University of Kalyani

Part-III Semester-1 & 2
Syllabus

for

Bachelor of Technology

on

Electronics and Instrumentation Engineering

Department of Engineering and Technological Studies

NO. OF THEORETICAL SUBJECT	: 05	CREDITS ON THEORETICAL SUBJECTS	: 15
NO. OF SESSIONAL SUBJECT	: 03	CREDITS ON SESSIONAL	: 6
		TOTAL SEMESTER CREDITS	: 21

PART –III, 1ST SEMESTER (EIE)

A. THEORETICAL SUBJECTS							
Sl. No.	Subject Code	Subject Name	Contacts (Periods/Week)				Credits
			L	T	P	Total	
1.	EI501	Electromagnetic Waves	3			3	3
2.	EI502	Control Engineering	3			3	3
3.	IT504	Computer Organization & Architecture	3			3	3
4.	EI503	Digital Communication	3			3	3
5.	EI504	Instrumentation I (Elective I)	3			3	3
		Total of Theoretical Subjects				15	15
B. SESSIONAL SUBJECTS							
6.	EI591	Electromagnetic Waves Lab			2	2	2
7.	EI592	Control Engineering Lab			2	2	2
8.	EI593	Digital Communication Lab			2	2	2
		Total of Sessional Subjects				6	6
		Total of Semester				21	21

Subject : **Electromagnetic Waves**
Paper Code : EI 501 Subject Category: Theoretical
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson	Contact Hours
1.	**Vector Analysis :** Vector Algebra, Coordinate Systems and Transformation - Cartesian, Cylindrical and spherical coordinates, Vector Calculus - Differential length, area and volume, Line, surface and volume integrals, Del operator, Gradient of a scalar, Divergence of a vector, Divergence Theorem, Curl of a vector, Stoke's Theorem..	*5L*
2.	**Electrostatics:** Electrostatic Fields - Coulomb's Law and field intensity, Electric fields due to continuous charge distributions, Electric flux density, Gauss's Law, Applications of Gauss's Law, Electric Potential, Relationship between E and V, Electric dipole, Energy density in Electrostatic fields.	*7L*
3.	**Electric fields in material space** - Properties of materials, Convection and conduction currents, Conductors, Polarization, Continuity equation, relaxation time, Boundary conditions; Electrostatic Boundary value problems- Poisson's and Laplace's Equations, Uniqueness Theorem, Resistance and capacitance [Parallel-plate, coaxial, spherical capacitors.	*7L*
4.	**Magnetostatics and Maxwell's equations:** Magnetostatic fields - Biot-Savart's Law, Ampere's circuital law, Applications of Ampere's circuital law, Magnetic flux density, Magnetic scalar and vector potentials. Magnetic forces, Materials and devices - Forces due to magnetic fields, Magnetic torque and moment, Magnetic dipole, Magnetization in materials, Classification of Magnetic Materials, Magnetic boundary conditions, Magnetic energy, Magnetic circuits. Faraday's Law, Displacement current, Time-harmonic fields, Maxwell's equations for static fields and time varying fields.	*8L*
5.	**Electromagnetic wave propagation :** Electromagnetic waves-Wave propagation in lossy dielectrics- Wave equations, propagation constant, intrinsic impedance of the medium, complex permittivity, loss tangent, Plane waves in lossless dielectrics, Plane waves in free space - uniform plane wave, Plane waves in good conductors - skin effect, Poynting vector, Poynting's Theorem, Reflection and Refraction of a plane wave at normal incidence - standing waves, Reflection and Refraction of a plane wave at oblique incidence - parallel and perpendicular polarization, Brewster angle.	*7L*

Recommended Books:

1.	Sadiku, *Principles of Electromagnetics*, 4/e, 0xford University press.(2009)
2.	W.H.Hayt, and J.A.Buck, *Engineering Electromagnetics*, Tata McGraw Hill, 7/e, (2011)
3.	Jordan and Balmain, *Electromagnetic waves and radiating systems*, PHI Ltd, 2/e,(2010)
4.	Kraus and Fleisch, *Electromagnetics with applications*, Tata McGraw Hill, 5/e, (2010)
5.	Joseph A. Edminister, *Electromagnetics*, Schaum series - Tata McGraw Hill, 2/e, (2011)
6.	W.H.Hayt, and J.A.Buck, *Problems and solutions in Electromagnetics*, TMH, 7/e, (2011)
7.	Lonngren, *Fundamentals of Electromagnetics with Matlab*, PHI Ltd, 2/e, (2007)

