<table>
<thead>
<tr>
<th>Course Code</th>
<th>Name of the Course</th>
<th>Teaching Scheme</th>
<th>Evaluation Scheme</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Theory Hrs/week</td>
<td>Practical Hrs/week</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Theory Hrs/week</td>
<td>Practical Hrs/week</td>
<td>TA</td>
<td>CT1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tutorial Hrs/week</td>
<td></td>
<td>CT2</td>
<td>ESE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sem III</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IN301</td>
<td>Engineering Mathematics III</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>IN302</td>
<td>Electronic Devices &amp; Circuits</td>
<td>4</td>
<td>---</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>IN303</td>
<td>Signal &amp; System</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>IN304</td>
<td>Circuit Theory</td>
<td>4</td>
<td>---</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>IN305</td>
<td>Digital Electronics</td>
<td>4</td>
<td>---</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>IN306</td>
<td>Electronic Devices &amp; Circuits Lab</td>
<td>---</td>
<td>---</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>IN307</td>
<td>Circuit Theory Lab</td>
<td>---</td>
<td>---</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>IN308</td>
<td>Digital Electronics Lab</td>
<td>---</td>
<td>---</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>IN309</td>
<td>Computational method lab -I*</td>
<td>---</td>
<td>---</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>20</td>
<td>2</td>
<td>8</td>
<td>30</td>
</tr>
<tr>
<td>Sem IV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IN401</td>
<td>Engg. Mathematics IV</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>IN402</td>
<td>Sensors&amp; Transducer</td>
<td>4</td>
<td>---</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>IN403</td>
<td>Control System Component</td>
<td>4</td>
<td>---</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>IN404</td>
<td>Numerical Methods</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>IN405</td>
<td>Linear Integrated Circuits</td>
<td>4</td>
<td>---</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>IN406</td>
<td>Sensors&amp; Transducer Lab</td>
<td>---</td>
<td>---</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>IN407</td>
<td>Control System Component Lab</td>
<td>---</td>
<td>---</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>IN408</td>
<td>Linear Integrated Circuits Lab</td>
<td>---</td>
<td>---</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>IN409</td>
<td>Computational Method Lab -II**</td>
<td>---</td>
<td>---</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>20</td>
<td>2</td>
<td>8</td>
<td>30</td>
</tr>
<tr>
<td>Sem V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IN501</td>
<td>Microprocessor Based Instrumentation</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>IN502</td>
<td>Chemical &amp; Analytical Instrumentation</td>
<td>4</td>
<td>---</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>IN503</td>
<td>Digital Signal Processing</td>
<td>4</td>
<td>---</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>IN504</td>
<td>Electronic Instrumentation</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Code</td>
<td>Course Title</td>
<td>Credit</td>
<td>Theory</td>
<td>Lab</td>
<td>Prac</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------------------</td>
<td>--------</td>
<td>--------</td>
<td>-----</td>
<td>------</td>
</tr>
<tr>
<td>IN505</td>
<td>Material Science &amp; Process</td>
<td>4</td>
<td>10</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>IN506</td>
<td>Microprocessor Based Instrumentation Lab</td>
<td>---</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>IN507</td>
<td>Chemical &amp; Analytical Instrumentation Lab</td>
<td>---</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>IN508</td>
<td>Electronic Instrumentation Lab</td>
<td>---</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>IN509</td>
<td>General Proficiency-I</td>
<td>---</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
<td><strong>2</strong></td>
<td><strong>8</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

