SunRise University

Approved by Govt. of Rajasthan vide Sunrise University Act, 2011
Recognized by UGC Act, 1956 u/s 2 (f)

SYLLABUS FOR

B.E (Electronics & Instrumentation Engineering)

FULL TIME PROGRAMME

I SEMESTER

SL.NO.	SUB CODE	SUBJECT	C	IA	E	TM	DE
1	1BTEI01	English -I	3	40	60	100	3 Hrs
2.	1 BTEI02	Basic Mathematics For Engineering - I	3	40	60	100	3 Hrs
3.	1BTEI03	Engineering Physics	3	40	60	100	3 Hrs
4.	1BTEI04	Basic Electrical And Electronics Engineering	3	40	60	100	3 Hrs
5.	1BTEI05	Computer Programming	3	40	60	100	3 Hrs
6.	1BTEI06	Sanskrit And Indian Culture - I	1	100	-	100	2 Hrs
7.	1BTEI07	Engineering Graphics (Practical)	3	40	60	100	3 Hrs
8.	1BTEI08	Physics Lab	2	40	60	100	3 Hrs
9.	1BTEI09	Computer Programming Lab	2	40	60	100	3 Hrs
10.	1BTEI10	Basic Electrical Workshop	2	40	60	100	3 Hrs
							Total no of credits: 25

II SEMESTER

SL.NO.	SUB CODE	SUBJECT	C	IA	E	TM	DE
1	2BTEI01	English -II	3	40	60	100	3 Hrs
2.	2 BTEI02	Basic Mathematics For Engineering - II	3	40	60	100	3 Hrs
3.	2BTEI03	Engineering Chemistry	3	40	60	100	3 Hrs
4.	2BTEI04	Basic Civil And Mechanical Engineering	3	40	60	100	3 Hrs
5.	2BTEI05	Electric Circuit Theory	3	40	60	100	3 Hrs
6.	2BTEI06	Environmental Science And Engineering	3	40	60	100	3 Hrs
7.	2BTEI07	Sanskrit And Indian Culture - II	1	100	-	100	2 Hrs
8.	2BTEI08	Chemistry Lab	2	40	60	100	3 Hrs
9.	2BTEI09	Circuit Theory Lab	2	40	60	100	3 Hrs
10.	2BTEI10	Basic Mechanical Workshop	2	40	60	100	3 Hrs
							Total no of credits: 25

C- Credits, **IA -** Internal Assessment, **E -** External Assessment, **TM -** Total Marks, **DE –** Duration of Examinations

SL.NO.	SUB CODE	SUBJECT	C	IA	E	TM	DE
1	3BTEI01	Applied Mathematics for Instrumentation Engineers I	3	40	60	100	3 Hrs
2.	3 BTEI02	Principles of Communication	3	40	60	100	3 Hrs
3.	3BTEI03	Electronic Devices and Circuits	3	40	60	100	3 Hrs
4.	3BTEI04	Sensors And Transducers	3	40	60	100	3 Hrs
5.	3BTEI05	Electrical Engineering	3	40	60	100	3 Hrs
6.	3BTEI06	Object Oriented Programming Using C++	3	40	60	100	3 Hrs
7.	3BTEI07	Sanskrit & Indian Culture - III	1	100	-	100	2 Hrs
8.	3BTEI08	Soft Skills-I*	1*	-	-	-	-
9.	3BTEI09	Electronic Devices and Circuits Lab	2	40	60	100	3 Hrs
10.	3BTEI10	Object Oriented Programming Using C++ Lab	2	40	60	100	3 Hrs
11.	3BTEI01	Electrical Engineering Lab	2	40	60	100	3 Hrs
							Total no of credits: 25

IV-SEMESTER

SL.NO.	SUB CODE	SUBJECT	C	IA	E	TM	DE
1	4BTEI01	Applied Mathematics for Instrumentation Engineers II	3	40	60	100	3 Hrs
2.	4 BTEI02	Linear Integrated Circuits	3	40	60	100	3 Hrs
3.	4BTEI03	Industrial Instrumentation	3	40	60	100	3 Hrs
4.	4BTEI04	Digital Electronics	3	40	60	100	3 Hrs
5.	4BTEI05	Signals and Systems	3	40	60	100	3 Hrs
6.	4BTEI06	Measurements and Instrumentation	3	40	60	100	3 Hrs
7.	4BTEI07	Sanskrit & Indian Culture - IV	1	100	-	100	2 Hrs
8.	4BTEI08	Soft Skills-II*	1*	-	-	-	-
9.	4BTEI09	Linear Integrated Circuits& Digital Lab	2	40	60	100	3 Hrs
10.	4BTEI10	Measurements and Instrumentation Lab	2	40	60	100	3 Hrs
11.	4BTEI11	Transducer and Industrial Instruments Lab	2	40	60	100	3 Hrs
							Total no of credits: 25

V-SEMESTER

SL.NO.	SUB CODE	SUBJECT	C	IA	E	TM	DE
1	5BTEI01	Applied Mathematics for Instrumentation Engineers III	3	40	60	100	3 Hrs
2.	5 BTEI02	Control Systems	3	40	60	100	3 Hrs
3.	5BTEI03	Power Plant Instrumentation	4	40	60	100	3 Hrs
4.	5BTEI04	Digital Signal Processing	3	40	60	100	3 Hrs
5.	5BTEI05	Power Electronics and Drives	3	40	60	100	3 Hrs
6.	5BTEI06	Thermo Dynamics and Fluid Mechanics	3	40	60	100	3 Hrs
7.	5BTEI07	Sanskrit & Indian Culture - V	1	100	-	100	2 Hrs
8.	5BTEI08	Soft Skills-III*	1*	-	-	-	-
9.	5BTEI09	Open Elective***	2***	40	60	100	3 Hrs
10.	5BTEI10	Thermo Dynamics And Fluid Mechanics Lab	2	40	60	100	3 Hrs
11.	5BTEI01	Power Electronics and Drives Lab	2	40	60	100	3 Hrs
12.	2 BTEI02	Control Systems Lab	2	40	60	100	3 Hrs
13.	PT5P1	Industrial Training Process**	1**	40	60	100	3 Hrs
							Total no of credits: 26

VI SEMESTER

SL.NO.	SUB CODE	SUBJECT	C	IA	E	TM	DE
1	6BTEI01	Operational Research	3	40	60	100	3 Hrs
2.	6 BTEI02	Microprocessor and Microcontroller	3	40	60	100	3 Hrs
3.	6BTEI03	Process Control Instrumentation	4	40	60	100	3 Hrs
4.	6BTEI04	Industrial Chemical Process	3	40	60	100	3 Hrs
5.	6BTEI05	Analytical Instrumentation	3	40	60	100	3 Hrs
6.	6BTEI06	Fiber Optics and Laser Instrumentation	3	40	60	100	3 Hrs
7.	6BTEI07	Sanskrit & Indian Culture - VI	1	100	-	100	2 Hrs
8.	6BTEI08	Soft Skills-IV*	1*	-	-	-	-
9.	6BTEI09	Open Elective***	1***	40	60	100	3 Hrs
10.	6BTEI10	Microprocessor and Microcontroller Lab	2	40	60	100	3 Hrs
11.	6BTEI11	Simulation Lab	2	40	60	100	3 Hrs
12.	6 BTEI12	Industrial and Process Control Lab	2	40	60	100	3 Hrs
13.	6BTEI13	Industrial Training Process**	1**	40	60	100	3 Hrs
							Total no of credits: 26

VII-SEMESTER

SL.NO.	SUB CODE	SUBJECT	C	IA	E	TM	DE
1	7BTEI01	VLSI Design	3	40	60	100	3 Hrs
2.	7 BTEI02	Embedded Systems	3	40	60	100	3 Hrs
3.	7BTEI03	Principle of Management & Professional Ethics	3	40	60	100	3 Hrs
4.	7BTEI04	Computer Control of Process	4	40	60	100	3 Hrs
5.	7BTEI05	Elective – I	3	40	60	100	3 Hrs
6.	7BTEI06	Elective – II	3	40	60	100	3 Hrs
7.	7BTEI07	Computer Control Lab	2	40	60	100	3 Hrs
8.	7BTEI08	Virtual Instrumentation Lab	2	40	60	100	3 Hrs
9.	7BTEI09	Project Work Phase I	2	-	-	-	-
							Total no of credits: 25

VIII-SEMESTER

SL.NO.	SUB CODE	SUBJECT	C	IA	E	TM	DE
1	8BTEI01	Robotics and Automation	3	40	60	100	3 Hrs
2.	8 BTEI02	Bio Medical Instrumentation	3	40	60	100	3 Hrs
3.	8BTEI03	Elective – III	3	40	60	100	3 Hrs
4.	8BTEI04	Elective – IV	3	40	60	100	3 Hrs
5.	8BTEI05	Project Work Phase II	6	-	-	100	3 Hrs
							Total no of credits: 18

I - SEMESTER

Department of Electronics and Instrumentation

Course: **BTE** Branch: **EIE** Semester: **I**

Sub. Code: BTEI01 Credit: **3**

ENGLISH – I

UNIT - I **TECHNICAL WORDS, PHOBIA WORDS AND MANIA WORDS**
{List Enclosed}

UNIT- II **FUNCTIONAL GRAMMAR**
Parts of Speech, Articles, Prepositions, Verbs, Adverbs, Sentence Analysis, Tenses, Basic Patterns, Prefixes and Suffixes, Syllabification and Spelling

UNIT -III **ESSAYS**

1. Spoken English and Broken English G.B. Shaw
2. Arguing - Robert Lynd
3. The Verger - Somerset Maugham
4. The Beauty Industry Aldous Huxley

UNIT –IV Paragraph writing relating to Charts, Tables and graphs and Acronyms.

UNIT - V Dialogue Writing, Advertisement

VOCABULARY

Technical Words:

Collateral
Amalgamation
Permeability
Volatile
Defy
Paradox
Plague
Douse
Fantasy
Malevolent
Benevolent
Myth
Crux
Vagaries
Ballast
Sanctuary
Repository
Panorama
Heritage
Innovation
Nuances
Vicissitudes
Nodal
Viable
Deluge
Amphibian
Ornithologist
Pulmonary
Retard
Impediment
Rapport

Mania - Words:

1. Bibliomania
2. Dipsomania
3. Egomania
4. Kleptomania
5. Megalomania
6. Pyromania

Phobia - Words

1. Acrophobia
2. Gynophobia
3. Hydrophobia
4. Claustrophobia
5. Ergophobia
6. Zoophobia
7. Agoraphobia
8. Arachnophobia
9. Triskaidekaphobia
10. Xenophobia

T

Department of Electronics and Instrumentation

Course: **BTE** Branch: **EIE** Semester: **I**

Sub. Code:BTEI02 Credit: **3**

BASIC MATHEMATICS FOR ENGINEERS – I

(For Students admitted from 2014 onwards)

UNIT – I NUMERICAL SOLUTION OF ALGEBRAIC, TRANSCENDENTAL EQUATION

Solution of algebraic and transcendental equations - Bisection method Method of successive approximation-Method of false position (Regula-Falsi Method) - Newton-Raphson method-Honer's method-Secant method. Matlab applications.

UNIT- II EIGEN VALUES, EIGEN VECTORS

Rank of matrix Elementary transformation Elementary matrices-solution of linear system of equations-Cramer's rule-Matrix inversion method-Consistency of linear system of equations; Linear Transformations Linear dependence of vectors Eigen values and Eigen vectors Properties of Eigenvalues Cayley Hamilton theorem (without proof). Matlab applications

UNIT- III DIFFERENTIAL CALCULUS AND DIFFERENT IAL EQUATION

Function of two or more variables Partial derivatives Total derivative Taylor's expansion Maxima and Minima of functions of two variables Jacobians Homogenous functions - Euler's theorem for homogeneous function Operator D Rules for finding Complementary function Inverse operator Rules for finding particular Integral Working procedure to solve the equation. - Method of undetermined coefficients

UNIT-IV LINEAR DIFFERENTIAL EQUATIONS

Method of variation of parameters- Equations reducible to linear equations with constant coefficients: Cauchy's homogeneous linear equation , Legendre's linear equation - Linear dependence of solutions - Simultaneous linear equations with constant coefficients

UNIT -V VECTOR DIFFERENTIATION

Differentiation of vectors - Curves in space - Velocity and acceleration - Scalar and vector point functions vector operator Del- Del applied to scalar point functions : Gradient - Del applied to vector point functions : Divergence and curl - Physical interpretation of divergence and curl-irrotational and solenoidal vectors Del applied twice to point functions - Del applied to products of point functions-Conservative vector field.

Note: Questions are to be set on problem solving and not on the theoretical aspects.

