

# *Chhattisgarh Swami Vivekanand Technical University, Bhilai*

## Scheme of Teaching and Examination

### B.E. VI SEMESTER ELECTRICAL ENGINEERING

S. No.	Board of Studies	Subject Code	Subject	Periods per week			Scheme of Exam Theory / Practical			Total Marks	Credit L+(T+P)/
				L	T	P	ESE	CT	TA		
1	Electrical Engg.	324611 (24)	Power System Analysis	3	2	-	80	20	20	120	4
2	Electrical Engg.	324612 (24)	Power System Protection & Switchgear	3	1	-	80	20	20	120	4
3	Electrical Engg.	324613 (24)	Power Electronics	3	2	-	80	20	20	120	4
4	Electrical Engg.	324614 (24)	Microprocessors	3	1	-	80	20	20	120	4
5	Electrical Engg.	324615 (24)	Digital Signal Processing	3	-	-	80	20	20	120	3
6	Refer Table -1		Professional Elective- I	3	1	-	80	20	20	120	4
7	Electrical Engg.	324621 (24)	Power System Analysis Lab	-	-	3	40	-	20	60	2
8	Electrical Engg.	324622 (24)	Power System Protection & Switchgear Lab	-	-	3	40	-	20	60	2
9	Electrical Engg.	324623 (24)	Power Electronics Lab	-	-	3	40	-	20	60	2
10	Electrical Engg.	324624 (24)	Microprocessors Lab	-	-	3	40	-	20	60	2
11	Management	300625 (36)	Managerial Skills	-	-	2	-	-	40	40	1
12			Library	-	-	1	-	-	-	-	-
<b>Total</b>				<b>18</b>	<b>7</b>	<b>1</b>	<b>640</b>	<b>120</b>	<b>240</b>	<b>1000</b>	<b>32</b>

L – Lecture,            T – Tutorial,  
P – Practical,        ESE- End Semester Exam , CT- Class Test  
**TA – Teacher’s Assessment**

**Note :** Industrial Training of twelve weeks is mandatory for B.E. students. It is to be completed in two equal parts. The first part must have been completed in summer after IV sem. The second part to be completed during summer after VI sem. after which students have to submit a training report which will be evaluated by college teachers during B.E. VII sem.

**Table - 1**  
**Professional Electives-I**

S. No.	Board of Studies	Subject Code	Subject
1.	Electrical Engg.	324631 (24)	<i>Fibre Optics</i>
2.	Electrical Engg.	324632 (24)	<i>Power System Planning &amp; Reliability</i>
3.	Electrical Engg.	324633 (24)	<i>Process Control</i>
4.	Electrical Engg.	324634 (24)	<i>Robotics &amp; Automation</i>

Note (1) –            1/4<sup>th</sup> of total strength of students subject to minimum of twenty 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*

**Semester: 6th**

**Subject: Power System Analysis**

**Total Theory Periods: 40**

**Total Marks in End Semester Exam: 80**

**Minimum number of Class tests to be conducted: 2**

**Branch: Electrical Engg.**

**Code: 324611 (24)**

**Total Tut Periods: 24**

## **UNIT I:**

Symmetrical three-phase short circuit on power systems, calculation of interrupting capacity of circuit breakers, current limiting reactors, symmetrical components, synthesis of unbalanced phasors from symmetrical components, representation of phase variables voltage, current and power in terms of symmetrical components, sequence impedances of power system elements, sequence networks of power system elements, phase shift in star-delta transformer banks.

## **UNIT II: Unsymmetrical Short Circuits**

Single line-to-ground, line-to-line, double-line-to-ground faults on unloaded alternators, unsymmetrical faults on power systems, fault through impedance, open conductor faults.

## **UNIT III: Power System Stability**

The stability problem, steady-state stability, transient stability, Swing equation, Equal area criterion of stability, application of equal area criterion, step-by-step solution of the swing equation, factors affecting transient stability,

## **UNIT IV: Load Flow Studies**

Formulation of bus admittance matrix, formulation of load-flow equations and their solution techniques, digital computer techniques, reactive power optimization.

