## Scheme of Teaching and Examination

### B.E. VII 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>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L   T   P</td>
<td>Theory / Practical</td>
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<td></td>
<td></td>
<td></td>
<td>ESE   CT   TA</td>
<td>L+(T+P)/2</td>
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<td>1</td>
<td>Electronics &amp; Instrumentation</td>
<td>327711 (27)</td>
<td>Industrial Electronics</td>
<td>4   1   -</td>
<td>80   20  20</td>
<td>120</td>
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<td>2</td>
<td>Electronics &amp; Instrumentation</td>
<td>327712 (27)</td>
<td>Analytical Instrumentation</td>
<td>3   1   -</td>
<td>80   20  20</td>
<td>120</td>
<td>4</td>
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<tr>
<td>3</td>
<td>Electronics &amp; Instrumentation</td>
<td>327713 (27)</td>
<td>Micro controllers and Applications</td>
<td>3   1   -</td>
<td>80   20  20</td>
<td>120</td>
<td>4</td>
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<td>4</td>
<td>Electronics &amp; Instrumentation</td>
<td>327714 (27)</td>
<td>PC Based Instrumentation</td>
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<td>120</td>
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<td>Refer Table – II</td>
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<td>3   1   -</td>
<td>80   20  20</td>
<td>120</td>
<td>4</td>
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<td>Electronics &amp; Instrumentation</td>
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<td>Industrial Electronics Laboratory</td>
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<td>327722 (27)</td>
<td>Analytical Instrumentation Laboratory</td>
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<td>2</td>
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<td>8</td>
<td>Electronics &amp; Instrumentation</td>
<td>327723 (27)</td>
<td>Micro controllers and Applications Laboratory</td>
<td>-   -   4</td>
<td>40   -    20</td>
<td>60</td>
<td>2</td>
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<td>9</td>
<td>Electronics &amp; Instrumentation</td>
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<td>Minor Project</td>
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<td>100  -     40</td>
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<td>10</td>
<td>Management</td>
<td>300725 (36)</td>
<td>Innovative &amp; Entrepreneurial Skills</td>
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<td>-    -     40</td>
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<td>11</td>
<td>Electronics &amp; Instrumentation</td>
<td>327726 (27)</td>
<td>*Practical Training evaluation &amp; Library</td>
<td>-   -   1</td>
<td>-    -     40</td>
<td>40</td>
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<td>16  5   19</td>
<td>620  100  280</td>
<td>1000</td>
<td>31</td>
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</tbody>
</table>

L-Lecture, T- Tutorial, P- Practical, ESE- End Semester Examination, CT- Class Test, TA- Teacher's Assessment

* To be completed after VI Semester and before the commencement of VII Semester

### Table - II

**Professional Elective - II**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Board of Study</th>
<th>Code</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Electronics &amp; Instrumentation</td>
<td>327751 (27)</td>
<td>Digital Process Control</td>
</tr>
<tr>
<td>2</td>
<td>Electronics &amp; Instrumentation</td>
<td>327752 (27)</td>
<td>Virtual Instrumentation</td>
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<tr>
<td>3</td>
<td>Electronics &amp; Instrumentation</td>
<td>327753 (27)</td>
<td>Instrumentation System Reliability</td>
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<tr>
<td>4</td>
<td>Electronics &amp; Instrumentation</td>
<td>327754 (27)</td>
<td>Neural Network &amp; Fuzzy Logic Control</td>
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<tr>
<td>5</td>
<td>Electronics &amp; Instrumentation</td>
<td>327755 (27)</td>
<td>Digital Image Processing</td>
</tr>
<tr>
<td>6</td>
<td>Electronics &amp; Instrumentation</td>
<td>327756 (27)</td>
<td>Telematics</td>
</tr>
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</table>

Note (1) - 1/4th 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 : DC Amplifiers

UNIT – II : Regulated Power Supplies
Block diagram, Principle of voltage regulation, Series and Shunt type Linear Voltage Regulators, Protection Techniques—Short Circuit, Over voltage and Thermal Protection.

UNIT – III : Switched Mode & IC Regulators
Switched Mode voltage regulator, Comparison of Linear and Switched Mode Voltage Regulators, Servo Voltage Stabilizer, monolithic voltage regulators Fixed and Adjustable IC Voltage regulators, 3-terminal Voltage regulators—Current boosting.

UNIT – IV : Industrial Applications – I
Industrial timers -Classification, types, Electronic Timers – Classification, RC and Digital timers, Time base Generators. Electric Welding – Classification, types and methods of Resistance and ARC welding, Electronic DC Motor Control.

UNIT – V : Industrial Applications – II

Text Books:

Reference Books:
UNIT – I : Introductions
Selection of instruments for application in industries - on line instrumentation and laboratory techniques - a brief review, introduction to the subject, difference between analytical and other instruments.

