## Chhattisgarh Swami Vivekanand Technical University, Bhilai

**Scheme of Teaching and Examination**

### B.E. VI SEMESTER

#### ELECTRONICS AND INSTRUMENTATION

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Board of studies</th>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Period Per Week</th>
<th>Scheme of Exam</th>
<th>Total Marks</th>
<th>Credit</th>
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<td>327611 (27)</td>
<td>Process Dynamics and Control</td>
<td>3   1 - 80</td>
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<td>327612 (27)</td>
<td>Power Electronic Devices &amp; Applications</td>
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<td>328613 (28)</td>
<td>Advanced Microprocessor &amp; Interfacing</td>
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<td>Management</td>
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<td>Managerial Skills</td>
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L-Lecture, T- Tutorial, P- Practical, ESE- End Semester Examination, CT- Class Test, TA- Teacher's Assessment

* To be completed after IV Semester and before the commencement of V Semester

**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 - I

#### Professional Elective - I

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Board of Study</th>
<th>Code</th>
<th>Subject</th>
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<tr>
<td></td>
<td>Electronics &amp; Instrumentation</td>
<td>327631 (27)</td>
<td>Process Control Instrumentation</td>
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<td>Electronics &amp; Instrumentation</td>
<td>327632 (27)</td>
<td>Microelectronic Devices &amp; VLSI Technology</td>
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<td>Electronics &amp; Instrumentation</td>
<td>327633 (27)</td>
<td>Telecommunication Switching &amp; Computer Network</td>
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<td>Electronics &amp; Instrumentation</td>
<td>327634 (27)</td>
<td>Audio &amp; Video Engineering</td>
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<td>Electronics &amp; Instrumentation</td>
<td>327635 (27)</td>
<td>High Frequency Electronics</td>
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<td>Electronics &amp; Instrumentation</td>
<td>327636 (27)</td>
<td>AI &amp; Expert Systems</td>
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</table>

Note (1) - $1/4^{th}$ 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.
Unit I : Process Dynamics

Unit II : Basic Control Actions
Characteristics of on-off, proportional, single -speed floating control, integral and derivative modes - composite control modes - PI, PD and PID control modes - Response of controllers for different types of test inputs - Integral wind up - Auto - manual transfer - Selection of control mode for different processes - Typical control schemes for level, flow, pressure and temperature.

Unit III : Optimum Controller Settings
Tuning of controllers by process reaction curve method - continuous cycling method, damped oscillation method - Ziegler - Nichol's tuning - 1/4 decay ratio - Feed Forward control - Ratio control - cascade control - averaging control - multivariable control.

Unit IV : I/P and P/I Converters
Pneumatic and electric actuators - valve positioner - control valve - Characteristics of control valve - valve body - globe, butterfly, diaphragm ball valves - control valve sizing - Cavitation, flashing in control valves - Response of pneumatic transmission lines and valves.

Unit V : Applications
Distillation column - control of top and bottom product compositions - reflux ratio - control of chemical reactor - control of heat exchangers - steam boiler - drum level control and combustion.

Text Books

Reference Books:
1. Peter Harriot., “Process Control”, TMH
UNIT – I : Power Diodes
Construction, Principle of Operation, characteristics, power diode types, series and parallel connected diodes, diode circuits and rectifiers- diodes with RC RL LC and RLC loads, three phase bridge.

UNIT – II : Thyristors
Construction, Principle of Operation, characteristics, two-transistor model, turn on and turn off, thyristor types, firing circuits, Thyristor commutation techniques- natural and forced commutation- different types.

UNIT – III : Power Transistors
Power BJT, Power MOSFET, SIT and IGBT, steady state and switching characteristics of BJT and Power MOS. drive requirements and design of simple drive circuits for power BJT, MOSFET and IGBT. Spice models of the power devices

UNIT – IV : Controlled Rectifiers
Principle of phase controlled converter operation Single phase and three phase semi converters, full converters, and dual converters, power factor improvements, design of converter circuits, Effects of load and source inductances. AC voltage controllers- Principle of on-off and phase angle control, single phase controllers with resistive and inductive loads, three phase half wave and full wave controllers, cycloconverters

UNIT – V : Choppers

Text Books:

References:
1. Michael Jacob, Power Electronics Principle and Application, Thomson Delmar Series
UNIT I :- FREQUENCY MEASUREMENT
Spectral Analysis; Sept superheterodyne Frequency analysis; multi-filter Real – time spectrum Analysis tracking
Generator courtier; Techniques of Application of Analysis; choice of Bandwidth; Electronics techniques of frequency
measurement; Direct reading counters.