**Sem VI**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit</th>
<th>Theory</th>
<th>Lab</th>
<th>Prac</th>
<th>Essay</th>
<th>Exam</th>
<th>Project</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN601</td>
<td>Distributed Control System</td>
<td>4</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>60</td>
<td>---</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td>IN602</td>
<td>Microcontroller &amp; It's Application</td>
<td>4</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>60</td>
<td>---</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td>IN603</td>
<td>Power Electronics</td>
<td>4</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>60</td>
<td>---</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td>IN604</td>
<td>Power Plant Instrumentation</td>
<td>4</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>60</td>
<td>---</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td>IN605</td>
<td>Feedback Control System</td>
<td>4</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>60</td>
<td>---</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td>IN606</td>
<td>Distributed Control System Lab</td>
<td>---</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>25</td>
<td>25</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>IN607</td>
<td>Microcontroller &amp; It's Application Lab</td>
<td>---</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>25</td>
<td>25</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>IN608</td>
<td>Power Electronics Lab</td>
<td>---</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>25</td>
<td>25</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>IN609</td>
<td>General Proficiency-II</td>
<td>---</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>50</td>
<td>---</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>IN610</td>
<td>Minor Project</td>
<td>---</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>---</td>
<td>25</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
<td><strong>---</strong></td>
<td><strong>10</strong></td>
<td><strong>30</strong></td>
<td><strong>50</strong></td>
<td><strong>75</strong></td>
<td><strong>50</strong></td>
<td><strong>750</strong></td>
</tr>
</tbody>
</table>

**Sem VII**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit</th>
<th>Theory</th>
<th>Lab</th>
<th>Prac</th>
<th>Essay</th>
<th>Exam</th>
<th>Project</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN701</td>
<td>Modern Control Theory</td>
<td>4</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>60</td>
<td>---</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td>IN702</td>
<td>Biomedical Instrumentation</td>
<td>3</td>
<td>4</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>60</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td>IN703</td>
<td>Instrumentation System Design</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>60</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td>IN704</td>
<td>Operation Research &amp; Management</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>60</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td>IN705</td>
<td>Elective-I</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>60</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td>IN706</td>
<td>Biomedical Instrumentation Lab</td>
<td>---</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>---</td>
<td>25</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>IN707</td>
<td>Instrumentation System Design Lab</td>
<td>---</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>---</td>
<td>25</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>IN708#</td>
<td>Seminar &amp; Project</td>
<td>---</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>---</td>
<td>---</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
<td><strong>---</strong></td>
<td><strong>10</strong></td>
<td><strong>30</strong></td>
<td><strong>5</strong></td>
<td><strong>75</strong></td>
<td><strong>150</strong></td>
<td><strong>750</strong></td>
</tr>
</tbody>
</table>

**Sem VIII**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit</th>
<th>Theory</th>
<th>Lab</th>
<th>Prac</th>
<th>Essay</th>
<th>Exam</th>
<th>Project</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN801</td>
<td>Process Instrumentation &amp; Control</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>60</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td>IN802</td>
<td>Project Engineering &amp; Management</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>60</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td>IN803</td>
<td>Elective -II</td>
<td>4</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>15</td>
<td>60</td>
<td>---</td>
<td>100</td>
</tr>
</tbody>
</table>
### Electives

<table>
<thead>
<tr>
<th>Elective-I (IN705)</th>
<th>Elective-II (IN803)</th>
<th>Elective-III (IN804)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Opto- Electronics Instrumentation</td>
<td>A) Advance Sensors</td>
<td>A) Image Processing</td>
</tr>
<tr>
<td>B) Instrumentation for agriculture &amp; Food Processing</td>
<td>B) Neural Network and Fuzzy logic control</td>
<td>B) Adaptive Control</td>
</tr>
<tr>
<td>C) Embedded Systems</td>
<td>C) Computer Network</td>
<td>C) System Identification</td>
</tr>
<tr>
<td>D) Biomedical Signal Processing</td>
<td>D) Digital Control System</td>
<td>D) Nonlinear Control</td>
</tr>
</tbody>
</table>

Duration of ESE is 2 Hrs 30 Minutes for all courses

**TA**: Teacher Assessment  
**CT**: Class Tests  
**ESE**: End Sem. Examination

* For project there will be 4 students in each batch

** Lab-I has programming based on basic MATLAB

** Lab -II has programming based on MATLAB toolbox like neural network, fuzzy logic optimization
Introduction to 8085: Architecture and operation, pin out diagram. Assembly language programming for 8085 microprocessor instruction classification, instruction set study in details, addressing modes, writing assembly language programs, stacks subroutines, floating point routines. Instruction set timing diagrams, a minimum configuration for 8085.

