short and medium length transmission lines, their models and performance.
- To study the performance and modeling of long transmission lines.
- To study the effect of travelling waves on transmission lines.
- To study the factors affecting the performance of transmission lines and power factor improvement methods.
- To discuss sag and tension computation of transmission lines as well as to study the performance of overhead insulators.

UNIT–I:
Transmission Line Parameters
Conductor materials - Types of conductors – Calculation of resistance for solid conductors – Calculation of inductance for single phase and three phase– Single and double circuit lines– Concept of GMR and GMD–Symmetrical and asymmetrical conductor configuration with and without transposition–Bundled conductors-Numerical Problems–Calculation of capacitance for 2 wire and 3 wire systems – Effect of ground on capacitance – Capacitance calculations for symmetrical and asymmetrical single and three phase–Single and double circuit lines- Bundled conductors–Numerical Problems.

UNIT–II:
Performance of Short and Medium Length Transmission Lines
Classification of Transmission Lines – Short, medium, long line and their model representations –Nominal-T–Nominal-Pie and A, B, C, D Constants for symmetrical and Asymmetrical Networks– Numerical Problems– Mathematical Solutions to estimate regulation and efficiency of all types of lines – Numerical Problems.

UNIT–III:
Performance of Long Transmission Lines
Long Transmission Line–Rigorous Solution – Evaluation of A,B,C,D Constants– Interpretation of the Long Line Equations, regulation and efficiency– Incident, Reflected and Refracted Waves –Surge Impedance and SIL of Long Lines–Wave Length and Velocity of Propagation of Waves – Representation of Long Lines – Equivalent-T and Equivalent Pie network models (Numerical Problems).

UNIT – IV:

Power System Transients

Types of System Transients – Travelling or Propagation of Surges – Attenuation–Distortion– Reflection and Refraction Coefficients – Termination of lines with different types of conditions – Open Circuited Line–Short Circuited Line – T-Junction– Lumped Reactive Junctions.

UNIT–V:

Various Factors governing the Performance of Transmission line

Skin and Proximity effects – Description and effect on Resistance of Solid Conductors – Ferranti effect – Charging Current –Shunt Compensation –Corona – Description of the phenomenon–Factors affecting corona–Critical voltages and power loss – Radio Interference.

UNIT–VI:

Sag and Tension Calculations and Overhead Line Insulators

Sag and Tension calculations with equal and unequal heights of towers–Effect of Wind and Ice on weight of Conductor–Numerical Problems – Stringing chart and sag template and its applications–Types of Insulators – String efficiency and Methods for improvement– Numerical Problems – Voltage distribution–Calculation of string efficiency–Capacitance grading and Static Shielding.

Learning Outcomes:

- Able to understand parameters of various types of transmission lines during different operating conditions.
- Able to understand the performance of short and medium transmission lines.
- Student will be able to understand travelling waves on transmission lines.
- Will be able to understand various factors related to charged transmission lines.
- Will be able to understand sag/tension of transmission lines and performance of line insulators.

Text Books:

1. Electrical power systems – by C.L.Wadhwa, New Age International (P) Limited, Publishers, 1998.
2. Modern Power System Analysis by I.J.Nagarath and D.P.Kothari, Tata McGraw Hill, 2nd Edition

Reference Books:

1. Power system Analysis–by John J Grainger William D Stevenson, TMC Companies, 4th edition
2. Power System Analysis and Design by B.R.Gupta, Wheeler Publishing.
3. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.BhatnagarA.Chakrabarthy, DhanpatRai& Co Pvt. Ltd.
4. Electrical Power Systems by P.S.R. Murthy, B.S.Publications.

III Year – I SEMESTER

L	T	P	C
4	0	0	3

RENEWABLE ENERGY SOURCES

Preamble:

This course gives a flavor of renewable sources and systems to the students. It introduces solar energy its radiation, collection, storage and its applications. This covers generation, design, efficiency and characteristics of various renewable energy sources including solar, wind, hydro, biomass, fuel cells and geothermal systems.

Learning Objectives:

- To study the solar radiation data, extraterrestrial radiation, radiation on earth's surface.
- To study solar thermal collections.
- To study solar photo voltaic systems.
- To study maximum power point techniques in solar pv and wind energy.
- To study wind energy conversion systems, Betz coefficient, tip speed ratio.
- To study basic principle and working of hydro, tidal, biomass, fuel cell and geothermal systems.