TEXT BOOKS:

1. Grewal B.S, Higher Engineering Mathematics, 41st Edition, Khanna Publishers, New Delhi, 2011.

REFERENCE BOOKS:

1. Alan Jeffrey, Advanced Engineering Mathematics, Academic Press
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons
3. Gerald C.F and Wheatley P.O, Applied Numerical Analysis, Addison-Wesley Publishing Company

Department of Electronics and Instrumentation

Branch: **EIE** Semester: **I**

Sub. Code: BTEI03 Credit: **3**

ENGINEERING PHYSICS

(For Students admitted from 2014 onwards)

UNIT- I PROPERTIES OF MATTER

Elasticity

Stress - Strain - Hooke's law - Elastic Behavior of Material - Factors affecting elasticity - Young's modulus by cantilever depression - Non-uniform bending - Application -I-shaped girders. Torsional Pendulum - Couple per unit twist of a wire- Time period-Application- Determination of Rigidity Modulus.

UNIT- II TECHNICAL ACOUSTICS Acoustics

Acoustics of buildings - Reverberation - Weber Fechner law- Factors affecting acoustics of a building and remedies - Noise Pollution - Noise control in machines - Sabine's formula for standard reverberation time-Absorption coefficient.

Ultrasonics

Generation - Piezoelectric method - Magnetostriction method - Application of Ultrasonics in industries NDT.

UNIT- III PHOTONICS LASER

Properties- Population inversion- Einstein's theory of stimulated emission of radiation - Different types of Lasers Nd:YAG laser, CO2 laser Application of Lasers in holography.

Fiber Optics

Types of Optical Fibers (material, mode, index) - Fiber losses - acceptance angle - Numerical aperture - applications in engineering (communication).

UNIT -IV CRYSTAL PHYSICS

Crystalline and amorphous solids - lattice and unit cell - seven crystal systems and Bravais lattices - crystal planes and directions- Miller indices-Expression for interplanar distance - Atomic radius, Coordination number and packing factor for simple structures: SC, BCC, FCC and HCP.

UNIT -V PHYSICS OF MATERIALS Dielectric materials

Definition - Dielectric Breakdown - Dielectric loss - Internal field - Claussius Mossotti relation.

Superconducting materials

Introduction - Meissner effect - Type I & Type II superconductors - BCS theory-Applications.

Nanomaterials

Introduction - Synthesis of nano materials - Top - down and Bottom - up approach- Ball milling- PVD method-Applications.

TEXT BOOKS

1. Applied Physics for Engineers K.Venkatramanan, R.Raja, M.Sundarrajan (Scitech)
2. Applied Engineering Physics Rajendran & Marikani (Tata McGraw Hill)
3. Modern Engineering Physics R.K.Gaur & S.L.Gupta, Dhanpat Rai publications.
4. Modern Engineering Physics A.S.Vasudeva S.Chand & Company Ltd.
5. Engineering Physics Bhattacharya, Bhaskaran Oxford Publications.
6. Engineering Physics I & II G.Senthilkumar, VRB publications.

REFERENCE BOOKS

1. Properties of Matter - D.S.Mathur (Unit I)
2. Sound - Brijilal & Subramanian (Unit II)
3. Engineering Physics - M.N.Avadhanulu (Unit III)
4. Fiber Optics - R.Agarwal (Unit III)
5. Solid state Physics C.Kittal (Unit IV)
6. Modern Physics - R.Murugesan (Unit IV, V)
7. Fundamentals of Physics, 6th Edition, D. Halliday, R. Resnick and J. Walker, John Wiley and Sons, New York.

Department of Electronics and Instrumentation

Branch: **EIE** Semester: **I**

Sub. Code: BTEI04 Credit: **3**

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

UNIT -I ELECTRICITY AND MAGNETISM

Electric current - Ohms law - Temperature coefficient of resistance-Kirchhoff's laws Electromagnetic induction: Relation between magnetism and electricity - Production of induced E.M.F and current - Faraday's laws of electromagnetic induction - Direction of induced E.M.F and current-Fleming's Right rule-Lenz's law-Induced E.M.F Dynamically induced E.M.F-Statically induced E.M.F-Self inductance-Coefficient of self inductance (L)-Mutual inductance Coefficient of mutual inductance(M) -Coefficient of magnetic coupling-Inductances in series.

UNIT -II COMPLEX ALGEBRA AND A.C CIRCUITS

Mathematical representation of vectors - Symbolic notation - Significance of operator j Conjugate complex numbers - Trigonometrical form of vector representation - Exponential form of vector representation - Polar form of representation - Addition and subtraction of complex quantities - Multiplication and division of complex quantities - Powers and roots of vectors - Complex algebra applied to series circuits - Complex algebra applied to parallel circuits Series Parallel circuits.

UNIT- III THREE PHASE CIRCUITS

Generation of three phase voltages - Phase sequence Numbering of phases-Inter connection of three phases Star or wye(Y) connections Voltages and currents in Y-connection - Neutral current in unbalanced star-connection Delta(Δ) or mesh connection - Balanced Y/Δ and ΔY conversions Comparison: star and delta connections

Comparison between single and three phase supply system - Power factor improvement - Power factor correction equipment - Power measurement in three phase circuits Three wattmeter method, Two wattmeter method (Balanced and unbalanced load), Two wattmeter method Balanced load, Reactive power One wattmeter method.

UNIT- IV DIGITAL ELECTRONICS

Binary number system - Logic gates Boolean algebra - Half and Full adders - Flip Flops - Registers and counters - A/D and D/A conversion - (Basics only), Junction diodes basic types - transistors basic types.

UNIT- V FUNDAMENTALS OF COMMUNICATION ENGINEERING

Types of signals: Analog and digital signals Modulation and demodulation: Principles of amplitude and frequency modulation. Communication systems: Radio, T.V, Fax, Microwave, Satellite and Optical fiber (Block diagram approach only).

TEXT BOOKS

1. B.L.THERAJA-Fundamentals of Electrical Engineering and Electronics - 2012 Edition, S.Chand Publishers.
2. T.L.THYGARAJAN-Fundamentals of Electrical Engineering and Electronics - 2012 Edition, Scitech Publishers.
3. V.K.MEHTA Principle of Electronics - 2012 Edition S.Chand Publishers.

Department of Electronics and Instrumentation

Branch: **EIE** Semester: **I**

Sub. Code: BTEI0**5** Credit: **3**

COMPUTER PROGRAMMING

UNIT - I

Introduction to digital computer ALU Memory Unit, Control Unit-Types of Computers-Number Systems-Conversion Problems. DOS commands - Computer Languages - High Level, machine Level and Assembly Level language - Algorithm Flow Chart.

UNIT- II

Introduction to C - Character set, Constants, Variables, Data Types-Operators - Expression. Decision Making statement - Looping statements, break continue, goto functions.

UNIT - III

Arrays and its types - Functions - call by reference - storage classes in C Auto, Register, Static, Extern - Recursive function.

UNIT - IV

Structures and Unions, Introduction to Pointer, Pointer arithmetic, String operations.

UNIT - V

User defined data types - Introduction to Preprocessor, Macros, Files, Command line arguments

TEXT BOOKS

1. Let Us 'C' - Yashawant Kanetkar, (Unit 2 to 5), BPB publications, 10 Edition, 2010.
2. Ashok N Kamthane, “Computer Programming”, Pearson education, Second Impression, 2008.
3. Venugopal.K and Kavichithra.C, “Computer Programming”, New Age International Publishers, First Edition, 2007.

REFERENCE BOOKS

1. Kernighan B.W and Ritchie,D.M , The C programming language: second edition, Pearson education,2006
2. Fundamentals of Computing and Programming- V.Ramesh Babu, R.Samyuktha, M.Muniratham by VRB Publishers 2012 edition.
3. Balagurusamy. E, “Programming in ANSI C”, Tata McGraw Hill, Third edition, 2006

Department of Electronics and Instrumentation

Branch: **EIE** Semester: **I**

Sub. Code: BTEI06 Credit: **1**

SANSKRIT & INDIAN CULTURE –I

UNIT - I

1. An Introduction to Sanskrit Language
2. Meaning and definition, Significance of Sanskrit language
3. Relations between Sanskrit and other languages

UNIT - II

4. Introduction to Vedic literature, Origin of Vedas, Classification of Vedas
5. Structure of Vedas (Samhitā, Brāhmaṇā, Āranyaka)
6. Introduction to Upaniṣads and its relavance

UNIT - III

7. Introduction to Upavedas and their classification & its significance
8. Introduction to Āyurveda,
9. Application of Āyurveda in present days

UNIT - IV

10. Introduction to Dhanurveda - the Indian Martial Art, History of Dhanurveda, Dhanurveda and its impacts in the regional styles
11. Introduction to Gāndarvaveda
12. Text on dramaturgy and music

UNIT - V

13. Introduction to Arthaśāstra - the Indian statecraft, economic policy and military strategy
14. Relevance of Arthaśāstra to the present days
15. Message of Paramacharya

REFERENCE BOOKS

1. A text book of elementary Linguistics and Phonetics by Dr. R. Ravi S Sharma, New Delhi 2012
2. A history of Sanskrit literature by A. B. Keith New Delhi 1993
3. A history of Indian literature by Maurice Winternitz New Delhi 1990
4. Samskruta Sahitya Ka Itihas - by Baladev Upadyaya
5. A short history of Sanskrit Literature by T.K. Balachandra Iyer, Palaghat 1998

Department of Electronics and Instrumentation

Branch: **EIE** Semester: **I**

Sub. Code: BTEI07 Credit:**3**

ENGINEERING GRAPHICS (PRACTICAL)

UNIT - 0 (Not included for the examination)

BASICS OF DRAWING

Use of Drawing instruments - BIS conventions and specifications - size layout and folding of drawings sheets - lettering and dimensioning - studying the method of drawing ellipse, Parabola and Cycloids.

VISUALIZATION CONCEPTS AND FREE HAND SKETCHING

Visualization principles Representation of Three Dimensional objects Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT - I

PROJECTION OF POINTS

Introduction to orthographic projections - Projection of points

PROJECTION OF LINES

Projection of straight lines in the first quadrant, lines parallel to both planes - inclined to one plane and parallel to other - inclined to both planes.

UNIT - II

PROJECTION OF SOLIDS

Projection of Simple solids like prism, pyramid, cylinder, cone and sphere - Auxiliary projections.

UNIT - III

SECTION OF SOLIDS

Section of solids like prism, pyramid, cylinder, cone and sphere in simple position - True shape of sections for the above.

DEVELOPMENT OF SURFACES

Surfaces like - Prism, Pyramid, Cylinder, Cone and Cut solids.

UNIT - IV

ORTHOGRAPHIC PROJECTION

Conversion of pictorial views to orthographic views of simple machine members.

INTERPENETRATION OF SOLIDS

Interpenetration of solids - Cylinder and cylinder, cone and cylinder

UNIT - V

ISOMETRIC PROJECTIONS

Isometric Projections of solids.

PERSPECTIVE PROJECTIONS

Perspective projections of solids.

UNIT - VI (Not for examination)

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY) Introduction to drafting packages and demonstration of their use.

TEXT BOOKS

1 Engineering Drawing - K. Venugopal, Wiley Eastern Ltd., 1922. 2 A text book of Engineering Drawing - K.V. Natarajan.

REFERENCE BOOKS

1 Elementary Engineering Drawing (First Angle Projection) N.D. Bhatt, Charotar publishing Co., Anand.

2 Engineering Drawing - S.M. Sekkilar & S. Tamarai Selvi, Anuradha Agencies, Kumbakonam.

3 Engineering Drawing and Graphics - Prof. K.Venkataraman.

Special points applicable to University Examinations on Engineering Graphics:

1 There will be five questions, each of either or type covering all units of the syllabus.

2 All questions will carry equal marks of 20 each making a total of 100.

3 The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.

4. The examination will be conducted in appropriate sessions on the same day

Department of Electronics and Instrumentation

Branch: **EIE** Semester: **I**

Sub. Code: BTEI08 Credit: **2**

PHYSICS LAB

Any SIX

1. Determination of Rigidity Modulus & Moment of Inertia using Torsional Pendulum.
2. Determination of Young's Modulus.
3. (a) Determination of Wavelength of Laser light using transmission grating.
   (b) Measurement of numerical aperture of an optical fiber.
4. Determination of refractive index of material of prism using i-d curve.
5. Determination of radius of curvature of the given lens using Newton's Rings.
6. Determination of Velocity of sound waves in liquid using Ultrasonic interferometer.
7. Determination of wavelength of prominent colours of mercury spectrum using Spectrometer and grating.
8. Determination of emissivity of the surface of a black body.
9. Determination of number of lines per meter of the grating using normal incidence method.
10. Basic logic gates- Verification of truth tables

REFERENCE BOOKS FOR PHYSICS PRACTICALS

1. Practical Physics - Ouseph and Rangarajan.
2. Engineering Practical Physics-K. Srinivasan.
3. Engineering Practical Physics - M.N. Avadhanulu.
4. Experimental Physics K.Venkatramanan, R.Raja, M.Sundarrajan (Scitech)

Department of Electronics and Instrumentation

Branch: **EIE** Semester: **I**

Sub. Code: BTEI0**9** Credit: **2**

COMPUTER PRACTICES LAB

1. Evaluate Expressions using library Function.

a. pr^2

b. (A+B+(2C/3A)+A2+2B)

c. √S(S-A) (S-B) (S-C)

d. LOG ($x^3+y^3+z^3$)

2. Find Sum & Average of 'N" numbers.
3. Find the Biggest among 3 numbers.
4. Find the factorial of given number.
5. Check whether the number is prime or not.
6. Find the sum of digits using (i) For loop (ii) While loop
7. Program to add the first N odd numbers and even numbers.
8. Generate the Fibonacci series and Evaluate Sine series.
9. Arithmetic operations using Switch - Case Statements.
10. Find the biggest & smallest among "N" numbers.
11. Sort "N" numbers in ascending order.
12. Matrix addition and Multiplication.
13. Display the student information & marks using Structure & Unions.
14. Evaluate the Binomial coefficient.
15. Swapping of numbers using call by value, call by reference.
16. Number system Conversions
17. Basic File Operations
18. Preprocessor directives usage.
19. Pointer Arithmetic and Array access using Pointers.
20. Introduction to graphics.

