PROGRAMME: B.E. Electrical & Electronics Engineering, VII Semester
Course: EX701 Power System II

COURSE TITLE	COURSE CODE				THEORY PAPER
Power System II	EX701	L	T	P	**Max.Marks-100** Min.Marks-35
		3	1	2	Duration-3hrs.

Course Contents

Unit-I

General - Problems associated with modern interconnected power Systems, deregulation, power systems restructuring, distributed generation, congestion, available transfer capacities, pricing of energy and transmission services.

Unit-II

Power flow studies - Formulation of static power flow equations and solutions using Gauss- Seidel, Newton Raphson and FDLF methods, comparison of these methods, Economic operation of power system - Economic dispatch, Emission dispatch, line loss, ITL, economic dispatch using lagrangian multiplier method.

Unit-III

MW Frequency control- Coherency, control area, modeling of speed control mechanism, load damping, block diagrammatic representation of single and two area interconnected system, static and dynamic response, .optimum parameter adjustment.

Unit-IV

MVAR Voltage control Problem- Difference in control strategy over MW – f control, characteristics of an excitation system, DC AC and static excitation system, General block diagram representation of voltage regulators.

Unit-V

Power System Stability - Steady state, dynamic and transients stability, Swing equation , equal area criterion, solution of swing equation using step by step method modified Eulers method and Rnge-Kutta method, methods of improving transient stability.

Reference Books :

1. Modern Power System Analysis-by I.J. Nagrath & D.P. Kothari Tata Mc Graw – Hill Publication Company Ltd 2nd edition.
2. Electrical Power Systems-by C.L. Wadhwa New Age International (P) Limited Publishers, 2nd edition 1998.
3. Reactive power Control in Electric Systems-by T.J.E. Miller, John Wiley & Sons.
4. T.K. Nagsarkar, M.S. Sukhiza, -"Power System Analysis", Oxford University Press.
5. Elgerd O.I., "Electric Energy Systems Theory", TMH, New Delhi, Second Edition 1983.
6. Prabha Kundur, "Power system stability and control", Mc-Graw Hill Inc, New York, 1993.
7. Taylor C.W., "Power System Voltage Stability", Mc-Graw Hill Inc, New York, 1993.
8. Nagrath IJ, Kothari D.P., "Power System Engineering", Tata Mc-Graw Hills, New Delhi 1994.
9. Weedy B.M. "Electric Power System" John Wiley and Sons, 3rd edition.
10. P.S.R. Murthy, "Power System Operation and Control", B S Publication
11. Power Generation, Operation and Control by A.J. wood and B.F. Wollenberg John Wiley & Sons Inc. 1984.
12. Power Systems Analysis- by A.R. Bergen Prentice Hali Inc.
13. Economic Operation of Power Systems- by L.K. Kirchmayer Wiley Eastern Ltd.

List Of Experiments:

1. To develop a program in Matlab for information of Y-bus matrix for N bus system.
2. Load flow solution for 3-bus system using Gauss- Seidel, Newton Raphson and FDLF methods up to 3 iteration.
3. Load flow solution for IEEE 6-bus and 30-bus system in Matlab using Newton Raphson method.
4. Assessment of transient stability of a single machine system.
5. Effect of compensation on voltage profile of IEEE 6-bus system.
6. Study of any software tools (PSAT, EDSA, MY POWER, ETAP etc).

PROGRAMME : BE Electrical & Electronics Engineering-VII Semester

Course: EX-702

Computer Applications to Power Systems

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS -4 C			THEORY PAPERS
			L	T	P	
Departmental	Computer Applications to Power Systems	EX702				Max.Marks-100 Min.Marks-35 Duration-3hrs.

Course Contents

Unit-I

Models of power system components, network model using graph theory, formation of Z bus, transmission line models, regulating transformer, line loadability, capability curves of alternator.

Unit-II

Control of load bus voltage using reactive power control variable, SVC & SVS, Regulated shunt compensation, series and shunt compensation, Uniform series and shunt compensation and effect on loadability of transmission lines.

Unit-III

Sensitivity analysis- General sensitivity relations, generation shift distribution factors, line outage distribution factors, compensated shift factors, sensitivity associated with voltage-VAR, sensitivities relating load bus voltage changes in terms of PV bus voltage changes, sensitivity relating changes in reactive power generation for changes in PV Bus Voltage.