## **UNIT V: Automatic Generation & Voltage control**

Introduction, single area and two area load frequency control, and Economic dispatch control, optimal (two area) load frequency control, automatic voltage control, Tie-line bias control.

## **Text Books:**

1. " *Power System Analysis*", Grainger and Stevenson, TMH Pbs. "*Power System Analysis*", Haddi Saddat, TMH.

## **Reference books:**

1. "*Electrical Power Systems*", Ashfaq Hussain, CBS Pbs.
2. *Electrical energy system theory*, Elgerd, TMH.
3. *Modern power system analysis*, Nagrath and Kothari, TMH
4. *Power system analysis*, Bergen, Pearson Pbs.

# *Chhattisgarh Swami Vivekanand Technical University, Bilai*

**Semester: 6th**  
**Subject: Power System Protection & Switchgear**  
**Total Theory Periods: 40**  
**Total Marks in End Semester Exam: 80**  
**Minimum number of Class tests to be conducted: 2**

**Branch: Electrical Engg.**  
**Code: 324612 (24)**  
**Total Tut Periods: 12**

## **UNIT-I**

**REALY:** Terminology, Basic circuit, realy connection with trip circuit and circuit breaker, objectives of protection, types of relay, construction and operation of instantaneous over current realy. I.DM.T. Relay, directional Unit, differential relay, percentage differential relay, Buchholz relay, Generalized torque expression, logical construction of impedance reactance, MHO and Off-set MHO Relays using generalized torque expression.

## **UNIT-II**

**Protection of Alternators:** Differential protection, Protection of stator against phases to ground fault, phase to phase faults, inter turn fault, protection against unbalanced loading, protection of rotor against ground fault, field failure, reverse power, back up protection, field suppression, protection of bus bars, frame leakage protection, differential protection.

## **UNIT III**

**Protection of transformers & Feeders:** differential protection of transformers for different winding configurations, difficulties encountered in differential protection and their remedies, protection of feeders, protection of ring main and parallel feeders, protection of radial feeders by over current relays, distance relays and carrier current protection scheme.

## **UNIT IV**

**Static Relays:** directional relay, impedance relay, admittance relay and admittance relay, amplitude comparator, phase comparator, duality between amplitude and phase comparators.

## **UNIT V**

**Circuit Breakers and Fuses:** Arc formation, arc interruption and restriking voltage, current chopping, resistance switch, Air blast circuit breakers, minimum and bulk oil circuit breakers, SF6 and Vacuum Circuit breakers, circuit breakers rating, testing of CB, definitions of terms in fuses, HRC fuses.

### **Text Books:**

1. "Power system protection and switchgear", Ravindranath and Chander, TMH
2. "Power system protection", Badri Ram, TMH.
3. "Fundamentals of power system protection", Paithankar and Bhide, PHI

### **Reference books:**

1. "Electrical power system", Wadhwa, New Age.
2. J and P switchgear handbook

# *Chhattisgarh Swami Vivekanand Technical University, Bhilai*

**Semester: 6th**  
**Subject: Power Electronics**  
**Total Theory Periods: 40**  
**Total Marks in End Semester Exam: 80**  
**Minimum number of Class tests to be conducted: 2**

**Branch: Electrical Engg.**  
**Code: 324613 (24)**  
**Total Tut Periods: 24**

## **UNIT I: Thyristor**

Silicon controlled rectifier (SCR), construction and principle of operation, two-transistor analogy, static and dynamic characteristics, gate characteristics, ratings, series and parallel operation of SCRs, over voltage and over current protections, protection against high di/dt and high dv/dt, use of UJT for pulse generation.

## **UNIT II: Phase Controlled Rectifiers**

Principle of phase control, performance parameters, single-phase half wave and full wave controlled rectifiers, mid point and bridge converters, full controlled converters, half controlled converters, comparison between full and half controlled converters, three-phase half wave and fully controlled bridge converter, three-phase semi-converter, effect and source inductance in single-phase and three-phase bridge converters, commutation or overlap angle, effect of overlap.

## **UNIT III: DC To DC Conversion**

Principle of chopper operation, controlled strategies, step up chopper, step down chopper, chopper configuration, forced commuted chopper, voltage commutated chopper, current commuted chopper, Load commuted chopper, Jone's chopper, Morgan chopper.