Subject : **Control Engineering**
Paper Code : EI 502 Subject Category: Theoretical
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson	Contact Hours
1.	**Introduction**: Control systems, feedback and its effects, types of feedback control systems, mathematical modelling of physical and electrical systems, signal flow graph, block diagram, Block diagram reduction techniques	*6L*
2.	**Time domain analysis**: Transient response of a single input single output linear feedback control system, steady state error, proportional integral and derivative control systems.	*6L*
3.	**State variable analysis of control system:** State representation of systems, solving time invariant state equation. state transition equation and transfer function, state diagram, state equation, calculation of transfer function from state equation	*6L*
4.	**Root locus method**: Root locus plots, summery of general rules for construction root loci, root locus analysis of control systems.	*6L*
5.	**Concept of stability:** To determine stability of a system, conditions of stability, characteristics equation of a system, Rowth-Hurwitz criteria, examples.	*6L*
6.	**Frequency domain analysis of control system:** Polar Plot, Gain margin, Phase margin in dB. Stability analysis by Polar plot and Bode plot, Nyquist Plot, Nyquist stability criterion, application of Nyquist criterion	*6L*

Recommended Books:

1.	Control Systems Engineering, Nagrath and Gopal, New Age International (P) Limited
2.	Automatic Control Systems, Benjamin C. Kuo, McGraw Hill Professional
3.	Modern Control Engineering, Katsuhiko Ogata, Prentice Hall

Subject : **Computer Organization & Architecture**
PaperCode: **IT504** Subject Category: Theoretical Full
Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks] *Contact Hours per week = 3L* *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson	Contact hours
1.	Concepts & Terminology: Digital computer concepts; Von-Neumann concept; Hardware & Software and their dual nature, Role of operating system (OS). Features of PCs, Minis, Workstations and Mainframes.	3L
2.	Memory Unit: Memory classification, characteristics; Organization of RAM, address decoding, Registers and Stack, ROM/PROM/EEPROM basic cells: Organization and erasing schemes, Magnetic memories, recording formats & methods, Concept of memory map, memory hierarchy, Associative memory organization; Cache introduction, techniques to reduce cache misses, concept of virtual memory & paging. Bipolar and MOS storage cells. Instruction sequencing with examples. Microprogramming concept and variation in microprogramming	*9L*

	configuration.	
3.	CPU Design: ALU organization, Serial & Parallel Adders; implementation of highspeed Adders, Carry Look Ahead & carry Save Adders; Multiplication of signed binary numbers - Booth's algorithm; Divide algorithms - Restoring & Non-Restoring; Floating point number arithmetic; Overflow detection, status flags.	9L
4.	Control Design– Timing diagrams; T-States, Controlling arithmetic & logic instruction, control structures; Hardwired & Micro-programmed, CISC & RISC characteristics.	3L
5.	Parallel Processing: Pipelining-general concept, speed up, instruction & arithmetic pipeline; Examples of some pipeline in modern processors, pipeline hazards; Flynn's classification – SISD, SIMD, MISD, MIMD architectures-Vector and Array processors & their comparison, Concept of Multiprocessor; Centralized & distributed architectures.	9L
6.	Instruction Set Architecture- Choice of instruction set; Instruction word formats; Addressing modes. Input/output Organization: Introduction to Bus architecture, effect of bus widths, Programmed & Interrupt I/O, DMA.	3L

Recommended Books:

1.	"Computer Architecture & Organization", Hayes, 3/e, McGraw Hill
2.	"Computer Architecture (Schaum Series)", Carter, Tata McGraw Hill
3.	"Computer System Architecture", Mano M. M., Prentice Hall India
4.	*"Computer Organization & Design", Chaudhury P. Pal, Prentice Hall India*
5.	*A"Computer Organization", Hamacher, 5/e, McGraw Hill*

Subject :**Digital Communication**
Paper Code : EI 503 Subject Category: Theoretical
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson	Contact Hours
1.	Delta modulation, limitations of Delta modulation- slope overload, Adaptive Delta modulation. Pulse code modulation: Concept of sampling of continuous signal, Nyquist sampling theorem, quantisation error, signal to quantisation error ratio.	*6L*
2.	Different types of digital modulation: ASK, PSK, FSK, error analysis of different digital modulated signals.	*5L*
3.	Multiplexing: Time Division Multiplexing, Frequency Division Multiplexing, Code Division Multiplexing	*5L*
4.	Baseband signal receiver: Optimum filtering, matched filter, impulse response of matched filter	*5L*
5.	Need for synchronisation, bit synchronisation, Early-late bit synchronisation, bit synchronisation using voltage controlled clock	*5L*