Department of Electronics and Instrumentation

Branch: **EIE** Semester: **I**

Sub. Code: BTEI10 Credit: **2**

BASIC ELECTRICAL WORKSHOP

Course objectives:

To understand the concepts of industrial & domestic wiring

To train students on logic gates.

Course Outcomes:

Learners should be familiar with the concepts of Domestic & Industrial Wiring.

Should be able to do simple exercise and measurements using CRO.

Should able to do PCB Fabrication and measurements using Multimeter.

LIST OF EXPERIMENTS:

1. House Wiring Series, Parallel, 3 Pin Plug Socket, etc.
2. Staircase Wiring.
3. Tube Light / CFLWiring.
4. Circuit Tester.
5. Single Phase & Three Phase Energy meters.
6. To Study the use of Megger.
7. To Study The Applications Of CRO.
8. Logic Gate Trainer.
9. Soldering Practice for fabrication of DC power Supply.
10. Different faults in Domestic Electrical equipments.
11. Power wiring for three phase induction motor.
12. Power wiring for single phase induction motor.
13. To Study the use of Multimeter, Tong- tester.

II – SEMESTER

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: I**I**

Sub. Code: **EN2T1** Credit: **3**

ENGLISH – II

(For Students admitted from 2014 onwards)

Unit I : Words for social Interaction { List Enclosed

Unit II: Functional Grammar

Noun Group, Verbal Group, Modal Verbs, Conditionals, Connectives, Passivity, Gerund and Infinitives, Reported Speech, Synonyms and Antonyms, Concord and Error detection.

Unit III : Essays

1. On Habits A.G. Gardiner
2. How to Make a Speech - Edgar Baker
3. Springtime - O.Henry
4. Dangers of Drug Abuse Hardin Jones

Unit IV : Letter Writing, Report Writing, Essay Writing (Essays on Sports Social Issues, Science and Technology and Proverb Expansions) and Comprehension.

British English and American English With Emphasis on Vocabulary and

Unit V : Spelling (From Reader's Digest's Publication)

REFERENCE BOOKS

1. Bikaram K. Das : Functional Grammar and Spoken and Written communication in English (Orient Blackswan Chennai - 600002)
2. T. M.Farhathullah : English Practice Book (Emerald Publishers)

The prescribed Essays will be compiled and edited by the staff of the Department of English.

Words for Social Interaction

1. Euthanasia
2. Bier
3. Charlatan
4. Cynosure
5. dejà vu
6. Myopia
7. Epicentre
8. Oedipus complex
9. Electra complex
10. Halitosis
11. Imbroglio
12. Impasse
13. Paranoia
14. Id
15. Ego
16. Super Ego
17. Psychopath
18. Guarantee
24. Utopia
25. Dystopia
26. Philanthropy
27. Plagiarism
28. Euphemism
29. Autarky
30. White Paper
31. Theocracy
32. Ombudsman
33. Anthology
34. Dialectic
35. Asphyxiation
36. Doggy bag
37. Somnambulism
38. Dermatitis
40. Biopsy
41. Anti-biotic
42. Vendetta

19. Warranty
20. Neologism
21. Nepotism
22. Oligarchy
23. Anarchy
43. Virago
44. Prefixes pseudo, quasi, bi, mono, poly, semi, retro, circum, intro, intra and inter

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **II**

Sub. Code: **MA2T2** Credit: **3**

BASIC MATHEMATICS FOR ENGINEERS – II

(For Students admitted from 2014 onwards)

UNIT- I NUMERICAL SOLUTION OF SIMULTANEOUS EQUATIONS

Solution of linear simultaneous equations - Direct methods of solution: Gauss elimination method , Inversion of a matrix using Gauss Elimination method- Gauss Jordan method Method of Factorization-Crout's method, Iterative methods of solution : Jacobi's method , Gauss Seidel method.

UNIT- II ORTHOGONAL REDUCTION

Orthogonal transformation-Reduction to diagonal form Similarity matrices Powers of a matrix - Reduction of quadratic form to canonical form Nature of a quadratic form Hermitian, Skew Hermitian and Unitary matrices Outline of applications of Eigen values and Eigen vectors in engineering

UNIT -III INTEGRAL CALCULUS AND ITS APPLICATIONS

Reduction formulae reduction formulae[without proof] and Bernoulli's formula.Definite integrals , length of the curve. Double integrals - Change of order of integration - Double integrals in polar coordinates - Areas enclosed by plane curves - Triple integrals - Volume as triple integral

UNIT- IV BETA AND GAMMA FUNCTIONS

Change of variables in double integrals and Triple integrals Area of a curved surface Beta function - Gamma function Reduction formula for - Relation between Beta and Gamma functions Outline of applications of multiple integrals

UNIT -V VECTOR INTEGRATION

Integration of vectors - Line integral-circulation-work - Surface integral - Green's theorem in the plane (without proof) - Stoke's theorem (without proof) - Volume integral - Gauss divergence theorem (without proof) - Irrotational fields Outline of applications of vector calculus in engineering.

Note: Questions are to be set on problem solving and not on the theoretical aspects.

TEXT BOOKS:

Grewal B.S, Higher Engineering Mathematics, 41st Edition, Khanna Publishers, New Delhi, 2011.

REFERENCE BOOKS

1. Alan Jeffrey, Advanced Engineering Mathematics, Academic Press.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons
3. Gerald C.F and Wheatley P.O, Applied Numerical Analysis, Addison-Wesley Publishing Company

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **II**

Sub. Code:**CH2T3** Credit: **3**

ENGINEERING CHEMISTRY
(For Students admitted from 2014 onwards)

UNIT-I CHEMICAL THERMODYNAMICS

Entropy - entropy changes in isothermal expansion of an ideal gas - reversible and irreversible processes - work & free energy functions - Helmholtz and Gibbs free energy functions - Gibbs-Helmholtz equation - Gibbs-Duhem equation - Clausius-Clapeyron equation & its applications - Van't Hoff isotherm and its applications.

UNIT-II CHEMICAL KINETICS AND CATALYSIS

Kinetics of second and third order reactions half life period - saponification of ester - kinetics of opposing, parallel and consecutive reactions and its examples - effect of temperature on reaction rate - theory of absolute reaction rate. Classification and characteristics of catalysts autocatalysis steady state principle - enzyme catalysis - Michaelis menton equation (derivation) acid base catalysis (derivation).

UNIT-III THERMAL AND SPECTROSCOPIC TECHNIQUES

Thermogravimetry (TGA) schematic and block diagram - characteristics of thermo-balance design - methods expressing TG results - applications in qualitative analysis, composition of alloys and mixtures, study of polymers. Differential thermal analysis (DTA) - schematic and block diagram representation of DTA data - qualitative application (calcium oxalate monohydrate only). Electromagnetic spectrum - Beer Lambert's law (Derivation) - principle, theory, instrumentation and simple applications of: Flame photometry - UV-visible spectroscopy - IR spectroscopy.

UNIT –IV CORROSION - THEORY & PROTECTION

Electrochemical cells - standard electrode potential - electrochemical series - principles of chemical and electrochemical corrosion - factors influencing corrosion - types of corrosion - galvanic corrosion - differential aeration corrosion - stress corrosion - corrosion control - cathodic protection and sacrificial anode - corrosion inhibitors - protective coatings - constituents, functions and uses of paints and varnishes.

UNIT-V POLYMERS AND NANOMATERIALS

Polymer Chemistry: Monomers - functionality - polymers - degree of polymerization - effect of polymer structure on properties - addition, condensation, co-polymerization - mechanism of addition polymerization (free radical polymerization only). Nanomaterials: Introduction - synthesis of nano materials by physical and chemical methods - ball milling - chemical vapour deposition -sol-gel method - applications of nano materials.

TEXT BOOKS:

1. Engineering Chemistry, P.C. Jain and Monika Jain, Dhanpat Rai Publishing Co Pvt. Ltd., New Delhi, 2008.

REFERENCE BOOKS

1. Principles of Physical Chemistry, B.R. Puri, L.R. Sharma and Madan S. Pathania, Shoban Lal Nagin Chand & Co., Jalandhar, 2000.
2. Physical Chemistry for Engineers, P.C. Jain and Renuka Jain, Dhanpat Rai & sons, New Delhi, 2001.
3. Applied Chemistry, K. Sivakumar, Anuradha Publications, Chennai, 2009.
4. Chemistry in Engineering & Technology, J.C. Kuriacose and J. Rajaram, Vol. 1, Tata McGraw-Hill, New Delhi, 1996

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **II**

Sub. Code: **ME2T4** Credit: **3**

BASIC CIVIL AND MECHANICAL ENGINEERING

(For Students admitted from 2014 onwards)

PART A CIVIL ENGINEERING

UNIT - I

BUILDING MATERIALS: Construction Materials and foundation Properties and uses of construction materials such as stone, bricks, cement, concrete, steel.

BUILDING COMPONENTS: Selection of site - simple foundations such as well footing- isolated footing. Combined footing. Pile foundation - foundations of machinery. Superstructure Brick and stone masonry - beams. Columns and lintel RCC roofing - simple steel roof trusses and AC roofing - Flooring types such as granolithic. Concrete, mosaic, tile, terrazzo, marble etc., - plastering.

VALUATION : Valuation by plinth area method -simple problems.

UNIT - II

MECHANICS Units - Simple stresses and stains for uniform section - Moduli of elasticity - Factory of safety - centre of gravity and moment of inertia - simple problems.

DAMS Selection of site - Brief idea of different types of dams - their purpose.

BRIDGES Components of bridge - classification - slab bridge - T-beam bridge.

UNIT - III

SURVEYING - Different types of surveying - chain survey - calculation of area by Simpson's rule and trapezoidal rule - compass - conversion on bearings - simple leveling - reduction of levels - simple problems.

ROAD Classification - brief description of earthen road. Water bound macadam. Bituminous. Concrete roads - traffic signs and signals.

ENVIONMENTAL ENGINEERING Protected water supply - sewage treatment - septic tanks.

PART B MECHANICAL ENGINEERING

UNIT - I

BOILERS Classification - Principles of Low pressure steam generators simple Vertical Boiler, Cochran Boiler, Locomotive Boiler, Lancashire Boiler, Bab-cock Wilcox Boiler

POWER PLANTS Layout of Steam, Gas Turbine, Diesel, Nuclear and Hydropower Plants.

NEW SOURCES OF ENERGY Study of different types of alternative energy sources - Solar, Wind, Wave, Tidal and Geo - thermal.

UNIT - II

INTERNAL COMBUSTION ENGINES- Working principles of Petrol and Diesel Engines - Two stroke and Four stroke cycles-Function of main components - single jet carburation - ignition. Cooling and lubrication systems - fuel pump and injector.

METAL CASTING PROCESS Patterns - Types of patterns - Pattern materials - pattern allowances - Molding sand - Properties of molding sand - types of molding - preparation of Green sand mould for casting - melting of cast iron in cupola furnace only - casting defects.

UNIT - III

METAL FORMING PROCESS- Principles of Forging. Rolling, Drawing and Extrusion.

METAL JOINING PROCESS Principles of welding - fundamental of Arc welding. Gas welding and gas cutting - Brazing and soldering.

METAL MACHINING PROCESS Types of lathes - Main components and the functions of a centre lathe - operations - cutting tools - Drilling machines.

TEXT BOOKS

1 Basic Civil Engineering- V. Ramesh Babu, Anuradha Agencies, Kumbakonam.
2 Basic Civil Engineering- K.V. Natarajan, Madras.
3 Basic Mechanical Engineering - K. Venugopal, Anuradha gencies,Kumbakonam.