Unit-IV

Power system security – Security functions, Security level, contingency analysis, security control, economic dispatch using LP formulation, pre-contingency and post- contingency, corrective rescheduling.

Unit-V

Voltage stability - Difference between voltage and angle stability, PV Curve for voltage stability assessment, proximity and mechanism, modal analysis using reduced Jacobian, participation factor, effect of series and shunt compensation on voltage stability , effect of load models.

References:

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1. Power Generation, Operation and Control by A.J. wood and B.F. Wollenberg John Wiley & Sons Inc. 1984.
2. Computer methods in power systems analysis – by stage G.W. and E.L. Abiad A.H. Mc Graw Hill.
3. Computer Techniques in Power Systems Analysis- Pai M.A. Tata Mc Graw Hill.
4. Computer Modeling of Electrical Power Systems, Arrillaga J. Arnord C.P Harker B.J. John Wiley & Son
5. Computer Aided Power Systems Analysis Kusic G.L. 2nd Edition, CRC Press
6. Modern Power Systems Analysis Nagrath I.J. and Kothari D.P. Tata Mc Graw Hill.
7. Power System Analysis Grainger J.J. & Stevnson W.D. Mc Graw Hill.
8. Power System Stability and control –P Kundur ,IEEE Press 1994.
9. Advance Power Systems Analysis and Dynamics Singh L.P. John Wiley.

PROGRAMME: B.E. Electrical and Electronics Engineering, VII Semester
Course: EX 703 Digital Signal Processing

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS - 4C			THEORY PAPERS
			L	T	P	
Departmental Core	Digital Signal Processing	EX703	3	1	0	Max.Marks-100 Min.Marks-35 Duration-3hrs.

COURSE CONTENTS

Unit-I

Introduction to Digital Signal Processing, Discrete time signals & systems, linear shift invariant systems, stability and causality, Linear-constant coefficient difference equations, Frequency domain representation of discrete time signals and systems, properties of the Discrete Time Fourier transform (DTFT), Sampling and discrete time processing of continuous-time signals.

Unit-II

Applications of z-transforms, solution of difference equations of digital filters, System function, stability criterion, frequency response of stable systems, one sided Z-transform and its applications.

Unit-III

Discrete Fourier series: Properties of discrete Fourier series, DFS representation of periodic sequences. Discrete Fourier Transforms: Properties of DFT: Fast Fourier Transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms. Inverse FFT.

Unit-IV

IIR DIGITAL FILTERS: Analog filter approximations - Butterworth and Chebyshev, Design of IIR Digital filters from analog filters, Bilinear transformation method, step & impulse invariance techniques, Spectral Transformations, Realization of IIR digital filters - direct, canonic, cascade & parallel forms.

Unit-V

FIR DIGITAL FILTERS: Characteristics of FIR Digital Filters frequency response, Design of FIR Digital Filters using Window Techniques. Comparison of IIR and FIR filters, Realization of FIR digital filters - direct, linear phase, cascade & parallel forms.

References:

1. Oppenheim & Schaffer, Digital Signal Processing, PHI.
2. S.K. Mitra, Digital Signal Processing, TMH
3. Proakis and Manolakis, DSP.
4. A. Antoniou, Digital Filters Analysis & Design, TMH

PROGRAMME : BE Electrical & Electronics Engineering-VII Semester

Course: EX7101 High Voltage Engineering

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS -4 C			THEORY PAPERS
Departmental	High Voltage Engineering	EX7101	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	0	

Course Contents

Unit-I

Introduction:-Introduction to HV technology, advantages of transmitting electrical power at high voltages, need for generating high voltages in laboratory. Important applications of high voltage.

Unit-II

Breakdown phenomena:- Classification of HV insulating media, Properties of important HV insulating media. Gaseous dielectrics: Ionizations: primary and secondary ionization processes. Criteria for gaseous insulation breakdown based on Townsend's theory, Limitations of Townsend's theory. Streamer's theory breakdown in non uniform fields. Corona discharges. Paschen's law and its significance. Time lags of Breakdown. Breakdown in solid dielectrics: Intrinsic Breakdown, avalanche breakdown, thermal breakdown, and electro mechanic breakdown. Breakdown of liquids dielectric dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown (bubble's theory), electro convection breakdown.