UNIT–I:
Fundamentals of Energy Systems and Solar energy
Energy conservation principle – Energy scenario (world and India) – various forms of renewable energy - Solar radiation**:** Outside earth's atmosphere – Earth surface – Analysis of solar radiation data – Geometry – Radiation on tilted surfaces – Numerical problems.

UNIT–II:
Solar Thermal Systems
Liquid flat plate collectors**:** Performance analysis –Transmissivity– Absorptivity product collector efficiency factor – Collector heat removal factor – Numerical problems. Introduction to solar air heaters – Concentrating collectors, solar pond and solar still – solar thermal plants.

UNIT–III:
Solar Photovoltaic Systems
Solar photovoltaic cell, module, array – construction – Efficiency of solar cells – Developing technologies – Cell I-V characteristics – Equivalent circuit of solar cell – Series resistance – Shunt resistance – Applications and systems – Balance of system components - System design**:** storage sizing – PV system sizing – Maximum power point techniques**:** Perturb and observe (P&O) technique – Hill climbing technique.

UNIT–IV:
Wind Energy
Sources of wind energy - Wind patterns – Types of turbines –Horizontal axis and vertical axis machines - Kinetic energy of wind – Betz coefficient – Tip–speed ratio – Efficiency – Power output of wind turbine – Selection of generator(synchronous, induction) – Maximum power point tracking – wind farms – Power generation for utility grids.

UNIT–V:

Hydro and Tidal power systems

Basic working principle – Classification of hydro systems**:** Large, small, micro – measurement of head and flow – Energy equation – Types of turbines – Numerical problems.
Tidal power – Basics – Kinetic energy equation – Turbines for tidal power - Numerical problems – Wave power – Basics – Kinetic energy equation – Wave power devices – Linear generators.

UNIT–VI:

Biomass, fuel cells and geothermal systems

Biomass Energy**:** Fuel classification – Pyrolysis – Direct combustion of heat – Different digesters and sizing.
Fuel cell**:** Classification of fuel for fuel cells – Fuel cell voltage– Efficiency – V-I characteristics.
Geothermal**:** Classification – Dry rock and hot acquifer – Energy analysis – Geothermal based electric power generation

Learning Outcomes:

Student should be able to

- Analyze solar radiation data, extraterrestrial radiation, and radiation on earth's surface.
- Design solar thermal collectors, solar thermal plants.
- Design solar photo voltaic systems.
- Develop maximum power point techniques in solar PV and wind energy systems.
- Explain wind energy conversion systems, wind generators, power generation.
- Explain basic principle and working of hydro, tidal, biomass, fuel cell and geothermal systems.

Text Books:

1. Solar Energy**:** Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH, New Delhi, 3rd Edition.
2. Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis - second edition,2013.

Reference Books:

1. Energy Science**:** Principles, Technologies and Impacts, John Andrews and Nick Jelly, Oxford University Press.
2. Renewable Energy- Edited by Godfrey Boyle-oxford university.press,3rd edition,2013.
3. Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal, World scientific, Singapore.
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa.
5. Renewable energy technologies – A practical guide for beginners – Chetong Singh Solanki, PHI.
6. Non conventional energy source –B.H.khan- TMH-2nd edition.

III Year – I SEMESTER

L	T	P	C
4	0	0	3

SIGNALS & SYSTEMS

OBJECTIVES:

The main objectives of this course are given below:

- To introduce the terminology of signals and systems.
- To introduce Fourier tools through the analogy between vectors and signals.
- To introduce the concept of sampling and reconstruction of signals.
- To analyze the linear systems in time and frequency domains.
- To study z-transform as mathematical tool to analyze discrete-time signals and systems.

UNIT- I: INTRODUCTION: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions.

UNIT –II: FOURIER SERIES AND FOURIER TRANSFORM:
Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform.

UNIT –III: SAMPLING THEOREM – Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to Band Pass sampling.

UNIT-IV: ANALYSIS OF LINEAR SYSTEMS: Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

Cross-correlation and auto-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function. Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

UNIT –V: LAPLACE TRANSFORMS : Review of Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Relation

between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

UNIT –VI: Z–TRANSFORMS : Fundamental difference between continuous-time and discrete-time signals, discrete time signal representation using complex exponential and sinusoidal components, Periodicity of discrete time using complex exponential signal, Concept of Z- Transform of a discrete sequence. Distinction between Laplace, Fourier and Z transforms. Region of convergence in
Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.
3. Signals & Systems- Narayan Iyer and K Satya Prasad, Cenage Pub.