Parallel I/O and Interfacing: - In Basic interfacing concept, Memory- mapped I/O, I/O mapped concept interfacing memory. Interfacing memories EPROM and RAM with 8085 with exhaustive and partial decoding techniques.

Interrupt structure of 8085: - Internal interrupt circuit, hardware and software interrupts, serial data transfer. Following structure programmable peripheral devices are to be studied in details as regards to Introduction, block diagram, Functional pin Configuration Control word format and different mode, software for their interfacing with 8085: 8255, 8253, 8279, 8251, 8259 and 8257.

Interfacing application: Interfacing seven segment displays keyboard, A to D and D to A converter.

Microprocessor based data acquisition and control system: Temperature control system, Flow control system etc. Introduction to 8086, 80486, and Pentium processors.

Text Books:


Reference Books:

IN502 CHEMICAL AND ANALYTICAL INSTRUMENTATION

Teaching Scheme: 04 L+00T Total 04                                            Credit: 04
Evaluation Scheme: 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100
Duration of ESE     : 2hrs 30min.

Introduction to Chemical Instrumental Analysis, Advantages over classical (gravimetric and volumetric analysis) methods. Ultraviolet (UV) and visible absorption instruments components. Beer-Lambert Law, monochromator: design and associated equipment. UV and visible instruments, Colorimeter, Spectrophotometer: Single and Dual Beam.

Infra Red (IR) Spectrophotometers: Basic components and types.


Flame Photometry: Principle, Constructional details, Fuel gases, Atomizer, Burner, Optical and Recording System.

Atomic absorption Spectrometer: Theoretical concept. Instrumentation, hollow cathode lamp, Burner and flames, Plasma excitation sources.

Nuclear magnetic Resonance (NMR) Spectrometry: Principle, Nuclear spin, Chemical shift, constructional details, Spin decoupler, Fourier transform NMR Spectroscopy.


**Electron and Ion Spectroscopy**: Electron Spectroscopy for chemical analysis (ESCA), Auger Electron Spectroscopy (AES), Secondary Ion Mass Spectrometry (SIMS).

**Radio Chemical Instrumentation**: Radio chemical methods (Ionization chamber, Geiger Muller, Proportional counters).

**X-Ray Spectrometry**: Spectrum, Instrumentation, Diffractometers.

**Gas & Liquid Chromatography**: Classification, Basic parts, Carrier gas, Simple Injection System, Chromatographic column, thermal compartment, Dual column system, Detectors (thermal conductivity, flame ionization, electron capture). Introduction to Liquid Chromatography.

**Methods of Gas Analysis**: Oxygen, Carbon monoxide, Nitrogen analyzer, gas density analyzer.

**Refractometry**: Principle, Abbe & Dipping types.

**Text Books:**


**Reference Books:**

1. Instrumental Methods of Analysis by Willard, Merrit & Dean , CBS Publication, Sixth Edition 1986

---

**IN503 DIGITAL SIGNAL PROCESSING**

**Teaching Scheme** : 04 L + 01 T Total 05

**Evaluation Scheme** : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks : 100

**Duration of ESE** : 2hrs 30min.

Matlab should be used while imparting the instructions.

Digital filter structure: Block diagram representation, equivalent structures, Basic FIR structures, Basic IIR structures, All pass filters, IIR tapped cascaded lattice structures, FIR cascaded lattice structures.

Digital Filter design: IIR filter design – Bilinear transformation, Impulse invariant transformation, Low pass IIR digital filters, Spectral transformations, FIR filter design using windowing techniques, Frequency sampling technique, and Computer aided design.

DSP algorithm implementation: Computation of DFT, FFT algorithms, Decimation in time, Decimation in Frequency, Different algorithms of FFT such as DIT and DIF where input and output is in order, radix-n algorithms.

Introduction to Multirate Filter Banks and Wavelets

Introduction to DSP processors

Applications of DSP: Biometrics and Applications of DSP processors in control Systems (one application of each).