6.	Inter symbol interference, eye diagram, minimisation of ISI using zero forcing equalizer	*5L*
7.	Block code: Generator and parity check matrix, error control capacity, syndromes calculation and error detection	*5L*

Recommended Books:

1.	Modern Digital and Analog Communication Systems, B P Lathi, Oxford University Press
2.	Digital Communications, Haykin, Wiley-India

Subject :**Instrumentation I (Elective I)**
Paper Code : EI 504 Subject Category: Theoretical
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson	Contact Hours
1.	**Static and Dynamic errors**: Standard inputs and system analysis for evaluation of such errors. Definitions of precision, nonlinearity, sensitivity, speed of response, fidelity.	*6L*
2.	**Transducer:** - Resistive, Capacitive, Inductive and Piezoelectric transducer: Introduction, their signal conditioning, filter	*6L*
3.	**Measurement of temperature** – temperature scale – primary and secondary standards for calibration – different types of filled system thermometers – installation maintenance, source of errors – bimetallic thermometers – installation maintenance, source of errors – thermocouples – materials – construction- characteristics and circuits.	*6L*
4.	**Resistance thermometer** - temperature coefficient of resistance – RTD – material, construction and characteristic – measuring circuits – three wire and four wire method – response – thermisters – semiconductor and IC sensors.	*6L*
5.	**Measurement of pressure** – units of pressure – pressure standards – various types of manometers – elastic type pressure standards – various types of manometers – elastic type pressure gauges – material, construction and calibration – pressure gauges using strain gauge, capacitive, inductive and piezoelectric transducer – measurement of low presser – McLead gauge – thermal conductivity gauge – thermocouple gauges – Ionization gauges – solid state pressure transducers	*6L*
6.	**Level measurement** – Float activated devices – displacer devices – torque tube purge systems – diaphragm box type, manometer type – boiler drum level measurement – differential pressure method – Hydrastep method – resistance, capacitive, nucleonic and ultrasonic type level gauges – solid level measurement – gamma ray absorption method – weighing method – capacitive type – diaphragm method – rotating paddle and stack detector.	*6L*

Recommended Books:

1.	E.O.Deoblin – Measurement Systems – Applications and Design – McGraw Hill
2.	C.S.Rangan,G.R.Sharma and V.S.V Mani – Instrumentation Devices and Systems – Tata McGraw Hill
3.	D.P.Eckman – Industrial Instrumentation – Wiley Eastern
4.	R.K.Jain – Mechanical and Industrial Instruments – Khanna Publishers
5.	D.Patranbis – Priniciples of Industrial Instrumentation – Tata McGraw Hill

Subject : **Electromagnetic Waves Lab**
PaperCode : EI 591 Subject Category: Sessional
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson
1.	Experiment on measurement of reflection co-efficient of an antenna system
2.	Experiment on measurement of radiation patterns
3.	Experiment on measurement of gain of an antenna
4.	Experiment on EM wave power measurement
5.	Wavelength measurement of an EM wave

Subject : **Control Engineering Lab**
PaperCode : EI 592 Subject Category: Sessional
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson
1.	Experiment on finding roots of the characteristics equation of a transfer function
2.	Experiment on finding closed loop and open loop transfer function
3.	Experiment on finding poles and zeroes of a transfer function
4.	Experiment on finding root locus of a transfer function
5.	Experiment on finding gain margin and phase margin
6.	Experiment on finding bode plot of a transfer function
7.	Experiment on finding nyquist plot of a transfer function

Subject : **Digital Communication Lab**
PaperCode : EI 593 Subject Category: Sessional
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson
1.	Experiment on Amplitude Shift keying (ASK)
2.	Experiment on Frequency Shift keying (FSK)
3.	Experiment on Phase Shift keying (PSK)
4.	Experiment on Pulse code Modulation and Demodulation (PCM)
5.	Experiment on Pulse amplitude Modulation and Demodulation (PAM)
6.	Experiment on Pulse width Modulation and Demodulation (PWM)
7.	Experiment onPhase-Locked Loop (PLL)