REFERENCE BOOKS:

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition.
2. Principles of Linear Systems and Signals – BP Lathi, Oxford University Press, 2015
3. Signals and Systems – K Raja Rajeswari, B VisweswaraRao, PHI, 2009
4. Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition, 2008.
5. Signals and Systems – T K Rawat , Oxford University press, 2011

OUTCOMES:

At the end of this course the student will able to:

- Characterize the signals and systems and principles of vector spaces, Concept of orthgonality.
- Analyze the continuous-time signals and continuous-time systems using Fourier series, Fourier transform and Laplace transform.
- Apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruct back.
- Understand the relationships among the various representations of LTI systems
- Understand the Concepts of convolution, correlation, Energy and Power density spectrum and their relationships.
- Apply z-transform to analyze discrete-time signals and systems.

III Year – I SEMESTER

L	T	P	C
4	0	0	3

PULSE AND DIGITAL CIRCUITS OBJECTIVES

The student will be made

- To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.
- To study the design and analysis of various Multivibrators.
- To understand the functioning of different types of time-base Generators.
- To learn the working of logic families & Sampling Gates.

UNIT I

LINEAR WAVESHAPING: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and exponential inputs. RC network as differentiator and integrator; Attenuators , its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT II

NON-LINEAR WAVE SHAPING : Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper; Clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT III

SWITCHING CHARACTERISTICS OF DEVICES : Diode as a switch, piecewise linear diode characteristics, Design and analysis of Transistor as a switch, Break down voltage consideration of transistor, saturation parameters of Transistor and their variation with temperature, Design of transistor switch, transistor-switching times.

Bistable Multivibrator: Analysis And Design of Fixed Bias, Self Bias Bistable Multi Vibrator, Collector Catching Diodes, Commutating Capacitors, Triggering of Binary Circuits, Emitter Coupled Bistable Multivibrator (Schmitt Trigger).

UNIT IV

Monostable Multivibrator: Analysis and Design of Collector Coupled Monostable Multi vibrator, Triggering of Monostable Multivibrator, Applications of Monostable Multivibrator.

Astable Multivibrator: Analysis and Design of Collector Coupled Astable Multivibrator, Application of Astable Multivibrator as a Voltage to Frequency Converter.

UNIT V

VOLTAGE TIME BASE GENERATORS:

General features of a time base signal, Methods of generating time base waveform Exponential Sweep Circuits, Negative Resistance Switches, basic principles in Miller and Bootstrap time base generators, Transistor Miller time base generator, Transistor Bootstrap time base generator.

UNIT VI

LOGIC FAMILIES & SAMPLING GATES:

LOGIC FAMILIES: Diode Logic, Transistor Logic, Diode-Transistor Logic, Transistor-Transistor Logic, Emitter Coupled Logic, AOI Logic, Comparison of Logic Families.

SAMPLING GATES: Basic Operating Principles of Sampling Gates, Diode Unidirectional Sampling Gate and Two-Diode Bi-Directional Sampling Gate, Four-Diode gates, Six-Diode Gates, Reduction of Pedestal in Sampling Gates, Applications of Sampling Gates.

TEXT BOOKS:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill
2. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005

REFERENCES :

1.Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGraw-Hill, Second Edition, 2007.
2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002
3. Pulse & Digital Circuits by Venkata Rao,K,Ramasudha K, Manmadha Rao,G., Pearson,2010

OUTCOMES

After going through this course the student will be able to

- Design linear and non-linear wave shaping circuits.
- Apply the fundamental concepts of wave shaping for various switching and signal generating circuits.
- Design different multivibrators and time base generators.
- Utilize the non sinusoidal signals in many experimental research areas.

III Year – I SEMESTER

L	T	P	C
4	0	0	3

POWER ELECTRONICS

Preamble:

The usage of power electronics in day to day life has increased in recent years. It is important for student to understand the fundamental principles behind all these converters. This course covers characteristics of semiconductor devices, ac/dc, dc/dc, ac/ac and dc/ac converters. The importance of using pulse width modulated techniques to obtain high quality power supply (dc/ac converter) is also discussed in detail in this course.