Text Books:


Reference Books:

5. Introduction to Wavelets and Wavelet Transform” by Burrus C. S. , Ramesh and Gopinath A., Prentice Hall India.
IN 504 ELECTRONICS INSTRUMENTATION

Teaching Scheme : 04 L+00T Total 04 Credit : 04

Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100

Duration of ESE : 2hrs 30min.

Experimental data and errors: Measurement recording and reporting, graphical presentation of data, precision and accuracy, resolution and sensitivity, errors in measurement, statistical evaluation of measurement data and errors.

Electrical laboratory practice: Safety, grounds, circuit protection devices, cables, connectors, switches and relays, input impedance, output impedance and loading power transfer and impedance matching.

Analog DC and AC meters: Electromechanical meter movements, analog ac ammeters and voltmeters, analog multimeters.

Digital electronic meters: Counting and encoding, display devices, digital voltmeters, digital multimeters.

D.C and A.C bridges and applications: Whetstone Bridge, Kelvin bridge, Schering and Maxwell bridge, Wein bridge, Q meter.

The oscilloscope: Oscilloscope subsystems, display (cathode-ray tube), vertical deflection subsystem, dual –trace feature, horizontal deflection sub system, oscilloscope probes, oscilloscope controls, special purpose oscilloscope.

Recorders and potentiometer: Potentiometer, recorder, machine-interpretable recorders.

Time and frequency measurements: Time, frequency and phase measurement Interference signals and their elimination or reduction: Capacitive interference, inductive interference, input shielding, electromagnetic interference and shielding, input guarding to reduce ground-loop interference, internal noise.

Text Books:


Reference Books:

1. Modern electronic instrumentation and measurement techniques, by Helfric A, D and Cooper W. D Prentice Hall of India 2005
2. Electronic measurements, by Kantrowitz, Kousourou, and Zucker Prentice Hall, New Jersey

IN505 MATERIAL SCIENCE AND PROCESSES

Teaching Scheme : 04 L+00T Total 04 Credit : 04

Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100

Duration of ESE : 2hrs 30min.

Introduction to Engineering Materials, Materials classification and engineering requirements of materials, factor affecting the selection of materials for engineering purposes, properties of engineering materials, testing of materials, tensile test, torsion and shear test, compression test, impact test, hardness test, fatigue test, S-N diagram, creep of materials, Erichsen test.

Introduction To Manufacturing Processes, Casting, cold working and hard working processes like rolling, forging, extrusion, etc Crystal structure of metals and alloys: FCC, BCC, HCP.

Materials and their applications for electrical and electronic component, Materials for resisters, properties and applications, Superconducting materials, Transducers materials, Semiconductors-commonly used type working applications. Thermistors, Piezoelectric, ferro electric and Ferro ceramic materials, die electric materials and dielectric constant, capacitor insulating materials, properties of fibrous material, ceramic, mica glass, rubber, plastics, thermo setting and thermoplastic resins, insulating waxes, varnishes and coolants. Effects of carbon composition and applications.

Magnetic materials: soft material and hard magnetic materials ferrites and Di para antiferro, ferromagnetism.
Thermocouple materials: soldering materials, Fuse materials, contact materials, fluorescent and phosphorescent materials, processing of electronic materials, crystal growth, purification, junction IC fabrication processes of galvanizing and impregnation.

Text Books:


Reference Books:


IN 506 MICROPROCESSOR BASED INSTRUMENTATION LABORATORY

Teaching Scheme : 02 P Total 02 Credit : 01
Evaluation Scheme : 25 Internal + 25 External Total Marks: 50

Minimum 8 Experiments should be conducted from the sample list given below.

However experiment beyond the list and based on curriculum of IN501 may be conducted.

1. To study the architecture of 8085 microprocessor.
2. Addition and subtraction of 8/16/32 bit numbers
   1. (Number should be placed in memory).
3. Multiplication and division of 8 bit numbers using add and shift method.
4. Write an assembly language program to handle RST7.5 interrupt
5. Block transfer
6. Searching and Sorting
7. BCD binary Arithmetic
8. Number system conversion
9. Interfacing 7-segment displays with 8255.
10. Interfacing DAC
11. Interfacing ADC
13. Software implementation of ADC
14. Observing timing diagram on CRO.
15. Study of interrupts.
16. Interfacing programs must be based on applications used in process industries.