## **UNIT IV: Inverter**

Classification of inverters, voltage source inverter, current source inverter, series resonant inverter, modified series resonant inverter, parallel inverter, bridge inverter, auxiliary commuted single-phase inverter, complementary commuted single-phase inverter, and three-phase inverter, Cyclo-converters: basic principle of operation, step-up and step down single-phase to single-phase Cyclo-converter.

## **UNIT V: Speed Control Of DC Motors**

Four-quadrant operation of series and shunt DC motors, constant HP and constant torque operation, various schemes of speed control (single converter, double converter, chopper), modern semiconductor devices, power transistors, power bipolar junction transistors, steady state characteristics, switching characteristics, switching limits, safe operating area, power MOSFET: steady state characteristics, switching limits, safe operating area, IGBT: steady state characteristics, safe operating area.

### **Text Books:**

1. "Power electronics", Rashid, PHI pbs.
2. "An introduction to thyristor and its applications", Ramamurthy, EWP.

### **Reference Books:**

1. "A text book of power electronics", S.N Singh, Dhanpat Rai.
2. Power electronics, Murthy, Oxford.
3. "Power electronics", P. C. Sen, TMH.

# *Chhattisgarh Swami Vivekanand Technical University, Bhilai*

**Semester: 6th**

**Subject: Microprocessors**

**Total Theory Periods: 40**

**Total Marks in End Semester Exam: 80**

**Minimum number of Class tests to be conducted: 2**

**Branch: Electrical Engg.**

**Code: 324614 (24)**

**Total Tut Periods: 12**

## **UNIT I: Introduction and Microprocessor Architecture**

Evolution and overview of micro-processors, organization of 8085, data/address bus, registers, instruction types, classification of instruction, addressing modes, instruction set and simple 8085 programmes.

## **UNIT II: Microprocessor Memory Chips**

Introduction to semiconductor memory, types of memories, characteristics of memories, capacity and organization of memories, electrical signals on chips, static RAMs HM 6264,6116,62256,6168 AM 2168. Dynamic RAMS, organization of 51100x series, power requirements and soft errors in ROMs, organization of EPROMS, timing, programming, EEPROMs and shadow RAMs.

## **UNIT III: Data Transfer Interrupts and DMA**

Introduction, address space partitioning, address map, address decoding, memory interfacing, bus contention, data transfer schemes, programmed data transfer, synchronous, asynchronous, interrupt driven and DMA data transfer. Multiple interrupts. Enabling, Disabling, Reading and Masking interrupts.

## **UNIT IV: Interfacing Devices**

Introduction, types of interfacing devices, address decoding for I/Os, 8212 I/O port, Programmable Interrupt controller 8259, Programmable Direct Memory Access Controller 8257, Programmable Communication Interface 8251, Analog input/ output devices like AD 7820 and AD 557.

## **UNIT V: MDS and Microprocessor Timings:**

Software development aids, system monitor, text editor, assembler, types of OS, assembly techniques, macro assembler, compilers, hardware ads, SBC and system design kits.

Introduction to Microprocessor Timings, Timing and control unit, timings of INTEL 8085.

### **Text Books:**

1. "Introduction to Microprocessors" Aditya P. Mathur, Tata Mc Graw Hill Pbs.
2. "Microprocessor Architecture And Programming And Application", Gaonkar, Wiley Pbs.

### **Reference books:**

1. "Fundamentals of Microprocessors and microcomputers", B. Ram, Dhanpat Rai.
2. Microprocessor and interfacing circuits, Doughlas.

# *Chhattisgarh Swami Vivekanand Technical University, Bhilai*

**Semester: 6th**  
**Subject: Digital Signal Processing**  
**Total Theory Periods: 40**  
**Total Marks in End Semester Exam: 80**  
**Minimum number of Class tests to be conducted: 2**

**Branch: EE&EEE**  
**Code: 324615 (24)**  
**Total Tut Periods: Nil**

## **Unit-I: Classification of signals and systems:**

Introduction, Classification of signals, singularity Functions, Amplitude and Phase Classification of systems, simple Manipulation of discrete- time signals, Representation of Systems, Analog- to-Digital Conversion of signals.