UNIT II :- HIGH FREQUENCY POWER MEASUREMENT
Bolo meter method; colorimeter method; power measurement & monitoring using Directional couplers.

UNIT III :- VOLTAGE & CURRENT MEASUREMENT
Digital voltmeters – Non integrating type, using counting circuitry; Normal & common mode rejection; principles of
A.C. voltage measurement, Average & peak responding detectors, peak to peak responding detectors; root mean
square responding Detectors, other methods of detectors; sampling voltimeters; synchronous detector; DC & AC
probes.

UNIT IV :- ANALOG TO DIGITAL & DIGITAL TO ANALOG DATA CONVERTERS
Simultaneous A/D Converter, Stair step – Ramp type A/D converter, signal slope A/D converter, Dual slope A/D
converter, SAR ( Successive Approximation ) type A/D converter, Weighted – Resister D/A converter, Ladder type
D/A converter.

UNIT V :- DIGITAL INSTRUMENTS
Digital Transducer, Digital Multimeters, Digital frequency meter, Universal Counter, Decode counter, Electronic,
Counter, Digital measurement of frequency, Digital Tachometer, Digital P- H meter, Automation in Digital
Instruments, Digital phase meter, Digital capacitance meter, microprocessor based instruments, IEEE 488 Bus .

Name of Text Books:
   New Delhi .

Name of Reference Books:
UNIT I : Introduction

UNIT II : Realization of Digital Filters

UNIT III : IIR Digital Filters

UNIT IV: FIR Digital Filters
Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques, Frequency Sampling technique, Comparison of IIR & FIR filters.

UNIT V: Applications of Digital Signal Processing
Introduction, Applications of DSP: Digital Sinusoidal Oscillators, Digital Time Control Circuits, Digital Comb Filters. Applications in broader sense: Removal of noise from pictures, Applications of DSP to Radar, Applications of DSP in Image Processing, Applications of DSP in speech processing.

Name of Text Books:
1. Digital Signal Processing, J. Johnson, Pearson - PHI
2. Digital Signal Processing, Proakis, Manolakis & Sharma, Pearson Education

Name of Reference Books:
1. Digital Signal Processing, Nair, PHI
2. Discrete Time Signal Processing, Oppenheim & Schafer, Pearson - PHI
3. Digital Signal Processing, Vallavaraj, Salivahanan, Gnanapriya, TMH
Unit – I
Architecture & Instruction set for 8086: Architecture and pin configuration of 8086, Instruction Format; Addressing modes, Data Transfer Instruction; Arithmetic Instructions; Branching and Looping Instructions, NOP and Halt, Flag Manipulation Instructions; Logical, Shift and Rotate Instruction. Byte and String Instructions; REP Prefix, Table Translation, Number Format conversions. Assembler Directives and Operators; Assembly Process; Translation of assembler Instructions. Programming of microprocessor 8086

Unit – II
System Bus Structure: Basic 8086/8088 system bus architecture, Minimum mode Configuration, Maximum mode configuration; memory interfacing with 8086/8088 in minimum and maximum mode; System Bus Timings, Bus Standards. Interrupts of microprocessor 8086

Unit – III
Architecture of Interfacing Devices: Programmable interrupt controller (PIC) 8259, Programmable DMA Controller (8257), (Architecture and Functioning only) 8-bit ADC and DAC, Programming for Interfacing of 8253/8254, 8251, 8279, ADC and DAC with 8086.

Unit – IV

Unit – V
Multiprocessor Architecture & Programming: Numeric data Processor 8087; I/O Processor 8089, Communication between CPU and I0P, Related Instructions; programming of 8087 numeric data processor.

Name of Text Books:
2. Microprocessor & Interfacing – D. Hall, TMH

Name of Reference Books:
4. Advanced microprocessor, Rajasree, New Age International Publishers
Unit I: Process Characteristics
Dynamic elements in control loops, dead time, process capacity and multi-capacity processes, interaction, gain and its dependence.

Unit II: Analysis of Some Common Loops
Flow, pressure, level, temperature, composition and PH linear & nonlinear controllers, their tuning methods control values and their selection.

Unit III: Multiloop Systems
Definition & applications of feedback control, cascade control, ratio control, selective control, adaptive & feed forward control.

