

Scheme of Teaching & Examination
M.Tech in Power Electronics
II – Semester

S.N.	code	Subject	Periods per week			Scheme of marks		Total Credit
			L	T	P	ESE	IM	
1.	MTECE230	Switched mode Power Conversion	4	-	-	70	30	4
2.	MTECE231	Power Electronics Drives	4	-	-	70	30	4
3.	MTECE232	PWM converters & Application	4	-	-	70	30	4
4.	MTECE233	Advance Digital Signal Processing	4	-	-	70	30	4
5.	Ref Table	ELECTIVE – II	4	-	-	70	30	4
6.	MTECE235	Power Modules Lab	1	-	2	30	20	2
7.	MTECE236	Power Electronics Drives Lab	1	-	2	30	20	2
8.	MTECE237	Advance Digital Signal Processing Lab	1	-	2	30	20	2
Total			23	0	6	440	210	26

Elective – II

S.No	Subject code	Name of Subject
1.	MTECE2340	Artificial Neural Networks
2.	MTECE2341	Optimization Techniques
3.	MTECE2342	HVDC Transmission
4.	MTECE2343	Computer Aided Design Of Power Electronic Circuits
5.	MTECE2344	Power System Planning and Reliability

L – Lecture, T – Tutorial, ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

MATS UNIVERSITY

Semester : 2st M.Tech. Course Branch : Power Electronics
Subject : Power Electronics Drives
Code : MTECE231

UNIT :I

Basic power electronic drive system, components, Different types of loads, shaft-load coupling systems, Stability of power electronic drive.

UNIT :II

Conventional methods of D.C. motor speed control, single phase and three phase converter fed D.C motor drive, Power factor improvement techniques, four quadrant operation.

UNIT :III

Chopper fed drives, input filter design, Step-up chopper for photovoltaic systems. Braking and speed reversal of DC motor drives using choppers, multiphase choppers.

UNIT :IV

Conventional methods of induction motor speed control, Solid state controllers for Stator voltage control, soft starting of induction motors, Rotor side speed control of wound rotor induction motors. Voltage source and Current source inverter fed induction motor drives.

UNIT :V

Speed control of synchronous motors, field oriented control, load commutated inverter drives, switched reluctance motors and permanent magnet motor drives.

Text Books:

1. P.C Sen, „Thyristor DC Drives“, John Wiley and sons, New York, 1981.
2. R.Krishnan, „Electric Motor Drives – Modeling, Analysis and Control“, Prentice-Hall of India Pvt Ltd., New Delhi, 2003.
3. Bimal K. Bose, „Modern Power Electronics and AC Drives“, Pearson Education (Singapore) Pte. Ltd., New Delhi, 2003.

MATS UNIVERSITY

Semester : 2st M.Tech. Course Branch : Power Electronics
Subject : PWM converters & Application
Code : MTECE232

UNIT :I

AC/DC and DC/AC power conversion, overview of applications of voltage source converters, pulse modulation techniques for bridge converters.

UNIT :II

Bus clamping PWM, space vector based PWM, advanced PWM techniques, practical devices in converter; calculation of switching and conduction losses.

UNIT :III

Compensation for dead time and DC voltage regulation; dynamic model of a PWM converter, multilevel converters; constant V/F induction motor drives.

UNIT :IV

Estimation of current ripple and torque ripple in inverter fed drives; line – side converters with power factor compensation.

UNIT :V

Active power filtering, reactive power compensation; harmonic current compensation.

Text Books:

1. Mohan, Undeland and Robbins, " Power Electronics; Converters, Applications and Design", John Wiley and Sons, 2nd edition , 1995.
2. Erickson R W, " Fundamentals of Power Electronics", Chapman and Hall, 2001.
3. Vithyathil J, "Power Electronics: Principles and Applications ,, McGraw Hill, 1995

MATS UNIVERSITY

Semester : 2st M.Tech. Course Branch : Power Electronics
Subject : Artificial Neural Networks
Code : MTECE2340

UNIT-I

Pattern classification – Learning and generalisation-structure of neural networks – ADA line and Mada line-perceptrons.

UNIT-II

Linear separability – Back propagation – XOR function-Back propagation algorithm-Hopfield and Hamming networks- Kohensens network-Boltzmann machine-in and out star network –Art 1 and Art 2 nets.

UNIT-III

Neuro adaptive control applications-ART architecture – Comparison layer – Recognition layer – ART classification process – ART implementation – Examples.

UNIT-IV

Character recognition networks, Neural network control application, connectionist expert systems for medical diagnosis Self organizing maps.

UNIT-V

Applications of neural algorithms and systems -Character recognition networks, Neural network control application, connectionist expert systems for medical diagnosis.