## **Unit-II: Linear Time Invariant systems:**

Introduction, Properties of DPS systems, Difference equation and its Relationship with system function, Impulse Response and Frequency Response, Frequency Response.

## **Unit-III: Discrete and Fast Fourier Transforms:**

Introduction, Discrete Convolution, Discrete- Time Fourier Transform (DTFT), Fast Fourier Transform (FFT), Computing of inverse DFT by Direct DFT, Composite- radix FFT, Fast (Sectioned), Convolution, and correlation.

## **Unit-IV: Infinite Impulse Response (IIR) Filters:**

Introduction, IIR Filters Design by Approximation of derivatives, IIR Filter Design by Impulse invariant Method, IIR Filter Design by the Bilinear Transformation, Butter worth Filters Chebyshev Filters, Inverse Chebyshev Filters, Elliptic Filters, Frequency Transformation.

## **Unit-V: Realization of Digital Linear systems:**

Introduction, Basic Realization Block Diagram, Signal-flow Graph, Basic structure for HR systems, Basic Structure for FIR Systems. Application of Digital signal Processing, Introduction, Voice Processing, Application to Radar, Application to Image processing, Introduction to Wavelets.

## **Text Books:**

1. Digital Signal Processing – S.Salivahanan, A. Vallavraj, C. Gnanapriya TMH
2. Digital Signal Processing principles, algorithms and applications, Proakis, Pearson Education.
3. Signal and systems, Oppenheim, PHI

## **Reference books:**

1. Digital Signal Processing – A.V. Oppenheim, Schaffer, PHI
2. Digital Signal Processing, Johny, Johnson, PHI.

# *Chhattisgarh Swami Vivekanand Technical University, Bilai*

**Semester: 6<sup>th</sup>**  
**Subject: Power System Analysis Lab**  
**Total practical periods: 40**  
**Total Marks in end Semester Exam: 40**

**Branch: Electrical Engg.**  
**Code: 324621 (24)**

## **List of experiments: (To be performed minimum 10 experiments)**

- ❏ Determination of phase sequence by static method.
- ❏ To study the use of a DC network analyzer for fault calculation.
- ❏ To determine the positive sequence impedance of a three-phase transformer for
  - ?? connection with both the neutral grounded.
  - ?? Connection with one neutral grounded.
  - ?? Connection with neutral solidly grounded.
- ❏ To determine the negative sequence impedance of a three-phase transformer for
  - ?? connection with both the neutral grounded.
  - ?? Connection with one neutral grounded.
  - ?? Connection with neutral solidly grounded.
- ❏ To determine the sequence impedances of a three-phase transformer for
  - ❏ ?? Connection without ground.
  - ❏ ?? bank.
- ❏ The performance characteristics of artificial transmission line.
- ❏ Reactive power characteristics of artificial transmission line.
- ❏ Single line to ground fault analysis of unloaded generator.
- ❏ Line to line fault analysis of unloaded generator.
- ❏ To study the effect of angle  $\delta$  on stability of synchronous machine.

## **List of equipments:**

- ❏ Three-phase transformer
- ❏ Three-phase synchronous machine
- ❏ Single-phase and three phase AC supply
- ❏ DC motor
- ❏ Field regulator
- ❏ Induction Coil, Lamps
- ❏ Ammeters, Voltmeters, wattmeters
- ❏ Transmission line model
- ❏ RLC load unit

## **Books for Reference:**

- ❏ Electrical Power system, Wadhwa
- ❏ Electrical power system, Ashfaq Hussain

# *Chhattisgarh Swami Vivekanand Technical University, Bhilai*

**Semester: 6<sup>th</sup>**  
**Subject: Power System Protection & Switchgear Lab**  
**Total practical periods: 40**  
**Total Marks in end Semester Exam: 40**