PART –III, 2ND SEMESTER (EIE)

NO. OF THEORETICAL SUBJECT	: 05	CREDITS ON THEORETICAL SUBJECTS	: 15
NO. OF SESSIONAL SUBJECT	: 02	CREDITS ON SESSIONAL	: 5
		TOTAL SEMESTER CREDITS	: 20

A. THEORETICAL SUBJECTS							
Sl. No.	Subject Code	Subject Name	Contacts (Periods/Week)				Credits
			L	T	P	Total	
1.	EI601	Power Electronics	3	0	0	3	3
2.	IT602	Computer Networks	3	0	0	3	3
3.	EI602	Telemetry and Remote Control	3	0	0	3	3
4.	EI603	Instrumentation II	3	0	0	3	3
5.	EI604	Signal and Systems	3	0	0	3	3
		Total of Theoretical Subjects				15	15
B. SESSIONAL SUBJECTS							
1.	EI691	Power Electronics Lab	0	0	4	4	2
2.	EI692	Mini Project	0	0	4	4	3
		Total of Sessional Subjects				8	5
		Total of Semester				20	20

Subject : **Power Electronics**
Paper Code : EI 601 Subject Category: Theoretical
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson	Contact Hours
1.	Basic difference between linear electronics and power electronics. Characteristics of Semiconductor Power Devices: Thyristor, power MOSFET and IGBT- Treatment should consist of structure, Characteristics, operation, ratings, protections. Brief introduction to power devices viz. TRIAC, MOS controlled thyristor (MCT), Power Integrated Circuit (PIC) (Smart Power), Triggering/Driver, commutation and snubber circuits for thyristor, power MOSFETs and IGBTs. Concept of fast recovery and schottky diodes as freewheeling and feedback diode.	*L-8*
2.	Controlled Rectifiers: Single phase: Study of semi and full bridge converters for R, RL and RLE loads. Analysis of load voltage and input current- Derivations of load form factor and ripple factor, Input current Fourier series analysis of input current to derive input supply power factor, displacement factor and harmonic factor.	*L-8*
3.	Choppers: Quadrant operations of Type A, Type B, Type C, Type D and type E choppers, Control techniques for choppers – Detailed analysis of Type A chopper. Step up chopper.	*L-6*
4.	Single-phase inverters: Principle of operation of full bridge square wave, quasi-square wave, PWM inverters and comparison of their performance. Driver circuits for above inverters and mathematical analysis of output (Fourier series) voltage and harmonic control at output of inverter (Fourier analysis of output voltage). Filters at the output of inverters, Single phase current source inverter	*L-8*
5.	Switching Power Supplies: Analysis of fly back, forward converters for SMPS, Resonant converters - need, concept of soft switching, switching trajectory, Load resonant converter – series loaded half bridge DC-DC converter	*L-3*
6.	Applications: Power line disturbances, power conditioners. Block diagram and configuration of UPS, salient features of UPS, selection of battery and charger ratings, sizing of UPS. Separately excited DC motor drive.P M Stepper motor Drive	*L-3*

Recommended Books:

1.	Muhammad H. Rashid, “Power Electronics” Prentice Hall of India
2.	P. S. Bimbhra, “Power Electronics” Khanna Publishers
3.	V.R.Moorthi, “Power Electronics”, Oxford University Press
4.	Ned Mohan, Robbins, “Power Electronics”, edition III, John Wiley and sons

Subject :**Computer Networks**
Paper Code : IT 602 Subject Category: Theoretical
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson	Contact Hours
1.	Module 1: Data communication Components: Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum	5L
2.	Module 2: Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA	12L
3.	Module 3: Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.	10L
4.	Module 4: Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service.	6L
5.	Module 5: Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls.	3L

Recommended Books:

1.	Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGrawHill.
2.	Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.
3.	Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
4.	Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India
5.	TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

Subject :**Telemetry and Remote Control**
Paper Code : EI 602 Subject Category: Theoretical
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson	Contact Hours
1.	Basic classification of telemetry systems; voltage, current, position, frequency andtime components of telemetering and remote control systems, quantization theory,sampling theorem, sample and hold, data conversion, coding, for conversion	
2.	Multiplexing; time division multiplexers and demultiplexer theory, scanningprocedures, frequency division multiplexers with constant and proportionalbandwidth, demultiplexers.	
3.	Data acquisition and distribution system; telemetry system design.	
4.	Fundamentals of radio-telemetry system, RF link system design, IRIG and CCITT standards.	
5.	Pulse code modulation; methods and circuits	
6.	Practical telemetry systems; pipeline telemetry; power system telemetry; supervisory tele-control system	

