

**Sir.C R REDDY COLLEGE OF ENGINEERING, ELURU**  
**DEPT. OF ELECTRONICS AND INSTRUMENTATION ENGG.**

**Scheme of Instruction, Examination and Syllabus**

**FIRST YEAR**  
**I & II SEMESTERS**

Code. No	Subject	Credits	Periods		Exam Hrs.	Sessional Marks	Exam Marks.	Total Marks
			Theory	Tutorial/ Lab				
ENG 1001	English	2	2	1	3	30	70	100
ENG 1002	Mathematics –I	4	3	-	3	30	70	100
ENG 1003	Mathematics –II	4	3	-	3	30	70	100
ENG 1004	Physics	4	3	-	3	30	70	100
ENG 1005	Chemistry	4	3	-	3	30	70	100
ENG 1006	Information Technology	2	3	-	3	30	70	100
ENG 1007	Programming and Numerical Techniques	4	3	-	3	30	70	100
ENG 1008	Engineering Graphics	5	2	4	3	30	70	100
ENG 1009	Physics Laboratory	2	-	3	3	50	50	100
ENG 1010	Chemistry Laboratory	2	-	3	3	50	50	100
ENG 1011	Work shop	2	-	3	3	50	50	100
ENG 1012	Programming Lab	2	-	3	3	50	50	100
	<b>Total</b>	<b>37</b>	<b>22</b>	<b>17</b>		<b>440</b>	<b>760</b>	<b>1200</b>

**B.E 3<sup>rd</sup> SEMESTER**  
**B.E 2<sup>nd</sup> Year 1<sup>st</sup> Semester**

Code. No	Subject	Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
			Theory	Tutorial	La b				
EIE - 211	Mathematics - III	4	3	1	-	3	30	70	100
EIE - 212	Engineering Mechanics & Strength of Materials	4	3	1	-	3	30	70	100
EIE - 213	Network Theory	4	3	1	-	3	30	70	100
EIE - 214	Electrical Machines	4	3	1	-	3	30	70	100
EIE - 215	Electronic Devices & Circuits	4	3	1	-	3	30	70	100
EIE - 216	Material Science	4	3	1	-	3	30	70	100
EIE - 217	Networks Laboratory	2	-	-	3	3	50	50	100
EIE - 218	EDC Laboratory	2	-	-	3	3	50	50	100
	<b>Total</b>	<b>28</b>	<b>18</b>	<b>6</b>	<b>6</b>	<b>-</b>	<b>280</b>	<b>520</b>	<b>800</b>

**B.E 4<sup>th</sup> SEMESTER**  
**B.E 2<sup>nd</sup> Year 2<sup>nd</sup> Semester**

Code. No	Subject	Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks.	Total Marks
			Theory	Tutorial	Lab				
EIE - 221	Transducers	4	3	1	-	3	30	70	100
EIE - 222	Electro Magnetic Field Theory & Transmission Lines	4	3	1	-	3	30	70	100
EIE - 223	Analog Electronic Circuits	4	3	1	-	3	30	70	100
EIE - 224	Digital Electronics	4	3	1	-	3	30	70	100
EIE - 225	Thermal Engg. & Fluid Mechanics	4	3	1	-	3	30	70	100
EIE - 226	Advanced Network Theory	4	3	1	-	3	30	70	100
EIE - 227	Environmental Science	3	3	-	-	3	30	70	100
EIE - 228	Electrical Machines Laboratory	2	-	-	3	3	50	50	100
EIE - 229	Analog Electronic Circuits Laboratory	2	-	-	3	3	50	50	100
	<b>Total</b>	<b>31</b>	<b>21</b>	<b>6</b>	<b>6</b>	<b>-</b>	<b>310</b>	<b>590</b>	<b>900</b>

**B.E 5<sup>th</sup> SEMESTER**  
**B.E 3<sup>rd</sup> Year 1<sup>st</sup> Semester**

Code. No	Subject	Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks.	Total Marks
			Theory	Tutorial	Lab				
EIE - 311	Electrical & Electronic Measurements	4	3	1	-	3	30	70	100
EIE - 312	Linear ICs & Applications	4	3	1	-	3	30	70	100
EIE - 313	Control Systems	4	3	1	-	3	30	70	100
EIE - 314	Computer Architecture & Organization	4	3	1	-	3	30	70	100
EIE - 315	Industrial Instrumentation	4	3	1	-	3	30	70	100
EIE - 316	Microprocessor & Interfacing	4	3	1	-	3	30	70	100
EIE - 317	Linear IC Laboratory	2	-	-	3	3	50	50	100
EIE - 318	D.E. Laboratory	2	-	-	3	3	50	50	100
	<b>Total</b>	<b>28</b>	<b>18</b>	<b>6</b>	<b>6</b>	<b>-</b>	<b>280</b>	<b>520</b>	<b>800</b>

**B.E 6<sup>th</sup> SEMESTER**  
**B.E 3<sup>rd</sup> Year 2<sup>nd</sup> Semester**

Code. No	Subject	Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks.	Total Marks
			Theory	Tutorial	Lab				
EIE - 321	Bio-Medical Instrumentation	4	3	1	-	3	30	70	100
EIE - 322	Signals & Systems	4	3	1	-	3	30	70	100
EIE - 323	Industrial Electronics	4	3	1	-	3	30	70	100
EIE - 324	Telemetry & Tele control	4	3	1	-	3	30	70	100
EIE - 325	Advanced Instrumentation systems	4	3	1	-	3	30	70	100
EIE - 326	Process Control	4	3	1	-	3	30	70	100
EIE - 327	Industrial Instrumentation Laboratory	2	-	-	3	3	50	50	100
EIE - 328	Microprocessors Laboratory	2	-	-	3	3	50	50	100
	<b>Total</b>	<b>28</b>	<b>18</b>	<b>6</b>	<b>6</b>	<b>-</b>	<b>280</b>	<b>520</b>	<b>800</b>

**B.E 7<sup>th</sup> SEMESTER**  
**B.E 4<sup>th</sup> Year 1<sup>st</sup> Semester**

Code. No	Subject	Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
			Theory	Tutorial	Lab				
EIE - 411	Digital Signal Processing	4	3	1	-	3	30	70	100
EIE - 412	PC Based Instrumentation	4	3	1	-	3	30	70	100
EIE - 413	Analytical & Environmental Instrumentation	4	3	1	-	3	30	70	100
EIE - 414	Computer Control of Process	4	3	1	-	3	30	70	100
EIE - 415	Elective - 1	4	3	1	-	3	30	70	100
EIE - 416	Project-1	2	-	-	4	-	100	-	100
EIE - 417	BMI Laboratory	2	-	-	3	3	50	50	100
EIE - 418	PI Laboratory	2	-	-	3	3	50	50	100
	<b>Total</b>	<b>26</b>	<b>15</b>	<b>5</b>	<b>10</b>	<b>-</b>	<b>350</b>	<b>450</b>	<b>800</b>

**Elective – 1:**

1. Pattern Recognition & Image Processing
2. Principles of EMI & EMC
3. Artificial Intelligence & Expert Systems
4. Neural Networks

**B.E 8<sup>th</sup> SEMESTER**  
**B.E 4<sup>th</sup> Year 2<sup>nd</sup> Semester**

<i>Code. No</i>	<i>Subject</i>	<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks.</i>	<i>Total Marks</i>
			<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
EIE - 421	Engineering Economics & Management	4	3	1	-	3	30	70	100
EIE - 422	VLSI Design& Embedded Systems	4	3	1	-	3	30	70	100
EIE - 423	Data Communication	4	3	1	-	3	30	70	100
EIE - 424	Elective-2	4	3	1	-	3	30	70	100
EIE - 425	Project-2	6	-	-	12	-	50	50	100
EIE - 426	PCBI Laboratory	2	-	-	3	3	50	50	100
	<b>Total</b>	<b>24</b>	<b>12</b>	<b>4</b>	<b>15</b>	<b>-</b>	<b>220</b>	<b>380</b>	<b>600</b>

**Elective - 2 :**

1. Opto-Electronic Instrumentation & Advanced Sensors
2. Instrumentation for Industrial Processes
3. Process Modeling & Simulation
4. Robotics & Automation

SIR C R R COLLEGE OF ENGINEERING –ELURU

B.E. 2<sup>nd</sup> Year 1<sup>st</sup> Semester

EIM 211 MATHEMATICS-III

(Common with the subject Mathematics – III (EEM 211) of ECE II/IV 1<sup>st</sup> Semester)

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theor y</i>	<i>Tutorial</i>	<i>Lab</i>				
4	3	1	-	3	30	70	100

**1. Vector Calculus**

Scalar, Vector fields, Gradient, Divergence, Curl, Directional Derivative, Identities, Irrotational and Solenoidal Vector Fields, Line Integral, Surface Integral and Volume Integral, Introduction of Orthogonal Curvilinear Coordinates: Cylindrical, Spherical and Polar Coordinates.

**2. Partial Differential Equations and Applications**

Elementary Treatment of PDEs, Method of Separation of Variables, Vibrations of Stretched String-wave Equation, One-dimensional and Two-dimensional Heat Flow Equations, Solutions of Laplace Equations, Laplace Equation in Polar Coordinates, Transmission Lines.

**3. Statistics**

Review of Probability Distributions. Sampling Theory: Sampling Distribution, Standard Error, Testing of Hypothesis, Level of Significance, Confidence Limits, Simple Sampling of Attributes, Sampling of Variables - Large Samples and Small Samples, Student's T-distribution,  $\chi^2$  - Distribution, F - Distribution, Fisher's Z - Distribution.

**4. Integral Transforms**

Introduction, Definition, Fourier Integral, Sine and Cosine Integrals, Complex Forms of Fourier Integral, Fourier Transform, Fourier and Cosine Transforms, Finite Fourier Sine and Cosine Transforms. Properties of F - Transforms,

Convolution Theorem for F - Transforms, Parseval's Identity for Fourier Transforms, Fourier Transforms of the Derivatives of a Function, Applications to Boundary Value Problems, Using Inverse Fourier Transforms only.

**Text Book :**

Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Pub. New Delhi, 34<sup>th</sup> Edition, 1998.

**Reference Books :**

1. A Text Book on Engineering Mathematics, N. P. Bali Etal, Laxmi Pub. Pvt. Ltd. - New Delhi.
2. Higher Engineering Mathematics, Dr. M. K. Venkataraman, National Pub. and Co. - Madras.
3. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Pvt. - N. Delhi.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**

**EIE 212 ENGINEERING MECHANICS AND STRENGTH OF MATERIALS**

(Common with the subject Engineering Mechanics and Strength of Materials (EME 212) of ECE II/IV 1<sup>st</sup> Semester)

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
4	3	1	-	3	30	70	100

**Engineering Mechanics**

Concurrent Forces in a Plane and its Equilibrium, Centroids of Composite Plane Figures, General Case of Forces in a Plane.

Moment of Inertia of Plane Figures, Parallel Axis Theorem, Polar M.I., Concept of Mass M.I., Rectilinear Translation, Kinematics, Principle of Dynamics, Motion of a Particle Under Constant Force, Force Proportional to Displacement and Free Vibrations (SHM), D' Alembert's Principle, Momentum, Impulse - Work and Energy.

Rotation of a Rigid Body about a Fixed Axis Kinematics, Equation of Motion of a Rigid Body about a Fixed axis, Rotation and Constant Moment, Torsional Vibration.

**Strength of Materials:**

Simple Stress and Strain, Stresses on Inclined Plane, Two-dimensional Stress Systems, Principal Stress and Principal Planes, Mohr's Circle.

Shearing Force and Bending Moment, Types of Loads, Types of Supports, S.F. and D.M. Diagrams for Cantilever and Simply Supported Beams under Concentrated Loads and under U.D.L.

Flexure formula, Bending Stresses on the above types of Beams with Rectangular and Circular Sections.

Torsion of Circular Shafts, Determination of Shear Stress.

### **Text Books**

1. Engineering Mechanics, S. Timoshenko (Relevant sections only).
2. Elements of Strength of Materials, S. Timoshenko (Relevant sections only).

