UTTARAKHAND TECHNICAL UNIVERSITY
SESSION 2009-2010
STUDY AND EVALUATION SCHEME
B.Tech. Electrical & Electronics Engineering
Year 4th Semester-VIII

S.No	Course No.	Subject	Periods			Evaluation				Subject Total
						Sessional Exam.			External Exam.	
Theory			L	T	P	CT	TA	Total		
1.	TEE 803	Operation and Control in Power System	3	1	0	30	20	50	100	150
2.	TEC 803	Telemetry and Data Transmission	3	1	0	30	20	50	100	150
3.		Elective II	3	1	0	30	20	50	100	150
4.		Elective III	3	1	0	30	20	50	100	150
Practicals / Design										
5.	PEC 853	Telemetry Lab	0	0	2	-	-	25	25	50
6.	PEE 852	Project	0	0	2			100	200	300
7.	GP 801	General Proficiency	-	-	-	-	-	50	-	50
								375	625	1000

LIST OF ELECTIVE – II

TEE 021: Modern Control System
TEE 022: Bio-Instrumentation
TEE 025: High Voltage AC and DC Transmission

LIST OF ELECTIVE – III

TEE 031: Power Quality
TEE 032: Power Converter Application
TEC 031: Embedded Systems
TEC 033: Reliability Engineering

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TEE 803 Operation and control in power system

Unit I: Introduction
Structure of power system, power system control center and real time computer control, level decomposition in power system, power system security, various operational stages of power system, power system voltage stability, introduction to SCADA

Unit II: Economic operation
Concept and problems of unit commitment, input output characteristics of thermal and hydroplants, system constraints, Optimal operation of thermal units without and with transmission losses, penalty factor, incremental transmission loss, transmission loss , formula (without derivation), hydrothermal scheduling long and short terms, concept of optimal power flow

Unit III: Load frequency control
Concept of load frequency control, load frequency control of signal area system: turbine speed governing system and modeling, block diagram representation of single area system, steady state analysis, dynamic response control area concept, P-I control, load frequency Control and economic dispatch control. Load frequency control of two area system tie line power modeling, block diagram representation of two area system, static and dynamic response

Unit IV: Automatic voltage control
Schematic diagram and block diagram representation, Different type of excitation system & their
controllers. Voltage and reactive power control Concept of voltage control, methods of voltage control-control by tap changing transformer. Shunt compensation, series compensation, phase angle compensation

Unit V: State estimation
Detection and identification, linear and nonlinear models Flexible ac transmission systems Concept and objectives facts controllers: structures & characteristics of following facts controllers. TCR, FC-TCR, TSC, SVC, STATCOM, TSSC, TCSC, SSSC, TC-PAR, UPFC

Text books:

1. D.P. Kothari & Nagrath, "Modern Power System Analysis" Tata Mc Graw Hill, 3rd edition.
2. P.S.R.Murty, "Operation and Control in Power Systems" B.S. publications.
3. N.G. Hingorani & l. Gyugyi, "Understanding Facts “Concepts and Technology of Flexible AC Transmission Systems"
4. A.J. Wood & B.F. Wollenburg, "Power Generation, Operation and Control "John Wiley & Sons

Reference books:

1. O.J. Elgerd,"Electric Energy System Theory" Tata Mc Graw Hill.
2. P. Kundur, "Power System Stability and Control Mc Graw Hill.

3. M.H. Rashid, "Power Electronics: Circuits, Devices and Applications "Prentice Hall of India, 3rd edition.
4. T.K. Nagsarkar & M.S. Sukhiza, 'Power System Analysis' Oxford University Press

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TEC 803 Telemetry and Data Transmission

Unit-1.

1. Sampling Fundamentals:

Introduction to sampling theorem and sampling process, convolution, computing minimum sampling rate. Alising Errors. (2)

2. Digital Modulation Techniques:

Review of PCM, DPCM, Methods of binary data transmission, Data Formats, DM code converters, PSK, QPSK, FSK, probability of error, phase ambiguity resolution and differential encoding, error detection, error correction, error correction codes. (6)

Unit- 2 & 3

3. Data Handling System:

Block schematic, Sensors, Signal conditioners, Multiplexing- high level and low level, ADC- range and resolution, Word Format, Frame format, Frame synchronizer codes, R. F. links, X24, RS 422, RS423, RS 232C interfaces, Multi terminal configuration, Multiplier & Concentrator, Data Modems, Data transmission over telephone lines. (8)

4. Data Reception Systems:

Bit synchronizers, frame synchronizers, subframe synchronizers, PLL, Display systems. (4)

Unit-4

5. Remote Control:

Communication based processing control systems, pipelines, Operational security systems components, Pipeline control, Power system control, Programmable controllers for factory automation. (6)

6. Command:

Tone command system, Tone digital command system, ON/OFF command and data commands. (3)

Unit-5

7. Aerospace Telemetry:

Signal formation and conversion, Multiplexing techniques in telecontrol, Industrial telecontrol installations, reliability in telecontrol installations. (9)

Text Books:

1. Patranabis," Telemetry Principles: Tata Mcgrew Hill.
2. Schweber," Data Communication " Mcgraw Hill.
3. Berder & Menjewlse," Telemetry Systems".