REFERENCE BOOKS

1 Basic Civil Engineering - N. Arunachalam, Pratheeba Pub. Coimbatore.
2. Basic Civil and Mechanical Engineering - G. Shanmugam and M.S. Palanichamy, Tata McGraw Hill Publishing Co., 1993.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **II**

Sub. Code: **EE2T5** Credit: **3**

ELECTRIC CIRCUIT THEORY

(For Students admitted from 2014 onwards)

UNIT - I

BASIC CIRCUIT CONCEPTS Lumped circuits - Kirchhoff's Laws - V-I-relationships of R, L and C - Independent sources - Dependent sources Simple resistive circuits - Network reduction - voltage division - current division - source transformation.

UNIT - II

SINUSOIDAL STEADY STATE ANALYSIS Phasor - sinusoidal steady state response - concepts of impedance and admittance - analysis of simple circuits - power and power factor - series resonance and parallel resonance-bandwidth and Q factor - Solution of three-phase balanced circuits - power measurements by two-wattmeter methods - solution of three-phase unbalanced circuits.

UNIT - III

MESH-CURRENT AND NODE-VOLTAGE METHODS Formation of matrix equations and analysis of complex circuits using mesh-current and nodal-voltage methods mutual inductance - coefficient of coupling - Ideal transformer.

UNIT - IV

NETWORK THEOREMS AND APPLICATIONS Superposition theorem - Reciprocity theorem - Compensation theorem - Substitution theorem - Maximum Power transfer theorem - Thevenin's theorem - Norton's theorem and Millman's theorem with applications.

UNIT - V

TRANSIENT ANALYSIS Forced and free response of RL, RC and RLC circuits with D.C. and sinusoidal excitations.

TEXT BOOK:

1. Paranjothi S.R.,"Electric Circuit Analysis", New Age International Ltd., Delhi, 2nd Edition.

2. Hyatt W.H. and Kemmerly, "Engineering Circuits Analysis", McGraw- Hill International Editions, 1993.

REFERENCES:

1. Edminister J.A., "Theory and Problems of Electric Circuits", Schaum's outline series McGraw Hill Book Company, 2nd Edition, 1983.

2. Sudhakar A and Shyam Mohan S.P., "Circuits and Network Analysis and Synthesis", Tata McGraw-Hill Publishing Ltd., New Delhi, 1994.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **II**

Sub. Code:**CH2T6** Credit: **3**

ENVIRONMENTAL SCIENCE AND ENGINEERING

(For Students admitted from 2014 onwards)

UNIT – I INTRODUCTION TO ENVIRONMENT AND ENVIRONMENTAL STUDIES

Introduction to environment - components - nature of environment - need of awareness - reasons for environmental problems - anthropocentric and eco centric views.

Environmental studies - multidisciplinary nature - scope and aim - sustainable development - principles - RRR concept-Indian environmental movements - environmental calendar.

UNIT- II ECOSYSTEM AND BIODIVERSITY

Ecosystem - structure - functions - simplified ecosystem models (food chain and food webs and their types,energy flow) - forest - grassland - pond ecosystems - ecological succession - ecological pyramids - Bio-geochemical cycles of water oxygen-carbon-phosphorous and sulphur.

Biodiversity - definition - types - species - genetic and ecosystem diversities - values of biodiversity - threats to biodiversity - conservation of biodiversity - endemism - biodiversity hotspots - Indian biodiversity - endemic species of India - IUCN lists -red-green and blue data books.

UNIT- III NATURAL RESOURCES

Natural resources - definition - types - forest resources - uses - deforestation- reasons - effects - water resources dams - effects of dams - food resources - modern agriculture ill effects -energy resources- types hydel - nuclear - solar - wind and biomass energy - world scenario - Indian scenario.

Population and environment - reasons for over exploitation of resources - population - demography - population curves - population explosion - effect - consumerism - effects - urbanization - reasons and effects- role of an individual.

UNIT –IV ENVIRONMENTAL POLLUTION

Pollution - definition - types - air pollution - causes and effects - effects of CO2 - CO - NOx - SOx - particulates - control of air pollution - water pollution-causes - effects - remedies - soil pollution - solid waste management - e-waste - ill effects of e-waste - proper recycling- Noise pollution - reasons effects - control - nuclear pollution - cases - effects and control - thermal pollution causes - effects and remedies.

Legal provisions for protecting environment - article 48 A - 51 A (g)-Environment act 1986 - Air act 1981 - Water **act 1974 - wild** life protection act - Forest act 1980- problems in implementation-reasons.

UNIT –V SOCIAL ISSUES AND ENVIRONMENTAL ETHICS

Present environmental scenario - green house effect - climate change - The Kyoto Protocol - ozone layer depletion -The Montreal Protocol - acid rain - causes - effects - disparity among the nations - The Copenhagen UNFCCC summit - carbon currency- virtual water- genetically modified organisms, Disaster management.

Environmental ethics - introduction - people - getting affected - resettlement and rehabilitation issues involved - Sardhar Sarovar project - Tawa Matsya sang - Melting icebergs of Arctic.

Text Book

1. Anubha Kaushik and C.P. Kaushik, ”Prospects of Environmental Science”, New Age International publishers, 2013.

Reference books

1. Environmental Studies, N. Nandini, N. Sunitha and Sucharita Tandon, Sapna Book House,2007.
2. Text book of Environmental Science, Ragavan Nambiar, Scitech Publications, 2009.
3. Text book of Environmental Chemistry and Pollution Control, S.S.Dara, S.Chand and Co., 2002.
4. Environmental Chemistry, Colin Baird, W.H.Freeman and company, New York,1999.
5. Environmental Chemistry, Gary W. VanLoon and Stephen J.Duffy, Oxford University Press, 2000.
6. New Trends in Green Chemistry, V.K. Ahluwalia and M. Kidwai, Anamaya Publishers, 2006.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **II**

Sub. Code: **SA2T2** Credit: **1**

SANSKRIT & INDIAN CULTURE – II
(For Students admitted from 2014 onwards)

Unit - I

1. Introduction to Vedāṅgas
2. Introduction to Śikśā, Vyākaraṅa, Chandas
3. Introduction to Nituktam, Jyotiṣa, Kalpa

Unit - II

4. Introduction to classical literature
5. Introduction to Epics
6. Introduction to Purānas

Unit - III

7. Introduction to Sanskrit poets any five
8. Introduction to Kāvyas and their classifications, Pañcamahākāvyas and their significance in Sanskrit literature
9. Significance of Kālidasa and his contribution

Unit - IV

10. Introduction to Dramas
11. Introduction to Subhāṣitas
12. Tales and fables

Unit - V

13. Introduction to System of Indian philosophy, Six Darśanas and their profounder, principles of Nyāya and Vaiśeṣika schools
14. Valid means of Sāṅkya philosophy and its significance, Yoga and Patañjali, Aṣṭāṅgayoga and its application
15. Introduction to (Manu and Yāgñyavalkya)

Reference Books

1. A history of Sanskrit literature by A. B. Keith New Delhi 1993
2. Samskruta Sahitya Ka Itihas - by Baladev Upadyaya
3. A short history of Sanskrit Literature by T.K. Balachandra Iyer, Palaghat 1998

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **II**

Sub. Code: **CH2P7** Credit: **2**

CHEMISTRY LAB
(For Students admitted from 2014 onwards)

List of experiments (ANY SIX of the following)

1. Estimation of Na_2CO_3 present in washing soda sample.
2. Estimation of alkalinity of the given water sample.
3. Estimation of total hardness of the given water sample- EDTA method
4. Conductometric titration Strong acid Vs Strong base.
5. Conductometric titration Strong base Vs mixture of acids
6. Potentiometric titration - Strong acid Vs Strong base.
7. Potentiometric titration Fe^{2+} Vs KMnO4.
8. Determination of K_{SP} of a sparingly soluble salt concentration cell method
9. Construction of phase diagram for a simple eutectic system.
10. Rate and order of reaction between $K_2S_2O_8$ and KI Clock reaction method.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **II**

Sub. Code: **EE2P8** Credit: **2**

CIRCUITS THEORY LAB
(For Students admitted from 2014 onwards)

LIST OF THE EXPERIMENTS:

1. Verification of Kirchhoff's laws
2. Verification of Superposition theorem.
3. Verification of Thevenin's Theorem.
4. Verification of Norton's Theorem.
5. Verification of Maximum Power Transfer theorem.
6. Verification of Reciprocity theorem.
7. Verification of Compensation theorem.
8. Verification of Millman's theorem.
9. Three phase power and power factor Measurement by Two wattmeter method.
10. Series and Parallel resonance in RLC Circuits.
11. Verification of theorems using Digital simulation.
12. Circuit Transients by Digital simulation.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **II**

Sub. Code: **ME2P9** Credit: **2**

BASIC MECHANICAL WORKSHOP

(For Students admitted from 2014 onwards)

CARPENTRY

Names and uses of tools used in carpentry - Handling of the tools. Practice in marking, sawing, planning and chiseling to size. Making simple joints such a half lap, mortises and Tenon joints.

FITTING

Name and uses of tools like files, chisels, hammer, tri square, calipers, hacksaw, etc., and handling of these tools. Practice in marking, chipping, fitting to size and drilling marking of simple mating, profiles such as Vee , Square.

WELDING

Study of Arc & Gas Welding, Tools and Equipments Simple welding exercises Butt welding and Lap Welding.

TURNING

Study of Centre Lathe, Accessories and tools Simple turning exercises Facing and Step turning - use of measuring Instruments for lathe work.

DRILLING

Study of drilling machines Drills, Taps, and reamers Demonstration of Drilling and Tapping operations.

Demonstration of the following (not included for the examination)

1. Preparation of green sand mould.
2. Study of tool in smithy shop and making a square section from circular section.
3. Gas welding and cutting.
4. Brazing and soldering.
5. Sheet Metal Work.

III - SEMESTER

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **III**
Sub. Code: **MG3T1** Credit :**3**

Subject: **APPLIED MATHEMATICS FOR INSTUMENTATION ENGINEERS I**

UNIT I
(INTERPOLATION AND NUMERICAL INTEGRATION)

Interpolation with equal intervals – Newton's forward interpolation formula – Newton's backward interpolation formula - Interpolation with unequal intervals: Lagrange's interpolation formula, Newton's divided difference formula - Numerical integration: Trapezoidal rule - Simpson's one-third rule - Simpson's three-eighth rule – Outline of applications of interpolation and numerical integration in engineering.

UNIT II(LAPLACE TRANSFORMS AND APPLICATIONS)

Transforms of elementary functions : $1, t^n, e^{at}, \sin at, \cos at, \sinh at, \cosh at$ - Properties of Laplace transforms: Linearity Property, First shifting property, Change of scale property –Transforms of derivatives - Transforms of integrals - Multiplication by t^n - Division by t - Evaluation of integrals by Laplace transform - Inverse transforms: Method of partial fractions – Other methods of finding inverse - Convolution theorem (Without proof) - Unit step function – Unit Impulse function - Application to differential equations – Outline of applications of Laplace transforms in engineering.

UNIT III
(FOURIER TRANSFORMS AND APPLICATIONS)

Fourier integral theorem (without proof) - Fourier Sine and Cosine integrals – Complex form of Fourier integral - Fourier integral representation of a function - Fourier transform – Fourier sine and Cosine transforms – Properties of Fourier Transforms: Linear property, Change of scale property, Shifting property - Parseval's identity for Fourier transforms (without proof) – Application of transforms to boundary value problems: Heat conduction, Vibrations of a string, Transmission lines.

UNIT IV (DIFFERENCE EQUATIONS AND APPLICATIONS)

Formation of difference equations – Linear difference equations – Rules for finding the complementary function – Rules for finding the particular integral – Simultaneous difference equations with constant coefficients – Outline of other applications of difference equations in engineering

UNIT V (Z – TRANSFORM AND APPLICATIONS)

Standard z-transforms of $1, a^n, n^p$ – Linearity property – Damping rule – Shifting rules – Multiplication by n - Initial and final value theorems (without proof) – inverse z –transforms – Convolution theorem (without proof) – Convergence of z-transforms – Two sided z-transform – Evaluation of inverse z-transforms: Power series method, Partial fraction method, inversion integral method – Application to difference equations – Outline of applications of z-transform in engineering

Note: Questions are to be set on problem solving and not on the theoretical aspects.

TEXT BOOK:

Grewal B.S, Higher Engineering Mathematics, 41st Edition, Khanna Publishers, New Delhi, 2011.

REFERENCES

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons
2. Gerald C.F and Wheatley P.O, Applied Numerical Analysis, Addison-Wesley Publishing Company
3. Murrey R.Spiegel, Laplace Transforms, Schaum's Outlines, McGraw Hill

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **III**

Sub. Code: **EC3T6** Credit : **3**

Subject: **PRINCIPLES OFCOMMUNICATION**

Prerequisite: Basic Electronic.

Aim

To study the various analog communication fundamentals viz., Amplitude modulation and demodulation; Angle modulation and demodulation. To introduce the basic concepts of digital modulation techniques.