**Branch: Electrical Engg.**  
**Code: 324622 (24)**

## **List of experiments: (To be performed minimum 10 experiments)**

- ⚡⚡ To study Over current Relay static type & draw characteristics.
- ⚡⚡ To study under voltage relay Electromechanical type & draw characteristics.
- ⚡⚡ To study over voltage relay Electromechanical type & draw characteristics.
- ⚡⚡ To study IDMT Over current relay Electromechanical Type & draw current verses time characteristics.
- ⚡⚡ To study IDMT earth fault relay electromechanical type draw current verses time characteristics.
- ⚡⚡ To study operating characteristics of percentage-biased differential relays tp plot the characteristics of percentage biased differential relay for 30%, 40%, & 20%.
- ⚡⚡ To determine the characteristics of instantaneous relays.
- ⚡⚡ To study Bucholz Relays.
- ⚡⚡ To study Solid State O.C.R.
- ⚡⚡ To study Merz Price Protection of transformer (Simulation Model).
- ⚡⚡ To study Static type negative sequence relay.
- ⚡⚡ To study the time-grading protection of feeder [simulation Model].
- ⚡⚡ To study the current-grading protection of feeder [simulation Model].
- ⚡⚡ To study the time-current grading protection of feeder [simulation Model].
- ⚡⚡ To study the simulation model for short, medium, & long transmission line.

## **Apparatus Required:**

- ⚡⚡ Relays
- ⚡⚡ Transformer
- ⚡⚡ Alarm
- ⚡⚡ Auxiliary power supply
- ⚡⚡ Variable voltage source
- ⚡⚡ Digital meter, digital time totalizer

## **Reference Book:**

1. Protection –Westing House.



# *Chhattisgarh Swami Vivekanand Technical University, Bhilai*

**Semester: 6<sup>th</sup>**

**Subject: Power Electronics Lab**

**Total practical periods: 40**

**Total Marks in end Semester Exam: 40**

**Branch: Electrical Engg.**

**Code: 324623 (24)**

List of Experiments: - (To be performed minimum 10 experiments)

- ❏ Study of VI characteristic of a silicon controlled Rectifier (SCR).
- ❏ Study of VI characteristic of a Diac
- ❏ Study of VI characteristic of a Triac
- ❏ Study of VI characteristic of a UJT.
- ❏ Application of UJT as relaxation Oscillator.
- ❏ Study of Half wave gate controlled rectifier-using SCR.
- ❏ RC triggering Scheme of SCR.
- ❏ Study of Voltage Commutation.
- ❏ Study of current commutation.
- ❏ Study of single-phase, Half –controlled, full-wave rectifier using two SCRs, and two diodes.
- ❏ Speed controls of a dc shunt Motor using SCR.
- ❏ Study of a three –Phase rectifier using power diodes.
- ❏ Study of a three phase full-wave half –controlled rectifier.
- ❏ To study a triac power control circuit (i)use to control the speed of a fan (ii)used as a dimmer.
- ❏ To observe how a photoconductive cell may be used to trigger an SCR.

Apparatus required:

1. Diodes
  - ❏ SPST switch.
  - ❏ Transformer
  - ❏ Oscilloscope
  - ❏ Photo cells
  - ❏ CRO
  - ❏ Voltmeter, Ammeter
  - ❏ DC shunt motor

Reference books:-

- ❏ Fundamentals of Power Electronics .ISTE .S .K Bhattacharya.
- ❏ Fundamentals of Power Electronics by S.Rama Raddy.
- ❏ Industrial and power Electronics by Harish C . Rai

# *Chhattisgarh Swami Vivekanand Technical University, Bhilai*

**Semester: 6<sup>th</sup>**  
**Subject: Microprocessor Lab**  
**Total practical periods: 40**  
**Total Marks in end Semester Exam: 40**