Learning Objectives:

- To study the characteristics of various power semiconductor devices and to design firing circuits for SCR.
- To understand the operation of single phase full–wave converters and analyze harmonics in the input current.
- To study the operation of three phase full–wave converters.
- To understand the operation of different types of DC-DC converters.
- To understand the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
- To analyze the operation of AC-AC regulators.

UNIT–I:
Power Semi-Conductor Devices
Thyristors–Silicon controlled rectifiers (SCR's) –Characteristics of power MOSFET and power IGBT– Basic theory of operation of SCR–Static characteristics– Turn on and turn off methods–Dynamic characteristics of SCR– Snubber circuit design– Basic requirements of gating circuits for SCR, IGBT and MOSFET.

UNIT–II:
AC-DCSingle-Phase Converters
1-phase half wave controlled rectifiers – R load and RL load with and without freewheeling diode – 1-phase full wave controlled rectifiers – center tapped configuration and bridge configuration- R load and RL load with and without freewheeling diode – continuous and discontinuous conduction – Effect of source inductance in 1-phase fully controlled bridge rectifier with continuous conduction.

UNIT–III:
AC-DC3-Phase Converters
3-phase half wave and Full wave uncontrolled rectifier – 3-phase half wave controlled rectifier with R and RL load – 3-phase fully controlled rectifier with R and RL load – 3-phase semi controlled rectifier with R and RL load.

UNIT–IV:
DC–DC Converters
Analysis of Buck, boost and buck, buck-boost converters in ContinuousConduction Mode (CCM) and Discontinuous Conduction Modes (DCM) – Output voltage equations using volt-sec balance in CCM & DCM output voltage ripple & inductor current, ripple for CCM only – Principle operation of forward and fly back converters in CCM.

UNIT – V:

DC–AC Converters

1- phase halfbridge and full bridge inverters with R and RL loads – 3-phase square wave inverters – 120^0 conduction and 180^0 conduction modes of operation – PWM inverters – Quasi-square wave pulse width modulation – Sinusoidal pulse width modulation – Prevention of shoot through fault in Voltage Source Inverter (VSI) – Current Source Inverter (CSI) – Introduction to Auto Sequential Commutated Current Source Inverter (ASCCSI) .

UNIT – VI:

AC – AC Regulators.

Static V-I characteristics of TRIAC and modes of operation – 1-phase AC-AC regulator phase angle control and integrated cycle control with R and RL load – For continuous and discontinuous conduction- 3-Phase AC-AC regulators with R load only – Transformer tap changing using antiparallel Thyristors.

Learning Outcomes:

Student should be able to

- Explain the characteristics of various power semiconductor devices and analyze the static and dynamic characteristics of SCR's.
- Design firing circuits for SCR.
- Explain the operation of single phase full–wave converters and analyze harmonics in the input current.
- Explain the operation of three phase full–wave converters.
- Analyze the operation of different types of DC-DC converters.
- Explain the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
- Analyze the operation of AC-AC regulators.

Text Books:

1. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998
2. Power Electronics: Essentials & Applications by L.Umanand, Wiley, Pvt. Limited, India, 2009

Reference Books:

1. Elements of Power Electronics–Philip T.Krein.oxford.
2. Power Electronics – by P.S.Bhimbra, Khanna Publishers.
3. Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradla, A. Joshi and R. M. K.Sinha, New Age International (P) Limited Publishers, 1996.
4. Power Electronics handbook by Muhammad H.Rashid, Elsevier.
5. Power Electronics: converters, applications & design -by Nedmohan, Tore M. Undeland, Robbins by Wiley India Pvt. Ltd.
6. Power Converter Circuits -by William Shepherd, Li zhang, CRC Taylor & Francis Group.

	L	T	P	C
III Year – I SEMESTER	**0**	**0**	**3**	**2**

ELECTRICAL MACHINES – II LABORATORY

Learning objectives:

- To control the speed of three phase induction motors.
- To determine /predetermine the performance three phase and single phase induction motors.
- To improve the power factor of single phase induction motor .
- To predetermine the regulation of three–phase alternator by various methods, find X_d/ $X_q$ratio of alternator and asses the performance of three–phase synchronous motor.