**SIR C R R COLLEGE OF ENGINEERING –ELURU**

**EIE 213 NETWORK THEORY**

(Common with the subject Network Theory (EEE 213) of ECE II/IV 1<sup>st</sup> Semester)

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
4	3	1	-	3	30	70	100

**1. Analysis of DC Circuits:**

Active Elements, passive Element, Reference Directions for current and voltage, Kirchoffs Laws, Voltage and Current Division Nodal Analysis, MESH Analysis, Linearity and superposition, Thevinin's and Norton's Theorem, Source Transformation.

**2. DC Transients:**

Inductor, Capacitor, Source free RL, RC and RLC Response, Evaluation of Initial conditions, application of Unit-step Function to RL, RC and RLC Circuits, Concepts of Natural, Forced and Complete Response.

**3. Sinusoidal Steady State Analysis:**

The Sinusoidal Forcing Function, Phasor Concept, Average and Effective values of Voltage and Current, Instantaneous and Average Power, Complex Power, Steady State Analysis Using Mesh and Nodal Analysis, Application of Network Theorems to AC Circuits, Balanced 3-phase circuits, Resonance, Concept of Duality.

**4. Coupled Circuits:**

Magnetically Coupled Circuits, Dot Convention, Y, Z, H, T - Parameters of Two - Port Networks, Reciprocity Theorem.

**5. Laplace Transform Techniques:**

Transforms of Typical Signals, Response of Simple Circuits to Unit – Step, Ramp and Impulse Functions, Initial and Final Value Theorem, Convolution Integral, Time Shift and Periodic Functions, Transfer Function.

**Text Books**

1. Engineering Circuit Analysis, Willam H. Hayt Jr., and Jack E. Kemmerly, 5<sup>th</sup> Edition, McGraw Hill.
2. Network Analysis, M. E. Vanvalkenburg, 3<sup>rd</sup> Edition, PHI.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**

**EIE 214 ELECTRICAL MACHINES**

(Common with the subject Electrical Machines (ECE 214) of ECE II/IV 1<sup>st</sup> Semester)

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
4	3	1	-	3	30	70	100

**1. Electric Energy System**

Basic Structure, Generation, Transmission, Distribution and Utilization of Electric Power, Non - Conventional Energy Sources (Elementary treatment only).

**2. DC Machines**

Constructional Features, Function of Commutator, Induced EMF and Torque Expressions, Relationship Between Terminal Voltage and Induced EMF for Generator and Motoring Action, Different Types of Excitation and Performance Characteristics of Different Types of DC Machines, Starting and Speed Control of DC Motors, Losses and Efficiency, Efficiency by Direct Loading, Swinburne's Test and Hopkin's Test, Applications of DC Machines.

**3. Transformers**

Constructional Details, EMF Equation, Equivalent Circuit, Voltage Regulation, Losses and Efficiency, Auto - Transformers, Instrument Transformers, Open/Short - Circuit Tests and Determination of Efficiency and Regulation.

**4. Three - Phase Induction Machines**

Construction, Rotating Magnetic Field and 3ph Induction Motor, Power Flow Diagram, Torque and Torque-slip Characteristics, Condition for Max. Torque and its Value, Starting and Speed Control, Losses and Efficiency, Equivalent Circuit and Circle Diagram of Induction Motor, No - Load and Rotor - Blocked Tests and Efficiency and Torque - Speed Characteristics.

### **5. Three - Phase Synchronous Machines**

Generation of EMF, Constructional Details, Induced EMF, Synchronous Generator on No - Load and Load, Synchronous Impedance and Voltage Regulation.

6. V - Curves and Inverted V - Curves, Synchronous Condenser, Starting of Synchronous Motors, Applications of Synchronous Machines.

### **7. Single - Phase Motors**

Double Revolving Field Theory, Methods of Starting Single Phase Induction Motors, Universal Motor, Stepper Motor.

#### **Text Books :**

1. Electrical Machines, S. K. Bhattacharya, TMH Publications N. Delhi.
2. A First Course In Electrical Engineering, S. M. Tiwari, A. S. Binsaroor, Wheeler Publications.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**

**EIE 215 ELECTRONIC DEVICES AND CIRCUITS**

(Common with the subject Electronic Devices and Circuits (ECE 215) of ECE II/IV 1<sup>st</sup> Semester)

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
4	3	1	-	3	30	70	100

**1. Energy Band Theory of Solids**

Intrinsic and Extrinsic Semiconductors Doping, Doping Materials, Carrier Mobility, Conductivity, Diffusion and continuity equation, Hall - Effect and its Application.

**2. Semiconductor Diodes**

Band structure of PN Junction, Quantitative Theory of PN Diode, Volt - Amp. Characteristics, Temperature Dependence, Transition and Diffusion Capacitance of PN Junction, Zener and Avalanche Breakdowns, Tunnel Diode, LED, Schottky Barrier Diode, Varactor Diode, Photo Diode, PIN Diode, Point Contact Diode.

**3. Diode Rectifiers**

Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Ripple Factor and Regulation Characteristics.

**4. Bipolar Junction Transistor**

NPN and PNP junction Transistor, Characteristics of Current Flow across the Base Regions, Minority and Majority Carrier Profiles, CB, CE and CC Configurations and their Input and Output Characteristics. Comparison of CE, CB and CC Configurations. Junction Biasing for Saturation, Cutoff and Active Region,  $\alpha$  and  $\beta$  Parameters and the relation between them.

**5. JFET**

JFET and its characteristics, Pinch off Voltage, Drain Saturation Current, MOSFET - Enhancement and Depletion Modes, Small signal models of FET.

**6. Transistor Biasing Circuits**

Various Biasing Circuits and Stabilization, Thermal Runaway, Thermal Stability, Biasing of FETs.

**7. Small Signal - Low Frequency Transistor Biasing Circuits**

Transistor as an Amplifier, h - parameter model, Analysis of Transistor Amplifier Circuits using h - parameters. CB, CE and CC Amplifier configurations and performance factors. Analysis of Single Stage Amplifier, RC Coupled Amplifiers. Effects of Bypass and Coupling Capacitors. Frequency Response of CE Amplifier, Emitter - Follower, Cascaded Amplifier, High Frequency model of Transistor.

**Text Books :**

1. Electronic Devices and Circuits, G.S.N. Raju, I.K. International Publications, New Delhi, 2006.
2. Integrated Electronics Analog Digital Circuits, Jacob Millman and D. Halkias, McGraw Hill.
3. Electronic Devices and Circuits Theory, Boylsted, Prentice Hall Publications.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**

**EIE 216 MATERIAL SCIENCE**

(Common with the subject Material Science (EEP 216) of ECE II/IV 1<sup>st</sup> Semester)

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
4	3	1	-	3	30	70	100

**1. Conducting Materials**

Relaxation Time and Electrical Conductivity. Sources of Resistivity of Metals and Alloys, Electrical Conductivity at High Frequencies. Geometrical and Magnetic Field Effects on Electrical Conductivity. Types of Conducting Materials.

**2. Dielectric Materials**

Types of Electric Polarization, Frequency and Temperature Effects on Polarization, Dielectric Loss, Dielectric Breakdown, Insulating Materials, Ferroelectric Materials, Electrets.

**3. Magnetic Materials**

Types of Magnetic materials, Ferro and Ferri magnetism, Hard and Soft Magnetic materials, Ferrites – Microwave applications, Magnetic bubbles.

**4. Super Conducting Materials**

Types of Super Conductors, High T<sub>c</sub> Super Conductors and High Frequency Applications.

**5. Integrated Circuits – Fabrication**

Crystal Growth, Epitaxial Process, Masked Diffusion, Fabrication of Thin Films, Principles of IC Packaging.

**Text Books :**

1. Material Science, M. Arumugam, Anuradha Agencies Publishers.
2. Science of Engineering Materials, C. M. Srivastava and C. Srinivasan, Wiley Eastern Ltd.

3. Integrated Circuits, R. M. Warner Jr., McGraw Hill.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**

**EIE 217 NETWORK LABORATORY**

(Common with the subject Network Laboratory (ECE 217) of ECE II/IV 1<sup>st</sup> Semester)

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
2	-	-	3	3	50	50	100

Ten Experiments based on Networks Theory.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**EIE 218 ELECTRONIC DEVICES AND CIRCUITS LABORATORY**

(Common with the subject Electronic Devices and Circuits Laboratory (ECE 218) of ECE II/IV  
1<sup>st</sup> Semester)

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
2	-	-	3	3	50	50	100

1. Study of CRO and Applications
2. V-I Characteristics of PN Junction Diode
3. V-I Characteristics of Zener Diode and Zener regulator characteristics.
4. V-I Characteristics of LED
5. V-I characteristics of Photo diode
6. Half-wave and full-wave rectifiers
7. Half-wave and full-wave rectifiers with capacitor filter
8. CE characteristics of BJT, h-parameters
9. CB characteristics of BJT, h-parameters
10. Voltage gain, input impedance and output impedance of emitter follower
11. Drain and transfer characteristics of JFET
12. Frequency response of CE amplifier

**Textbook**

Electronic devices and circuits (Chapter 14), G.S.N. Raju, IK International Publishers, New Delhi, 2006.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**

**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**

**2/4 BE: 2<sup>nd</sup> SEMESTER**

**EIE-221: TRANSDUCERS**

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
4	3	1	-	3	30	70	100

**UNIT I**

Block diagram of instrumentation system, classification of transducers, performance characteristics of instruments: Static Characteristics of Instruments-accuracy, precision, sensitivity, linearity, resolution, hysteresis, threshold, input impedance-loading effect-generalized mathematical model of measurement systems

Dynamic Characteristics operational transfer function –zero ,first and second order instruments-impulse ,step, ramp and frequency responses of the above instruments.

**UNIT II**

Resistance potentiometer-loading effect –strain gauges-gauge factor-types of strain gauges-rosettes-semiconductor strain gauges –installation of strain gauges-strain measuring circuits

**UNIT III**

Resistance thermometers- materials, construction. Characteristics-thermowells-thermistors, thermocouples-hot wire anemometer –constant current and constant temperature operation –humidity sensors –photo resistor

**UNIT IV**

Induction potentiometers-variable reluctance transducers –EI pickup-LVDT construction –signal conditioning circuit-application RVDT- magnetostrictive transducers

**UNIT V**

Capacitive transducers-variable area type –variable air gap type-variable permittivity type-signal conditioning circuit-Blumlein bridge-capacitor microphone-frequency response

**UNIT VI**

Piezoelectric transducers- Piezoelectric crystals-accelerometer-change amplifier-Hall effect transducers

**UNIT VII**

IC sensor for temperature and pressure-Introduction to fiber optic and Intelligent sensors .Eddy current transducers

**Text Books:**

1. E.O.Doeblin, Measurement systems-Application and design McGraw Hill 1990
2. H.K.P.Neubert, Instrument Transducers, Clarendon Press, 1975

**References:**

1. F.G.Oliver, Practical Instrument Transducers, Pitman Publishing Co.. 1971
2. John B.Bently, Principals of Measurement systems Longman Publishers,1983

**Sir C R Reddy College of Engineering – Eluru**

***Dept. of Electronics & Instrumentation Engineering***

**EIE 222 ELECTROMAGNETIC FIELD THEORY & TRANSMISSION LINES**

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
4	3	1	-	3	30	70	100

## **Electrostatics**

Introduction, Applications of electrostatic fields, Different types of charge distributions, Coulomb's law, Applications of coulomb's law, Limitation of coulomb's law, Electric field strength due to point charge, Salient features of electric intensity, Electric field due to line charge density, Electric field strength due to an infinite line charge, Field due to surface charge density, Field due to volume charge density, Potential, Potential at a point, Potential difference, Salient features of potential difference, Potential gradient, Salient features of potential gradient, Equipotential surface, Potential due to electric dipole, Electric field due to dipole, Electric flux, Salient features of electric flux, Faradays experiment to define flux, Electric flux density, Salient features of electric flux density, Gauss's law and applications, Proof of Gauss's law, Gauss's law in point form, Divergence of a vector, Applications of Gauss's law, Limitations of Gauss's law, Salient features of Gauss's law, Poisson's and Laplace's equations, Applications of Poisson's and Laplace's equations, Uniqueness theorem, Boundary conditions on E and D, Proof of boundary conditions, Conductors in electric field, Properties of conductors, Electric current, Current densities, Equation of continuity, Relaxation time, Relation between current density and volume charge density, Dielectric materials in electric field, Properties of dielectric materials, Dipole movement, Polarization, Capacitance of different configurations, Energy stored in an electric field, Energy in a capacitor.