Objectives

The course should enable the students to:

1. Study the need of modulation, Amplitude Modulation and demodulation
2. Provide various Angle modulation and demodulation
3. Understand different methods of pulse digital modulation and demodulation schemes.
4. Study some basic information theory with some channel coding theorem. Analyze pass band digital modulation and demodulation schemes and compare its bit error probability.

Outcome

At the end of the course the student should be able to:

1. Understand the need for modulation and amplitude modulation techniques.
2. Understand frequency modulation, demodulation and the comparison of AM and FM.
3. Understand the PAM, PPM and PWM techniques.
4. Understand the different methods of PCM, PAM, DPCM, DM, ADM schemes which are used in digital communication.
5. Understand the analysis of ASK, FSK, PSK, DPSK, DEPSK, QPSK, MSK and GMSK schemes and comparison of bit error probability.

UNIT - I AMPLITUDE MODULATION

Generation and demodulation of AM, DSB-SC, SSB-SC, VSB Signals, Filtering of sidebands, Comparison of Amplitude modulation systems, Frequency translation, Frequency Division multiplexing, AM transmitters - Super heterodyne receiver, AM receiver.

UNIT - II ANGLE MODULATION

Angle modulation, frequency modulation, Narrowband and wideband FM, transmission bandwidth of FM signals, Generation of FM signal - Direct FM - indirect FM, Demodulation of FM signals, FM stereo multiplexing, PLL - Nonlinear model and linear model of PLL, Non-linear effects in FM systems, FM Broadcast receivers, FM stereo receives, Pre-emphasis and de-emphasis in FM, Comparison of performance of AM and FM systems.

UNIT - III PULSE MODULATION

Time Divison Multiplexing, Types of Pulse modulation, PAM (Single polarity, double polarity) PWM- Generation & demodulation of PWM, PPM- Generation and demodulation of PPM

UNIT - IV PULSE DIGITAL MODULATION

Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error. PAM and Other forms of pulse modulations Differential PCM system (DPCM), TDM, Delta modulation, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems.

UNIT - V MODULATION SCHEMES

Introduction of digital modulation techniques- Generation, Detection, Signal space diagram, calculation of bit error probability and Power spectra of ASK, FSK, PSK, DPSK, DEPSK, QPSK, MSK and GMSK, similarity of BFSK and BPSK, Comparison of Digital modulation systems using bit error probability.

TEXT BOOK

1. Simon Haykin, Communication Systems, John Wiley & sons, NY, 4th Edition, 2001.
2. Simon Haykin, "Digital communications", John Wiley, 2005.
3. H. Taub and D. Schilling, "Principles of Communication Systems", TMH, 2003.

REFERENCES

1. Roddy and Coolen, Electronic communication, PHI, New Delhi, 4th Edition, 2003.
2. Bruce Carlson et al, Communication systems, McGraw-Hill Int., 4th Edition, 2002.
3. Bernard Sklar, "Digital Communication",Paerson Education, 2nd Edition , 2006.
4. Sam Shanmugam, " Digital and Analog Communication Systems", -, John Wiley, 2005.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **III**

Sub. Code: **EC3T4** Credit: **3**

Subject**: ELECTRONIC DEVICES AND CIRCUITS**

(Common to EIE/MECHATRONICS)

Prerequisite: Basic Electronics

Aim

The aim of this course is to understand the concepts and to familiarize the student with the principle of operation, capabilities and limitations of various electron devices so that he will be able to use these devices effectively.

Objectives

The course should enable the students to:

1. Understand the Diode operation and switching characteristics.
2. Understand the Operation of BJT, FET, MOSFET metal semiconductor rectifying and ohmic contacts,
3. Study the characteristics of special type semiconductor diodes.

Outcome

At the end of the course the student should be able to:

1. Develop through basic knowledge on the behavior and the characteristics of semiconductor junction,
2. Acquire knowledge on the applications of BJT, FET, MOSFET.
3. Learn the usage of different types of devices for various applications.

UNIT -I SEMICONDUCTORS & DIODES

Semiconductor fundamentals –Energy Band diagram – Intrinsic and Extrinsic Semiconductors- Working and description of a PN diode– Varactor Diode –Avalanche and Zener Breakdown – Zener diode –Photo diode – Photo voltaic cell – Light emitting diode – Liquid crystal display – Light dependant resistor.

UNIT -II TRANSISTORS

Principle of transistor action – Cut off, Active and saturation regions of a transistor – CE,CB,CC Configurations –Transistor as a switch – Use of a heat sink – Constructional features of a field effect transistor – theory of operation–MOSFET –Working and V-I Characteristics – Depletion and enhancement types –Working and V-I characteristics of UJT – SCR

UNIT -III AMPLIFIERS

Classification of amplifiers– Distortion in amplifiers– frequency response of an amplifier– operation of class A Power amplifier– push-pull amplifier–Class B amplifier, class C amplifiers –single tuned and double tuned amplifier - stagger tuned amplifier

UNIT –IV OSCILLATORS & MULTI VIBRATORS

Classification of oscillators – Barkhausen criterion - operation and analysis of RC phase shift – Hartley and colpitts oscillators – Multivibrators – astable, monostable and bistable multivibrators

UNIT - V RECTIFIERS & POWER SUPPLIES

Single –phase, half-wave and full-wave rectifiers – Bridge rectifiers – Ripple factor, rectification efficiency, Transformer utilisation factor and regulation – Performance characteristics of rectifiers with filters – Regulated power supply– switched mode power supplies.

TEXT BOOKS

1. Millman and Halkias, Electronic devices and Circuits, Tata McGraw Hill International,Edition 1994.
2. G.K.Mithal, Electronic Devices and Circuits, Khanna Publishers, 1999.

REFERENCE BOOKS

1. Salivahanan Electronic devices and Circuits, second editionTata McGraw Hill International, 2011.
2. David A.Bell, Electron Devices and Circuits, Prentice Hall Of India, 3rd Edition, 1995.
3. Thomas L. Floyd , Electron Devices, Charles & Messil Publications, 1989.
4. Boylestad & Nashelsky, Electronic Devices & Circuit Theory, Eighth edition, Prentice Hall Of India (P) Ltd., 2003.
5. Sedha.R.S., A Text Book of Applied Electronics, Sultan chand Publishers, 1999.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **III**

Sub. Code: **EI3T2** Credit : **3**

Subject: **SENSORS AND TRANSDUCERS**

Prerequisite: Basic Electronics.

Aim

To provide basic knowledge about various transducers, sensors and their Applications

Objectives

The course will enable the students to:

1. Acquire knowledge about the principles and analysis of sensors.
2. Learn about errors and error analysis.
3. Emphasis on characteristics and response of transducers.
4. Acquire adequate knowledge of different transducers.

Outcome

The students should be able to:

1. Understand the basic principles and classification of transducers.
2. Understand the errors and analysis of those errors in measurement system.
3. Know the various static and dynamic characteristics of transducers.
4. understand selection of transducers

UNIT -I SENSORS

Difference between Sensors and Transducers – Sensors for Motion and Position Measurement , GPS, INS,Doppler, SONAR. Thermal Sensors – Gas Thermometric Sensors, Acoustic Temperature Sensor, Thermoemf Sensors, NQR Thermometry, Heat Flux Sensor. Biosensors – Types - Calorimetric Biosensors, Potentiometric Biosensors, Amperometric Biosensors, Optical Biosensors, Immunosensors

UNIT -II RESISTIVE TRANSDUCER

Transducers –Classification of Transducers, Characteristics - Basic Requirements of a Transducer – Mechanical Devices as Primary Detectors -Mechanical Springs, Proving Rings, Potentiometer, Strain Gauges - Theory, Types (includes Rossette), Temperature Compensation, Calibration – Resistance Hygrometer, Photoconductive cell, Hot wire anemometer.

UNIT- III INDUCTIVE & CAPACITIVE TRANSDUCER

Self inductive transducers, Mutual inductive transducer, Linear variable Differential transformer - Eddy current gauge, Proximity sensors, Microsyn, Induction potentiometer, Capacitive displacement transducers, Single ended capacitive displacement transducers - Desirable features of capacitive transducers -Practical capacitive pickups – Equibar differential pressure transducer -Feedback type capacitance proximity pickup – Capacitor microphone - Application in level measurement

UNIT- IV SPECIAL TRANSDUCER & SENSORS.

Piezoelectric, Photovoltaic, Hall Effect, Magnetostrictive, Radio-Active Absorption, Ionic Conduction

Transducers, Digital Transducers - Digital Displacement Transducer, Shaft Angle Encoder, Optical Encoders, Magnetic Encoders -Digital Speed Transducers -Variable Reluctance Type, Smart Sensors - SQUID Sensors - Film Sensors – MEMS., Sensors for angular measurement using non contact type (wireless)

UNIT -V OPTICAL AND GAS SENSORS

Optical radiation sensors. Physics of optical radiation sensing devices. Technologies in microand Nano-manufacturing. Optical sensors areas.

Gas sensors. Basics of operating. Manufacturing technologies. Materials used for various gases. Methods used in dimensionality decrease.

TEXT BOOKS:

1. Sawhney A.K., “Electrical & Electronic Measurements and Instrumentation”, Dhanpat Rai Publications,2001
2. D. Patranabis, ‘Sensors and Transducers’, Prentice Hall of India, 1999.
3. Doeblin E..O. “Measurement System Applications and Design”, TMH, 5th Edition, 2004.

REFERENCE BOOKS:

1. Rangan C.S. Mani V.S.V: and Sharma G.R., “Instrumentation Devices and Systems” Tata McGraw Hill.
2. D. Patranabis, “Principles of Industrial Instrumentation”,TMH, 2nd Edition.
3. Dr. S. Renganathan, “Transducer Engineering” -Allied Publishers Limited.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **III**

Sub. Code: **EE3T3** Credit: **3**

Subject: **ELECTRICAL ENGINEERING**
(Common to EIE/ECE/ MECHATRONICS)

Prerequisite: Circuit Theory.

Aim

To expose the Students to the Concepts of Various types of Electrical Machines, Transmission and Distribution Systems of Electrical Power

Objectives

The course will enable the students to:

1. Learn constructional details, principle of operation, performance, starters and testing of D.C.Machine.
2. Learn constructional details, principle of operation and performance of transformers.
3. Learn constructional details, principle of operation and performance of induction motors.
4. Learn constructional details and principle of operation of alternators and special machines.

Outcome

The students should have knowledge in the following:

1. Various types, Principle of Operation and Characteristics of DC Motors and DC Generators.
2. Construction and Principle of Operation, Testing, Regulation , equivalent circuit of Transformers
3. Construction, Types and Principle of operation of induction motors. Starting and speed control of Single - phase induction motors.
4. Synchronous Machines, Brushless alternators, Reluctance motor, Hysteresis motor and Stepper motor.

UNIT – I D.C. MACHINES

Construction, principle of operation of D.C. motor and D.C. Generator, Various types of D.C. motors and generators. Performance characteristics of D.C. motors and D.C. generators. Starting and speed control.

UNIT – II TRANSFORMERS

Construction details and principles of operation of single phase transformers - losses and efficiency. Special types of transformers - Servo stabilizer, pulse transformer, Isolation transformer

UNIT – III SYNCHRONOUS MACHINES

Constructional features - operating principle of 3-phase alternator and synchronous motor principle and operation of synchronous motor

UNIT – IV INDUCTION MACHINE

Constructional features - Operating principle of 3-phase induction motor [squirrel cage and slip ring] and single phase induction motor, Slip - Torque characteristics - Starters - Speed control methods.

UNIT – V SPECIAL MACHINES

Tachogenerator - A.C and D.C. Servo motor, Stepper motor, synchronous– PWM Methods. Linear induction motor – switched reluctance motor, Brushless motors.

Text Book:

1. B.L.Theraja : Electrical Technology Vol.II 1993
2. Rajput: Electrical Machines 2004, Laxmi Publications

REFERENCE BOOKS:

1. M.G. Say and Taylor: D.C. Machines ELBS 1980.
2. M.G. Say: Alternating Current Machines ELBS 1980.
3. E.V. Armensky and G.B. Falk: Fractional Horsepower Electrical Machines.
4. B.R. Sharma: Utilization of Electrical Energy [Satyaprakashan Publications 1992]
5. B. Ravindranath and M. Chander: Power system Protection and Switchgear [Wiley Eastern Ltd.]
6. C.R. Paul, S.A. Nasar and L.E. Unnewehr: Introduction to Electrical Engineering, McGraw Hill Inc., 1992.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **III**

Sub. Code: **CS3T6** Credit: **3**

Subject**: OBJECT ORIENTED PROGRAMMING USING C++**

Prerequisite: Basic Computer Science.