**Practical Examination:**

It consists of performance of experiment based on file/journal/report submitted by students and oral based on curriculum of course IN501.

---

**IN 507 CHEMICAL AND ANALYTICAL INSTRUMENTATION LABORATORY**

**Teaching Scheme : 02 P Total 02**

**Credit : 01**

**Evaluation Scheme : 25 Internal + 25 External**

**Total Marks: 50**

Minimum 8 Experiments should be conducted from the sample list given below.

However experiment beyond the list and based on curriculum of IN502 may be conducted.

1. To find pH of given solution.
2. To study conductivity measurement.
3. Analysis of colour by using colorimeter.
4. To study spectro-photometer
5. To Study Fluorimeter.
6. To study flame photometer.
7. To determine the Refractive index by using refractometer.
8. Use of gas chromatography for analyzing components of gas mixtures.
9. To study Nuclear Magnetic Resonance(NMR)
10. To study Atomic absorption spectrometer(AAS)

**Practical Examination:**

It consists of performance of experiment based on file/journal submitted by students and oral based on curriculum of course IN502.
IN 508 ELECTRONICS INSTRUMENTATION LABORATORY

Teaching Scheme : 02 P Total 02                                                                 Credit : 01
Evaluation Scheme : 25 Internal + 25 External                                    Total Marks: 50

Minimum 8 Experiments should be conducted from the sample list given below.

However experiment beyond the list and based on curriculum of IN504 may be conducted.

1. Measurement of resistance (high, medium, low)
4. Phase and frequency measurement on CRO using Lissajous pattern
5. Study of digital storage oscilloscope
7. Study of recorders.
8. Digital measurement of phase and frequency.
9. Study of AC and DC meters.

**Practical Examination:-**

It consists of performance of experiment based on file/journal submitted by students and oral based on curriculum of course IN504.

IN 509 GENERAL PROFICIENCY-I

Teaching Scheme : 02 P Total 02                                                                 Credit : 02
Evaluation Scheme : 50 Internal + 50 External                                    Total Marks: 100

After completing this course the student should able to get proficiency in Reading, Writing and Speaking Skills

**Style and Structure:** Art of writing, Elements of prose, aspects of effective style, patterning the test, editing the own writing, the mechanism of writing Comprehension.

**Writing at work, home:** Writing letters at work, how to write reports, writing for meeting, job application, writing letters from home, invitation and announcement, modes of address, coping with exams, studied techniques, essay writing and research,
The skill of good speaking: improving your voice and speech, the art of conversation, public speaking, using visual aids, being interviewed by media, job interview, dealing with the boss, dealing with the subordinates, how to run a meeting, negotiating and selling

Thinking skill.: How to think, critical thinking and lateral thinking. Memorizing and memorizing skills

Reference Books:

1. Orient communication in English for technical students, by Longman, TTTI Calcutta.
2. How to write and speak better, Reader’s digest, By John Ellison Kahn, Touchan Books Limited.
3. Six Hat thinking, by Bono E.D., Pengwin Books
4. English Grammar by Wren and Martin.

Minimum 8 tutorials/assignments/group discussions based on above curriculum,

following list will be considered as a guideline.

1. Vocabulary building. (words/week)
2. Demonstration of audio, video CDs.(LRs)
3. Reading, orating and writing paragraphs from English daily.
   a. Precise writing and comprehension.
   b. Enriching communication with use of idioms and phrases.
   c. Learning read/write/speak by listening to learning recourses
4. Supervised one to one, one to many and many to many communication (letter,
   d. extempore, board writing, telephonic conversation, debate, elocution etc.)
5. Demonstration of Audio, Video CDs of interviews, speeches etc.
6. Audio recording of the conversations and analysing it offline.
7. Pronunciation of foreign language words commonly practiced. (French,
   Greek, Latin etc)
8. Six thinking hats/lateral thinking.
9. Practice of memorizing

Practical Examination:

The examination consists of oral based on tutorial/assignments/reports
IN601 DISTRIBUTED CONTROL SYSTEM

Teaching Scheme : 04 L +00T Total 04 Credit : 04

Evaluation Scheme: 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100

Duration of ESE : 2hrs 30min.