## **Steady Magnetic Fields**

Introduction, Applications of magnetic fields, Fundamentals of steady magnetic fields, Faradays law of induction, Magnetic flux density, Ampere's law of current, Element or Biot-Savart law, Field due to infinitely long current element, Field due to a finite current element, Ampere's work law or Ampere's circuit law, Differential form of Ampere's circuit law, Stock's theorem, Force on a moving charge due to electric and magnetic charge, Applications of Lorentz force equation, Force on a current element in a magnetic field, Ampere's force law, Boundary conditions on H and B, Scalar magnetic potentials, Vector magnetic potentials, Force and torque on a loop or coil, Materials in magnetic fields, Magnetization in materials, Inductance, Standard inductance configurations, Energy density in a magnetic field, Energy stored in inductor, Expression for inductance, L in terms of fundamental parameters, Mutual inductance, Comparison between electric and magnetic fields / circuits / parameters.

## **Maxwell's Equations**

Introduction, Equation of continuity for the varying fields, Maxwell's equations for time varying fields, Meaning of Maxwell's equations, Conversion of differential form of Maxwell's equations to integral form, Maxwell's equations for static fields, Characteristics of free space, Maxwell's equations for free space, The Maxwell's equations for static fields in free space, Proof of Maxwell's equations, Sinusoidal time varying fields, Maxwell's equations in phasor form, Influence of medium on the fields, Types of media, Summary of Maxwell's equations for different cases, Boundary conditions, Proof of boundary conditions on E, D, H and B, Complete boundary conditions in scalar form, Boundary conditions in vector form, Time varying potentials, Retarded potentials,

Maxwell's equations approach to relate potentials, Fields and their sources, Helmholtz theorem, Lorentz gauge condition.

## **Electromagnetic Waves**

Introduction, Applications of EM waves, Wave equations in free space, Wave equations for a conducting medium, Uniform plane equation, General solutions of uniform plane wave equations, Relation between E and H in a uniform plane wave, Proof of E and H wave are perpendicular to each other, Wave equations in phasor form, Wave propagation in a lossless medium, Propagation characteristics of EM waves in free space, Propagation characteristics of EM waves in a conducting medium, Summary of propagation, Characteristics of EM waves in conducting medium, Conductors and dielectrics, Wave propagation characteristics in good dielectrics, Summary of the propagation characteristics in good dielectrics, Wave propagation characteristics in good conductors, Summary of characteristics of wave propagation in good conductors, Depth of penetration, Polarization of a wave, Sources of different polarized EM waves, Direct cosines of vector field, Waves on a perfect conductor - Normal incidence, Waves on dielectric -Normal incidence, Oblique incidence of a plane wave on a boundary plane, Oblique incidence of a wave on perfect conductor, Oblique incidence of a plane wave on dielectric, Brewster angle, Total internal reflection, Surface impedance, Poynting vector and flow of power, Complex poynting vector.

## **Guided Waves**

Induction, Waves between parallel plates, Derivation of field equations between parallel plates and propagation parameters, Field components for TE waves ( $E_z = 0$ ), Field components of TM waves ( $H_z = 0$ ), Propagation parameters of TE and TM waves, Guide wavelength, Transverse electromagnetic waves (TEM wave), Velocities of propagation, Attenuation in parallel plane guides, Wave

impedances, Waves in rectangular waveguides, Derivation of field equations in rectangular hollow waveguides, Propagation parameters of TE and TM waves in rectangular waveguides, TEM does not exist in waveguides, Excitation methods for different TM and TM modes, Evanescent wave or mode, Wave impedance in waveguide, Power transmitted in a lossless waveguide, Waveguide resonators, Salient features of cavity resonators, Circular waveguides, Salient features of circular waveguides.

### **Transmission Lines**

Types of transmission lines, Applications of transmission lines, Equivalent circuit of pair of transmission lines, Primary constants, Transmission line equations, Secondary constants, lossless transmission lines, Distortionless line, Phase and group velocities, Loading of lines, Input impedance of transmission lines, RF lines, Relation between reflection coefficient, Load and characteristic impedance, Relation between reflection coefficient and voltage standing wave ratio (VSWR), Lines of different lengths -  $\lambda/8, \lambda/4, \lambda/2$  lines, Losses in transmission lines, Smith chart and applications, Stubs, Double stubs.

### **Textbook**

1. Electromagnetic Field Theory and Transmission Lines, G.S.N. Raju, Pearson Education (Singapore) Pvt., Ltd., New Delhi, 2005.

### **References:**

1. Engineering Electromagnetics, W. H. Hayt Jr., McGraw Hill – New York.
2. EM Waves and Radiating Systems, E. C. Jordan, PHI, 1997.
3. Electromagnetics with Applications, Kraus and Fleisch, McGraw Hill, 1999.
4. Time Harmonic EM Fields, R. F. Harrington, McGraw Hill.

(Common with the subject Analog Electronic Circuits (ECE 223) of ECE II/IV 2<sup>nd</sup>

Semester)

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
4	3	1	-	3	30	70	100

**Multistage Amplifiers**

BJT and FET RC Coupled Amplifiers - Frequency Response. Cascaded Amplifiers. Calculation of Band Width of Single and Multistage Amplifiers. Concept of Gain Bandwidth Product.

**Feed back Amplifiers**

Concept of Feedback Amplifiers - Effect of Negative feed back on the amplifier Characteristics. Four Feedback Amplifier Topologies. Method of Analysis of Voltage Series, Current Series, Voltage Shunt and Current Shunt feedback Amplifiers.

**Sinusoidal Oscillators**

Condition for oscillations -LC Oscillators - Hartley, Colpitts, Clapp and Tuned Collector Oscillators - Frequency and amplitude Stability of Oscillators - Crystal Oscillators - RC Oscillators -- RC Phase Shift and Weinbridge Oscillators.

**Power Amplifiers**

Classification of Power Amplifiers - Class A, Class B and Class AB power Amplifiers. Series Fed, Single Ended Transformer Coupled and Push Pull Class A and Class B Power Amplifiers. Cross-over Distortion in Pure Class B Power Amplifier, Class AB Power Amplifier - Complementary Push Pull Amplifier with trickle Bias, Derating Factor - Heat Sinks.

**Tuned Voltage Amplifiers**

Single Tuned and Stagger Tuned Amplifiers - Analysis - Double Tuned Amplifier - Bandwidth Calculation.

**Operational Amplifiers**

Concept of Direct Coupled Amplifiers. Ideal Characteristics of an operational Amplifier - Differential Amplifier - Calculation of common mode Rejection ratio - Differential Amplifier supplied with a constant current - Normalized Transfer Characteristics of a differential Amplifier - Applications of OP-Amp as an Inverting and Non-Inverting Amplifier, Integrator, Differentiator Summing and Subtracting Amplifier and Logarithmic Amplifier. Parameters of an Op-Amp, Measurement of OP-Amp Parameters.

**Books :**

1. Integrated Electronics - Millman and Halkias
2. Electronic Devices and Circuits, G.S.N. Raju, IK International Publications, New Delhi, 2006.
3. Electronic Devices and Circuits - Mottershead

#### 4. Op-Amps and Linear Integrated Circuits - Gayakwad.

**2/4 BE: 2<sup>nd</sup> SEMESTER  
EIE- 224 : DIGITAL ELECTRONICS**

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
4	3	1	-	3	30	70	100

**Unit I:**

Number systems & codes:

Number systems \_\_ Binary arithmetic \_\_ Binary weighted and non- weighted codes \_\_ Error detecting and error correcting codes.

**Unit II:**

Boolean Algebra and simplification of Boolean functions \_\_ logic operators \_\_ Logic Gates \_\_ Boolean Algebra: postulates and theorems \_\_ Universal Property \_\_ Alternative logic gate representation \_\_ Representation of switching functions \_\_ SOP & POS forms \_\_ Karnaugh map Representation \_\_ minimization using K – maps \_\_ Tabular minimization.

**Unit III:**

Design of Combinational Circuits:

Design procedure \_\_ Multi output functions \_\_ Code conversion \_\_ Adders and subtractors \_\_ n – bit parallel adder and subtractor \_\_ Comparison between serial and parallel adder \_\_ Digital Comparator \_\_ Magnitude comparator.

**Unit IV:**

Combinational logic with MSI and LSI:

Introduction : Multiplexer \_\_ Decoder \_\_ Encoder

Logic implementation using ROM, PAL, PLA:

ROM \_\_ PAL \_\_ PLA \_\_ Comparison between ROM, PAL& PLA

**Unit V:**

Introduction to sequential circuits:

Combinational vs Sequential circuits, Asynchronous vs synchronous circuits \_\_ State table \_\_ State Diagram \_\_ State equations \_\_ State reduction \_\_ State assignment \_\_ Flip flop excitation tables \_\_ Sequence generators \_\_ Sequence detectors \_\_ Binary counters

**Unit VI:**

Capabilities and minimization of Sequential machines:

Melay & More machines \_\_ Capabilities & limitations of finite state machines, State equivalence and machine minimization.

**Unit VII:**

Algorithmic state machines:

ASM charts \_\_ Firing considerations \_\_ control implementation \_\_ design with multiplexers and PLA control.

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
4	3	1	-	3	30	70	100

### UNIT –I

Open and closed systems-thermodynamic properties- internal energy-enthalpy- isothermal and adiabatic process-zeroth law, first law of thermodynamics –heat engine- efficiency-coefficient of performance.

### UNIT –II

I.C.engines-working of two stroke and four engines –petrol engines-carburetors-ignition system-diesel fuel pump

### UNIT –III

Properties of fluids and fluid static's-density, specific weight, specific volume, specific gravity, viscosity-Newton's law of viscosity-surface tension-real and ideal flows.

### UNIT –IV

Fluid dynamics Eulers equation of motion – Bernoulli's theorem, limitation, applications- flow measurement using orifice meter, venture meter and pitot tube.

### UNIT –V

Impact of jets-force of jet on stationary and moving plates-force on curved vanes

### UNIT –VI

Turbines classifications of hydraulic turbines-velocity triangles-work done and efficacy, specific speed-pelton wheel wheel-reaction turbines-inward and out ward flow Francis and Kaplan turbine

### UNIT –VII

Reciprocating pumps – types-work done –slip and coefficient of discharge- effect of acceleration and frictional resistance. Centrifugal pumps classification-velocity triangles-specific speed.

### Text Books :

1. Domkundwar, A course in Thermodynamics and Heat Engines, Danpat Rai & sons.
2. K.L.Kumar, Engineering Fluid Mechanics, Eurasia publications, 1984.

### Referance Books:

1. C.P.Gupta and R.Prakash, Engineering Thermodynamics, Nanchand & bros
2. R.K.Bansal, A text book of Fluid Mechanics and Hydraulic Machines, Lakshmi Publications, Madras.

## SIR C R R COLLEGE OF ENGINEERING –ELURU

### EIE 226 ADVANCED NETWORK THEORY

(Common with the subject Advanced Network Theory (ECE 226) of ECE II/IV 2<sup>nd</sup> Semester)

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
4	3	1	-	3	30	70	100

### Fourier Transforms

Definitions and Properties, Transforms for Simple Time Domain Functions, Transforms of General Periodic Time Functions, Convolution and Response in Time Domain, Response in Frequency Domain, Relationship between Fourier and Laplace Transforms.

### **Network Functions**

Network Functions for Single Port and Two Port, Calculation of Network Functions for Ladder and General Networks, Poles and Zeroes, Restriction of Poles and Zeroes for Driving point and Transfer Functions, Time Domain Behavior from Pole Zero Plot, Transfer Functions in terms of Y and Z functions, Scaling Network Functions.

Positive Real Function and Other Properties, Herwitz Polynomials, Computation of Residues, Even and Odd Functions, Test for Positive Real Functions.

### **Network Synthesis**

Elementary Synthesis Operation, LC Network Synthesis, Properties of RC Network Functions, Foster and Cauer Forms of RC and RL Networks.

### **RLC Networks**

Minimum Positive Real Functions, Brune's Method of RLC Synthesis, Realization Difficulties.

### **Textbooks :**

1. Network Analysis, M. E. Van Valkenburg, 3<sup>rd</sup> Edition, PHI.
2. Modern Network Synthesis, M. E. Van Valkenburg, Wiley Eastern.