Aim

To expand knowledge in computer languages and to introduce object oriented programming

Objectives

The course will enable the students to:

1. Study the object oriented programming principles, tokens, and expressions, control a structures and functions.
2. Introduce the classes, objects, constructors and destructors.
3. Introduce the operator overloading, inheritance and polymorphism concepts in C++.
4. Introduce constants, variables, data types, operators, classes, objects, methods, arrays and strings in Java.
5. Introduce the programming approach in Java, interfaces and packages, multithreading, managing errors and exceptions and Applet programming.

Outcome

After completion of the course the students are expected to be able to

1. Understand basic programming principles.
2. Write programs using concepts like overloading, inheritance and polymorphism.
3. Write programs in java.
4. Create their own package and can write programs using interface concept.
5. Write multithreaded program and manage exceptions.

UNIT – I

Need for object oriented programming, Characteristics of object oriented language -objects, classes, Inheritance, Reusability, creating new data types, Polymorphism and overloading. C++ programming basis – Data types, Manipulators, Cin, Cout, Type conversion, arithmetic operators, Loops and decisions.

UNIT – II

Class and objects : A simple class, C++ Objects as physical Objects, C++ Objects as Data Types, Constructors, destructors, objects as function arguments, overloaded constructors, member functions defined outside the class, inline functions, Returning objects from Functions.

UNIT – III

Arrays: Defining & accessing Array elements, arrays as class member data, array of Objects. Operator Overloading: Overloading Unary Operators, Operator Arguments, Return Values, nameless Temporary objects, postfix notations. Overloading Binary Operators - Arithmetic operators, Concatenating Strings, Multiple overloading Comparison operators, Arithmetic Assignment Operators.

UNIT – IV

Inheritance-Derived class and base class, derived class constructors, overriding member functions, Class Hierarchies, Abstract base class, Public and private inheritance, Levels of inheritance, Multiple inheritance. Memory management – new and delete operator, a string class using new, Pointers to Objects – Referring to Members, another Approach to new, An array of pointers to Objects.

UNIT –V

Virtual Functions – Pure virtual functions, Late Binding, Abstract Classes, Virtual base classes. Friend Functions – Friend Classes, Friends for functional Notation. Static Functions , investigating destructors. Assignment and copy – initialization- overloading the assignment operator, the copy constructor, the this pointer. Templates,function templates, class template.

TEXT BOOKS :

1. Object Oriented Programming in Microsoft c++ - Robert Lafore,Galgotia Publication Pvt Ltd.1998
2. Let us C++ - Yaswant Kanitkar(used for templates) ,BPB ,2002 Publication

REFERENCE BOOKS :

1. Object Oriented Programming in C++ - C. Balagurusamy, Tata Mcgraw Hill.2/e 2001
2. Teach yourself C++ - Herbertsehildt, OSBORNE/MH,1999.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **III**

Sub. Code: **SA3T3** Credit: **1**

Subject: **SANSKRIT & INDIAN CULTURE - III**

Unit - I (Gītā)

1. Introduction to Jñānayoga
2. Introduction to Bhaktiyoga
3. Introduction to Karmayoga

Unit - II (Upaniṣadic principles)

4. Introduction to Śaṅkara's Phillosophy
5. Introduction to Rāmānuja's Phillosophy
6. Introduction to Mādhva's Phillosophy

Unit - III

7. Amazing creations in Sanskrit (Varnacitras, Sthānacitras and Svaracitras, Gaticitras, Citrabandanas)
8. Intercity verses in Sanskrit, some intercity discoveries, Sanskrit and artificial intelligence beauty and charm of Sanskrit Poetry.
9. Stotrakāvyas and its relevance

Unit - IV

10. Introduction to Maths
11. Introduction to Physics and Chemistry
12. Introduction to Environmental science

Unit - V

13. Introduction to Yoga
14. Introduction to Botany & Zoology
15. Introduction to Agriculture

Reference Texts

1. The wonder that was India by Arthur Llewellyn Basham - 1971
2. The wonder that is Sanskrit by Sampadananda Misra - 2002
3. Vedic Science & Technology by Sadasiva Biswal and Bidyut Lata Ray - 2009
4. Vedavijnanasree by Urmila Srivatsava – 2002

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **III**

Sub. Code: **EI3P7** Credit: **2**

Subject**: ELECTRONIC DEVICES AND CIRCUITS LAB**

LIST OF EXPERIMENTS

1. V-I characteristics of PN & Zener diode.
2. Characteristics BJT (CE mode)
3. Characteristics of JFET
4. Characteristics of SCR
5. Characteristics of UJT
6. Characteristics of LED, Photo diode
7. Hartley oscillators & Colpilt's oscillators
8. Astable Multivibrator
9. Single Phase Half Wave Rectifier & Full Wave Rectifier
10. Bridge Rectifier.
11. Zener voltage regulator

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **III**
Sub. Code: **CS3P9** Credit : **2**

Subject**: OBJECT ORIENTED PROGRAMMING USING C++ LAB**

1. Illustrate class & objects
2. To demonstrate the use of Switch –Case statement and to perform arithmetic operations.
3. To demonstrate the use of constructor and destructor.
4. To demonstrate the use of this poiter
5. To enter the records of n number of students and then display them using nested structure.
6. Illustrate the use of in line functions
7. Illustrate the use of Copy Constructor
8. Illustrate operator overloading
9. To demonstrate the concept of polymorphism applied to the member functions.
10. To demonstrate the use of Inheritance.
11. To demonstrate the use of Demonstration of New & Delete Operator
12. To demonstrate the Pure Virtual Function
13. To demonstrate the use of unary operator
14. To demonstrate the use of Binary operator
15. To demonstrate the use of Friend Function.
16. To demonstrate the use of class template.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **III**

Sub. Code: **EE3P6** Credit : **2**

Subject: **ELECTRICAL ENGINEERING LAB**

1. Series and parallel resonance
2. Measurement of Active power, Reactive power, PF using Wattmeter.
3. Measurement of R, L, C Using Bridge.
4. Load test on DC shunt motor
5. Load test on DC series motor
6. Speed control of DC shunt motor
7. Load test on DC shunt generator
8. Load test on 3 phase squirrel cage Induction motor
9. Load test on single phase transformer
10. Control of servomotor. (AC/DC)
11. Control of Stepper Motor.
12. Load test on Synchronous Generator.

IV- SEMESTER

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **IV**

Sub. Code: **MG4T1** Credit: **3**

Subject: **APPLIED MATHEMATICS FOR INSTRUMENTATION ENGINEERS II**

UNIT- I FOURIER SERIES

Euler's Formulae (Without Proof) – Condition for Fourier expansion – Functions having points of discontinuity – Change of interval – Expansions of even and odd functions - Half-Range series – Parseval's formula (without proof) – Root mean square value (without proof) – Typical waveforms (Definition Only): Square wave form, Saw toothed waveform, Modified saw toothed waveform, Triangular waveform, Half wave rectifier, Full wave rectifier - Outline of applications of Fourier series in engineering

UNIT –II SERIES SOLUTION OF DIFFERENTIAL EQUATIONS

Validity of series solution - Series solution when x=0 is an ordinary point - Frobenius method (Series solution when x=0 is a regular singularity) - Bessel's equation (Bessels functions of the first and second kind) - Recurrence formulae for $J_n(x)$ - Expansions for J_0 and J_1 : Value of $J_{1/2}$ - Generating function for $J_n(x)$ - Equations reducible to Bessel's equation – Orthogonality of Bessel functions – Outline of applications of Bessel's functions in engineering.

UNIT- IIINUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

Picard's method – Taylor series method - Euler's method – Modified Euler's method – Runge's method – Runge-Kutta method – Predictor-corrector methods: Milne's method, Adams Bashforth method – Outline of applications of numerical solutions of ordinary differential equations in engineering.

UNIT- IV PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations – Solution of a partial differential equation – Equations solvable by direct integration – Linear equations of first order – Non linear equations of the first order – Charpit's method - Homogeneous linear equations with constant coefficients –Rules for finding complementary functions – Rules for finding particular integral – Solution of homogeneous linear equation of any order.

UNIT –V NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS

Classification of second order equations – Finite difference approximation to derivatives – Elliptic equations: Laplace Equation, Poisson's equation – Solution of Laplace's equation – Solution of Poisson's equation –

Parabolic equations: Heat equation – Solution of heat equation – Hyperbolic equations: Wave equation – Solution of wave equation – Outline of applications of numerical solution of partial differential equations in engineering.

Note: Questions are to be set on problem solving and not on the theoretical aspects.

TEXT BOOK:

Grewal B.S, Higher Engineering Mathematics, 41st Edition, Khanna Publishers, New Delhi, 2011.

REFERENCES

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons
2. Gerald C.F and Wheatley P.O, Applied Numerical Analysis, Addison-Wesley Publishing Company
3. Peter V.O'Neil, Advanced Engineering Mathematics, Thomson

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **IV**
Sub. Code: **EI4T2** Credit: **3**

Subject: **LINEAR INTEGRATED CIRCUITS**

(Common to EIE/MECHATRONICS)

Prerequisite: Basic knowledge in Electronic devices.

Aim

To teach the basic concepts in the design of electronic circuits using linear integrated circuits and their applications in the processing of analog signals.

Objectives

The course should enable the students to:

1. Learn the IC fabrication technology.
2. Know the Op -amp characteristics and its linear applications.
3. Learn comparator, Schmitt-Trigger circuits, Voltage regulator and some linear and nonlinear oscillators
4. Study how an Op-Amp can act as a filter on an electrical signal.
5. Learn the theory and applications of PLL, ADC and DAC.

Outcome

At the end of the course the student should be able to:

1. Enumerate different steps involved in the process of fabrication of integrated circuit.
2. Distinguish clearly between an ideal and actual characteristics of an Op-amp. And to learn different linear applications.
3. Understand different nonlinear applications.
4. Understand the advantages of using active filters in place of passive filters.
5. Understand how an operational amplifier can be helpful in signal processing

UNIT-I IC FABRICATION

IC classification, Fundamental of Monolithic IC technology, Basic Planar processes: epitaxial growth, masking and etching, diffusion of impurities. Assembly processing and packaging. Fabrication of diodes, capacitance, resistance and FETs.

UNIT-I CHARACTERISTICS OF OPAMP

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and offset current, CMRR, Slew rate, virtual ground concept, differential amplifier: Transfer characteristics, Inverting and Non-inverting amplifier, voltage follower, summer, multiplier, differentiator and integrator.

UNIT -III APPLICATIONS OF OPAMP

Instrumentation amplifier, first order active filters, V/I & I/V converters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R-2R ladder and weighted resistor types), A/D converter - Dual slope, successive approximation and flash types.

UNIT -IV SPECIAL ICs

555 Timer circuit – Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications.

UNIT -V APPLICATION ICs

IC voltage regulators - LM317, 723 regulators, 78xx, 79xx regulators, switching regulator, Power amplifier: MA 7840, LM 380, Function generator IC:XR2206, isolation amplifiers, Opto coupler.

TEXT BOOKS

1. Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. (2000)
2. D.Roy Choudhary, Sheil B.Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.

REFERENCE BOOKS

1. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', Tata McGraw Hill, 2003.
2. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson Education, 4th edition, 2002 / PHI.
3. David A.Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2nd edition, 1997

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **IV**
Sub. Code: **EI4T3** Credit: **3**

Subject: **INDUSTRIAL INSTRUMENTATION**

Prerequisite: Electron Devices and Circuits, Sensors and Transducers.

Aim

To equip the students with relevant knowledge to suit the industrial requirements.

Objectives

The course will enable the students to:

1. Learn about Tachometer, Load cells, Torque meter and various densitometers.
2. Have an adequate knowledge about pressure transducers.
3. Have an idea about the temperature standards, calibration, thermocouples; signal conditioning used in RTD's and pyrometer techniques.
4. Study about various types of flow meters and their installation.
5. Have sound knowledge about various types of viscometers, level measurements, humidity and moisture measurements adopted in industrial environment

Outcome

At the end of the course, the students should be able to:

1. Understand the various techniques used for the measurement of industrial parameters.
2. Explain the design and working of various instruments.
3. Understand the installation techniques of various systems.
4. Understand the concept of various transducers used in industries.
5. Work with signal conditioning circuit of various measuring equipments.

UNIT-I MEASUREMENT OF SPEED, FORCE, TORQUE, ACCELERATION

Measurement of speed- Revolution counter, Drag cup tachometer, AC and DC tachogenerators, photo electric pickup. Measurement of force - Load cell, pneumatic load cell, hydraulic load cell. Measurement of Torque using strain gauges and magneto elastic principle, Measurement of acceleration - Elementary accelerometers, seismic accelerometers, practical accelerometers, calibration.

UNIT- II MEASUREMENT OF PRESSURE

Manometers – different types of manometers, Elastic pressure transducers, Dead weight Tester, Electrical types, Vacuum gauges - McLeod gauge, Knudsen gauge, thermocouple gauge, ionization gauge, Differential pressure transmitter - electrical & pneumatic types

UNIT- III MEASUREMENT OF TEMPERATURE

Temperature scales, Bimetallic thermometer, filled- in Thermometers, Vapour pressure thermometers, Resistance thermometers, Thermistor, Thermostat, Thermocouples - types and ranges, characteristics, laws of thermocouples, cold junction compensation, IC temperature sensors AD 590, Pyrometers - radiation and optical pyrometers.