UNIT – II : Sampling Techniques.
Sampling Systems for liquids and gases for analysis purposes, components, automatic sampling, maintenance.

UNIT – III : Gas Analysis
Gas analysis by chemical absorption, Orsat apparatus, carbon dioxide & monoxide and hydrogen measurements, Manometer, Gravimetric method of gas analysis.

UNIT – IV : Humidity and Moisture Measurement
Measurement of humidity, definition of wet and dry basis moisture content, laboratory methods and online measurement techniques, electrical methods, radioscopy technique, IR Techniques, moisture in gases.

UNIT – V : Spectrochemical Analysis
Classification of techniques, Mass spectrometry, Principle Components, Applications to analysis of solids, Liquids and gases, Emission spectrometry components, spectrophotograph, Applications, Absorption Spectrometry, Electromagnetic radiation spectrum, Schemes for UV, IR and near IR analyzers, Comparison of the methods, Examples of Absorption patterns.

Text Books:

Reference Books:
UNIT – I: OVERVIEW OF ARCHITECTURE AND MICROCONTROLLER RESOURCES

UNIT – II: 8051 FAMILY MICROCONTROLLERS INSTRUCTION SET
Basic assembly language programming – Data transfer instructions – Data and Bitmanipulation instructions – Arithmetic instructions – Instructions for Logical operations on the tes among the Registers, Internal RAM, and SFRs – Program flow control instructions – Interrupt control flow.

UNIT – III: REAL TIME CONTROL: INTERRUPTS
Interrupt handling structure of an MCU – Interrupt Latency and Interrupt deadline – Multiple sources of the interrupts – Non-maskable interrupt sources – Enabling or disabling of the sources – Polling to determine the interrupt source and assignment of the priorities among them – Interrupt structure in Intel 8051.

UNIT – IV: REAL TIME CONTROL: TIMERS
Programmable Timers in the MCU’s – Free running counter and real time control – Interrupt interval and density constraints.

UNIT – V: SYSTEMS DESIGN: DIGITAL AND ANALOG INTERFACING METHODS

Text Books:

Reference Books:
3. S.Yeralan and A.Ahuwalia, ‘Programming and Interfacing the 8051 Microcontroller’, Addison Wesley, 1995
UNIT –I : Introduction to Computers

UNIT – II: Data Acquisition and Control using Standard Cards
PC expansion systems, Plug-in Data Acquisition Boards; Transducer to Control room, Backplane bus – VXI

UNIT – III: PC Programming
Considerations Using the command line interface; Assembly language programming; C and C++ programming; Data transfer; Scaling and linearization.

UNIT – IV : Computers in Process Control

UNIT – V : Data Acquisition Basics
ADC, DAC, DIO, counters & timers, PC Hardware structure, timing, interrupts, DMA, software and hardware installation.

Text Books:

Reference Books:
1. PC Based Instrumentation and Control Third Edition by Mike Tooley ; Elsevier
2. PC Interfacing and Data Acquisition Techniques for Measurement, Instrumentation and Control. By Kevin James; Elsevier
3. Practical Data Acquisition for Instrumentation and Control Systems by John Park and Steve Mackay
Unit – I : Sampling Theorem and Converters

Unit – II : System Response

Unit – III : Function Realisation
State sequences for sampled data systems - solutions - Pulse transformation function by direct, cascade and parallel realization - Sampled data model for continuous system - Controllability and observability.

Unit – IV : Digital Process Control Design

Unit – V : Applications
System models, control algorithms and their implementation for micro processor based position and temperature control systems - Operational features of stepper motors - Drive circuits - Interfacing of stepper motor to microprocessors.

Text Book

Reference Books:
1. Ahson, S.I., “Microprocessors with Applications in Process Control” , TMH.
UNIT – I : Review of Virtual Instrumentation
Historical perspective, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with Conventional programming.

UNIT – II : VI Programming Techniques
VIS and sub-VIS, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O

UNIT – III : Data Acquisition Basics
ADC, DAC, DIO, counters & timers, PC Hardware structure, timing, interrupts, DMA, software and hardware installation.

UNIT – IV : Common Instrument Interfaces
Current loop, RS 232C/ RS485, GPIB, System buses, interface buses: USB, PCMCIA, VXI, SCXI, PXI, etc., networking basics for office & Industrial applications, VISA and IVI, image acquisition and processing. Motion control.

UNIT – V : Use of Analysis Tools
Fourier transforms, power spectrum, correlation methods, windowing & filtering. VI applications in various fields.

Textbooks
2. Lisa K. wells & Jeffrey Travis, Labview for everyone, Prentice Hall.

References
1. Sokoloff, Basic concepts of Labview 4, Prentice Hall.
UNIT – I: Reliability Concepts
Introduction, reliability, importance of reliability in system instrumentation, failures and failure mode, cause of failures, instantaneous failure rate, general reliability function.