**Introduction:** To programmable logic controllers, PLC architecture, operation, definition of discrete process control, ladder diagrams, ladder diagram elements, ladder programming and its features, programming examples of typical processes.

**Hierarchical control:** Hierarchical control, overall tasks of the system, task listing, lower and higher level computer tasks. The centralized control and its features Personal computers in process control, direct digital control, distributed process control.

**Introduction:** to supervisory control and data acquisition (SCADA) as applied to process control systems.

**DCS Configurations:** Functional block diagram of DCS, supervisory computer displays, Software configurations in DCS, control technique, Communication between components of DCS, DCS algorithm, attributes. Study of any one DCS such as TDC-3000.

**Introduction:** To data highways, Field buses, Multiplexers and remote sensing terminal units.

**System integration:** With PLC and computer (Hybrid control system), I/O hardware, set point stations, Network protocols, MAP/TOP.

**Computer integrating process** communication hierarchy, ISO/OSI reference model, MAP, TOP application. Study of YOKOGAWA, Rosemount Distributed Control Systems.

**Text Book:**


**Reference Books:**


IN602 MICROCONTROLLERS AND ITS APPLICATIONS

Teaching Scheme : 04 L +00T Total 04
Credit : 04

Evaluation Scheme: 15 CT1 + 15 CT2 +10 TA+ 60 ESe
Total Marks: 100

Duration of ESE : 2hrs 30min.

Introduction to microcontrollers: Evaluation of Microcontroller , Classification families, manufacturer and applications, Comparison of microprocessor and microcontrollers 4-bit, 8-bit, and 16-bit microcontrollers 89C5I and other 8-bit microcontroller chips, System Development tools, assembler Simulator, Emulator, EPROM programmers.

8051 Architecture: Pin out diagram, 8051 oscillator and clock, Program counter and Data Pointer, A and B CPU registers, Flags and Program Status Word, internal memory, stack and stack pointer, Special Function Registers, internal ROM, i/p and o/p ports.

Assembly language programming for 8051 microcontroller instruction classification, instruction set Arithmetic and logical operations, jump and call instructions etc., Writing assembly language programming based on instruction set, stacks and subroutines.

Interrupts of 8051: Serial data input and output, serial data transmission and communication counters and timers, timer modes timer/counter programming. 8051 microcontroller interfacing with: 8255, Keyboard and Display, A/D and D/A chips external memories (RAM and EPROM).

Design of dedicated systems using 8051 for temperature indication OR/AND control, Flow indication OR/AND control stepper motor control Embedded control systems, Smart transmitters.

**Microcontroller Selection:** Features, architectures and instruction set comparison of 8051 ATMEL, MOTOROLA, DALLAS Devices data sheets.

**Text Books:**


**Reference Books:**

2. The 8051 Microcontroller and Embedded System By Mazidi M.A., Pearson Education 2004

---

**IN603 POWER ELECTRONICS**

**Teaching Scheme** : 04 L+00T Total 04

**Evaluation Scheme** : 15 CT1 + 15 CT2 +10 TA+ 60 ESE

**Total Marks**: 100

**Duration of ESE** : 2hrs 30min.

---

**Introduction:** Modern power semiconductor devices and their characteristics, gate drive specifications, ratings, applications, Design of gate triggering circuits using UJT, PUT, IGBT ,Diac, Triac, Thyristor and Thyristor protection circuits.

**Thyristor Commutation Techniques:** Principles of Natural commutation, Design of Forced commutation circuits: Self commutation, Impulse commutation, Resonant pulse commutation, Complementary commutation, External pulse commutation.

**Phase Controlled Rectifiers:** Single phase rectifiers: Half wave, Center tapped, Bridge (half controlled and fully controlled) with R and RL load.

**Three phase rectifiers:** Half wave, Bridge with R and RL load. Effect of source inductance, voltage and current harmonics analysis, dual converters. Power factor improvement methods.