UNIT -IV MEASUREMENT OF FLOW, LEVEL

Orifice, Venturi, Pitot tube, flow nozzle rotameter, Positive displacement meter, turbine flowmeter, electromagnetic flow meter, ultrasonic flow meter, open channel flow measurement, solid flow measurement. Sight glass, float gauge, displacer, torque tube, bubbler tube, diaphragm box, Differential Pressure methods, electrical methods- resistance type,capacitance type, ultrasonic level gauging.

UNIT -V MEASUREMENT OF DENSITY, VISCOSITY, HUMIDITY

Hydrometer – continuous weight measurement, liquid densitometer – float principle, air pressure balanced method, using gamma rays – gas density measurements – gas specific gravity measurements – Viscosity terms, saybolt viscometer, rotometer type viscometer, and Industrial consistency meters. Humidity terms – dry & wet bulb psychrometers – hot wire electrode type hygrometer, electrolytic hygrometer, Dew point hygrometer

TEXT BOOKS:

1. D. Patranabis, “Principles of Industrial Instrumentation”, Tata McGraw Hill, 2ndEdition, New Delhi, Reprint 2009.
2. S. K. Singh, “Industrial Instrumentation & Control” 3rd Edition, Tata McGraw Hill, Reprint 2009.
3. K.Krishnaswamy & S.Vijayachitra, “Industrial Instrumentation” New age International, Reprint 2008.

REFERENCE BOOKS:

1. Ernest O. Doeblin, Dhanish. N. Manik, “Measurement Systems Application & Design”, TMH, 5th Edition, 2004.
2. R.K.Jain, “Mechanical & Industrial Measurements”, Khanna Publishers, 11th Edition, 2004.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **IV**

Sub. Code: **EE4T2** Credit: **3**

Subject: **DIGITAL ELECTRONICS**

(Common to EIE/ECE/EEE/ MECHATRONICS)

Prerequisite: Basic Electronics.

Aim

To have the Knowledge of Basic Digital Circuits and their Design

Objectives

The course should enable the students to:

1. Study various number systems and to simplify the mathematical expressions using Boolean functions - simple problems.
2. Study implementation of combinational circuits.
3. Study the design of various synchronous and asynchronous circuits.
4. Learn about the various hazards present in the circuit
5. Expose the students to various memory devices

Outcome

The students should be able to:

1. Understand the basic number system and Boolean algebra.
2. Understand the basics of combinational circuits.
3. Know about Flip flops and synchronous sequential circuits and their design.
4. Analyse about various hazards present in the circuit.

UNIT - I NUMBER SYSTEMS AND CODES

Review of Number systems: Binary, Octal and Hexadecimal. Representations of numbers and their conversions. Binary arithmetic's. Conversion algorithms. Weighted binary codes and Non-weighted binary codes. Error detecting and error correcting codes. Alphanumeric codes.

UNIT - II BOOLEAN ALGEBRA AND LOGIC FUNCTIONS

Boolean Algebra: Introduction to Boolean algebra - The AND, OR and NOT operations. Laws of Boolean algebra. Minimization of Boolean expression. Boolean expressions and logic diagrams. Universal building blocks. Negative logic.

Logic Simplifications: Truth tables and maps. Sum-of-products and product-of-sums. Simplification of logic functions using Karanaugh map Minimization and Quine-McCluskey method of minimization.

UNIT - III COMBINATIONAL CIRCUITS

Arithmetic circuits: Half Adder, Full Adder, Half Subtractor and Full Subtractor, Number complements. Multiplexer - Demultiplexer, Decoder and Encoder code converters – BCD to Excess3, Gray, Seven Segment Display Conversions – Parity Generator and Checkers.

UNIT - IV SEQUENTIAL CIRCUITS

Synchronous sequential circuits: Basic latch circuits - Flip-flops, truth table and excitation table. Shift Registers. Synchronous counter design using JK, T, D flip flops, Up-down counter, General BCD counter and Ring counters.

Asynchronous Sequential Circuits – State Reduction, Multiple Inputs.

UNIT - V LOGIC FAMILIES AND PROGRAMMABLE LOGIC DEVICES

Logic Families: BJT as a switch- Logic Specifications – RTL, DTL, IIL, TTL open Collector O/P, Totem pole O/P, Tristate O/P, Schottky TTL gate, ECL, MOS, CMOS Logic – Comparison of Logic Families.

Programmable Logic Devices: PAL, PLA, PROM.

TEXT BOOKS:

1. W.H. Gothmann: Digital Electronics - An Introduction, Theory and Practice, PrenticeHall of India.Second edition,1992.
2. M.Morris Mano – Digital Logic & Computer Design – PHI, 2nd Edition, 1999.

REFERENCE BOOKS:

1. A. Anand Kumar: Switching Theory and Logic Design – PHI, 2008.
2. Heiser Man: Handbook of Digital IC applications, Prentice Hall.1980.
3. D.J. Comer: Digital Logic and State Machine Design, HOLT-SAUN-DERS, 3rd Edition, 1995.
4. T.L. Floyd: Digital Fundamentals, Prentice Hall of India.3rd Edition,1995.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **IV**
Sub. Code: **EC4T6** Credit: **3**

Subject**: SIGNALS AND SYSTEMS**

(Common to EIE/ECE)

Prerequisite: Calculus, Differential equations

Aim

To study and analyze characteristics of continuous, discrete time signals and systems.

Objectives

The course should enable the students to:

1. Understand the representation of Signals, classification of signals, signal transforms and their properties.
2. Understand the concepts in the analysis of continuous time signals and systems.
3. Understand Sampling Theorem and Z-Transform.
4. Understand the concepts of Discrete Time systems.
5. Understand the finite and infinite Impulse response.

Outcome

At the end of the course the student should be able to:

1. Understand the properties and representation of discrete and continuous signals.
2. Analyze and transform signals to different domains.
3. Perform sampling on the continuous signals along with the analysis of discrete systems using Z-transforms.
4. Perform the analysis and synthesis of discrete time systems
5. Perform the finite and infinite impulse response analysis of discrete time systems.

UNIT – I CONTINUOUS AND DISCRETE TIME SIGNALS

Continuous time signal – Discrete time signals – Representation of signals: step, ramp, pulse, impulse, exponential – Classification of continuous time signals and discrete time signals – periodic, aperiodic, random signals – Continuous time systems and Discrete time systems - classification of systems – Linear invariant systems.

UNIT – II FOURIER SERIES ANALYSIS

Fourier series Analysis – Representation of periodic signals in exponential and trignometric forms – Spectrum of continuous time signals: Properties – Fourier Transform and Laplace Transforms in signal analysis, Hilbert Transform.

UNIT – III SIGNAL ANALYSIS

Differential Equation – Block diagram Representation, reduction techniques – Impulse response – Convolution Integral – Parsevals theorem – Frequency response, Fourier Methods and Laplace Transforms in analysis – State variable equations and Matrix.

UNIT – IV SPECTRUM OF DISCRETE SIGNALS

Spectrum of discrete time signals – Discrete Time Fourier Transform – Discrete Fourier Transform – Properties – Z-Transform in signal analysis.

UNIT – V TRANSFORMS AND APPLICATIONS

Difference equations, Block Diagram representation, Impulse response, Convolution sum, Frequency response, Fast Fourier Transform and Z – transform – Properties – Z -Transform in signal analysis, State variable equation and matrix.

TEXT BOOK:

1. Robert A.Gabel and Richard A.Roberts, Signals and Linear Systems John wiley and sons 3ed, 1987.

REFERENCE BOOKS:

1. Allam V. Oppenheim et al. Signals and systems , Prentice Hall of India Pvt.Ltd.,1992
2. Roger E.Ziemer et al, Signals and systems continuous and Discrete, Mc Millan 2ed, 1990.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **IV**

Sub. Code: **EE4T7** Credit : **3**

Subject: **MEASUREMENT AND INSTRUMENTATION**
(Common to EIE/ECE/EEE, MECHATRONICS)

Prerequisite: Electric Circuits.

Aim

To introduce the concept of measurement and the related instrumentation requirement as a vital ingredient of electronics and communication engineering.

Objectives

The course should enable the students to:

1. Acquire the knowledge on basic measurement concepts
2. Acquire the knowledge on basic electronic measurements
3. Acquire the knowledge on recording devices
4. Acquire the knowledge on digital instruments

Outcome

At the end of the course the student should be able to:

1. Understand Measurement systems, Bridge measurements
2. Know the principles of cathode ray oscilloscopes and other measuring instruments
3. Compare analog and digital techniques, and measurement errors

UNIT-1 SCIENCE OF MEASUREMENT AND CHARACTERISTICS OF TRANSDUCERS

Functional elements of an instrument - Units and standards - calibration methods – errors in measurement - statistical methods - Static characteristics - accuracy, precision, sensitivity, linearity, Reproducibility, Repeatability and Noise - Dynamic characteristics – impulse, step, ramp and sinusoidal inputs.

Classification of transducers – Selection of Transducer – Applications of Transducer - Resistive Transducer: Strain gauges, Resistance Thermometers, Thermistor - Inductive Transducers: LVDT, RVDT- Capacitive Transducers – Piezoelectric Transducer.

UNIT-2 POTENTIOMETERS AND ELECTRICAL INSTRUMENTS

DC potentiometer - Loading effect – Application – Basic circuit - standardization – Laboratory type (Crompton's) – AC potentiometer – Drysdale (polar type) type – Gall-Tinsley (coordinate) type – Limitations & applications –Instrument Transformer - C.T and V.T construction, theory, operation, phasor diagram, characteristics, testing, error elimination – Applications – Single and three Phase Wattmeters and Energy meter.

UNIT-3 MEASUREMENT OF RESISTANCE AND IMPEDANCE

Low Resistance: Kelvin's double bridge – Ductor Ohmmeter - Medium Resistance: Voltmeter Ammeter method, Substitution method, Wheatstone bridge method – High Resistance: Megger, Direct deflection method, Megohm bridge method- Earth resistance measurement. Introduction to A.C. bridges – Sources and Detectors in A.C. bridges – Measurement of Inductance – Anderson Bridge. - Measurement of Capacitance: Schering's bridge, De-Sauty's bridge - Measurement of frequency using Wien's bridge- LCR meter- Q meter

UNIT- 4 CRO AND RECORDING INSTRUMENTS

Oscilloscope: CRO – CRT, Deflection System, Specifications, Controls, Phosphors -Dual Beam / Dual trace oscilloscope - Storage Oscilloscope, Digital Storage Oscilloscope and Sampling Oscilloscope.

Recording Instruments: Method of Recording – Frequency Modulated (FM) recording-Pulse Duration Modulation (PDM) Recording - Strip Chart Recorders, X-Y, UV Recorders, and Plotters.

UNIT-5 ANALOG & DIGITAL INSTRUMENTS

Operating Forces – Deflecting Force, Controlling Force, Damping Force - Galvanometer, PMMC & moving iron instruments – Principle of operation, construction and sources of errors and compensation – Dynamo meter – True RMS meter - electronic voltmeter – Digital Voltmeter – Multimeter – vector voltmeter.

TEXT BOOKS:

1. D. Patranabis, 'Sensors and Transducers', Prentice Hall of India, 1999
2. Helfrick & Cooper, Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall of India,5th Edition,2002.
3. Joseph J Carr, Elements of Electronic Instrumentation & Measurement, Pearson, 3rd Edition 1995.
4. H.S.Kalsi, "Electronic Instrumentation", TMH Co., 1995.
5. Moorthy, D.V.S., "Transducers and Instrumentation", Prentice Hall of India Pvt. Ltd., 1995.
6. A.K Sawhney, 'A course in Electrical & Electronic Measurement and Instrumentation', Dhanpat Rai and Co (P) Ltd., 2004.
7. Oliver and Cage, "Electronics measurements & Instrumentation," TMH Co.

8. M.M.S.Anand,"Electronic instruments and instrumentation thcnology,"PHI, 2006.

REFERENCE BOOKS:

1. E.A. Doeblin, 'Measurement Systems – Applications and Design', Tata McGraw Hill, New York, 1990
2. A.K. Sawhney, 'A course in Electrical & Electronic Measurement and Instrumentation', Dhanpat Rai and Co (P) Ltd., 2004..
3. S. Ranganathan, 'Transducer Engineering', Allied Publishers Pvt. Ltd., 2003.
4. Stout M.B., "Basic Electrical Measurement", Prentice Hall of India, 1986.
5. Dalley,J.W., Riley, W.F. and Meconnel, K.G., " Instrumentation for Engineering Measurement", John Wiley & Sons, 1993.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **IV**

Sub. Code: **SA4T4** Credit : **1**

Subject **SANSKRIT & INDIAN CULTURE - IV**

Unit I – (1) Introduction to Sindh Vedic Cultures; significance & how it is different from the other cultures. (2) Why we have to follow? Important features. (3) Chronology of Indian Cultures; origin & spread; general features.