Unit-III

Generation of HV AC DC and Impulse Voltage and current:- HV AC-HV transformer; Need for cascade connection and working of transformers units connected in cascade, Series resonant circuit- principle of operation and advantages. Tesla coil. HV DC- voltage doubler circuit, cock croft- Walton type high voltage DC set, Introduction to standard lightning and switching impulse voltages. Analysis of single stage impulse generator-expression for Output impulse voltage, Multistage impulse generator Components of multistage impulse generator. Triggering of impulse generator by three electrode gap arrangement. Triggering gap and oscillograph time sweep circuits. Generation of switching impulse voltage. Generation of high impulse current.

Unit-IV

Measurement of high voltages:- Electrostatic voltmeter-principle, construction and limitation. Generating voltmeter- Principle, construction. Series resistance micro ammeter for HV DC measurements. Standard sphere gap measurements of HV AC, HV DC, and impulse voltages;Factors affecting the measurements. Potential dividers-resistance dividers capacitance dividers mixed RC potential dividers. Surge current measurement.

Unit-V

High voltage tests on electrical apparatus:-Definitions of technologies, tests on isolators, circuit breakers, cables insulators and transformers.

Reference books:

1. E. Kuffel and W.S. Zaengl, “High voltage engineering fundamentals”, 2nd edition, Elsevier, press, 2005.
2. M.S.Naidu and Kamaraju, “High Voltage Engineering”, 3rd edition, THM, 2007.
3. L. L. Alston, “High Voltage technology”, BSB Publication, 2007..
4. Rakosh Das Begamudre, Extra High voltage AC transmission engineering, Wiley Easternlimited, 1987.
5. Transmission and distribution reference book-Westing House.C.L.Wadhwa, High voltage engineering, New Age International Private limited, 1995.

PROGRAMME : BE Electrical & Electronics Engineering-VII Semester

Course: EX7102: SCADA Systems and Applications

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS -4 C			THEORY PAPERS
Departmental	**SCADA Systems and Applications**	EX7102	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	0	

Course Contents

Unit I

Introduction to SCADA and PLC:SCADA: Data acquisition system, evaluation of SCADA, communication technologies, monitoring and supervisory functions. PLC: Block diagram, programming languages, Ladder diagram, Functional Block diagram, Applications, Interfacing of PLC with SCADA.

Unit II

SCADA system components: Schemes, Remote Terminal Unit, Intelligent Electronic Devices, Communication Network, SCADA server.

Unit III

SCADA Architecture-Various SCADA Architectures, advantages and disadvantages of each system, single unified standard architecture IEC 61850 SCADA / HMI Systems.

Unit IV

SCADA Communication-Various industrial communication technologies- wired and wireless methods and fiber optics, open standard communication protocols.

Unit V

Operation and control of interconnected power system-Automatic substation control, SCADA configuration, Energy management system, system operating states, system security, state estimation. Unit VI: SCADA applications Utility applications, transmission and distribution sector operation, monitoring analysis and improvement. Industries oil gas and water. Case studies, implementation, simulation exercises.

Reference Books:

1. Stuart A Boyer: SCADA supervisory control and data acquisition.
2. Gordan Clark, Deem Reynders, Practical Modem SCADA Protocols.
3. Sunil S. Rao, Switchgear and Protections, Khanna Publication.

PROGRAMME : B.E. Electrical & Electronics Engg., VI Semester

Course: EX-7103- VLSI

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS - 4C			THEORY PAPERS
			L	T	P	
Departmental	VLSI	EX-7103	3	1	0	Max.Marks-100 Min.Marks-35 Duration-3hrs.

Course Contents

Unit-I

Overview of VLSI Design Methodology VLSI design process, Architectural design, Logical design, Physical design, Layout styles, Full custom & Semi custom approaches**.**

Basic Electrical Properties of MOS and CMOS Circuits, NMOS, PMOS, Transistors, MOS device equations, Basic DC equations second order effects, MOS modules, Small signal AC characteristics, NMOS inverter, Steered input to an NMOS inverter, depletion mode & enhancement mode pull ups, CMOS inverter, DC characteristics, inverter delay, Pass transistor, transmission gate.

Unit-II

VLSI Fabrication Techniques An overview of wafer fabrication, Wafer processing, Oxidation, Pattering, Diffusion, Ion implantation, Deposition, silicon gate NMOS process, CMOS processor, N well, P well, Twin-tub, Silicon on insulator, CMOS process enhancements interconnect circuit elements latch up, latch up triggering & prevention techniques.