**DC Chopper:** Basic chopper, continuous and discontinuous current conduction; TRC, CLC methods, classification of choppers, step-up chopper.
**AC Voltage Controller**: Types of ac voltage controllers, single-phase ac voltage controllers with R and RL load, transformer tap changers.

**Inverters**: Single phase inverters: series, parallel and bridge configurations with R load, PWM inverters. Three phase inverters with 120° and 180° conduction with R and load RL, voltage control and harmonics reduction.

**Cycloconverters**: The basic principle of operations of single phase to single phase, three phase to single phase, three phase to three phase with circulating and non-circulating mode.

**Speed control of DC motors**: Using different rectifiers, principles of regenerative braking, principles of two/ four quadrant chopper drives, control using multiphase choppers, microprocessor control of DC drives.

**Speed control of AC motors**: Stator voltage control, rotor voltage control, frequency control, voltage and frequency control, microprocessor control of AC drives.

**Text Books:**


**Reference Books:**

Basic concept: Unit operation & unit process, block diagram of chemical process, classification of unit operation, material and energy balance, batch and continuous process, endothermic and exothermic reactions, reversible and irreversible process, humidification and dehumidification.

Extraction: Field of application of liquid extraction, selection of solvent, Extraction Equipments: mixer settlers, spray column. Leaching Equipment.

Transportation & Systems: Classification, efficiency and characteristics of pumps, compressors, fans, blowers and NPSH of centrifugal pumps.

Heat Exchangers: Types of heat exchangers.

Distillation: Continuous, Fractionating columns, plate efficiencies, flash distillation and batch distillation.


Evaporation: Types of evaporators, single effect evaporators, multiple effect evaporators, forced circulation evaporator.

Thermal Power plant: Unit overview, types of boilers, turbine generators, condensers, material handling systems. Introduction to Hydroelectric power plant & Nuclear Power plant. Automation strategy for power plant.

Boiler Instrumentation: Control and optimization, combustion control air to fuel ratio control, three element drum level control, steam temperature and pressure control, O₂/CO/CO₂ in flue gases, furnace draft, boiler interlocks.

Filtration: Mechanism of filtration, rotary drum filter, suspended batch centrifuge, clarifying filter, cyclone, bag filter.

Separation: Hydroclone, Centrifugal decanter, disk centrifuge.

Size Reduction: Crushing laws, crushing equipments.
Text Books:


Reference Books:

2. Computer Based Industrial Control by Krishan Kant Prentice Hall of India7th Edition 2005

IN605 FEEDBACK CONTROL SYSTEM

Teaching Scheme: 04L+00TTotal04 Credit :04

Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100

Duration of ESE : 2hrs 30min.

Introduction: Basic definition of control system and related terms, historical development of automatic control system, basic control action, classification of control system, open loop and closed loop system, examples.

Mathematical modeling of physical systems: Definition of physical system, linear, non linear, time varying, time invariant systems, differential equation of physical systems- mechanical system, electrical system, thermal system, pneumatic system, Analogy between electrical and mechanical system.

Transfer functions: Transfer function of physical system, Block dig. Algebra, reduction rules, signal flow graph- definition, construction properties, Masons gain formula, Application of gain formula to block diagrams.

Time response analysis: Standard test signals, Analysis of first order and second order systems, time response specifications, steady sate error, system types and error constants.

**Frequency response analysis:** General response of closed loop system, introduction to frequency response, Bode plots, stability margins for the Bode plot, stability analysis of system using bode plots, polar plots, Nyquist stability (Use MATLAB)

**Introduction to Compensation technique** in frequency and time domain

**Text Books:**

2. Control system Engg. By Ogata K.

**Reference Books:**

5. Modern control systems by Ogata K., PHI publication 4th edition

**IN 606 DISTRIBUTED CONTROL SYSTEM LABORATORY**

**Teaching Scheme** : 02 P Total 02 Credit : 01

**Evaluation Scheme** : 25 Internal + 25 External Total Marks: 50

Minimum 8 Experiments should be conducted from the sample list given below.

However experiment beyond the list and based on curriculum of IN601 may be conducted.

