

# *Chhattisgarh Swami Vivekanand Technical University Bhilai (C.G.)*

## SCHEME OF EXAMINATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

***M.Tech. in Electrical Devices & Power System Engineering***

**3<sup>rd</sup> SEMESTER**

S. No.	Board of Study	Subject Code	Subject	Periods Per Week			Scheme of exam			Total Marks	Credit L+(T+P)/2
				L	T	P	Theory/Practical				
							ESE	CT	TA		
1	Electrical and Electronics Engg	570311(25)	Power System Planning and Reliability	3	1	-	100	20	20	140	4
2	Refer table-III		Elective-III	3	1	-	100	20	20	140	4
3	Electrical and Electronics Engg.	570321 (25)	Preliminary work on Dissertation	-	-	28	100	-	100	200	14
4	Electrical and Electronics Engg.	570322 (25)	Technical Seminar	-	-	3	-	-	20	20	2
<b>TOTAL</b>				<b>6</b>	<b>2</b>	<b>31</b>	<b>300</b>	<b>40</b>	<b>160</b>	<b>500</b>	<b>24</b>

Table III

<b>Elective- I</b>			
S. No.	Board of Study	Subject Code	Subject
1	Electrical and Electronics Engg.	570331 (25)	HVACDC Transmission
2	Electrical and Electronics Engg.	570332 (25)	Digital Signal Processing
4	Electrical and Electronics Engg.	570333 (25)	Electrical Energy Conservation

Lecture T- Tutorial P- Practical ESE- End Semester Exam

CT- Class Test TA- Teachers Assessment

Note (1) – 1/4th of total strength of students subject to minimum of eighteen students is required to offer an elective in the college in a Particular academic session .

Note (2) – Choice of elective course once made for an examination cannot be changed in future examinations.

## *Chhattisgarh Swami Vivekanand Technical University Bhilai (C.G.)*

Semester: **M.TECH. 3<sup>rd</sup>**

Subject: Power system Planning and Reliability

Total Theory Periods: **40**

Total Marks in End Semester Exam. : **100**

Minimum number of class test to be conducted: **02**

Specialization: Electrical Devices and Power System Engg.

Branch: **Electrical and Electronics Engineering**

Code: **570311 (25)**

Total Tutorial Periods: **12**

### **UNIT-I**

Introduction of power planning, National and Regional Planning, structure of P.S., planning tools, Electricity Regulation, Electrical Forecasting, techniques and modeling.

### **UNIT-II**

Generation planning, Integrated power generation cogeneration/captive power, Power pooling and power trading. Transmission and distribution planning. Power System Economics. Power sector finance, financial planning, private participation Rural Electrification investment, concept of rational tariffs.

### **UNIT-III**

**Probability and Reliability:** Review of probability concepts, probability distributions, applications of binomial distribution to engineering problems, probability distribution in reliability evaluation, reliability indices, network modeling and evaluation of simple and complex networks, system reliability evaluation using probability distributions, frequency and load duration techniques, key indices of power system reliability and their calculations.

### **UNIT-IV**

**Generation System Reliability Evaluation:** Concept of loss of load probability (LOLP), Energy demand, E(DNS), Evaluation of these indices for isolated systems, generation system, reliability analysis using the frequency and duration techniques.

### **UNIT-V**

**Transmission System Reliability Evaluation:** Evaluation of LOLP and E(DNS), indices for an isolated transmission system, interconnected system reliability, bulk power system reliability. Operating research, evaluation, transmission and distribution system reliability. **Distribution System Reliability Evaluation:** Reliability analysis of radial systems with perfect and imperfect switching. Inter connected system reliability, bulk power system reliability.

### **TEXT BOOK:**

1. Testing Method of Reliability, A.Simpson, K.C.Kapur & L.R.Labenson

### **REFERENCE BOOK:**

2. Billinton R., Power System Reliability Calculation, MIT Press, USA
3. Endreyeni, Reliability Modeling in Electric Power System, John Wiley, New York

## *Chhattisgarh Swami Vivekanand Technical University Bhilai (C.G.)*

Semester: **M.TECH. 3<sup>rd</sup>**

Subject: **HVAC-DC Transmission**

Total Theory Periods: **40**

Total Marks in End Semester Exam. : **100**

Minimum number of class test to be conducted: **02**

Specialization: Electrical Devices and Power System Engg.

Branch: **Electrical and Electronics Engineering**

Code: **570331 (25)**

Total Tutorial Periods: **12**

### **UNIT I**

**Overview:** Comparison of EHV AC and DC transmission, description of DC transmission systems, modern trends in AC and DC transmission.

### **UNIT II**

**EHV AC Systems:** Limitations of extra long AC transmission, Voltage profile and voltage gradient of conductor, Electrostatic field of transmission line, Reactive Power planning and control, traveling and standing waves, EHV cable transmission system.  
**Static Var System:** Reactive VAR requirements, Static VAR systems, SVC in power systems, design concepts and analysis for system dynamic performance, voltage support, damping and reactive support.

### **UNIT III**

**HVDC System:** Converter configurations and their characteristics, DC link control, converter control characteristics; Monopolar operation, converter with and without overlap, smoothing reactors, transients in DC line, converter faults and protection, HVDC Breakers.