Recommended Books:

1.	"Telemetry Principles", D. Patranabis, Tata McGraw-Hill
2.	"Telemetry And Data Transmission", R. N Baral, S. K. Kataria & Sons

Subject :**Instrumentation II**
Paper Code : EI 603 Subject Category: Theoretical
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson	Contact Hours
1.	**Flow measurement** – Bernoulli's theorem – Flow of incompressible fluids – Compressible fluids – Orifice, Nozzle, venturi, Pitot tubes – Installation and maintenance – Square root extractor – Rota meter – Installation and maintenance.	
2.	**Quantity flow meters** – Positive displacement – Reciprocating pistons – Oscillating pistons – Rotating disc – Helix – Oval gear – Lobed impeller type – Rotating vane – Propeller type – Turbine – Combination meter – Shunt motor – Electromagnetic type – Ultrasonic type meters – Mass flow meter – Anemometer	
3.	**Measurement of speed** – mechanical – electrical – electronic methods – stroboscopic method – measurement of acceleration – various types – calibration.	
4.	**Measurement of weight force, Vibration torque load cell** – various types – Spring piezoelectric and strain gauge load cell – torque transducers – Various types – Cause of Vibrations – Various methods measurement – Vibration shaker – Piezoelectric and variable reluctance type – Vibration analysis of holography.	
5.	**Measurement of density, viscosity, specific gravity scales used in petroleum industries** – Different methods of measuring consistency and viscosity – Methods for measuring moisture and humidity – Electrical conductivity – Dielectric constant – Automatic electric psychrometer.	
6.	**pH and conductivity meters** – pH measurement – pH electrode station – Various types of electrodes – Installation and maintenance of pH – meters – Conductivity meter – Electrical conductivity of solution – Cell construction operating principles	

Recommended Books:

1.	E.O.Deoblin – Measurement Systems Application and Designs – McGraw Hill.
2.	D.Patranbis – Principles of Industrial Instrumentation – Tata McGraw Hill.
3.	D.P. Eckman – Industrial Instrumentation – Wiley Eastern.
4.	R.K.Jain – Mechanical and Industrial Measurement – Khanna Publishers.

Subject :**Signal and Systems**
Paper Code : EI 604 Subject Category: Theoretical
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30 Marks]
Contact Hours per week = 3L *Credits: 3*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson	Contact Hours
1.	Concept of Laplace Transform, Properties of Laplace Transform, Laplace Transform of some standard time domain signals, Applications.	
2.	Concept of Fourier Transform, Properties of Fourier Transform, Fourier Transform of some standard time domain signals, Applications.	
3.	Introduction-Signal representation: Continuous and discrete time signals: Classification of Signals - Periodic aperiodic, even-odd, energy and power signals-deterministic and random signals- complex ex'ponential ~nd sinusoidal signals- periodicity, unit step impulse functions- Transformation of independent variable of signals: time shifting	
4.	Continuous time Signals and Systems: Basic properties of continuous time systems: Linearity, Causality, time invariance, stability, magnitude and Phase representations of frequency response of LT! systems- Analysis and characterization of LTI systems: Computation of impulse response and transfer function convolution, co-relation, signal, energy, signal power, energy spectral density, power spectral density.	
5.	Sampling Theorem: Representation of continuous time signals by its sample – Sampling theorem - Reconstruction of Signal from its samples, aliasing zero-order hold circuit	
6.	Z - Transforms: Basic principles of z-transform definition- region of convergence -properties of ROC - Properties of z-transform - Poles and Zeros - inverse z-transform using Contour integration - Residue Theorem. Power Series expansion and Partial fraction expansion, Relationship between z-transform and Fourier transform.	
7.	Filter: Concept of analog passive filters, LPF, HPF, BPF, BRF	

Recommended Books:

1.	"Signals and Systems", P. Rameshbabu and R. Anadanatarajan

Subject : **Power Electronics Lab**
PaperCode : EI691 Subject Category: Sessional
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson
1.	Analyse and design controlled rectifier
2.	DC to DC converters
3.	DC to AC inverters, Learn how to analyse these inverters and some basic applications
4.	Design SMPS