1. Architectural study of Allen bradly PLC.
2. Study of any one PLC software package.
3. Developments of Ladder diagram for the controlling motor operation
4. Development of ladder diagram for temperature control system.
5. Development of Ladder diagram for bottling plant.
6. Study of Software package for SCADA
7. Development of mimic diagram for a particular process using SCADA software
8. Comparative Study of SIMATIC range of products(S7-200,300,400 PLC)
9. Study of any one DCS software package.
10. Comparative study of DCS systems.

**Practical Examination:**

It consists of oral based on file/journal/report submitted by students based on curriculum of course IN601.

**IN 607 MICROCONTROLLERS AND ITS APPLICATIONSLABORATORY**

**Teaching Scheme** : 02 P Total 02  
Credit : 01

**Evaluation Scheme** : 25 Internal + 25 External  
Total Marks: 50

Minimum 8 Experiments should be conducted from the sample list given below.

However experiment beyond the list and based on curriculum of IN602 may be conducted.

1. At least 4 software programs from the following list  
a. Block transfer  
b. Searching Sorting  
c. BCD binary Arithmetic  
d. Number system conversion etc.

2. Block operational  
a. Moving  
b. Exchange  
c. Search  
d. Sum  
e. Avg.

3. Interfacing Keys and LED’s with microcontroller.
4. Interrupts timers serial communication.
5. Interfacing ADC with microcontroller.
6. Interfacing DAC with microcontroller.
7. Interfacing 7 segment display and keyboard with microcontroller
8. Study of interrupts.
9. Interfacing of stepper motor with microcontroller
10. PC downloads experiment

**Practical Examination:**

It consist of performance of experiment based on file/journal/report submitted by students and oral based on curriculum of course IN602
Minimum 8 Experiments should be conducted from the sample list given below.

However experiment beyond the list and based on curriculum of IN603 may be conducted.

1. UJT Relaxation oscillator.
2. SCR characteristics.
3. Triac characteristics.
4. Power control using SCR.
5. Power control using Triac.
8. Fully controlled full wave.
10. Basic transistor chopper.

**Practical Examination:**

It consist of performance of experiment based on file/journal/report submitted by students and oral based on curriculum of course IN603

**IN 609 GENERAL PROFICIENCY-II**

Memorizing and memorizing technique

**Verbal communication:** Interpersonal skills, Group Discussion Face to Face

Communication, Interview Techniques, Ways of conducting meeting Seminars and Conferences, Workshops etc
Written Communication: Format for Business Correspondence Technical Proposals, Research Papers, Articles, Advertising and Graphics, Notices minutes of meetings Quotations, Order, Enquiry

Reference Books:

1. Orient communication in English for technical students, By Longman, TTTI Calcutta (for first topic)
2. How to write and speak better, Reader’s digest, By John Ellison kahn, Touchan Books Limited.
3. Body language, By Allan Pease, Sheldon press

The sample list is given below as a guideline. The list is to inform about minimum expected outcome.

1. Live observation of the conversation/communication, body language.
2. Learning conversation by listening to guidelines.(with learning recourses)
3. Supervised one to one, one to many and many to many conversation can be practiced.
4. Demonstration of Audio, Video CDs of well known personalities.
5. Audio recording of the conversations and analyzing it offline.
6. Video recording of the conversations and analyzing it offline.
7. Talking in front of mirror in the laboratory in presence of observers like other batch mates, group leaders and/or teachers

The internal assessment is based on submission of Tutorials/assignments/group discussion and oral based on Curriculum of course IN609.

IN 610 MINOR PROJECT

Teaching Scheme : 02 P Total 02 Credit : 02
Evaluation Scheme : 50 Internal Total Marks: 50

The Minor Project consist of Design and fabrication of Instrumentation oriented projects such as

1. Process Instrumentation & Automation
2. Biomedical Instrumentation
3. Electronic Instrumentation
The minor project work should be carried out in laboratory only. The topic may be given to the individual student or group of not more than three students. The evaluation will be based on the quality of work, report, presentation and demonstration by the students in front of the Expert committee from the department.