### **UNIT IV**

**Corona and Interference:** Corona and corona loss due to EHV AC and HVDC, Radio and TV interference due to EHV AC and HVDC systems, methods to reduce noise, radio and TV interference.  
**Harmonic Filters:** Generation of harmonics, design of AC filters, DC filters

### **UNIT V**

**Power flow analysis in AC/DC systems:** Component models, solution of DC load flow, per unit system for DC quantities, solution techniques of AC-DC power flow equations, Parallel operation of HVDC/AC systems, Multi terminal systems.

### **Text Books:**

1. Padiyar K.R., HVDC Power Transmission Systems, Wiley Eastern Ltd., New Delhi.
2. Kimbark E., " Direct Current Transmission", Vol-I, John-Wiley & sons, NY
3. Arrillaga J., HVDC Transmission, IEE Press, London.

### **Reference Books:**

4. Begamudre R.D., EHV AC Transmission Engineering, Wiley Eastern Press.
5. Arrillaga J. and Smith B.C., AC-DC Power System Analysis, IEE Press, London.

## ***Chhattisgarh Swami Vivekanand Technical University Bhilai (C.G.)***

Semester: **M.TECH. 3<sup>rd</sup>**

Subject: **Digital Signal Processing**

Total Theory Periods: **40**

Total Marks in End Semester Exam. : **100**

Minimum number of class test to be conducted: **02**

Specialization: Electrical Devices and Power System Engg.

Branch: **Electrical and Electronics Engineering**

Code: **570332 (25)**

Total Tutorial Periods: **12**

### **UNIT-I**

Discrete time Signal & System - Discrete time signal and sequences; resolution of discrete- time signal into impulses; analysis of discrete- time LTI system; convolution seem consality and stability; difference equations and their solutions; response to complex exponential signals; frequency response function

### **UNIT-II**

Transforms - Representation of sequences by Fourier transform; Z transforms, ROC; LTI in Z domain; sampling, frequency domain representation ; application of Z transform in transient A.C. signal filtering. Discrete-time system -- Block diagram representation of linear constant coefficient difference equation; direct form I and II, cascade form , parallel form ; finite precision ward- length effect , number representation; effect of quantization and rounding of noise; zero input limit cycles in fixed point realization.

### **UNIT-III**

Filter design -- Design of FIR filters by windowing; Butterworth and chebyshev filters; IIR filters impulse invariance and bilinear transformation.

### **UNIT-IV**

Discrete Fourier transform-- Frequency domain sampling; The DFT; linear and circular convolution; application in. A.C. transient signal analysis; FFT algorithm, DIT and DIF.

### **UNIT-V**

Application -- Dual tone multifrequency signal detection; spectral analysis; application in power system ,image processing; Multidimensional digital signal processing.

### **TEXT Books:**

1. openheim & Schafer -- Discrete time signal processing; PH
2. proakes & Manolakes --Digital signal processing ; PHI
3. Mitra , S.k. --Digital signal processing ; TMH.

### **Reference Books:**

4. B.C.Kuo-- Digital signal processing
5. M.Gopal--Digital signal processing

## *Chhattisgarh Swami Vivekanand Technical University Bhilai (C.G.)*

Semester: **M.TECH. 3<sup>rd</sup>**

Subject: **Electrical Energy Conservation**

Total Theory Periods: **40**

Total Marks in End Semester Exam. : **100**

Minimum number of class test to be conducted: **02**

Specialization: Electrical Devices and Power System Engg.

Branch: **Electrical and Electronics Engineering**

Code: **570333 (25)**

Total Tutorial Periods: **12**

### **UNIT - I ELECTRICAL ENERGY AND SAFETY AUDIT**

Overview of Electricity Act – Energy conservation act - Electrical energy audit - tools for electrical energy audit - billing elements - tariff system, energy and demand charge, electrical demand and load factor improvement, power factor correction, power demand control, demand shifting – Electrical Safety Auditing.

### **UNIT - II ELECTRIC MOTORS**

Motors efficiency, idle running - motor selection – factors affecting motor performance, efficiency at low load – high efficiency motors - reduce speed/variable drives, load reduction - high-starting torque, rewound motors, motor generator sets, energy efficiency in transformers - Case studies.

### **UNIT - III ELECTRICAL ENERGY CONSERVATION IN DRIVEN EQUIPMENTS**

Input electrical energy requirements in pumps – fans and compressors – load factor estimation in the equipments – different types of VFD, energy conservation potential– electrical energy conservation in refrigeration and A/C system, operation and maintenance practices for electrical energy conservation case studies.

### **UNIT - IV ENERGY CONSERVATION IN INDUSTRIAL LIGHTING**

Choice of lighting - energy saving - control of lighting - lighting standards - light meter audit - methods to reduce costs – summary of different lighting technologies – Case Studies.

### **UNIT - V ENERGY EFFICIENCY AND DEMAND SIDE MANAGEMENT**

Basic concepts – Co-generation – importance of demand side management – virtues of DSM – efficiency gains estimation of energy efficiency potential, cost effectiveness, payback period, barriers for energy efficiency and DSM – Case Studies.

Text Books:

### **Reference Books**

- 1 Openshaw Taylor E., "Utilisation of Electric Energy", Orient Longman Ltd, 2003
- 2 Donald R. Wulfingoff, "Energy Efficiency Manual", Energy Institute Press, 1999.
- 3 Tripathy S.C., "Electrical Energy Utilization and Conservation", TMH, 1991.

### **Reference Books:**

- 4 Cyril G. Veinott, Joseph E. Martin, "Fractional & Sub Fractional HP Electric Motor", McGraw Hill, 1987.
- 5 Abhay Jain, "How to Achieve Energy Conservation", Electrical India, Feb'04, pp.48-53.