Unit-III

MOS and CMOS Circuit Design Process-Layer representation, Stick diagrams, NMOS design style, CMOS design style, Design rules, Need for design rules, Mead Conway design rules for silicon gate NMOS process, CMOS n well/ p well based design rules simple layout examples, Sheet resistance estimation.

Capacitance estimation, Area capacitance, Wiring capacitance, Driving large capacitive loads.

Unit-IV

NMOS & CMOS Circuit and Logic Design, Switch logic, Pass transistor & Transmission gate, gate logic, inverter, two input NAND gate, NOR gate other form of CMOS logic, Dynamic CMOS logic Clocked CMOS logic, Precharged domino CMOS logic, Structured design, Simple combinational logic design examples, Parity generator, Multiplexers clocked sequential circuits, Two phase clocking, charge storage, Dynamic register element, NMOS and CMOS, Dynamic shift register, semi static register, J-K flip flop.

Unit-V

Subsystem Design Process

Design of a 4-bit shifter, general arrangement of 4 bit arithmetic processor, Design of a ALU system implementing ALU functions with an adder, carry look ahead adders, Multipliers, Serial parallel multipliers, Pipe lined multiplier array, Modified Booth's algorithm

References:

1. Douglas "A puchnel and Kamrah Eshraghian, Basic VLSI design, Prentice Hall of India.
2. Neil H.E. West and Kamrah Eshraghigm "Principle of CMOS VLSI design: A System perspective", Addison wisely.
3. Eugene D Fabricus " Introduction to VLSI design" McGraw Hill International.
4. Amar Mukherjee, "Introduction to NMOS & COMS VLSI design" Prentice Hall.
5. Wayne Wolf "Modern VLSI design- Systems on Silicon", Prentice Hall.
6. Carver Mead a Lynn Conway, "Introduction to VLSI Systems", Addison Wesley.

PROGRAMME : B.E. Electrical & Electronics Engineering,VII Semester
Course: EX7201 EHV A.C. and D.C. Transmission

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS - 4C			THEORY PAPERS
Departmental	EHV A.C. and D.C. Transmission	EX7201	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	0	

COURSE CONTENTS

Unit-I

Constitution of EHV a.c. and d.c. links, Kind of d.c. links, Limitations and Advantages of a.c. and d.c. transmission, Principal application of a.c. and d.c. transmission, Trends in EHV a.c. and d.c. transmission, Power handling capacity. Converter analysis garetz circuit, Firing angle control, Overlapping.

Unit-II

FACTS devices, basic types of controller, series controller, static synchronous series compensator(SSSC), thyristor-controlled series capacitor(TCSC), thyristor controlled series reactor(TCSR), shunt controller (STATCOM), static VAR compensator(SVC), series-series controller, combined series-shunt controller, unified power flow controller(UPFC), thyristor controlled phase shifting transformer(TCPST).

Unit-III

Components of EHV d.c. system, converter circuits, rectifier and inverter valves, Reactive power requirements, harmonics generation, Adverse effects, Classification, Remedial measures to suppress, filters, Ground return. Converter faults & protection harmonics misoperation, Commutation failure, Multiterminal D.C. lines.

Unit-IV

Control of EHV d.c. system desired features of control, control characteristics, Constant current control, Constant extinction angle control. Ignition Angle control. Parallel operation of HVAC & DC system. Problems & advantages.

Unit-V

Travelling waves on transmission systems, Their shape, Attenuation and distortion, effect of junction and termination on propagation of traveling waves. Over voltages in transmission system. Lightning, switching and temporary over voltages: Control of lighting and switching over voltages

Reference:

1. S. Rao,- "EHV AC & DC Transmission" Khanna pub.
2. Kimbark,-" HVDC Transmission" john willy & sons pub.
3. Arrillaga,- "HVDC Transmission"2nd Edition ,IEE londan pub.
4. Padiyar, -"HVDC Transmission" 1st Edition ,New age international pub.
5. T.K. Nagsarkar,M.S. Sukhiza, -"Power System Analysis", Oxford University
6. Narain.G. Hingorani, l. Gyugyi-"Undustanding of FACTS concept and technology", john willy & sons pub.
7. P.Kundur- "H.V.D.C. Transmission" McGraw Hill Pub.