Unit IV: Multivariable Process Control
Choosing controlled variables, pairing controlled & manipulated variable, coupling & Decoupling control systems. Typical process controls: control of compressors, pump heat exchangers, furnaces, distillation columns, steam boilers.

Unit V: Process Instrumentation
Introduction to instrumentation for petroleum and petrochemicals, paper & pulp, fertilizers polymerization industries.

Text Book:
1. F.C. Shinsky, “Process control system”.

Reference:
1. Harriot, “Process control”.
2. Liptack, “Instrument Engineer’s Handbook (process control)”.
Unit – I : BASIC DEVICE CHARACTERISTICS
NMOS, PMOS and CMOS devices characteristics, linear, saturation modes, bulk effect capacitance, device models for simulation. CMOS device fabrication principles.

Unit – II : BASIC CIRCUITS DIGITAL SYSTEMS

Unit – III : BUILDING BLOCKS OF DIGITAL SYSTEMS
Combinational Logic and Sequential logic circuits, Data path circuits, Adder multiplier architecture and accumulators.

Unit – IV : PROGRAMMABLE LOGIC DEVICES AND FPGAS
Programmable Logic interconnect principles and types, Programmable logic elements and AND-OR arrays, Routing Procedures in FPGAs and CPLD, programming methods for FPGAs and CPLDs, Comparison of ACTEL, Altera And Xilinx FPGAs.

Unit – V : PRINCIPLES OF HDL
Introduction to VHDL – sequential and concurrent descriptions. Signal, port and variable statements. Wait, case and other sequential statements. Block, process component and generate descriptions. Test branch creation and principles of operation of VHDL simulator. Introduction to Verilog and brief comparison with VHDL.

List of Text Books:

List of Reference books:
UNIT I - INTRODUCTION

UNIT II - PHYSICAL & DATA LINK LAYER:

UNIT III - LOCAL AREA NETWORK

UNIT IV - TELECOM SWITCHING NETWORKS:

UNIT V - OTHER OSI LAYERS

TEXT BOOKS:

REFERENCE BOOKS
3. Vishwanathan Thiagarajan, “Telecommunication Switching Systems And Networks”, PHI.
UNIT – I : Audio Systems
Input types of microphones and speakers. Monophonic, stereophonic and quadraphonic audio systems.

UNIT – II : Magnetic Disc Recording and Reproduction:
Monophonic and stereophonic disc recording and reproducing, Recording systems. Magnetic recording & playback Biasing & equalization, Recording medium, Magnetic heads record, replay & erase heads, Audio cassettes, Tape speed, Maximum usable frequency, Tape transport mechanism, Distortion & noise aspects. HI-FI stereo system.

UNIT – III : Video Cassette Recorders
Video recording requirements. Video tape formats. Modulation-up conversion and down conversion of video signal, Servo systems, Functional Block, Functional Block diagram of VCR Video disc recording & playback.

UNIT – IV : Compact Disc Recording and Reproduction
Compact disc advantages, Specifications, CD player optical requirements. CD technology & manufacturing, CD ROM, CD Video. Introduction to DVD technology.

UNIT – V : Television Engineering

Text Books:

Reference Books:
1. S.P. Bali, Consumer Electronics, Pearson Education
UNIT – I : Electromagnetic & Transmission Lines
Elements of vector calculus: Gradient, divergence and Curl; Gauss and Stokes theorems, Maxwell's equations, Differential and Integral forms. Wave equations, Poynting vector.

UNIT – II : High Frequency Devices
High frequency transistors and their equivalent circuit analysis Microwave semiconductor devices. Klystron, Magnetron and TWT. Microwave Instrumentation in Air-Traffic Control.

UNIT – III : Coupling Circuits and Impedance Matching Networks
Resistive, capacitive, inductive, mutual inductive and combination type for R.F. couplings single and double tuned couplings. Effect of loose, tight and optimum couplings, load conditions and Q Various impedance matching networks for low and high impedance loads. Balanced-to unbalanced network.

UNIT – IV : RF Voltage Amplifiers

UNIT – V : RF Power Amplifiers

Text Books:

Reference Books:
1. Network, Lines and Fields, Ryder, 2nd Ed., PHI
2. Engineering Electromagnetism, Hayt, 7th Ed., TMH
3. Microwave Semiconductor Devices, Roy & Mitra, PHI
4. Microwaves, Gupta, New Age International Publishers
UNIT – I : Introduction

UNIT – II : Knowledge Representation
Knowledge – general concepts - predicate logic - representing simple fact - instance and ISA relationships – resolution – natural deduction.