### **Reference :**

Engineering Circuit Analysis, William H. Hayt Jr. and Jack E. Kemmerley, 5<sup>th</sup> Edition, McGraw Hill International Edition.

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
3	3	-	-	3	30	70	100

**Module 1 : Introduction**

Definition, Scope and importance, Measuring and defining environmental development : Indicators

**Module 2 : Ecosystems**

Introduction, Types, Characteristic features, Structure and functions of ecosystems, Forest, Grassland, Desert, Aquatic (lakes, rivers and estuaries).

**Module 3 : Environment and Natural Resources Management**

Land Resources : Land as a resource, Common property resources, land degradation, Soil erosion and desertification, Effects of modern agriculture, fertilizer-pesticide problems, Forest Resources : Use and over-exploitation, Mining and dams - their effects on forest and tribal people, Water resources : Use and over-utilization of surface and ground water, Floods, Droughts, Water logging and salinity, Dams - benefits and costs, Conflicts over water, Energy Resources : Energy needs, Renewable and non-renewable energy sources, Use of alternate energy resources, Impact of energy use on environment.

**Module 4 : Bio-Diversity and its Conservation**

Value of bio-diversity - Consumptive and productive use, Social, Ethical, Aesthetic and option values, Bio-geographical classification of India - India as a mega diversity habitat, Threats to biodiversity - Hot-spots, habitat loss, poaching of wildlife, loss of species, seeds etc., Conservation of biodiversity - in - situ and ex-situ conservation.

**Module 5 : Environmental Pollution - Local and Global Issues**

Causes, Effects and control measures of : Air pollution, Indoor air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Solid waste management, Compositing, Vermiculture, Urban and industrial wastes, Recycling and re-use, Nature of thermal pollution and nuclear hazards, Global warming, Acid rain, Ozone depletion.

**Module 6 : Environmental Problems in India**

Drinking water, Sanitation and public health, Effect of activities on the quality of environment : Urbanization, Transportation, Industrialization, Green revolution, Water scarcity and ground water depletion, Controversies on major dams - Resettlement and rehabilitation of people problems and concerns, Rain water harvesting, Cloud seeding and watershed management.

**Module 7 : Economy and Environment**

The economy and environment interaction, Economics of development, Preservation and conservation, Sustainability : Theory and practice, Limits to

growth, Equitable use of resources for sustainable lifestyles, Environmental impact assessment.

### **Module 8 : Social Issues and the Environment**

Population growth and environment, Environmental education, Environmental movements, Environment Vs development.

### **Module 9 : Institutions and Governance**

Regulation by Government, Monitoring and enforcement of environmental regulation, Environmental acts : Water (Prevention and control of pollution) act, air (Prevention and control of pollution) act, Environmental Protection Act, Wild life protection act, Forest conservation act, Coastal zone regulations, Institutions and policies relating to India, Environmental Governance.

### **Module 10 : International Conventions**

Stockholm Conference 1972, Earth Summit 1992, World Commission for Environmental Development (WCED).

### **Module 11 : Case Studies**

Chipko movement, Narmada bachao andolan, Silent valley project, Madhura refinery and Taj Majal, Industrialization of pattancheru, Nuclear reactor at Nagarjuna Sager, Tehri Dam, Ralegaon Siddhi (Anna Hazare), Kolleru lake - Acquaculture, Florosis in Andhra Pradesh.

### **Module 12 : Field Work**

Visit to a local area to document and mapping environmental assets - River / forest / grassland / hill / mountain, Study of local environment - Common plants, Insects, Birds, Study of simple ecosystems - Pond, river, hill, slopes etc. Visits to industries, Water treatment plants, Affluent treatment plants.

**Textbooks :** Kaushik - Kaushik, Anubha

**Reference :** Deswal & Deswal, Raja Gopal, Dharmaraj Publishers.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**

**EIE 228 ELECTRICAL MACHINES LABORATORY**

(Common with the subject Electrical Machines Laboratory (ECE 228) of ECE II/IV  
2<sup>nd</sup> Semester)

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
2	-	-	3	3	50	50	100

Ten Experiments based on Electrical Machines Theory.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**

**EIE 229 ANALOG ELECTRONIC CIRCUITS LABORATORY**

(Common with the subject Analog Electronic Circuits Laboratory (ECE 229) of ECE II/IV  
2<sup>nd</sup> Semester)

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
2	-	-	3	3	50	50	100

1. Feedback Amplifier - Calculation of Gain without Input Resistance, Output Resistance and Frequency Response Characteristic.
2. Current series feedback amplifier
3. Voltage series feedback amplifier
4. Colpitt's Oscillator
5. RC Phase - Shift Oscillator
6. Wein - Bridge Oscillator
7. Class B Push - Pull Power Amplifier
8. Operational Amplifier - as an Inverting and Non-inverting Amplifier and Frequency Response Characteristics
9. Measurement of Op-Amp Parameters
10. Multistage Amplifier
11. Tuned Voltage Amplifier
12. Class A Transformer - Coupled Amplifier

**Textbooks**

1. Electronic Devices and Circuits (Chapter 14), G.S.N. Raju, IK International Publications, New Delhi, 2006.
2. Bernard Grob, "Basic Electronics", McGraw Hill Book Company

# SIR C R R COLLEGE OF ENGINEERING –ELURU

## EIE 227 ENVIRONMENTAL STUDIES

(Common with the subject Environmental Studies (ECE 227) of ECE II/IV 2<sup>nd</sup> Semester)

**Module 1 : Introduction** :Definition, Score and importance, Measuring and defining environmental development : Indicators

**Module 2 : Ecosystems** :Introduction, Types, Characteristic features, Structure and functions of ecosystems, Forest, Grassland, Desert, Aquatic (lakes, rivers and estuaries).

**Module 3 : Environment and Natural Resources Management** :Land Resources : Land as a resource, Common property resources, land degradation, Solerosion and desertification, Effects of modern agriculture, fertilizer-pesticide problems, Forest Resources : Use and over-exploitation, Mining and dams – their effects on forest and tribal people, Water resources : Use and over-utilization of surface and ground water, Floods, Droughts, Water logging and salinity, Dams – benefits and costs, Conflicts over water, Energy Resources : Energy needs, Renewable and non-renewable energy sources, Use of alternate energy resources, Impact of energy use on environment.

**Module 4 : Bio-Diversity and its Conservation:** Value of bio-diversity – Consumptive and productive use, Social, Ethical, Aesthetic and option values, Bio-geographical classification of India – India as a mega diversity habitat, Threats to biodiversity – Hot-spots, habitat loss, poaching of wildlife, loss of species, seeds etc., Conservation of biodiversity – in – situ and ex-situ conservation.

**Module 5 : Environmental Pollution – Local and Global Issues:** Causes, Effects and control measures of : Air pollution, Indoor air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Solid waste management, Compositing, Vermiculture, Urban and industrial wastes, Recycling and re-use, Nature of thermal pollution and nuclear hazards, Global warming, Acid rain, Ozone depletion.

**Module 6 : Environmental Problems in India:** Drinking water, Sanitation and public health, Effect of activities of the quality of environment : Urbanization, Transportation, Industrialization, Green revolution, Water scarcity and ground water depletion, Controversies on major dams – Resettlement and rehabilitation of people problems and concerns, Rain water harvesting, Cloud seeding and watershed management.

**Module 7 : Economy and Environment** : The economy and environment interaction, Economics of development, Preservation and conservation, Sustainability : Theory and practice, Limits to growth, Equitable use of resources for sustainable lifestyles, Environmental impact assessment.

**Module 8 : Social Issues and the Environment** : Population growth and environment, Environmental education, Environmental movements, Environment Vs development.

**Module 9 : Institutions and Governance:** Regulation by Government, Monitoring and enforcement of environmental regulation, Environmental acts : Water (Prevention and control of pollution) act, air (Prevention and control of pollution) act, Environmental Protection Act, Wild life protection act, Forest conservation act, Costal zone regulations, Institutions and policies relating to India, Environmental Governance.

**Module 10 : International Conventions:** Stockholm Conference 1972, Earth Summit 1992, World Commission for Environmental Development (WCED).

**Module 11 : Case Studies** : Chipko movement, Narmada bachao andolan, Silent valley project, Madhura refinery and Taj Majal, Industrialization of pattancheru, Nuclear reactor at Nagarjuna Sager, Tehri Dam, Ralegaon Siddhi (Anna Hazare), Kolleru lake – Acquaculture, Florosis in Andhra Pradesh.

**Module 12 : Field Work:** Visit to a local area to document and mapping environmental assets – River / forest / grassland / hill / mountain, Study of local environment – Common plants, Insects, Birds, Study of simple ecosystems – Pond, river, hill, slopes etc. Visits to industries, Water treatment plants, Affluent treatment plants.

**Textbooks** : Kaushik – Kaushik, Anubha

**Reference** : Deswal & Deswal, Raja Gopal, Dharmaraj Publishers.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-311: Electrical & Electronics Measurement, 3/4 BE: 1<sup>st</sup> SEMESTER**

**SYLLABUS:**

**Unit-1**

Introduction –Measurement and error –Definitions-Accuracy and Precision –significant figure Types of error-Statistical analysis-Probability of errors-Limiting Errors.

**Unit-II3**

Standards of Measurement-Classification of standards-Time and frequency standards –IEEE Standards.

**Unit-III**

Electronic Instrumentation for measuring basic Parameters: Introduction –PMMC Principle-Amplified DC Meter-AC Voltmeter using rectifiers-True RMS responding voltmeter-Electronic Multimeter-Considerations in choosing an Analog voltmeter-Digital Voltmeter

**Unit-IV**

Component Measuring instruments –Q-meter –Vector impedance Meter –Vector Volt meter-RF Power and Voltage Measurement.

**Unit-V**

Oscilloscopes-Block diagram- Oscilloscopes- probes and Transducers- Oscilloscopes Techniques-Special Oscilloscopes

**Unit-VI**

Series and shunt type ohmmeter, Wheatstone bridge, Kelvine bridge, Megger. AC bridges-Maxwell bridge, wein bridge, Anderson bridge, hay bridge, Schering bridge. Detectors in bridge measurements

**Unit-VII**

Wave meters-Frequency Meters- Phase Meters-Wave Analyzers-Spectrum Analyzers.

**Text Books:** Modern Electronic Instrumentation and Measurement Techniques by A.D.Helfricle and W.D.COOPER P.H.I.

1. Electronic Measurement by Terman and Pettit, Mc.Graw Hill Publications
2. Automatic Test equipment Hardware. Software and Management Edited by FRED LIGUORI, IEEE Press 1974
3. A Course in Electrical & Electronic Measurements and Instrumentation by A.K.Sakey, Kanna publications

## ECE 312 Linear ICs and Applications

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
4	3	1	-	3	30	70	100

1. Operational Amplifiers:

Design Aspects of Monolithic Op-Amps, Ideal Characteristics, Specifications, Offset Voltages and Currents, Frequency Compensation Techniques, Measurement of Op-Amp Parameters,

2. Applications of Op-Amps, Inverting and Non-inverting Amplifiers, Integrators, Function Generators, Logarithmic Amplifiers, Instrumentation Amplifiers,
3. Signal Conditioning Circuits, Multivibrators, Square Wave Generators, Rectifiers, Peak Detection and Voltage Regulation.
4. 555 Timers, 556 Function Generator ICs and their Applications. Three Terminal IC Regulators,
5. IC 1496 (Balanced Modulator), IC 565 PLL and its Applications.
6. Active Filters - LPF, HPF, BPF, BEF, All-pass Filters, Higher Order Filters and their Comparison.
7. Op-Amp Phase Shift, Wein-bridge and Quadrature Oscillator, Voltage Controlled Oscillators, Voltage to Frequency and Frequency to Voltage Converters, Voltage to Current and Current to Voltage Converters. Switched Capacitance Filters, Analog Multiplexers, Sample and Hold Circuits.