**Branch: Electrical Engg.**  
**Code: 324624 (24)**

## **List of experiments: (To be performed minimum 10 experiments)**

- ✍✍ Study Of 8085 Microprocessor & Its Architecture.
- ✍✍ Write a Programme To Add Two 8-Bit No. & Store The Result In Register.
- ✍✍ Write a Programme To Subtract Two 8-Bit No. & Store The Result In Register.
- ✍✍ Write a Programme To Add Two 8-Bit No. & Store The Result In Memory Location.
- ✍✍ Write a Programme To Subtract Two 8-Bit No. & Store The Result In Memory Location.
- ✍✍ Write a Programme To Load The Data Of Particular Address Into Accumulator, Adding It To New Number & Then Storing The Data To Another Memory Location.
- ✍✍ Write a Programme to One's & Two's Complement Of 8-Bit No.
- ✍✍ Write a Programme To Find One's Complement Of 16-Bit No.
- ✍✍ Write a Programme To Find Two's Complement Of 16-Bit No.
- ✍✍ Write a Programme To Find Smaller Of The Three Numbers.
- ✍✍ Write a Programme To Multiply Two 8-Bit Numbers Who's Result Is Of 8-Bit.
- ✍✍ Write a Programme To Transfer N Byte Of Data From XX00 To YY00.
- ✍✍ Write a Programme To Find The Smallest Of N Given No. & Store The Smallest Number In An Address Location.
- ✍✍ Write a Programme To Convert Two Digits BCD To Binary Number.
- ✍✍ Write a Programme To Find The Larger Of The Two No. & Store The Largest In An Address Location
- ✍✍ Write a Programme To Add Two 8-Bit Numbers Whose Result Is Of 16-Bit.
- ✍✍ Write a Programme To Add Two Decimal Numbers & Store The Result In Decimal.

## **Apparatus required: -**

- ✍✍ Trainer Kit: - Intel 8085 Microprocessor -10 Nos.
- ✍✍ SMPS for above kit ( if not built in)

## **Reference Books:**

- ✍✍ "Introduction to Microprocessors" Adutya P. Mathur, Tata Mc Graw Hill Pbs.
- ✍✍ Microprocessor Architecture, Programming, and Applications - Ramesh.S.Gaonkar.
- ✍✍ Fundamentals of Microprocessor – B.Ram.

# *Chhattisgarh Swami Vivekanand Technical University, Bhilai*

**Semester: 6<sup>th</sup>**

**Subject: Fibre Optics**

**Total Theory Periods: 40**

**Total Marks in End Semester Exam: 80**

**Minimum number of Class tests to be conducted: 2**

**Branch: Electrical Engg.**

**Code: 324631 (24)**

**Total Tut Periods: 12**

**UNIT I:** Introduction to optical communication, principle of light transmission, optical fiber modes and configuration, mode theory for circular wave guides, single mode fibers, multimode fibers, numerical aperture, mode field diameter, fiber material, fiber fabrication techniques.

**UNIT II:** Optical sources, LEDs, LASER diodes, Modal reflection noise, Power launching and coupling, Population inversion, Fiber splicing, Optical connectors, Photo detectors, PIN, Avalanche detectors, 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, Intermodal distortion, Pulse broadening in graded index fiber, mode coupling, Advanced fiber designs: Dispersion shifted, Dispersion flattened, Compensating fibers, Design optimization in single mode fibers.

**UNIT – IV:** Coherent optical fiber communication, Modulation techniques for homodyne and heterodyne systems, Optical fiber 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:** Advanced system techniques, Wavelength division multiplexing, Optical amplification, Semiconductor amplifier, EDFA comparison between semiconductor and optical amplifier, Gain bandwidth, Photonic switching, Optical networks, Optical fiber bus, Ring topology, Star architecture, FDDI and SONET standards.

## **TEXT BOOKS: -**

1. "Optical Fibre Communication", Gerd Keiser, Mc Graw Hill International Ed.
2. "Optical Fiber Communication" A.K. Ghatak & K. Tyagarajan.
3. "Optical Fibre Communication: Principals and Techniques", John M. Senior, PHI New Delhi

## **Reference Books:-**

1. "Fibre Optics: Principles and Applications", N.S. Kapany, Academic Press, New York.
2. "Fibre Optics System Network Applications", Terry Edwards, John Wiley & Sons.
3. "Fibre Optics Test & Measurements", Dennis Drickson, Prentice Hall PTR, NJ USA.
4. "Fibre Optic Communication Technology", D. Jafar, K. Mynbaev & Lowell L. Schenier, Pearson Education, Asia.
5. "Optical Fibre Communication and it's Applications, S.C. Gupta, PHI India.