UNIT – III : Knowledge Organization and Manipulation

UNIT – IV : Reception – Communication and Expert Systems
Natural language processing – pattern recognition – visual image understanding – expert system architecture

UNIT – V : Knowledge Acquisition

Text Books:

Reference Books:
Experiments to be performed:
1. Study of LVDT & displacement measurement
2. Study the Characteristics of strain gauge & Measurement of force
3. Study of electromagnetic flow meter
4. Study of hot wire anemometer
5. Study the characteristics of NTC, Thermistor
6. Study of Platinum RDT and draw its characteristics
7. Study of R-type and K-type thermocouple
8. Study of IC temperature Sensor (LM 335)
9. Study the characteristics of photo voltaic cell.
10. Study of characteristics of photo-conductive cell.
11. Discharge coefficient of orifice plate
12. Torque measurement
13. Viscosity measurement
14. Vacuum pressure measurement
15. pH meter standardisation and measurement of pH values of solutions

List of Equipments/Machine Required:
Discrete Components, Function Generator, Power Supply, CRO, AVO Meter, Multimeter, Voltmeter

Recommended Books:
List of Experiments to be performed:

- To write a program to perform subtraction X-Y where X and Y are 48 bit numbers.
- To write a program to multiply 4 and 5 in ASCII and store the result.
- To find the largest number from a block of 15 bytes.
- To find the smallest number from a block of 15 bytes.
- To write a program to add series of 20 bytes.
- A block of 200-signed bytes is present in memory from address BA: EA add all the positive bytes and store 8 bit signed result in memory after this block.
- To write a program to compare two data blocks.
- To write a program to scan for a specific word in the block and to store the location of the word at a suitable memory location.
- To write an assembly language program to solve following arithmetic equation: 3AX+5DX+BP.
- To write a program to arrange a data block in ascending order.
- To write a program to arrange a data block in descending order.
- To write a program to convert an 8-bit BCD number into its equivalent binary.
- To write a program to insert a specific data byte under certain given conditions.
- To write program to input a 4 bit BCD number, look up the seven segment code for this number and output to the display.
- To write a program to count the number of odd and even bytes in a data block.

List of Equipments/Machine Required:
8086 Microprocessor kit, Keyboard, Assembler, PCs.

Recommended Books:
List of Experiments to be performed:
- To generate Analog Signals.
- To generate discrete sequences
- To sample a sinusoidal signal at Nyquist rate
- To convolve two given signals
- To correlate two given signals
- To design LPF using recursive structures
- To design HPF using recursive structure
- To design BPF using recursive structure
- To design BSF using recursive structure
- To design LPF using non-recursive structures
- To design HPF using non-recursive structure
- To design BPF using non-recursive structure
- To design BSF using non-recursive structure
- To design a digital notch filter and embed it on a digital signal processor block
- Experimentation with application of DSP in Communication/Speech Processing/Image Processing

(Institutes may append more programmes/Experiments based on the infrastructure available)

List of Equipments/Machine Required:
C++ Compiler, MATLAB with Tool boxes, DSP Processor kit, Digital Storage CRO, Spectrum Analyzer.

Recommended Books:
1. Digital Signal Processing, Vallavaraj, Salivahanan, Gnanapriya, TMH
Experiments to be performed:

- Introduction to PCB
- Design of PCB
- Fabrication of PCB using Copper clad
- Fabrication of PCB on Glass Epoxy Board
- Fabrication of double sided PCB
- Fabrication of Multilayer PCB
- Testing of PCB
- Winding of RF Choke
- Winding of Transformer for power supply
- Winding of pulse transformer
- Design, fabrication and testing of Power supplies.
- Design, fabrication and testing of low frequency amplifier using transistor
- Design, fabrication and testing of high frequency amplifier using transistor
- Design, fabrication and testing of multi-stage amplifier using transistor
- Design, fabrication and testing of variable frequency oscillator using transistor
- Study and operation of VCR
- Study and operation of Video Camera.

(Institutes may append more programmes/Experiments based on the infrastructure available)

List of Equipments/Machine Required:
PCB design software, PCB Fabrication unit, Discrete components, Transformer winding machine etc..

Recommended Books:
1. Manuals of the instruments
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.

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 books, 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