**Books:**

1. Microelectronics, Jacob Millman
2. Op-Amps and Linear ICs, Ramakanth Gayakwad.
3. Integrated Circuits, Botkar, Khanna Publications.
4. Applications of Linear ICs, Clayton.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-313 : Control Systems, 3/4 BE: 1st SEMESTER**

**Unit-I**

Classification of Control Systems – Open loop Control System – Closed loop Control System – Feed back and feed forward system – Concept of transfer function- Definition – Properties – Advantage and disadvantage – Procedure to determine – Features of transfer function – Impulse response at linear system

**Unit-II**

Block diagram of control system- advantages and disadvantages – rules for reduction of block diagram – signal flow graphs- properties – Mason's gain formula – Application of Mason's gain formula between output nodes and non input nodes- Application of Mason's gain formula for electrical networks

**Unit-III**

Introduction to Mathematical Modeling of Physical Systems - Equations of Electrical Networks Modeling of Mechanical Systems - Equations of Mechanical Systems. Pages (127 - 150)

**Unit-IV**

Time Domain Analysis of Control Systems - Time Response of First and Second Order Systems with Standard Input Signals - Steady State Error Constants - Effect of Derivative and Integral Control on Transient and Steady State Performance of Feedback Control Systems. Pages (296 - 350)

**Unit-V**

Concept of Stability and Necessary Conditions for Stability Routh-Hurwitz Criterion. Relative Stability Analysis, the Concept and Construction of Root Loci, analysis of Control Systems with Root Locus (Simple Problems to understand theory). Pages (355 - 428)

**Unit-VI**

Correlation between Time and Frequency Responses - Polar Plots - Bode Plots - Log Magnitude versus Phase Plots

**Unit-VII**

All Pass and Minimum Phase Systems - Nyquist Stability Criterion - Assessment of Relative Stability - Constant M and N Circles. Pages (552 - 624)

**TEXTBOOK:**

1. Automatic Control Systems, Benjamin C. Kuo, PHI Publication (5th Edition).

**REFERENCES:**

1. Modern Control Engineering .Ogata,PHI
2. Control Systems Engineering I.J.Nagrath and M.GopIal Wiley Eastern Ltd.

## ECE 314 Computer Architecture and Organization

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
4	3	1	-	3	30	70	100

**1. Register Transfer and Micro operations:**

Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

**2. Basic Computer Organization:**

Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory Reference Instructions, Input - Output and Interrupt, Complete Computer Description.

**3. CPU Organization:**

Introduction, General Register Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC), Stack Organization.

**4. Micro programmed Control:**

Control Memory, Address Sequencing, Microinstruction Formats, Micro program Example, Design of Control Unit.

**5. Memory Organization:**

Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

**6. Input - Output Organization:**

Peripheral Devices, Input - Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA),

**7. Introduction to Multiprocessor System.**

**Text Book:**

Computer System Architecture, M. Morris Mano, PHI Publications, (3<sup>rd</sup> Edition May 1996).

**References:**

1. Computer Organization, V. Carl Hamacher, Zvonko G. Vranesic and Safwat G. Zaky, McGraw Hill International, (4<sup>th</sup> Edition).
2. Digital Computer Fundamentals, Thomas C. Bartee.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-315 : Industrial Instrumentation , 3/4 BE: 1<sup>st</sup> SEMESTER**

**Unit-I**

**Measurement of speed:** Revolution counter, Drag-cup tachometer, *stroboscope*, AC and DC tacho-generators, capacitive tachometer, speed measurement using reluctance pick-up, photo-transducer. - Density measurements for liquids.

**Unit-II**

Measurement of force load cell-strain gauges - and LVDT load cells - Pneumatic load cell - hydraulic load cell. Torque measurements using strain gauges and magnetostriction effect

**Unit-III**

**Measurement of Pressure:** Manometers, Bourdon gauges, Diaphragm gauges, Bellows gauges, Beil gauges, Electrical types - vacuum gauges, McLeod gauge, Knudsen gauge, thermocouple gauge, ionization gauge, Differential pressure transmitter - Pneumatic and electrical types - Calibration of pressure gauges.

**Unit-IV**

**Measurement of temperature:** temperature scale, Bimetallic thermometer, filled-in thermometers, vapor pressure thermometers, resistance thermometers, 3-lead and 4-lead arrangement - thermistor, thermocouples - types and ranges characteristics, laws of thermocouples, cold junction compensation, radiation pyrometer, optical pyrometer.

**Unit-V**

**Measurement of flow:** Variable head flow meters orifice plate, venturi tube, dall tube, flow nozzle, pitot tube, Rota meter, mass flow meter, positive displacement meter, turbine flow meter, electromagnetic flow meter, ultrasonic flow meter, open channel flow measurements, solid flow measurement, flow meters calibration.

**Unit-VI**

**Measurement of level:** Sight glass, float gauge, displacer, torque tube, bubbler tube, diaphragm box method, electrical methods - resistance type, capacitance type, ultrasonic level gauging.

**Unit-VII**

**Miscellaneous measurements:** Humidity, dew point, psychrometer, hygrometers, moisture measurement in paper, kilns, viscosity, consistency, say bolt viscometer, Rota meter type viscometer, consistency measurements.

**TEXTBOOK:**

1. D.Patranabis, Principles of Industrial Instrumentation, TataMcGraw Hill.

**REFERENCES:**

1. A.E.Fribance Industrial Instrumentation Fundamentals McGraw Hill 1975
2. Industrial Instrumentation and control –S.K.Singh TMH 1992

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-316: Microprocessor & Interfacing, 3/4 BE: 1<sup>st</sup> SEMESTER**

**Unit-I**  
Introduction of 8085 Microprocessor, Internal Architecture and Functional Description of INTEL 8085.

**Unit-II**  
Interrupt Structure of 8085, Instruction Set and Timing Diagrams.

**Unit-III**  
Programming The 8085: Introduction to 8085 Assembly Language Programming, Sample Programs - Stack and Subroutines.

**Unit-IV**  
Interfacing Semiconductor Memory Devices to 8085: Classification and Internal Organization of Semiconductor Memory Devices,

**Unit-V**  
Interfacing of SRAMs, DRAMs' and EPROM's. Interfacing I/O Devices to 8085: Parallel I/O (8255A), Timer/Counter (8253), Serial I/O (8251A), Keyboard display Interface.

**Unit-VI**  
Data Converters: ADC, DAC, and their Interfacing to 8085.

**Unit-VII**  
Elementary Concepts of 16-Bit and 32-Bit Microprocessors, INTEL 8086 Architecture.

**TEXTBOOK:**

1. Architecture Programming and Applications, Ramesh S. Gaonkar, New Age International Pvt. Ltd., (3rd Edition).

**REFERENCES:**

1. Microcomputer and Microprocessor –The 8080, 8085 and Z-80 Programming, Interfacing and Troubleshooting, John Ufferbeck, PHI (2<sup>nd</sup> Edition)
2. Introduction to Microprocessors, A.K.Mathur, TMH (3<sup>rd</sup> Edition)

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-3.1.7: Linear IC Laboratory, 3/4 BE: 1<sup>st</sup> SEMESTER**

1. OP-AMP: INVESTING NON-INVERTING AMPLIFIER
2. APPLICATIONS OF OP-AMPS: SUB TRACTOR
3. 555 TIMERS AS MONOSTABLE AND ASTABLE MULTIVIBRATOR.
4. THREE TERMINAL IC VOLTAGE REGULATORS.
5. SCHMITT TRIGGER.
6. FILTERS 1<sup>ST</sup> ORDER LPF & HPF.
7. UJT SWEEP GENERATOR.
8. FILTERS 2<sup>ND</sup> ORDER LPF & HPF.
9. VOLTAGE CONTROLLED OSCILLATOR.
10. INSTRUMENTATION AMPLIFIER USING 741 IC'S.
11. OP-AMP AS INTEGRATOR, DIFFERENTIATOR

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**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-318: D.E. Laboratory, 3/4 BE: 1<sup>st</sup> SEMESTER**

1. MINIMIZATION AND REALIZATION OF A GIVEN FUNCTION USING BASIC GATES (AND, OR,NOR,NAND,XOR)
2. FUNCTION GENERATTING USING DECORDERES AND MULTIPLEXERS
3. EXEPERIMENTS ON PROIRITY ENCODER USING 74LS148
4. APPLICATION OF MULTIPLEXER
5. SEVEN SIGMENT DISPLAY EXEPERIMENTS
6. 4-BIT & 8-BIT ADDERS AND SUBTRACTERS
7. EXEPERIMENTS USING 74LS181 & 74LS182 ICs(ALU AND CARRY LOOK AHEAD ADDERS)
8. EXEPERIMENTS ON SR LOGIC AND MASTERS SLAVE JK FLIP FLAP USING SSI GATES
9. DESIGN AND TESTING OF RIPPLE COUNTER USING ICs
10. DESING AND TESTING OF SHIFT REGISTERS
11. DESING AND TESTING OF MOD-K COUNTERS
12. EXEPERIMENTS USING ROMS
13. A PCM COMPANDED ENCODER USING 27512
14. PLAS TO REALIZE SOP FUNCTION USING IC828100.
15. TO REALIZE BINARY – SELECT MULTIPLEXER USING PAL 16L8

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**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-321: Bio-Medical Instrumentation, 3/4 BE: 2<sup>nd</sup> SEMESTER**

**SYLLABUS:**

**UNIT – I**

**Human Physiological Systems:**

Specifications of Bio-Medical Instrumentation, Man Instrumentation System, Physiological systems of the body, problems encountered in measuring a living system

**Unit-II**

**Electrophysiology:**

Functional structure of the cell, resting and action potentials, propagation of action potentials in different types of cells, differential electrode systems to pick up bio electric potentials, different types of electrodes used in recording, biomedical amplifiers and signal conditioners.

**UNIT –III**

**Classification of Instruments:**

Instruments for recording physiological parameters ECG, EEG,EMG, AND PCG Prosthetic devices - Pacemakers, Artificial organs.

**UNIT – VI**

**Respiratory System and blood flow meters:**

Physiology of respiratory system, Tests and Instrumentation for the mechanics of breathing – Electromagnetic blood flow meter, Ultrasonic blood flow meter

**UNIT - V**

**Patient monitoring Systems:**

Measurement of blood pressure, measurement of temperature, Intensive cardiac care unit – bedside and central monitoring systems-digital computers for medical applications- data acquisition , data storage, data reduction and transformation, mathematical operations, pattern recognition, limit detection, data presentation, control functions - sources of electrical hazards and safety techniques.

**UNIT – VI**

**Ultrasonic Imaging :**

Construction of an ultrasonic transducer, Ultrasonic propagation through tissues, display- A-mode, B-mode, M-mode, recording devices, ultrasonic imaging instrumentation, applications of diagnostic ultrasound – Echocardiography, Endoscopy.

**Unit-VII**

**Computerized tomography:**

Principles of CT, CT number scale, block diagram for CT scanner, detector arrays, image reconstruction, applications of CT, laser applications

**Text Books:**

Leslie Cromwell, Fred J.Weilbell and Erich A.Pleiffer  
Bio medical instrumentation and measurements, PHI, 1990

**Reference Books:**

R.S.Kandpur, Hand book of Bio-medical instrumentation, Tata Magraw Hill, 1987  
M.Arumugam, Bio-medical instrumentation, Anuradha agencies, 1992

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-322: Signals & Systems, 3/4 BE: 2<sup>nd</sup> SEMESTER**

**UNIT 1: Introduction to Signals & Systems**

Signals, Transformations of Independent Variables, Basic Continuous Time Signals, Basic Discrete Time Signals, Systems, Properties of Systems, linear Time - invariant Systems.

**UNIT II: Continuous Time Linear Time Invariant systems**

Linear Time - Invariant (LTI) Systems: Representation of Signals in terms of Impulses, Continuous time LTI systems, the convolution integral, properties of convolution.

**UNIT III: Discrete Time linear Time Invariant systems**

Discrete Time LTI Systems, the Convolution Sum, Properties of LTI Systems, Systems described by Differential and Difference Equations. Block Diagram Representation of LTI Systems described by Differential Equation, Singularity Functions.

**UNIT IV: Fourier series of Continuous Time Systems**

Fourier analysis of Continuous Time Signals and Systems, The-Response of Continuous Time LTI Systems to Complex Exponentials, the Continuous Time Fourier series. Convergence of Fourier series.

**UNIT V: Fourier Transform of Continuous Time LTI systems**

A periodic Signals and Continuous Fourier Transform. Periodic Signals and Continuous Fourier Transform. Convolution and Modulation Property; Polar Representation: of Continuous Fourier Transform. Frequency Response Characterized by Linear Constant Coefficient Differential Equations. First Order and Second-order Systems.