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ELECTIVE – II

TEE 021: Modern Control System

Unit I: Introduction to control systems
Introduction to control systems, properties of signals and systems. Convolution integral, Ordinary differential equation, Transfer function, Pole zero concepts, effect of pole location on performance specification.

Unit II: State Space analysis
State equations for dynamic systems, State equations using phase, physical and canonical variables, realization of transfer matrices, Solution of state equation, concepts of controllability, observability, Controllability and Observability tests.

Unit III: Discrete time control systems
Sampling theorem, Sampled-data systems, the sample and hold element, pulse transfer function, The Z-transform, stability analysis.

Unit IV: Stability
Liapunov's method, generation of Liapunov's function, Popov's criteria, design of state observers and controllers, adaptive control systems, model reference.

Unit V: Optimal Control
Introduction , formation of optimal control problems, calculus of variation, minimization of functions, constrained optimization, dynamic programming, performance index , optimality principles, Hamilton – Jacobian equation, linear quadratic problem, Ricatti II equation and its solution, solution of two point boundary value problem

Text Books:

1. K. Ogata, "Modern Control Engineering", Prentice Hall of India.
2. M. Gopal, "Modern Control System", Wiley Eastern. Reference Books:
3. B.D.O. Anderson and IB. Moore, " Optimal Control System: Linear Quadratic Methods", Prenctice Hall International.
4. U. Itkis, "Control System of Variable Structure", John Wiley and Sons.
5. H. Kwakemaok and R. Sivan, "Linear Optimal Control System", Wiley Interscience.

TEE 022: Bio-Instrumentation

Unit I: Basic Physiological system of body

Problem encountering measuring leaving system, bioelectric potential, biomaterial Basic transducers principle Active and passive transducers, transducer for biomedical applications Generation, propagation and distribution of bioelectric potential (ECG, EEG and EMG)

Unit II: Bio Potential Electrode

Basic type (micro skin surface and needle electrodes), Biochemical transducer (PH, blood gas and specification electrodes) Cardiovascular System & Measurement Heat and cardiovascular system and circulation block diagram blood pressure and measurement, characteristics of blood flow and heart sound, Electrocardiography, ECG an lead configuration, ECG recording and their types

Unit III: Nervous System

The anatomy of nervous system, neuronal communication, EPSP, IPSP, Organization of brain, Measurement from the nervous system Systematic skin and body temperature measurement Temperature measurement, Brief idea about ultrasonic measurements

Unit IV: Patient Care Monitoring

Element of intensive care, Organizational the hospital fore patient-care monitoring, Pace makers-type, systems, mode and generators, Defibrillator-types. Biotelemetry and application of telemeter inpatient care

Unit V: Automation of Chemical Test

Instrumentation for diagnostic X rays, Interfacing computer with medical instrumentation and other equipments, Bio medical computer application. Shock hazards from electrical equipments, methods of accident prevention.

Text Books:

1. Khandpur R.S. - Biomedical Instrumentation- TMH
2. Venkata Ram, S.K.-Bio-Medical Electronics & Instrumentation (Revised) - Galgotia.

Refe rence Books:

3. Cromwell- Biomedical Instrumentation and Measurements- PHI
4. Webster, J.G. –Bio- Instrumentation, Wiley (2004)
5. Ananthi, S. –A Text Book of Medical Instruments-2005-New Age International
6. Carr & Brown –Introduction to Biomedical Equipment Technology – Pearson
7. Pandey & Kumar-Biomedical Electronics and Instrumentation. - Kataria

TEE 025: High Voltage AC and DC Transmission

Unit I: Introduction

Need of EHV transmission, standard transmission voltage, comparison of EHV AC & DC transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC & DC transmission.

Unit II: EHV AC Transmission

Corona loss formulas, corona current, audible noise- generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferroresonance, reduction of switching surges on EHV system, principle of half wave transmission.

Unit III: Extra High Voltage Testing

Characteristics and generation of impulse voltage, generation of high AC and DC voltages, measurement of high voltage by sphere gaps and potential dividers. Consideration for Design of EHV Lines, Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines.

Unit IV: EHV DC Transmission-I

Types of dc links, converter station, choice of converter configuration and pulse number, effect
of source inductance on operation of converters, principle of dc link control, converter controls
characteristics, firing angle control, current and excitation angle control, power control, starting
and stopping of dc link.

