SHRI VENKATESHWARA UNIVERSITY

EVALUATION SCHEME

M.TECH Power Electronics

(Two Years Post Graduation Programme)
III Semester

(w.e.f. 2019-20)

SCHOOL OF ENGINEERING & TECHNOLOGY

M.TECH Power Electronics SEMESTER-III													
Sl. No.	**Subject Codes**	**Subject**	**Periods**			**Evaluation Scheme**				**End Semester**		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	MPE-052	FACTS and Custom Power Devices	3	0	0	20	10	30		70		100	3
2	MOE-335	Composite Materials	3	0	0	20	10	30		70		100	3
3	MPE-321	Dissertation Phase-I	0	0	20				125		125	250	10
		Total										450	16

PE 5: FACTS AND CUSTOM POWER DEVICES

Course Objectives:

Students will be able to:

To learn the active and reactive power flow control in power system
To understand the need for static compensators
To develop the different control strategies used for compensation

Units	Content
1	Reactive power flow control in Power Systems – Control of dynamic power unbalances in Power System. Power flow control -Constraints of maximum transmission line loading – Benefits of FACTS Transmission line compensation. Uncompensated line -Shunt compensation - Series compensation –Phase angle control. Reactive power compensation. Shunt andSeries compensation principles – Reactive compensation at transmission and distribution level.
2	Static versus passive VAR compensator, Static shunt compensators: SVC and STATCOM - Operation and control of TSC, TCR and STATCOM - Compensator control. Comparison between SVC and STATCOM.
3	Static series compensation: TSSC, SSSC -Static voltage and phase angle regulators – TCVR and TCPAR Operation and Control –Applications, Static series compensation – GCSC,TSSC, TCSC and Static synchronous

	series compensators and their Control.	
4	SSR and its damping Unified Power Flow Controller: Circuit Arrangement, Operation and control of UPF. Basic Principle of P and Q control- Independent real and reactivepower flow control- Applications.	
5	Introduction to interline power flow controller. Modeling and analysis of FACTS Controllers – Simulation of FACTS controllers Power quality problems in distribution systems, harmonics. Loads that create harmonics, modeling, harmonic propagation, series and parallel resonances, mitigation of harmonics, passive filters, active filtering – shunt , series and hybrid and their control.	
6	Voltage swells, sags, flicker, unbalance and mitigation of these problems by power line conditioners- IEEE standards on power quality.	

Suggested reading

K R Padiyar, "FACTS Controllers in Power Transmission and Distribution", New AgeInternationalPublishers, 2007**.**

X P Zhang, C Rehtanz, B Pal, "Flexible AC Transmission Systems- Modelling andControl",Springer Verlag, Berlin, 2006.

N.G. Hingorani, L. Gyugyi, "Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems", IEEE Press Book, Standard Publishers and Distributors, Delhi, 2001.

K.S.Sureshkumar, S.Ashok , "FACTS Controllers & Applications", E-book edition, Nalanda Digital Library, NIT Calicut, 2003.

G. T.Heydt, "Power Quality", McGraw-Hill Professional, 2007.

T. J. E. Miller, "Static Reactive Power Compensation", John Wiley and Sons, Newyork, 1982.

Course Outcomes:

Students will be able to:

Acquire knowledge about the fundamental principles of Passive and Active Reactive PowerCompensation Schemes at Transmission and Distribution level in Power Systems.

Learn various Static VAR Compensation Schemes like Thyristor/GTO Controlled. Reactive Power Systems, PWM Inverter based Reactive Power Systems and their controls.To develop analytical modeling skills needed for modeling and analysis of such Static VARSystems.

Composite Material

UNIT–I: INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II: REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particlereinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – III: Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique,Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon

composites: Knitting, Braiding, Weaving. Properties and applications. **UNIT–IV:** Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method
– Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – V: Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum straincriteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS:

Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, WestGermany.
Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R.Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

References:

Hand Book of Composite Materials-ed-Lubin.
Composite Materials – K.K.Chawla.
Composite Materials Science and Applications – Deborah D.L. Chung.
Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W.Tasi.