**UNIT VI: Fourier Transform of Discrete Time LTI Systems**

Fourier analysis of Discrete Time Signals and Systems. Response of Discrete Time LTI Systems to Complex Exponential. Fourier series, DTFT, Periodic Signals and DTFT, Properties of DTFT, Convolution, Modulation and Duality Property. Polar Representation of DTFT, First-order and Second-order Systems.

**UNIT VII: Concept of Z-Transforms**

Concept of Z: Sampling Theorem, Reconstruction of a Signal from Samples, the Effect of Under-sampling, Discrete Time Processing of Continuous. Time Signals. Sampling in Frequency Domain, Sampling of Discrete Time Signals. Z-transform of a Discrete Sequence, Region of Convergence for the Z-transform. Inverse Z-transform, Properties of Z-transform, Relation between Z and Fourier Transform.

**TEXTBOOK:**

Signals and Systems, Alan V. Oppenheim, Alan S. Will sky and Ian T. Young, PHI.

**REFERENCES:**

Communication Systems B.P.Lathi.

Signals and Systems B.P.Lathi

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-323: Industrial Electronics, 3/4 BE: 2<sup>nd</sup> SEMESTER**

**Unit-I**

**Types of power electronic converters:** PNP diode – Basic structure - - Two transistor version – Volt amp characteristics – Holding current – Temperature dependence – Rate effect – DIAC : Basic structure Volt ampere characteristics – Silicon Controlled Switch (SCS) : Basic structure – TRIAC: Basic structure- Volt –ampere characteristics – Positive bias and negative bias operations

**Unit-II**

**Silicon Controlled Rectifier (SCR):** Basic structure- Two transistor equivalent – Volt ampere characteristics – ON and OFF times of gate – SCR rating – Turn ON and Turn OFF methods of SCR- Gate circuit of SCR- Two SCRS connected back to back – UJT – Basic structure – Potential divider equivalent – Static emitter characteristics

**Unit-III**

**Poly phase Controlled Rectifiers:** Single – phase controlled rectifiers: Half wave controlled rectifier with R, RL load, Full wave controlled rectifier with resistance load. Three phase controlled rectifier: Half wave controlled rectifier with R, RL load – six phase half controlled rectifier with R, RL load – Effect of free wheeling diode.

**Unit-IV**

**Principle of step down DC:** Chopper operation- control strategies – step up choppers – chopper configuration first quadrant or type a chopper – second quadrant or type – B chopper – type c chopper – type – B chopper – type – E chopper communication of choppers

**Unit-V**

**Inverters:** Classification of Inverters – Series inverters – Parallel inverters – Single phase bridge inverters – MC Murray half bridge inverter – Modified McMurray half bridge inverter- McMurray full bridge inverter- Modified mode – Voltage control techniques in single phase inverters – PWM

**Unit-VI**

**Speed Control of DC Motors:** Single Phase SCR drive – 3 SCR drive – closed loop motor control system – Half controlled SCR bridge for series motor drive – chopper controlled DC drive

**Unit-VII**

**Speed control of AC Motors:** Chopper controlled rotor resistance scheme – speed control by variation of stator voltage using SCRS – closed loop speed control of an induction motor by variation of stator voltage using SCRS voltage fed inverter control – current fed inverter control.

**TEXTBOOKS:**

1. Industrial Electronics – G.K.MITHAL
2. Power Electronics – Haribabu
3. Power Electronics – M.D.Singh , Khanchandhani

**SIR C R R COLLEGE OF ENGINEERING –ELURU**

**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**

**EIE-324: Telemetry & Tele -Control**

**3/4 BE: 2<sup>nd</sup> SEMESTER**

**Unit-I**

Telemetry Systems: Functional blocks of telemetry system, Methods of telemetry: Landline telemetry, Mechanical, Pneumatic and Electrical systems. Industrial applications. Negative feedback principle applied to Pneumatic and wire telemetry. Telemetry Links

**Unit-II**

Modulation techniques: Modulation, Different kinds of AM and FM modulators and demodulators

**Unit-III**

Sampling theorem, Nyquist frequency, Sampling techniques and signal reconstruction. Pulse modulation, PAM, PWM, PPM signals. Pulse code modulation.

**Unit-IV**

Multiplexing, FDM and TDM systems, their relative merits, Amplitude shift keying, Frequency shift keying and Phase shift keying modulation methods.

**Unit-V**

Basics of Satellite Telemetry & Communication: Functional blocks of satellite telemetry system, TT&C sub systems and TT&C services. Remote Control Systems; Mechanical, electrical and electronic methods.

**Unit-VI**

Telemetry Applications: Telemedicine and Tele surgery, Ocean data telemetry Application, Physiological telemetry application, A dockside communications systems for LNG tanks (military application)

**Unit-VII**

TeleControl : Basic Telecontrol installation, Control room engineering, The erection of Telecontrol and ancillary equipments, Telecontrol centers in railway systems

**TEXTBOOKS:**

D Patranabis – Telemetry Principles, Tata McGraw Hill publishing company Ltd 1999

Sanjay Sharma – Analog and Digital Communication Kataria Publications

David Bailey – Practical Radio Engineering and Telemetry for Industry”. Elsevier - 2003

Swobada G – Tele control: Methods and Applications of Telemetering and Remote Control, Van Nostrand, 1971.

Gruenberg L - Handbook of Telemetry and Telecontrol, McGraw Hill, 1967.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-325: Advanced Instrumentation Systems,3/4 BE: 2<sup>nd</sup> SEMESTER**

**Unit-I**

**Modern Sensors :** Micro flow sensors, Breeze sensors, Drag force flow sensors, Fabry-perot sensors for measuring small displacements, Linear optical sensors for position detection, advances in ultrasonic sensors, Radar sensors

**Unit-II**

**Modern measurement techniques for Level and Temperature:** Thickness and level sensors-Ablation sensors, Dry dielectric film capacitive sensor for level measurement, Thermistors, NTC thermistors, Fabrication of NTC Thermistors, self heating effect in NTC thermistor, PTC thermistor & its applications, Acoustic Temperature sensors

**Unit-III**

**Intelligent Systems:** Components of microprocessor based Transmitter, Attributes and features of microprocessor-based and intelligent transmitters, Microprocessor based and intelligent liquid level measurement system, Microprocessor based and Intelligent Temperature Transmitter

**Unit –IV**

**Field Communication** Field Bus-Introduction, Three-layer Implementation of the field bus concept, Field bus functions and benefits, HART protocol, Basics of Ethernet.

**Unit-V**

**Virtual Instrumentation Basics:** Block diagram and architecture of a virtual Instrument, Virtual Instrument software Architecture (VISA), Real-time Programming, Data flow and Graphical programming techniques, comparison with conventional programming.

**Unit-VI**

**Basics of Lab view:** Components of Lab view, Tools and other palettes, code debugging, creating sub VIS, Guide lines for good programming.

**Unit-VII**

**Data Acquisition in VI:** Real-world signal interfacing, Analog Interfacing, Connecting the signal, Ideal Interfacing, Measurement and Automation Explorer.

Text Books:

1. Jacob Fraden “Hand Book of Modern Sensors” Springer International edition – 3<sup>rd</sup> edition 2004
2. Walt Boyes “Instrumentation Reference Book” Elsevier – 2004
3. N.Mathivanan , PC-Based Instrumentation, Prentice – Hall of India Pvt Ltd, 1<sup>st</sup> Edition, 2007.
4. Sanjay Gupta & Joseph John “Virtual Instrumentation using LabVIEW” Tata MCGraw-Hill publishing company Ltd., 2005

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-326: Process Control, 3/4 BE: 2<sup>nd</sup> SEMESTER**

**Unit - I**

Process variables - degrees of freedom - characteristics of liquid system, gas system, Thermal system mathematical model of liquid process, gas process. Thermal process – batch process and continuous process - self-regulation.

**Unit - II**

Basic control actions. characteristics of On-Off, proportional, single speed floating, integral and derivative control modes - composite control modes - P+ I, P+ D and P+ I+D control modes response controllers for different types of test inputs.

**Unit - III**

Pneumatic and electronic controllers to realize various control action - selection of control made for different process

**Unit - IV**

Optimum controller settings - tuning of controllers by process reaction curve method - continuous cycling method - damped oscillation method - Ziegler - Nichols tuning - 1/4 decay ratio.

**Unit - V**

Feed forward control. Ratio control - Cascade control - Averaging control – Multivariable control.

**Unit- VI**

I/P and P/I converters - pneumatic and electric actuators - valve positioned- control valve - characteristics of control valve - valve body - globe, butterfly, diaphragm, ball valves - control valve sizing -cavitation, flashing In control valves.

**Unit - VII**

Distillation column - control at top and bottom product compositions - Reflux- Ratio - control of chemical reactor - control of heat exchanger. Steam boiler drums level control and combustion control! Piping and Instrumentation diagram of control loops

**TEXTBOOKS:**

- A. Pollard, Process control, Heinemann Educational books,1971.  
D.P. Eckman, Automatic Process Control, Wiley Eastern Ltd., 1972.

**REFERENCES:**

- T.Weber, Introduction to Process Dynamics and Control, John Wiley & Sons, 1973  
P.Harriott Process Control, Tata McGraw Hill 1984  
B.G.Liptak, Instrumentation in Process Industries Vol.I & II Chiton Book Co., 1974  
C.Stephopoulos, Chemical Process Control, Prentice Hall of India Pvt.Ltd.1990  
F.G.Shinkey Process Control System,3<sup>rd</sup> Edition Mc Graw Hill 1990

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**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-3.2.7: Industrial Instrumentation Laboratory , 3/4 BE: 2<sup>nd</sup> SEMESTER**

1. LVDT CHARACTERISTICS AND CALCULATIONS.
2. DC MOTOR SPEED MEASUREMENT.
3. STRAIN GAUGE AND LOAD CELL CHARECTERSTICS.
4. TEMPERATURE MEASUREMENT USING RTD& THERMOCOUPLE .
5. CONTROL VALVE CHARECTERSTICS
6. CALIBRATION OF PRESSURE GAUGES USING DEAD WEIGHT TESTER
7. PH MEASUREMENT
8. HUMIDITY & COLOUR INTENSITY MEASUREMENT
9. FLOW MEASUREMENT USING ORIFICE METER
10. THERMISTER CHARECTERSTICS AND TEMPERATURE MEASUREMENT USING THERMISTOR
11. CHARECTERSTICS OF MICROPHONE / SPEAKER AND SOUND LEVEL MEASUREMENT

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**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-328 : Microprocessor Laboratory, 3/4 BE: 2<sup>nd</sup> SEMESTER**

1. UNDERSTANDING INSTRUCTIONS 8085 MP
2. BLOCK MANIPULATION
3. ARTHMETIC OPERATION- ADDITION N NUMBERS
4. MULTIPLICATION
5. HEXADECIMAL COUNTER.
6. DECIMAL COUNTER.
7. HEXA DECIMAL CLOCK.
8. DIGITAL CLOCK
9. FLASHING DISPLAYS
10. KEYBOARD MAMAGEMENT
11. INTERRUPTS.
12. INTERFACING D/A CONVERTER.

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**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**

**EIE-411 Digital Signal Processing**  
**4/4 BE: 1<sup>st</sup> SEMESTER**

<i>Credits</i>	<i>Periods</i>			<i>Exam Hrs.</i>	<i>Sessional Marks</i>	<i>Exam Marks</i>	<i>Total Marks</i>
	<i>Theory</i>	<i>Tutorial</i>	<i>Lab</i>				
4	3	1	-	3	30	70	100

**CHAPTER-1**

Introduction to Digital Signal Processing. Discrete time signals & sequences, linear shift invariant systems, stability and causality. Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems.

**CHAPTER-2**

Applications of Z-transforms: System function H(Z) of digital systems, Stability analysis, solution of difference equations of digital filters. Frequency response of stable systems. Realization of digital filters – direct, canonic, cascade & parallel forms, Finite word length effects.

**CHAPTER-3**

Discrete Fourier Transform (DFT): Properties of discrete Fourier series, DFS representation of periodic sequences. Discrete Fourier Transforms: Properties of DFT, linear convolution of sequences using DFT. Computation of DFT

**CHAPTER-4**

Fast Fourier Transforms (FFT) : Radix-2 decimation-in-time(DIT) and decimation-in-frequency(DIF) FFT Algorithms. Inverse FFT.