# *Chhattisgarh Swami Vivekanand Technical University, Bhilai*

**Semester: 6<sup>th</sup>**

**Subject: Power System Planning & Reliability**

**Total Theory Periods: 40**

**Total Marks in End Semester Exam: 80**

**Minimum number of Class tests to be conducted: 2**

**Branch: Electrical Engg.**

**Code: 324632 (24)**

**Total Tut Periods: 12**

## **UNIT – I**

Review of probability theory element of probability theory Probability distribution, Random variable, Density & distribution functions, Mathematical expectation, Binominal distribution, Poisson distribution, Normal distribution, Exponential distribution, and Weibull distribution.

## **UNIT – II**

Reliability of engineering systems Component reliability, Hazard models, Reliability of systems with non-repairable components, series, parallel, series-Parallel, Parallel-Series configurations, Non-series-parallel configurations, Minimal tie-set, minimal cut-set and decomposition methods, Repairable systems, MARKOV process, Long term reliability Power System reliability.

## **UNIT – III**

Reliability of engineering systems Reliability model of a generating unit, State space methods, Combining states, Sequential addition method, Load modeling, Cumulative load model, Merging of generation and load models, Loss of load probability, percentage energy loss, Probability and frequency of failure, operating reserve calculations.

## **UNIT –IV**

Power Network Reliability Weather effect on transmission lines, Common mode failures, Switching after faults, three, state components, Normally open paths, Distribution system reliability.

Composite System Reliability Bulk Power supply systems, Effect of varying load, Inter connected systems, Correlated and uncorrelated load models, cost and worth of reliability.

## **UNIT – V**

Reliability Improvement & Testing proper Design simplicity, Component improvement Testing Plans, time censored & sequential reliability tests, accelerated life test, environment test, Reliability estimations.

## **Textbooks:**

1. J.Endreny, Reliability Modeling in Electric Power Systems, John Wiley & Sons.
2. Roy Billinton & Ronald, Nallan, Reliability Evaluation of Power systems, Plenum Press, New York

# *Chhattisgarh Swami Vivekanand Technical University, Bhilai*

**Semester: 6<sup>th</sup>**

**Subject: Process Control**

**Total Theory Periods: 40**

**Total Marks in End Semester Exam: 80**

**Minimum number of Class tests to be conducted: 2**

**Branch: Electrical Engg.**

**Code: 324633 (24)**

**Total Tut Periods: 12**

## **UNIT – I**

Special characteristics of process systems large time constraints, interaction, multistage, pure lag, control loops for simple systems and their Dynamics & stability.

## **UNIT – II**

Generation of control action in electronic and pneumatic controllers, control valves, valves positiners, relief and safety valves, relays, volume boosters, pneumatic transmitters for process variable, Tuning of controllers – Zeigler Nichols and other techniques.

## **UNIT – III**

Different control techniques and interaction of process parameters e.g. feed forward, cascade, ratio, override controls, batch continuous process controls, Feed forward Control scheme.

## **UNIT – IV**

Various process schemes / unit operations and their control schemes e.g. distillation columns, absorbers, heat exchangers, furnaces, reactors, mineral processing industries, etc. Use of control schemes for process optimization.

## **UNIT – V**

Advanced control strategies with case studies, Use of DDC and PLC, Introduction to supervisory control, Conversion of existing control schemes in operating plants, data loggers.

### **Text Books:**

1. Dale Patrick, Stephen Fardo, "Industrial Process Control system".
2. Smith C.A. & A.B. Corripio, "Principal & Practiced Automatic Process Control", J.Willey.

### **Reference books:**

1. Shinsky F.G." Process control System", III Ed. McGraw Hill
2. Rao M & S.Qiv,"Process Control Engg."Gorden & Breach

# *Chhattisgarh Swami Vivekanand Technical University, Bhilai*

Semester: 6<sup>th</sup>  
Subject: **Robotics & Automation**  
Total Theory Periods: **40**  
Total Marks in End Semester Exam: **80**  
Minimum number of Class tests to be conducted: **2**

Branch: **Electrical Engg.**  
Code: **324634 (24)**  
Total Tut Periods: **12**

## **UNIT-I: Fundamental Concepts of robotics**

History, present status & future trends-Robotics & automation-Laws of Robotics-Robot definitions-Robotics systems & robot anatomy-Specification of Robots-resolution, Repeatability & accuracy of a manipulator. ROBOT DRIVES & POWER TRANSMISSION SYSTEMS & CONTROL: Robot drive mechanisms, hydraulic-electric-pneumatic drives, mechanical transmission method-Rotary-to /Rotary motion conversion, Rotary –to linear motion conversion-End effectors-Types- in piping problem-Remote centered compliance devices-control of actuators in robotics mechanisms.