The following experiments are required to be conducted as compulsory experiments:

1. Brake test on three phase Induction Motor
2. No–load & Blocked rotor tests on three phase Induction motor
3. Regulation of a three –phase alternator by synchronous impedance &m.m.f. Methods
4. Regulation of three–phase alternator by Potier triangle method
5. V and Inverted V curves of a three—phase synchronous motor.
6. Determination of X_d and X_q of a salient pole synchronous machine
7. Equivalent circuit of single phase induction motor
8. Speed control of induction motor by V/f method.
9. Determination of efficiency of three phase alternator by loading with three phase induction motor.
10. Power factor improvement of single phase induction motor by using capacitors and load test on single phase induction motor.

Learning outcomes:

- Able to assess the performance ofsingle phase and three phase induction motors.
- Able to control the speed of three phase induction motor.
- Able to predetermine the regulation of three–phase alternator by various methods.
- Able to find the X_d/ $X_q$ratio of alternator and asses the performance of three–phase synchronous motor.

.

III Year – I SEMESTER

L	T	P	C
0	0	3	2

CONTROL SYSTEMS LAB

Learning Objectives:

- To impart hands on experience to understand the performance of basic control system components such as magnetic amplifiers, D.C. servo motors, A.C. Servo motors, stepper motor and potentiometer.
- To understand time and frequency responses of control system with and without controllers and compensators.

Any 10 of the following experiments are to be conducted:

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller – characteristics of stepper motor
4. Effect of feedback on DC servo motor
5. Effect of P, PD, PI, PID Controller on a second order systems
6. Lag and lead compensation – Magnitude and phase plot
7. DC position control system
8. Transfer function of DC motor
9. Temperature controller using PID
10. Characteristics of magnetic amplifiers
11. Characteristics of AC servo motor
12. Characteristics of DC servo motor
13. Potentiometer as an error detector

Learning Outcomes

- Able to analyze the performance and working Magnetic amplifier, D.C and A.C. servo motors and synchronous motors.
- Able to design P,PI,PD and PID controllers
- Able to design lag, lead and lag–lead compensators
- Able to control the temperature using PID controller
- Able to determine the transfer function of D.C.motor
- Able to control the position of D.C servo motor performance

III Year – I SEMESTER

L	T	P	C
0	0	3	2

ELECTRICAL MEASUREMENTS LABORATORY

Learning Objectives:

- To understand the correct function of electrical parameters and calibration of voltage, current, single phase and three phase power and energy, and measurement of electrical characteristics of resistance, inductance and capacitance of a circuits through appropriate methods.
- To understand testing of transformer oil.

Any 10 of the following experiments are to be conducted

1. Calibration and Testing of single phase energy Meter
2. Calibration of dynamometer wattmeter using phantom loading
3. Calibration of PMMC ammeter and voltmeter using Crompton D.C. Potentiometer
4. Measurement of resistance and Determination of Tolerance using Kelvin's double Bridge.
5. Capacitance Measurement using Schering bridge.
6. Inductance Measurement using Anderson bridge.
7. Measurement of 3 phase reactive power with single phase wattmeter for balanced loading.
8. Calibration of LPF wattmeter by direct loading.
9. Measurement of 3 phase power with single watt meter and using two C.Ts.
10. Testing of C.T. using mutual inductance method.
11. Testing of P.T. using absolute null method.
12. Dielectric oil testing using H.T test Kit.
13. Calibration of AC voltmeter and measurement of choke parameters using AC Potentiometer in polarform.
14. Measurement of Power by 3 Voltmeter and 3 Ammeter method.

Learning Outcomes:

- To be able to measure the electrical parameters voltage, current, power, energy and electrical characteristics of resistance, inductance and capacitance.
- To be able to test transformer oil for its effectiveness.
- To be able to measure the parameters of inductive coil.

III Year – I SEMESTER

L	T	P	C
0	2	0	0

INTELLECTUAL PROPERTY RIGHTS AND PATENTS

Objectives:

***To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines.**

***Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments.**

Unit I: Introduction to Intellectual Property Rights (IPR)

Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

Unit II: Copyrights and Neighboring Rights

Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers **–** Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.

Unit III: Patents

Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations.

Unit IV: Trademarks

Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

Unit V: Trade Secrets

Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of Unfair Competition – Trade Secret Litigation – Applying State Law.

Unit VI: Cyber Law and Cyber Crime

Introduction to Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions - E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

- Relevant Cases Shall be dealt where ever necessary.

Outcome:

*** IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents.**

***Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements.**

References:

1. Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2. Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
3. PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
4. Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
5. Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
6. Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
7. R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
8. M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.