**CHAPTER-5**

IIR DIGITAL FILTER DESIGN TECHNIQUES: Analog filter approximations – Butterworth and Chebyshev approximations. Frequency transformations, General considerations in digital filter design, Design of IIR Digital filters from analog filters – Bilinear transformation method, step & impulse invariance techniques.

**CHAPTER-6**

DESIGN OF FIR DIGITAL FILTERS: Characteristics of FIR Digital filters, frequency response. Fourier series method, Design of FIR Digital Filters using Window Techniques. Frequency Sampling technique. Comparison of IIR and FIR filters.

**CHAPTER-7**

APPLICATIONS: Applications of FFT in Spectrum analysis and filtering. Application of DSP in Speech processing.

**Text Book:**

Alan V. Oppenheim and Ronald W. Schaffer: Digital Signal Processing, PHI.

**References:**

1. Sanjit K. Mitra, Digital Signal Processing “A – Computer Based Approach”, Tata Mc Graw Hill.
2. Raddar and Rabiner, Application of Digital Signal Processing.
3. S. P. Eugene Xavier, Signals, Systems and Signal Processing, S. Chand and Co. Ltd.
4. Antonio, Analysis and Design of Digital Filters, Tata Mc Graw Hill.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**

**EIE-412 PC Based in Instrumentation**  
**4/4 BE: 1<sup>st</sup> SEMESTER**

**Unit-I**  
8086/8088 Microprocessor architecture, Pin configuration and Addressing modes of 8086/8088 Microprocessor.

**Unit-II**  
Instruction set of 8086, Assembly language programming, Assembler Directives, Interrupts in 8086/8088 microprocessor and Advanced programming

**Unit-III**  
Interfacing memory and I/O devices to the 8086 micro processor, Minimum & Maximum mode configurations.

**Unit-IV**  
Interfacing A/D converters to the PC and Data Acquisition systems

**Unit-V**  
Interfacing D/A converters to the PC and Generation of waveforms

**Unit-VI**  
PC based instruments for monitoring several Physical Parameters and Computer aided ECG analysis

**Unit-VII**  
80286, 80386, 80486 and Pentium processors

**TEXT BOOKS:**

1. Microprocessor and interfacing by Douglas V.Hall,Mc- Graw Hill 1986
2. The Intel microprocessor 8086/8088, 80186, 80286, 80386 and 80486

**REFERENCES**

1. Assembly Language programming the IBM PC by Alanr, Miller,Sybex Ino1987

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-413 Analytical & Environmental Instrumentation**  
**4/4 BE: 1st SEMESTER**

**Unit-1**

Introduction: Laboratory and Industrial Analyzers. Classification of the methods of analysis .Block Diagram of Analyzing systems, Colorimeters Spectrophotometers (Visible & Ultra Violet): Electromagnetic radiation .The Beer Lambert Law. Absorption Instruments. Calibration of the systems.

**Unit-II**

Infra-Red Spectrophotometers: Types of Instruments Principals of operations. Basic components of the systems. Calibration of the systems

**Unit-III**

Nuclear magnetic resonance spectrophotometer (NMR): Principle, Construction details. Fourier Transform NMR Spectroscopy .Computerized NMR, Electron spins Resonance Spectrometer (ESR): Principle of operation Construction of the ESR Spectrometer.

**Unit-IV**

X-Ray Spectrometers: X-Ray spectrum Instrumentation for X-Ray Spectrometry X-Ray of absorption meters X-Ray fluorescence spectrometers

**Unit-V**

Gas and Liquid Chromatographic Systems: Principals of Chromatographic Systems Principals Chromatography .Schemes and constructional details and functions Chromatographic Systems components. Thermo Analytical Systems, Systems working on Thermal Conductivity Principle of operation- Conductivity cell construction-Measuring Circuits. Differential Thermal Analysis.-Principles of Operation- Instrumentation and working.

**Unit-VI**

Electro-Chemical Instruments: Electro-Chemical cell -construction potentiometer. Instrument Conductivity Meters – Construction –Measurement of conductance .Polar graphs –Types of Electrodes-Instrumentation.

PH Measuring Systems: Principles of PH Measuring. Electrodes – Measuring reference - Selective Ion Type.

**Unit-VII**

Industrial Gas Analyzers: Types of gas analyzers, Flue gas analyzers, Para magnetic oxygen gas analyzers, Electro chemical gas analyzers, IR gas analyzers, Analyzers based on gas density, Systems based in Ionization of gases. Environmental pollution monitoring instruments, Air pollution monitoring instruments, systems for carbon monoxide, sulphurdioxide, Nitrogen oxides, Hydrocarbons, ozone, automated wet chemical analyzer, water pollution monitoring instruments

**TEXTBOOKS:**

1. Handbook of Analytical Instruments-RS Khandapur TMH pub
2. Instrumental methods or analysis-HH-Willard LL Merritt Jr.,
3. JA Dean, FA Settle, JR CBS pub
4. Instrument Engineers Hand Book
5. Process instrumentation and Analysis –GB Liptak Editor in –Charge Chition book Company.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**

**EIE-414: Computer Control of Processors**  
**4/4 BE: 1<sup>st</sup> SEMESTER**

**Unit I:**

Introduction: Historical developments of control systems-current trends in computer control of process plants. Fundamentals of Automatic process control-Process definition feedback control-Single controller loop-Two Position control- Multi position control-PID control-Multivariable control-Feed forward control.

**Unit II :**

Building blocks of .Automation system-Processing system-Multi microprocessor systems-local area networks-Analog and Digital I/O modules-Supervisory and data acquisition systems-Remote terminal unit.

**Unit III:**

Direct Digital Control (DDC): Introduction-DDC Structure-DDC Software position algorithm and velocity)""algorithm. Microcomputer based DDC structure .

**Unit IV :**

Programmable logic controllers (PLC's)-Principles of operation, Architecture of programmable controller-Programming the programmable controllers Ladder diagram, instructions- Software-configuration-applications.

**Unit V :**

Distributed Digital Control: Introduction-Distributed Vs centralized control Advantages-Functional requirements of distributed process control system System Architecture-Distributed Control System(DCS)-Sub-systems-Local field station-Presentation and monitoring device-Communication options in DCSConfiguration. Some popular distributed control systems. Display systems Display parameters-Display in process control environment-Computer graphics.

**Unit VI :**

Modeling and simulation of plant automation-Definition of terms-Need and uses of systems simulation- Mathematical model of a plant-model evaluation and improvement-modern tools for modeling and simulation of systems application examples.

**Unit VII:**

Industrial control applications-cement plant-thermal power plant-water treatment plant-irrigation canal management steel plant

**TEXTBOOKS:**

1. Computer-based Industrial Control by Krishna Kanth

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-415: Pattern Recognition & Image Processing**  
**4/4 BE: 1<sup>st</sup> SEMESTER**

**Unit-I**

**Digital image fundamentals:** Digital image processing applications-A simple image model-sampling & Quantization – some basic relationship between pixels.

**Unit-II**

**Image transforms:** Two dimensional orthogonal and unitary transforms-properties of unitary transforms -one dimensional DFT -Two dimensional DFT-cosine transforms sine transforms-Hadamard transforms-Haar transforms

**Unit-III**

**Image Enhancement:** Point operations-Histogram Modeling- spatial operations-Transform operations.

**Unit-IV**

**Image restoring and compression:** Image observation models-inverse and Wiener filtering-Pixel coding –predictive techniques-Transform coding of Images.

**Unit-V**

**Statistical and Non-parametric Decision Making:** Applications of pattern recognition-Bayes's Theorem-Multiple features-conditionality independent features-Decision boundaries-unequal cost of error –estimation of error rates- kernel and window estimates-nearest neighborhood classification techniques-adaptive decision boundaries-adaptive discriminate functions

**Unit-VI**

**Clustering:** Introduction-Hierarchical clustering –Partitional clustering.

**Unit-VII**

**Artificial Neural Networks:** Introduction – nets without hidden layers-nets with hidden layers-the back propagation algorithms-Hopfield nets – Classifying sex from facial images

**TEXT BOOKS:**

1. Fundamentals of digital image processing - Anil.K Jain
2. Pattern Recognition and image analysis-earl Gose and Richard Johnsonbaugh steve jost
3. Digital image processing- Rafeal C.Gonzalez and Richard E.Woods

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-415: EMI and EMC, 4/4 BE: 2<sup>nd</sup> SEMESTER**

**Unit-I**

Introduction: History and concept of EMI, Definitions of EMI and EMC environment. Practical experiences and concerns, frequency spectrum conservations, mechanism of EMI generation, EMI testing, methods of elimination of EMI, Biological effects of EMI.

**Unit-II**

Natural and man made sources of EMI and EMC: Sources of electromagnetic noise, typical noise paths, models of noise coupling, designing for EM compatibility, Lightning discharge electro static discharge, electromagnetic pulse EMP.

**Unit-III**

EMI from apparatus slash circuits and open area test sites, Electromagnetic emissions, Noise from relays and switches, non linearities in circuits, passive inter modulation, transients in power supply lines, EMI from power electronic equipment, EMI as combination of radiation and conduction.

**Unit-IV**

Open area test sites: OATS measurements, measurement precautions.

Radiated interference measurements: Anechoic chamber, TEM cell, reverberating chamber, GTEM cell, comparison of test facilities.

**Unit-5**

Conducted interference measurements : Characterization of conduction current slash voltages, conducted EM noise and power lines, conducted EMI from equipment, immunity to conduct EMI, characteristics of EMI filters and power line filter design.

**Unit-6**

Grounding and cabling: Safety and signal grounds, Low and high frequency grounding methods, grounding of amplifiers and cable shields, isolation, neutralizing transformers, shield grounding at high frequencies, digital grounding.

Types of cables, mechanism of EMI emission/ coupling in cables.

**Unit-7**

Shielding and Bonding: Effectiveness of shielding, near and far fields/ impedances, methods of analysis, total loss due to absorption and reflection effects, composite absorption and reflection losses for electric field/ magnetic fields. Magnetic materials as a shield , shield discontinuities, slots and holes, seams and joints, conductive gaskets.

Electrical bonding, shape and material for bond strap, general characteristics of good bonds.

**Text Books:**

1. Engineering Electromagnetic Compatibility by Dr. V.P. Kodall, IEEE Publication, printed in India by S. Chand & Co Ltd, New Delhi, 2000.
2. Electromagnetic interference and Compatibility IMPACT Series, IIT Delhi, Modules 1-9.
- 3. References:**
4. Introduction to Electromagnetic Compatibility, NY, Jhon Wiley, 1992, by C.R.Pal.
5. Radar Hand Book by Skolink.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-415: Artificial Intelligence & Expert Systems, 4/4 BE: 2<sup>nd</sup> SEMESTER**

**Unit-I**

Definition and scope of artificial intelligence (AI) - Fundamentals of expert systems - data base programs versus expert systems - components, features and categories of expert systems.

**Unit-II**

Heuristic search - 8 Puzzle problems - control strategies - production system characteristic - knowledge representation - matching heuristic function search methods - problem reduction - Hierarchical planning.

**Unit-III**

Introduction to knowledge representation - representing simple facts in logic - resolution - propositional logic - predicate logic - Non monotonic reasoning - statistical and probabilistic reasoning - rule based systems.

**Unit-IV**

Structured representation of knowledge - declarative representation - semantic nets - frames – scripts

**Unit-V**

Syntactic and procedural representations - natural language understanding - principles of natural language processing.

**Unit-VI**

Characteristics of AI language - PROLOG and LISP - symbol manipulation - LISP functions definitions, predicates, conditional - recursion - iteration -properties

**Unit-VII**

Arrays - I/O, statements - search, sort, hill climbing methods perception and learning.

**Textbooks:**

1. Elaine rich, Artificial intelligence, Mc Graw hill, 1983.
2. Henry, understanding 3. Tony Hasmemar locking at LISP eddison vasly, 1984 intelignace, BPB pub.

**Reference Books:**

1. P. H. Winston, artificial intelligence, Addison Wesley, 1984.
2. N. J. Nilson, principles of AI, springer verlag, 1982.
3. Tony Hasmemar, Locking at LISp, Addiscn wesiey, 1984.
4. Ciccksin and Mellish, programming J in FRC:LOG, springer verlog, 1987.