## **Unit-II: Sensors & Intelligent Robots**

Sensory devices-Non optical-position sensors-optical position sensors-Velocity sensors-Proximity sensors-contact & non-contact type-touch & slip sensors-Force & torque sensors-AI & Robotics.

## **Unit-III: Computer Vision for Robotics Systems**

Robot vision systems-Imaging components-image representation-Hardware aspects-Picture coding-Object recognition & categorization-Visual inspection-Software Considerations-Application-Commercial robotics vision systems

## **Unit-IV: Transformations & Kinematics**

Homogenous coordinates-coordinates references frames-Homogenous transformation for the manipulator-The forward & inverse problem of manipulator kinematics-Motion generation-Manipulator dynamics-Jacobian in terms of D-H matrices-Controller architecture.

## **Unit-V: Robot Cell Design & Control**

Specification of commercial robots-Robots design & process specification-Motor selection in the design of a robotic joint-Robot cell layouts-Economic & social aspect of robotics. Application of Robots: Capabilities of Robots-Robotics applications-Obstacle avoidance-Robotics in India-The future of robotics Factor Automation-Hierarchical computer control.

### **Text books:**

1. Richard D.Klafter, Thomas A.Chmielewski Michael Negin, Robotics Engg-An Integrated Approach", Eastern Economy Edition, Prentice Hall of India P.Ltd.1989.
2. Shiman Y.Nof,"Handbook of Industrial Robotics. "John Willey & Sons, New York, 1985.

### **Reference Book:**

1. Fu.K.S.Gomalez, R.C.Lee, C.S.G,"Robotics: Control, Sensing, Vision& Intelligence", MGH book co.1987.
2. Mikell P.Groover et.al,"Industrial Robots-Technology, Programming & application", MGH, New York, 1980.
3. Deh, S.R."Robotics Technology & Flexible Automation",Tata McGraw Hill Publishing Co.Ltd.1994.

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

Semester: VI

Subject: Managerial Skills

Total Practical Periods: 28

Total Marks in End Semester Exam: Nil

Minimum number of class test to be conducted: 2

Branch: Common to all branches

Code: 300625 (36)

Total Tut Periods: NIL

## **Unit-I**

Managerial Communication Skills: Importance of Business Writing: writing business letters, memorandum, minutes, and reports- informal and formal, legal aspects of business communication, oral communication- presentation, conversation skills, negotiations, and listening skills, how to structure speech and presentation, body language.

## **Unit-II**

Managerial skills: Leadership: Characteristics of leader, how to develop leadership; ethics and values of leadership, leaders who make difference, conduct of meetings, small group communications and Brain storming, Decision making, How to make right decision, Conflicts and cooperation, Dissatisfaction: Making them productive.

## **Unit-III**

Proactive Manager: How to become the real you: The journey of self-discovery, the path of self-discovery, Assertiveness: A skill to develop, Hero or developer, Difference between manager and leader, Managerial skill check list, team development, How to teach and train, time management, Stress management, Self assessment.

## **Unit-IV**

Attitudinal Change: Meaning of attitude through example, benefits of positive attitude, how to develop habit of positive thinking, what is fear? How to win it? How to win over failure? How to overcome criticism? How to become real you? How to Motivate?

## **Unit-V**

Creativity – a managerial skill, Trying to get a grip on creativity.

Overview of Management Concepts: Function of Management: Planning, organizing, staffing, controlling.

### *Text & Reference Books:*

1. Basic Managerial skills for all by E.H. McGrawth, Prentice Hall India Pvt Ltd,2006
2. How to develop a pleasing personality by Atul John Rego, Better yourself bools, Mumbai, 2006
3. The powerful Personality by Dr. Ujjawal Patni & Dr. Pratap Deshmukh, Fusion Books, 2006
4. How to Success by Brian Adams, Better Yourself books, Mumbai, 1969