PROGRAMME: B.E. Electrical & Electronics Engineering, VII-Semester
Course: EX7202 Optical Communication

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE				THEORY PAPER
Departmental	Optical Communication	EX7202	L	T	P	Max.Marks-100
			3	1	0	Min.Marks-35 Duration-3hrs.

COURSE CONTENTS

Unit-I

Introduction to optical communication principles of light transmission optical fiber modes and configurations, Mode theory for circular wave-guides, Single-mode fibers, Multimode fibers, Numerical aperture, Mode field diameter, V-number, fiber materials, Fiber fabrication techniques.

Unit-II

Optical sources, LED'S, LASER diodes, Model reflection noise, Power launching and coupling, population inversion, fiber splicing, optical connectors, Photo-detectors, PIN, Avalanche detector, Response time, Avalanche multiplication noise.

Unit III

Signal degradation in optical fibers, Attenuation losses, Signal distortion in optical wave guides, Material dispersion, Wave guide dispersion, Chromatic dispersion, Inter-modal distortion, Pulse broadening in Graded index fibers, Mode coupling, Advance fiber designs: dispersion shifted, Dispersion flattened, Dispersion compensating fibers, Design optimization of single mode fibers.

Unit-IV

Coherent optical fiber communication, Modulation techniques for Homodyne and Heterodyne systems, Optical filter link design. Rise time budget and link power budget, Long haul systems bit error rate, line coding, NRZ, RZ, Block Codes eye pattern.

Unit-V

Advance system and techniques, wavelength division multiplexing, optical amplifiers semiconductor amplifier, EDFA, Comparison between semiconductor and optical amplifier, Gain band width, Photonic switching, Optical Networks . Optical fiber bus, Ring topology, Star architectures, FDDI, SON-ET.

References:

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1. Frams J. & V.K. Jam, Optical Communication Systems.
2. Ghatak A.K., & Thyagarajan, K., Optical Communication. TMH
3. Liu- Principles & Application of Optical Communication 1st ed., TMH
4. G. Keiser- Optical Fiber Communication 4th ed., TMH

PROGRAMME: B.E. Electrical and Electronics Engineering, VII-Semester

Course: EX7203 Computer Networks

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDIT-4C			THEORY PAPER
			L	T	P	
Departmental	Computer Networks	**EX7203**	3	1	0	**Max.Marks-100** Min.Marks-35 Duration-3hrs.

COURSE CONTENTS

Unit-I

Introduction to computer network, classification of networks (WAN, MAN, LAN), distributed systems, digital signals and data rates, bit stream, symbols and band rate, transmission media, modems, structure of computer network, circuit, packet, message switching topological design, back bone design OSI, reference model.

Unit-II

Physical and data link layer, bit communication between DTE and DCE, RS232C, novel modem Terminal handling, multiplexing and concentration data link layer service and design issues, errors detection and correction, retransmission strategies, sliding window protocols, satellite and packet radio networks, pure aloha protocols, slotted aloha protocol, satellite networks, reservation aloha protocol, DES, PCEM, packet radio networks.

Unit-III

Network layer, basic design issues, network layer services, connection oriented and connection less services, routing, static multipath, centralized isolated distributed hierarchical broadcast, flow based routing, congestion deadlocks radio concept of Ethernet LAN topology and architecture CSMA/CD protocol, token ring LAN token bus LAN, Fiber optic LAN principle of LAN bridges, transparent bridge source routing bridges, gateway, gateway design issues x25 internet working.

Unit-IV

ISDN, B-ISDN and ATM, evolution of ISDN, goal of ISDN services, ISDN system architecture and network terminating devices ISDN interface ISDN signaling, broad band ISDN, Asynchronomous transfer modem ATM adaptation layer, transport layer, OSI transport protocol, session layer designing issues, data exchange OSI session layer primitives, transport protocol TCP

Unit-V

Presentation layer, abstract syntax notation data compressed on oxyptography, application layer OST service elements ACSE and CCR, the transfer access and management, concurrence control nistual terminals, electronic mail directory services distributed systems, formal protocol modules, network management, mobile networking.

Unit-VI

Networking Equipments and Monitoring Tools Routers, Modems, Switches, Gateways, online networking monitoring tools, Network security, Proxy Server design.

References:

1. Tanenbum, Computer Networks, PHI.
2. Keizer, LANs.
3. Stalling W., Computer Networks, PHI.
4. ISDN & Broadband.
5. ISDN: Stalling W., PHI.