Unit V: EHV DC Transmission- II

Converter faults, protection against over currents and over voltage, Smoothing reactors, generation of harmonics, ac and dc filters, multi –terminal dc systems (MTDC): Types, control, protection and application

Text Books:

1. R.D. Begamudre, “Extra High Voltage AC Transmission Engineering “Wiley Eastern
2. K.R Padiyar,”HVDC power transmission System, Technology and System Reactions “new age international.
3. J Arrillaga,”High Voltage Direct current Transmission “IFFE Power Engineering Series 6, Peter Peregrionus Ltd. London.
4. M.S Naidu & V.K Kamaraju “High Voltage Engineering “Tata Mc Graw Hill.

Reference books:

1. M.H Rashid,”Power Electronics: Circuit, Devices and Applications “Prentice hall of India.

2. S .Rao, “EHV AC & HVDC Transmission Engineering and practice” Khanna Publishers.

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ELECTIVE – III

TEE 031: Power Quality

Unit I: Power Quality Terms and Definitions

Introduction, transients, short duration/long duration voltage variations, voltage imbalance, waveform distortion, voltage fluctuations, power frequency variation. Power Quality Problems: Poor load power factor, loads containing harmonics, notching in load voltage, DC offset in loads, unbalanced loads, disturbance in supply voltage.

Unit II: Voltage Sags and Interruptions

Sources of sags and interruptions, end user issues: Ferro resonant transformer, on-line UPS, hybrid UPS, motor generator set, SMES etc., motor starting sags, utility system fault clearing issues. Transient over Voltage Sources of transient over voltages, principles of over voltage protection, devices for over voltage protection, utility capacitor switching transients, utility lightning protection, load-switching transient problems.

Unit III: Long Duration Voltage Variations

Devices for voltage regulation, utility voltage regulator applications, capacitors for voltage regulation, end-user capacitor application, regulating Utility voltage with dispersed sources. Quality and Reliability of Power Supply Reliability of power supply, reliability measurements consumer interruption cost, distribution automation, substation grounding, energy auditing.

Unit IV: Harmonics

Voltage and current harmonics distortions, harmonics of single-phase power supplies, three phase power converters, arcing devices, storable devices, effects of harmonics distortion, system response characteristics, locating sources of harmonics, peripherals for controlling harmonics, devices for filtering harmonics distortion, harmonics study procedure, symmetrical components, modeling harmonics sources, harmonic filter design, telecommunication interferences, computer tools for harmonic analysis.

Unit V: Wiring and grounding

Reason for grounding, typical wiring and grounding problems, solution of wiring and grounding
problems. Monitoring Power Quality Power quality related standards, standard test waveform, and detailed power quality monitoring, power quality measurement equipments. Custom Power Devices Utility customer interface, network reconfiguring device load compensation using shunt compensators, voltage regulation using shunt compensators, dynamic voltage restorer, unified power quality conditioner.

Text Book:

1. Roger C.Dugan, Mark F. Mc Granhgan, Surya Santoso,” Electrical Power System Quality”Mc Graw hill, 2nd Edition.

2. Arindam Ghosh and Gerard Ledwich,"Power Quality Enhancement using custom power devices ", Kulwer academic publishers.
3. C.L Wadhwa,"Generation and Distribution utilization of electrical Energy" New Age International.

Reference books:

1. C. Sankarm,"Power Quality" CRC Press USA.
2. Barry W. Kennedy, "Power Quality Primer "McGraw Hill.
3. Wilson E. Kazibwe,"Electrical power quality controls techniques" Van Nostrand Reinhold.

TEE 032: Power Converter Application

Unit I: HVDC Transmission

Schematic diagram; modes of operation, twelve pulse line commutated converters, effect of source inductance; control of HVDC converters, converter faults and protection, harmonic filters

Unit II: FACT Controllers

Principal of power transmission, principal of shunt compensation- and series compensation- TCR, TCS, SVC, STATCOM, Series compensator- TSSC, FCSC, TCSC, SSVC, phase angle compensator, unified power flow controller (UPFC), comparison of compensator .

Unit III: Power Supplies

Desirable specification of power supply, draw back of linear power supply. Switch mode power supply (SMPS)-schematic diagram, fly back converters, forward converter, push pull converters, half bridge and full bridge converter; uninterruptible power supply,(UPS)-configuration of line and online UPS, switch mode and resonant power supplies, air craft power supply.

Unit IV: Industrial Applications

High frequency inverters for induction and dielectric heating, ac voltage controllers for resistance heating and illumination control, high frequency fluorescent lighting, electric welding control.

Unit V: Interconnection of Renewable Energy Sources to the Utility Grid

Photovoltaic array interconnection, wind and small hydro interconnection, interconnection of energy storage system, DC circuit breaker, single phase and three phase ac switches, Excitation control of synchronous generator.