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**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE – 415 Elective, 4/4 BE: 1- SEMESTER**  
**Neural Networks**

**Unit-1**

Fundamentals of artificial neural networks- biological neurons and their artificial models, neural processing, learning and adoption.

**Unit-2**

Neural networks Learning rules- Hebbian, perceptron, Delta Widrow-hoff, Correlation, and Winner-take all, Outstar learning rules.

**Unit-3**

Single layer perception, multi-player feed forward networks – Error back propagation training algorithm, problems with back propagation, Boltzman training, Cauchy training , combined back propagation/ Cauchy training.

**Unit -4**

Hopfield networks, Recurrent and bidirectional associative memories, counter propagation network, artificial resonance theory (ART).

**Unit-5**

Application of Neural Networks- Hand written digit and Character Recognition, Traveling sales man problem, and Neuro Controller- Inverted pendulum Controller, Cerebellar model articulation Controller, Robot Kinematics, Expert systems for medical diagnosis.

**Unit-6**

Introduction to Fuzzy set theory- Classical set Vs fuzzy set, properties of fuzzy sets , operational fuzzy sets- union, intersection, compliment, T-norm and co-T-norm.

**Unit-7**

Fuzzy relations – operations on fuzzy relations, cylindrical extensions, inference rules, compositional rule of inference.

**Text books:-**

1. Introduction to Artificial Neural systems, S.M.ZURADA, Jaico publishing house, (1992)
2. Neural compute- Theory and practice, Phillip.D.WESSERMAN, Van nostrandreinhold, New York (1989)
3. Neural net Works and Fuzzy Systems, Bart Kosko, Prentice Hall, NJ (1992)
4. An Introduction to Fuzzy control, Ddrainkov, H.Hellen Doorn, M.Rein frank, Narosa Publishing House, New Delhi.(1993)

**SIR C R REDDY COLLEGE OF ENGINEERING –ELURU**  
**DEPT. OF ELECTRONICS AND INSTRUMENTATION ENGG.**  
**EIE-416: BIO-MEDICAL INSTRUMENTATION LABORATORY**  
**4/4 B.E., EIE: I- SEMESTER**

1. RECORDING AND PARAMETER CALCULATIONS OF ECG - L1, L2, L3 – BIPOLAR CONFIGURATION
2. RECORDING AND PARAMETER CALCULATION OF ECG WITH -aVR, aVL, aVF- UNIPOLAR CONFIGURATION
3. RECORDING AND PARAMETER CALCULATION OF ECG WITH UNIPOLAR CHEST LEADS-V<sub>1</sub>-V<sub>6</sub>.
4. RECORDING AND FREQUENCY CALCULATION OF EEG SYSTEM
5.  $\alpha, \beta, \theta, \gamma$
6. PATIENT MONITORING SYSTEM WITH PCG,PULSE,RESPIRATION, TEMP.
7. MEASUREMENT OF LUNG VOLUME
8. PC BASED DATA ACQUISITION OF STRAINED AND UNSTRAINED EMG SIGNAL THROUGH 4 – CHANNEL AMPLIFIER
9. BIO-SIGNAL (ECG, EMG, EEG) ANALYSIS THROUGH TRANSFORM TECHNIQUE
10. ULTRASONIC BLOOD FLOW METER
11. SYSTOLIC & DIASTOLIC PRESSURE MEASUREMENT.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE – 417: PROCESS INSTRUMENTATION LABORATORY**  
**4/4 BE: I- SEMESTER**  
**(ASPER UNIVERSITY SYLLABUS)**

1. Measurement of Displacement
2. Measurement of Temperature
3. Measurement of Pressure
4. Measurement of Level
5. Measurement of Flow
6. Temperature Control Using PLC
7. Realization of Boolean expressions using PLC
8. Pressure Control
9. Level Control
10. Flow Control

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**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE – 421: Engineering Economics & Management**  
**4/4 BE: II- SEMESTER**

(Common with ECE)

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-422: VLSI Design,4/4 BE: 2<sup>nd</sup> SEMESTER**

**Unit-I**

VLSI technology trends, Moore's Law

**Unit-II**

Difference between MOS and BJTs, MOS transistor characteristics, Types of MOS transistors, NMOS and CMOS inverter circuit and transmission gates, Inverter circuit operation, ratioed logic, Structure of NMOS and CMOS inverter

**Unit-III**

NMOS and CMOS circuits for combinational and sequential logic, Stick notation, Shannon's, expansion theorem and realization of Boolean functions, PLA generators, Pseudo NMOS circuits, Clocked logic, Simple Flip -flop realization, Using: NMOS and CMOS, Shift register & dynamic shift registers, Super buffers, .RAM and ROMS.

**Unit-IV:**

VLSI fabrication Techniques: Lithographic process, Twin-tub and SOS process, Design rules, specification of layers.

**Unit-V**

Delay and timing calculation, Power estimates.

**Unit-VI**

System Design, VLSI Design levels system design examples,

**Unit-VII:**

CAD tools for VLSI Design Steps, CIF Representation, Design Styles, Placement, Routing.

**TEXT BOOKS:**

1. Basic VLSI Design by Douglas A, Puckneil, Kumaran Eshraghian ,PHI, 1996, 3rd Edition
2. Mead, C.A. and Conway, L.A: introduction to VLSI Systems Addition – Wesley Reading Massachusetts, 1980.

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE – 423: Data Communication & Networks**  
**4/4 BE: II- SEMESTER**

**(Common with ECE)**

**SIR C R R COLLEGE OF ENGINEERING –ELURU**

**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**

**EIE-424: Opto Electronic Instrumentation**

**4/4 BE: 2<sup>nd</sup> SEMESTER**

**Unit-I**

Optical Fiber Communication systems: Introduction, Merits and Demerits, Optical fiber structure, Optical fiber manufacturing Techniques

**Unit-II**

Signal degradation in Optical fibers: Attenuation, Signal distortion mechanisms.

**Unit-III**

Optical sources: Lasers, LED'S. Structures and characteristics, Power launching and coupling.

**Unit-IV**

Optical detectors: Avalanche Photo Diode and PIN photo diode, modulation and demodulation.

**Unit-V**

Fiber Optic Sensors for industrial applications: Intrinsic and Extrinsic Fibre Sensors, On-Off Sensors, Temperature Sensors, Image Sensors, Displacement Sensors, Pressure Sensors, Acceleration Sensors, fluid Level Sensors, Flow Sensors.

**Unit-VI**

Network Topologies in Fibers:

Linear, Ring, Star and Ladder type Networks

**Unit-VII**

Multiplexing of Fiber Optic Sensors: TDM, wavelength division multiplexing, FM CW Multiplexing scheme, Optical time domain reflectometry, Optical frequency domain reflectometry.

**TEXT BOOKS:**

- 1.Optical fiber communications: Principles and Practice' John .M.Senior. PHI 2nd Edition.
- 2.Opto electronics - LBharupich and N.TIIgov:
- 3.Optical Fiber Communications - Gerd Keiser -Mcgraw hill. 2nd Edition

**REFERENCES**

Opto Electronics –An Introduction.J.Wilsonand J.F.B.Hawkes.PHI 2<sup>nd</sup> Edition

**SIR C R R COLLEGE OF ENGINEERING –ELURU**  
**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**  
**EIE-424: Instrumentation for Industrial Processes**  
**4/4 BE: 2<sup>nd</sup> SEMESTER**

**Unit-I**

Air handler and building conditioning controls, Batch control description and terminology, Batch process and automation.

**Unit-II**

Blending and ratio controls, boiler control and optimization

**Unit-III**

Centrifuge controls, chiller control and optimization, clean room control and optimization

**Unit-IV**

Compressor control and optimization, cooling tower control and optimization

**Unit-V**

Crystallizer controls, distillation basic controls and advanced controls-relative gain calculations.

**Unit-VI**

Dryer controls-evaporator controls, Extruder controls-fan controls, furnace and reformer controls, heat exchanger, condenser and evaporator controls. ORP controls, PH control, pump control and optimization.

**Unit-VII**

Reactors: Control and optimization recipe charging and batch automation, simulation and modeling rolling mill controls, steam turbine controls, water treatment controls.

Text Books:

1. Process control by Liptak

**SIR C R R COLLEGE OF ENGINEERING –ELURU**

**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**

**EIE-424: Process Modeling & Simulation**

**4/4 BE: 2<sup>nd</sup> SEMESTER**

**Unit-I**

Introduction : Process Synthesis, Process analyzers, Optimization, Process plant simulation

**Unit-II**

Modeling: Modeling aspects, Deterministic and stochastic process, Mathematical modeling, chemical system modeling, cybernetics, controlled system, principles of similarity

**Unit-III**

Classification of mathematical modeling: Independent dependent variables, parameter,

Classification based on variation of independent variables, state of process, Type of process, Boundary conditions, Black box principle

**Unit-IV**

Chemical System Modeling: Models in mass-transfer operation, steady state, single stage, two stage, solvent extraction, cross current solvent extraction

**Unit-V**

Unsteady state : Single –stage solvent extraction, mass balance in a stirred tank, mixing tank, mass transfer ( Fick's second law of diffusion) steady-stage N stage counter-current solvent extraction, Multistage gas absorption.

**Unit-VI**

Models in Heat – transfer operations: Steady state heat conduction through a hollow cylindrical pipe, unsteady state steam heating of a liquid, unsteady state heat loss through a maturing tank

**Unit-VII**

Simulator: Modular approaches and equations – solving approach to process simulator. Professional simulation packages- HYSIS FLUENT-Software packages

**Text Book:**

Process Plant simulation by B.V.Babu, Publications: Oxford University Press

**SIR C R R COLLEGE OF ENGINEERING –ELURU**

**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION**

**EIE-424: Robotics & Automation**

**4/4 BE: II - SEMESTER**

**Unit - I**

- 1. Introduction to Robotics & Robot end Effectors:** Classification of end Effectors, Drive system for gripper, Mechanical grippers, Magnetic grippers, Vacuum grippers, Adhesive grippers, Hooks, Scoops, and other miscellaneous devices, active and passive grippers.

**Unit-II**

- 2. Robot Drives and actuators and Controller:** Function of Drive system general types of fluids, pump classification, attention introduction to pneumatic systems, electrical drives, DC motors, and transfer functions, stepper motor, and drive mechanisms.

**Unit -III**

- 3. Robot Kinematics:** Forward and Reverse Kinematics of three degrees of freedom of robot of arm, forward and reverse transformation of four degree of freedom manipulator in 3-D , Homogenous transformations kinematics equations using homogenous transformation.

**Unit - IV**

- 4. Robot Sensors:** Need for Sensors, Types of sensors, Robot vision systems, robot tactile systems, robot proximity sensors.

**Unit - V**

- 5. Robot Speech and Hearing:** Speech Synthesis, noise command systems, speech recognition systems

**Unit-VI**

- 6. Robot Intelligence & Programming Robots:** AI and Robotics, expert systems, interpreting sensory inputs, intelligent puttering systems. Robot languages, Robot operating systems, Robot application programming, teaching Robots

**Unit-VII**

- 7. Robot Applications:** Capabilities of Robots, materials handling, machine loading and unloading, machining and fettling, robot assembly welding future applications.

**Text Books**

1. Robotics technology and flexible automation, Tata McGraw Hill Pub. New Delhi. Satya Ranjan deb
2. Robotics introduction ,programming and projects , Maxwell Macmillan international edition, James.L.Fuller

**References:**

1. Robo technology, A series in 8 volumes pub: Kogan page, London,
2. Current trends in robotics: internet websites.

**SIR.C.R.R COLLEGE OF ENGINEERING**  
**DEPT. OF ELECTRONICS AND INSTRUMENTATION ENGG.**  
**EIE—425 : PC BASED INSTRUMENTATION LABORATORY**

**4/4 B.E. EIE: II -SEMESTER**

1. MACRO ASSEMBLER & CREATION OF COM & EXE FILES
2. MACROS
3. DEBUGGER, CREATION AND EXECUTION OF ASSEMBLY LANGUAGE FILES
4. ADDRESS DECODING AND DESIGNING OF I/O CARDS
5. A/D CONVERTER INTERFACE & DATA ACQUISITION USING THE PC
6. D/A CONVERTER INTERFACE AND DATA ACQUISITION USING THE PC
7. GENERATION OF SPECIFIC TIME DELAYS USING A TIMER INTERFACE
8. PC-BASED ELECTRO CARDIOGRAPH