UNIT – II: Component Reliability & Hazard Model
Component reliability from test data, failure data (Failure density, failure rate reliability, probability of failure), mean failure rate, mean time to failure, mean time between failure, MTTF in terms of failure density, hazard models, linear hazard model, non-linear hazard model.

UNIT – III: System reliability
Logic diagram of system instrumentation, series configuration, parallel configuration, stand by configuration, Kout of configuration, complex system, markov method, fault tree technique, event space method, tie set method.

UNIT – IV: Reliability Improvement
Introduction, Component versus unit redundancy, weakest link technique, mixed redundancy, stand by redundancy.

UNIT – V: Maintainability & Availability
Introduction, Maintainability function, Availability function, frequency of failure two unit parallel system with repair allocation of redundancy failure rate, time of continuous operation, mean repair time.

Names of Text Books:
1. An Introduction to Reliability and Maintainability Engineering - Ebeling; Tata McGraw Hill

Name of Reference Books:
1. Fault-Diagnosis Systems: An Introduction from Fault Detection to Fault Tolerance, Rolf Isermann
UNIT – I : Introduction to Neural Networks
Different architectures of neural networks, Rosenblott’s perceptrons, multi layer perceptrons, back propagation algorithm, Hopfield’s networks, Kohonen’s self organizing maps, adaptive resonance theory.

UNIT – II : Neural Networks for Control Systems
Schemes of neuro-control, identification and control of dynamical systems, case studies (Inverted Pendulum, Articulation Control)

UNIT – III : Introduction to Fuzzy Logic
Fuzzy sets, fuzzy relations, fuzzy conditional statements, fuzzy rules, fuzzy learning algorithms.

UNIT – IV : Fuzzy Logic for Control Systems
Fuzzy logic controllers, fuzzification interface, knowledge/rule base, decision making logic, defuzzification interface, design of fuzzy logic controllers, case studies (Inverted Pendulum, Articulation Control)

UNIT – V : Neuro-fuzzy and Fuzzy-neural Control Systems

Text Books:

Reference Books:
Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: VII  
Subject: Digital Image Processing  
Total Theory Periods: 40  
Total Marks in End Semester Examination: 80  
Minimum number of Class tests to be conducted: 2

UNIT – I  

UNIT – II  
Statistical properties: Histogram mean, standard deviation, profile different distributions. Image Transform: One and two dimensional DFT the discrete cosine transform, Hadamard transform, haar transform, slant transform.

UNIT – III  
Image Enhancement: Spatial and frequency Domain methods point operations, contrast stretching, bit extraction, range compression, Histogram equalization, modification local enhancement, image smoothing spatial operations, filtering multispectral, color image processing, Pseudo- color image enhancement.

UNIT – IV  
Image restoration: degradation model, Restoration in spatial domain geometric transformation spatial transformation, approach to restoration, Inverse & Wiener filtering, image compression: basics of image compression, models, elements of information theory, error free compression, lossy compression, image segmentation, line detection, edge detection, edge linking and boundary detection, thresholding & region oriented segmentation.

UNIT – V  
Image Analysis: boundary extraction, boundary representation, region representation structure shape features, texture, scene matching and detection. Applications of image processing: Character recognition, diagram understanding, medical imaging, scientific analysis, military guidance and reconnaissance remote sensing, telecommunication.

Name of Text Books:  
2. Digital Image Processing, Madhuri A. Joshi, PHI

Name of Reference Books:  
UNIT – I : Digital Telephony

UNIT – II : Radio Communication Systems
Various types of AM and FM transmitters, Various types of AM and FM communication receivers. Receiver testing.

UNIT – III : Satellite Communications
Basic considerations. Up-link and down link parameters. Orbit and frequency selection. Elements of multiple access techniques. Functional description of earth stations.

UNIT – IV : System Performance Communication

UNIT – V : Mobile Communication
Essential aspects of working of radio paging, cellular radio telephone and cordless telephone.

Text Books:
1. Electronic communication by -D Roody and J. Coolen, PHI, India.
2. Telecommunication and computers by -J. Mortin, PHI, India.

Reference Books:
Experiments to be performed:

1. SCR characteristics.
2. TRIAC characteristics.
3. DIAC characteristics.
4. UJT characteristics.
5. Power control using SCR.
6. Power control using TRIAC.
7. Commutation of SCR class A,B,C.
8. Single phase half controlled rectifier.
12. Study and obtain the waveforms for single-phase fully controlled bridge converter.
13. Perform experiment on triggering circuits for SCR.
   - R-triggering circuit.
   - R-C triggering circuit.
   - UJT triggering circuit.