Text Books:

1. Neural Networks, Fuzzy logic , Genetic algorithms: synthesis and applications by Rajasekharan and Rai- PHI Publication.
2. Introduction to Artificial Neural Systems- Jacek M.Zurada, Jaico Publishing House, 1997.

REFERENCE BOOKS:

1. Neural Networks – James A Freeman and Davis Skapura, Pearson, 2002
2. Neural Networks – Simon Hykins, Pearson Education.
3. Neural Engineering by C. Elasmith and CH. Anderson, PHI

MATS UNIVERSITY

Semester : 2st M.Tech. Course Branch : Power Electronics
Subject : HVDC Transmission
Code : MTECE2342

UNIT - I

HVDC Transmission : General consideration , Power Handling Capabilities of HVDC lines ,
Basic Conversion principles , static converter configuration.

UNIT - II

Static Power Converters: 3 pulse, 6 pulse & 12 pulse converters, converter station and terminal
equipment communication process, Rectifier and inverter operation, equivalent circuit for
converter- special features of converter transformers.

UNIT - III

Harmonics in HVDC systems, harmonics elimination, AC & DC filter, Control of HVDC
converter and systems: constant current, constant extinction angle and constant ignition angle
control. Individual phase control and equidistant firing angle control, DC power flow control.

UNIT - IV

Interaction between HVAC & DC systems –voltage interaction, harmonic instability
problems and DC power modulation, Multi-terminal DC link and systems; series, parallel and series
parallel systems, their operation and control.

UNIT - V

Transient over voltage in HVDC systems: Over voltages due to disturbance on DC side,
over voltages due to DC and AC side line faults, Converter faults and protection in HVDC systems:
Converter faults, over current protection- valve group and DC line protection. Over voltage
protection of converters, surge arresters.

TEXT BOOKS:

- 1.E.W.Kimbark: Direct current Transmission, Wiley Inter Science- New York.
- 2.J.Arillaga: H.V.D.C. Transmission Peter Peregrinus Ltd., London UK 1983
- 3.K.R.Padiyar: High Voltage Direct current Transmission, Wiley Eastern Ltd
- 4.E.Uhlman: Power Transmission by Direct Current Springer Verlag, Berlin

MATS UNIVERSITY

Semester : 2st M.Tech. Course Branch : Power Electronics
Subject : Power Modules Lab

Code : MTECE235

List of Experiments:

1. Development of various configurations of power modules using SCRs, IGBTs, power transistors and power MOSFETs. Practical converter design considerations- Snubber design, gate and base drive circuits.

2. DC to DC converters of various configurations using SCRs, IGBTs, power transistors and power MOSFETs.

3. DC to AC converters of various configurations using SCRs, IGBTs, power transistors and power MOSFETs.

4. AC to AC converters of various configurations using SCRs, IGBTs, power transistors and power MOSFETs..

5. Practical implementation of control techniques for voltage control, speed control and harmonic minimization.

MATS UNIVERSITY

Semester : 2st M.Tech. Course Branch : Power Electronics
Subject : Power Electronics Drives
Lab
Code : MTECE236

List of Experiments:

1. Micro controller based speed control of Converter/Chopper fed DC motor.
2. Micro controller based speed control of VSI fed three-phase induction motor.
3. Micro controller based speed control of Stepper motor.
4. DSP based speed control of BLDC motor.
5. DSP based speed control of SRM motor.
6. Self control operation of Synchronous motors.
7. Condition monitoring of three-phase induction motor under fault conditions.
8. Re-programmable Logic Devices and Programming
 - (a) VHDL programming – Examples
 - (b) Verilog HDL programming – Examples
 - (c) Realization of control logic for electric motors using FPGA.
9. Simulation of Four quadrant operation of three-phase induction motor.
10. Simulation of Automatic Voltage Regulation of three-phase Synchronous Generator.
11. Design of switched mode power supplies

MATS UNIVERSITY

Semester : 2st M.Tech. Course Branch : Power Electronics
Subject : Advance Digital Signal
 Processing Lab

Code : MTECE237

List of Experiments:

1. To generate the following waveforms
a: Unit step Sequence b. Ramp Sequence c. Exponential Sequence d. Sine Sequence
2. Program for linear convolution.
3. Program of computing circular convolution.
4. Program for computing cross correlation of the given sequence.
5. Program for design of Butter worth LPF.
6. Program for the design of FIR, LP, HP, BP and BS Filters using Rectangular Window.
7. Program for estimating PSD of Two sinusoid Plus noise.
8. Program for Drawn Sampling a Sinusoidal sequence by a faster M.
9. To observe the effect of interpolation and decimation on the spectrum of a signal.
10. To Generate and amplitude modulation Signal and observe the presence of sideband in its spectrum.