Text Books:

1. Ned Mohan, T.M. Undeland and William P. Robins, "Power Electronics: Converters, Applications and Design", John Wiley & Sons.
2. M.H. Rashid, "Power Electronics: Circuits, Devices and Applications" Prentice Hall of India.

Reference Books:

3. K.R. Padiyar, "HVDC Power Transmission: Technology and System Reactions" New Age International

TEC 031 Embedded Systems

UNIT 1

Introduction: Embedded systems and its applications, Embedded Operating system, Design parameters of an embedded system and its significance, design life cycle, tools introduction, hardware and software partitioning and co-design Hardware Fundamentals for the embedded developers Digital circuit parameters- Watchdog Timers, Hardware design and development Open collector outputs Tristate outputs I/O sinking and Sourcing, PLD's Watchdog Timers, Hardware design and development Custom Single Purpose Processors: Optimizing program, FSMD, Data path & FSM General purpose processors and ASIP's (Application Specific Instruction set Programming): Software and operation of general purpose processors-Programmers View Development Environment-ASIPs Microcontrollers-DSP Chips.

UNIT 2

Introduction to Microcontrollers and Microprocessors, Embedded versus external memory devices, CISC and RISC processors, Harvard and Von Neumann

UNIT 3

8051 Microcontrollers-Assembly language, architecture, registers, Addressing modes, Instruction set, I/O ports and memory organization Interrupts Timer/counter and serial communication

UNIT 4

RTOS-Tasks, states, Data, Semaphores and shared data, Operating system services, Message queues, Mailboxes .Advanced Processor-(only architectures) 80386, 80486 and ARM (References).

UNIT 5

Communication basics, Microprocessor Interfacing I/O Addressing, Direct memory access, Arbitration, multilevel bus architecture, Serial protocols, Parallel protocols and wireless protocols10. Real world interfacing: LCD, Stepping Motor, ADC, DAC, LED, Push Buttons Key board, Latch Interconnection, PPI.

Text Books:

1. Embedded System Design-Frank Vahid/Tony Givargis, John Willey@2005.
2. Microcontroller (Theory and Applications) Ajay V Deshmukh, Tata McGraw-Hill@2005.
3. An Embedded Software Primer-David E.Simon, Pearson Education 1999.

References:

1. The 8051 Microcontroller and embedded systems-Muhammad Ali Mazidi and Janice Gillispie.
2. Microcontrollers (Architecture, Implementation & Programming) Kenneth Hintz, Daniel Tabak, Tata McGraw-Hill 2005.
3. 8051 Microcontrollers & Embedded Systems 2nd Edition- Sampath Kr, Katson Books 2006.

TEC 033: Reliability Engineering

UNIT 1

Introduction: definition of reliability, quality, availability, maintainability, types of failures, various parameters f system effectiveness, concept of failure modes,difference between MTTR and MTTF

UNIT 2

Reliability mathematics:Classical set theory, Boolean algebra, sample space,definition of probability, basic properties of probability, conditional probability, and randomvariables. Probability distribution: Exponential distribution,gamma distribution, binomial distribution, normaldistribution and weibull distribution

UNIT 3

Reliability Data Analysis:The reliability function, bathtub curve, data collection,storage recovery of data, component reliabilityfrom test data, linear hazard model & xponentialhazard model

UNIT 4

System Reliability:Systems with components in series, systems with components in parallel, series –parallel systems, Fault tree techniques. K out of m systems.

UNIT 5

Electronics System Reliability:Reliability of electronic components, componenttypes and failure mechanics, circuit and systemaspects, reliability of electronic system design, parameter variation and tolerance.

Text / Reference book:

1. Practical Reliability Engineering/ *Patrick D. T., O'Connor* / John Wiley & Sons 4th edition).
2. Reliability Engineering/ *E. Balagurusamy* / Tata McGraw- Hill

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PEC 853 Telemetry Lab

1. Measurement of Temperature Using RTD Thermistor and amplification to an appropriate level suitable for Teletransmission.
2. Sampling Through a S/H circuit, and reconstruction of the sampled signal.
3. Realizing of PCM signal using ADC & reconstruction using DAC using DAC using 4-bit /8-bit system. Observe Quantization noise in each case.
4. Fabricate and test a PRBS Generator.
5. Realization of data in Deferent Formats such as NRZ-L, NRZ-M & NRZ-S.
6. Clock recovery circuit from NRZ-L data using PLL.
7. Manchester Coding & Decoding (Biphase 1) of NRZ-L data.
8. Coding & Decoding of NRZ- L into URZ-L (Unipolar return to Zero coding)
9. ASK – Modulation & Detection
10 FSK - Modulation & Detection
11. PSK- Modulation & Detection.
12. Error introduction, Error detection & Correction using Hamming code.
13. Amplitude Modulation & Detection of signal obtained from Experiment no -1.