List of Equipments
Discrete Components, AC and DC Voltage Sources, Voltmeter, Ammeter, CRO, Function Generator, Trainer Kits

Reference Book:
1. Industrial Electronics and Power Control, H.C. Rai, Umesh Publications.
Experiments to be performed:

1. To measure pH value of given solution pH meter.
2. To determine suspended particular matter using right volume air samples.
3. Find out concentration of (Na or K) by flame photo meter in the given sample.
4. To measure transmittance and absorption of a solution using Single beam spectro photo meter.
5. To study water analysis kit & measure pH, temperature, conductivity, dissolved O₂ of a given solution.
6. To measure the conductivity of solution indicator controller.
7. To study the analysis of flue gases.
8. To study ion selective electrode.
9. To study pH monitor and controller.
10. Study of silica analyzer and zirconia based oxygen analyzer.
11. Study calibration technique of analysis.
12. Study gas/liquid chromatograph.

List of equipments:

pH Meter, Flame photometer, Spectrophotometer, Conductivity meter, Oxygen Analyzer, Chromatograph, Mathanometer and related instruments and chemicals.

Reference Book:

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: VII                     Branch: E&I
Subject: Microcontrollers and Applications Laboratory Code: 327723 (27)
Total Practical Periods: 50          Total Marks in End Semester Examination: 40

Experiments to be performed:
1. Write a microcontroller 8051 program to transfer the bytes into RAM locations starting at 50H, assuming that ROM space starting at 240H contains CHHATTISGARH by using – a) a Counter, b) null char for end of string.
2. Write a microcontroller 8051 program to get hex data on the range of 00-FFh from port 0 and convert it to decimal. Save the digits in R7, R6 and R5, where the least significant digit is in R7.
3. Write a microcontroller 8051 program to add two 16 Bit unsigned numbers. Results to be in R1-R0 pair.
4. Write a microcontroller 8051 program to subtract an unsigned 16 Bit number from another. Operands are two RAM variables. Results to be in R1-R0 pair.
5. Write a microcontroller 8051 program to add two unsigned 32-bit numbers. Operands are two RAM variables. Results to be in R1-R0 pair.
6. Write a microcontroller 8051 program to add two 16 Bit signed numbers.
7. Write a microcontroller 8051 program to convert a binary number to equivalent BCD
8. Write a microcontroller 8051 program to convert a packed BCD number to two ASCII numbers and place them in R5 and R6.
9. Write a microcontroller 8051 program to calculate the square root of an 8-bit number using iterative method.
10. Write a microcontroller 8051 program to add two floating-point numbers.
11. Write a microcontroller 8051 program to multiply two floating-point numbers.
12. Write a microcontroller 8051 program that generates 2kHz square wave on pin P1.0, 2.5 kHz on pin P1.2 and 25 Hz on pin P1.3.
13. Write a microcontroller 8051 program for counter 1 in mode 2 to count the pulses and display the state of the TL1 count on P2. Assume that the clock pulses are fed to pin T1.
14. Write a microcontroller 8051 program to transfer letter “N” serially at 9600 baud, continuously. Assume crystal frequency to be 11.0592 MHz.
15. Write a microcontroller 8051 program to transfer word “CSVTU” serially at 4800 baud and one stop bit, continuously. Assume crystal frequency to be 11.0592 MHz.
16. Write a microcontroller 8051 program to receive bytes of data serially, and put them in P1. Set the baud rate at 2400 baud, 8-bit data, and 1 stop bit. Assume crystal frequency to be 11.0592 MHz.

List of Equipments/Machine Required:
Microcontroller kit, Interfacing kit, Keyboard, Monitor, SMPS for Microcontroller

Recommended Books:
Unit I
Innovation: innovation- an abstract concept; creativity, innovation and imagination; types of innovation - classified according to products, processes or business organizations.

Unit II
Entrepreneurship: who is an entrepreneur? Entrepreneurship- A state of Mind, Emergence of entrepreneur; Role of Entrepreneur; A Doer not a Dreamer- Characteristics of an entrepreneur; Factors affecting entrepreneurial growth – Social, cultural, personality factors, psychological and Social Factors. Impact of Entrepreneurship for sustainable development.

Unit III
Difference between entrepreneur and entrepreneurship, Difference between entrepreneur and intra-preneur, Common Entrepreneurial competencies/Traits; Entrepreneurship stimulants, Obstacles inhibiting Entrepreneurship; Types of entrepreneurs, Functions of an entrepreneur.

Unit IV

UNIT-V

Text and Reference Books:
1. Competing through Innovation-Bellon & Whittington, Prentice Hall of India
3. Entrepreneurship- Rober D Hisrich, Peters, Shepherd- TMH
4. Entrepreneurship in Action- Coulter, Prentice Hall of India
5. Entrepreneurship Management and Development – Ajith Kumar, HPH
6. Fundamentals of entrepreneurship- Mohanty, PHI