Unit II – (4) Literary Heritage of India – significance of Indian Literature; (5 & 6) chronology of Indian literature; (7) Literature in Sanskrit and other languages;

Unit III – (8) Early Indian Education – significance & advantages. (9) Gurukulas and Guru-sishya parampara. Learning methods. (10) Evolution of script and languages; important early scripts and writing materials; (11) important early educational centers (*ghattikas,* universities) & their unique features.

Unit IV - (12 & 13) duties & responsibilities of human - *gruhya sutras, smrities* & *sruties* - significance in day to day life.

Unit V - (14 & 15) Scientific thoughts of Early Indian Sages;

Reference Books

1. Joshi,K. 1992(rp). The Veda and Indian Culture. Rastriya Veda Vidya Pratishthana.
2. New Delhi.
3. Majumdar, R.C. 1994 (rp). Ancient India. Motilal Banarsidas Publishers. Delhi.
4. Patel, I.S. (ed). 1984. Science and the Vedas. Bombay.
5. Sri Chandrasekarendra Sarasvati Swamihi. 1991. The Guru Tradition. Bharatiya Vidya Bhavan. Bombay.
6. Sri Jayendra Saraswatiji Maharaj. 1951. The Vedas and Vedangas. Prakashan Kendra. Lucknow.
7. Vartak, P.V. 1986. Scientific Knowledge in the Vedas. Delhi.
8. Winternize, M. 1996(rp). History of Indian Literature. Delhi.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **IV**

Sub. Code: **EI4P9** Credit : **2**

Subject: **LINEAR INTEGRATED CIRCUITS AND DIGITAL ELECTRONICS LAB**

LIST OF EXPERIMENTS

1. Applications of Op-amp-I-Inverting, Non-Inverting, Adder & Subtractor.
2. Applications of Op-amp II – Differential Amplifier, Comparator, Integrator & Differentiator.
3. Op-amp characteristics – Slew rate verifications, CMRR, Input-Offset voltage.
4. Study of Basic Digital – IC's – Verification of TT for AND, OR, EXOR, NOT, NOR & NAND.
5. Study of flip-flops - JK, RS, D &T FF.
6. Implementation of Boolean functions, Adder / Subtractor Circuits.
7. Counters: Design and implementation of 4-bit Ripple and Decade counter.
8. Shift registers – SISO, PIPO, PISO and SIPO.
9. Timer IC application – NE555 timer in Astable, Monostable operation.
10. Pspice simulation: Inverting /Non inverting amplifier, voltage follower, integrator, differentiator.

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Course: **BE** Branch: **EIE** Semester: **IV**

Sub. Code: **EE4P6** Credit : **2**

Subject: **MEASUREMENTS AND INSTRUMENTATION LAB**

LIST OF EXPERIMENTS

1. Measurements of medium resistance using Wheatstone bridge.
2. DC Bridge - Kelvin double bridge &Megger.
3. Design of Wien's, Anderson and Schering Bridge
4. Instrumentation amplifiers.
5. A/D Converter D/A Converter.
6. Calculation of single phase energy meter.
7. Measurement of three phase power & P.F
8. Measurement of iron loss.(Using Maxwell bridge)
9. Calibration of Voltmeter and Ammeter.
10. Extension of Voltmeter and Ammeter.
11. Calibration of CT & PT.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester**: IV**

Sub. Code: **EI4P8** Credit: **2**

Subject**: TRANSDUCER AND INDUSTRIAL INSTRUMENTS LAB**

LIST OF EXPERIMENTS:

1. Characteristics of LVDT/LDR
2. Characteristics of Thermocouple, RTD, Thermistor.
3. Characteristics of Strain Gauge, Torque Sensor.
4. Characteristics of Capacitive transducer.
5. Measurement of flow using Venturi Meter/ orifice Meter/Rotameter.
6. Level measurement using d/p transmitter.
7. Pressure measurement using pressure transducer.
8. Measurement of Viscosity and Humidity.
9. Characteristics of Tacho- Generator and stroboscope
10. PH meter standardization and measurement of PH value of solutions.
11. Conductivity meter calibration and measurement of test solution.
12. Flow measurement using Electromagnetic flow meter and ultrasonic flow meter.

V - SEMESTER

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **V**

Sub. Code: **MG5T1** Credit: **3**

Subject**: APPLIED MATHEMATICS FOR INSTRUMENTATION ENGINEERS III**

UNIT –I PROBABILITY THEORY

Random experiment – Mathematical, statistical and axiomatic definitions of probability – Conditional probability – Independent events - Theorem of total probability – Theorem of probability of causes: Bayes's theorem – Bernoulli's trials – De Moivre-Laplace approximation – Generalization of Bernoulli's theorem multinomial distribution – Outline of applications of probability theory in engineering.

UNIT- II ONE DIMENSIONAL RANDOM VARIABLES

Discrete random variable – Probability mass functions of Binomial, Poisson, Pascal and Geometric distributions - Continuous random variable – Probability density function of Uniform, Normal, Gamma, Erlang, Rayleigh, Maxwell and Laplace distributions - Cumulative distribution function – Outline of applications of one dimensional random variables in engineering.

UNIT- III TWO DIMENSIONAL RANDOM VARIABLES

Two dimensional random variables – Probability mass function – Joint probability density function – Cumulative distribution function – Marginal probability distribution – Conditional probability distribution – Independent random vectors – Function of random variable - Outline of applications of two dimensional random variables in engineering.

UNIT –IV STATISTICAL AVERAGES

Measures of central tendency – Mathematical expectation and moments – Measures of dispersion – Coefficient of variation – Skewness – Kurtosis – Pearson's shape coefficients – Expected values of a two dimensional random variables – Linear correlation – Correlation coefficient – Rank correlation coefficient – Regression – Equation of the regression line – Outline of applications of statistical averages in engineering.

UNIT –V STATISTICAL INEQUALITIES

Characteristic function – Moment generating function – Cumulative generating function – Bounds on probability: Tchebycheff, Bienayme's, Schwartz and Cauchy-Schwartz inequalities (without proof) – Convergence concepts and central limit theorem – Outline of applications of statistical inequalities in engineering.

Note: Questions are to be set on problem solving and not on the theoretical aspects.

TEXT BOOK:

1. Veerarajan. T.," Probability, Statistics and Random Processes, Third Edition, Tata McGraw-Hill Publishers, New Delhi 2008.

REFERENCES:

1. Gubner, John, Probability and random process for electrical and computer engineers, Cambridge
2. Gupta S.P, Statistical methods, Sultan Chand & Sons
3. Papoulis, Probability, Random Variables and Stochastic Processes, McGraw Hill.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **V**

Sub. Code: **EC5T4** Credit: **3**

Subject: **CONTROL SYSTEMS**

(Common to EIE/ECE/EEE/ MECHATRONICS)

Prerequisite: Basic knowledge in circuit theory and Laplace transform.

Aim

To acquire knowledge in designing and analyzing stable systems

Objectives

The course should enable the students to:

1. Analyze representation of systems and to derive transfer function models.
2. Provide adequate knowledge in the time response of systems and steady state error analysis.
3. Give basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.
4. Provide the concept of stability of control system and methods of stability analysis.
5. Study the three ways of designing compensation for a control system.

Outcome

The students should be able to:

1. Describe various input/output models of dynamic system.
2. Be familiar with frequency domain descriptions and dynamic analysis.
3. Understand the concept of stability and effect of feedback control on sensitivity.
4. Apply the basic methods of classical control system design such as root locus and phase lead-lag compensation based on Bode plots.
5. Understand the principles of control theory.

UNIT -I SYSTEM AND THEIR REPRESENTATION

Basic elements of control systems- open and close loop systems – Differential equation - Transfer function – Modeling of Electrical systems, translational and rotational mechanical systems – Block diagram reduction techniques – Signal flow graphs.

UNIT -II TIME RESPONSE

Time response – Time domain specifications – types of input – I and II order system response – Error coefficients – Generalized error series – Steady state error –Effect of P,PI,PD and PID modes of feedback control ,Analysis using MATLAB.

UNIT -III FREQUENCY RESPONSE

Frequency response – Bode plot – Polar plot – Nyquist plot – Frequency domain specifications from plots – Constant M and N circles – Nichol's chart– Analysis using MATLAB.

UNIT -IV STABILITY AND COMPENSATOR DESIGN

Characteristic equation – BIBO stability - Routh Hurwitz criterion - Root locus technique Construction of Root locus - Nyquist stability criterion – Effect of Lag, Lead and lag-lead compensation on frequency response, Analysis using MATLAB.

UNIT -V STATE VARIABLE ANALYSIS

Concept of state variables – State models for linear and time invariant systems – solution of state and output equation in controllable canonical form – concept of controllability and observability – Effect of state feedback.

TEXT BOOKS:

1. M.Gopal,"Control system – Principle and Design," Tata McGraw Hill, second edition, 2002.
2. K.Ogata,"Modern control Engineering, "fifth edition, PHI, 2012.

REFERENCES:

1. Benjamin C.Kuo, "Automatic control systems," seventh edition ,PHI,2010z
2. .J.Nagrath & Gopal ,"Control System Engineering," fifth edition,New Age International .

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **V**

Sub. Code: **EI5T3** Credit: **4**

Subject**: POWER PLANT INSTRUMENTATION**

Prerequisite: Basic Electronics.

Aim

To provide basic knowledge about various Power Plant Instruments and their Applications

Objectives

The course will enable the students to:

1. Acquire knowledge about the principles Power Generation.
2. Learn about measurement of various parameters in power plant.
3. Emphasis on characteristics and response of various analyzers in power plant.
4. Acquire adequate knowledge Turbine monitoring and boiler control.

Outcome

The students should be able to:

1. Understand the basic principles of Power Generation.
2. Understand about measurement of various parameters in power plant.
3. Know the various analyzers in power plant.
4. Understand Turbine monitoring and boiler control.

UNIT- I OVERVIEW OF POWER GENERATION

Brief survey of methods of power generation – hydro, thermal, nuclear, solar and wind power – importance of instrumentation in power generation – thermal power plants – building blocks – details of boiler processes UP&I diagram of boiler – cogeneration.

UNIT –II MEASUREMENTS IN POWER PLANTS

Electrical measurements – current, voltage, power, frequency, power – factor etc. – non electrical parameters – flow of feed water, fuel, air and steam with correction factor for temperature – steam pressure and steam temperature – drum level measurement – radiation detector – smoke density measurement – dust monitor.

UNIT –III ANALYZERS IN POWER PLANTS

Flue gas oxygen analyzer – analysis of impurities in feed water and steam – dissolved oxygen analyzer – chromatography – PH meter – fuel analyzer – pollution monitoring instruments.

UNIT –IV CONTROL LOOPS IN BOILER

Combustion control – air/fuel ratio control – furnace draft control – drum level control – main stem and reheat steam temperature control – super heater control – at temperature – deaerator control – distributed control system in power plants – interlocks in boiler operation. Nuclear power plant instrumentation - radiations detection instruments - process sensors - Spectrum Analyzer - nuclear reactor control systems and allied instrumentation.

UNIT- V TURBINE – MONITORING AND CONTROL

Speed, vibration, shell temperature monitoring and control – steam pressure control – lubricant oil temperature control – cooling system

TEXT BOOKS

1. Sam G. Dukelow, The control of Boilers, instrument Society of America, 1991.
2. Modern Power Station Practice, Vol.6, Instrumentation, Controls and Testing, Pergamon Press, Oxford, 1971.
3. Liptak B.G., Instrumentation in Process Industries, Chilton, 1973
4. P.Tamilmani, power plant instrumentation, sams publishers,chennai , ISBN : 978-81-908165-5-7

REFERENCES

1. Elonka,S.M.and Kohal A.L.Standard Boiler Operations, McGraw Hill, New Delhi, 1994.
2. R.K.Jain, Mechanical and industrial Measurements, Khanna Publishers, New Delhi, 1995.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **V**

Sub. Code: **EC5T5** Credit: **3**

Subject: **DIGITAL SIGNAL PROCESSING**
(Common to EIE/ECE)

Prerequisite: Signals and systems.

Aim

To provide the knowledge about various signal processing techniques and their importance in communication field.

Objectives

The course should enable the students to:

1. Study the DFT and FFT
2. Study the IIR Filters.
3. Study the FIR filter and Finite Word Length Problems.
4. Study the Sampling rate conversion.
5. Study the fundamentals of Digital Signal Processors.

Outcome

At the end of the course the student should be able to:

1. Understand the concept of Discrete Fourier Transform Technique and its efficient computation.
2. Understand the design techniques of IIR and FIR filter types
3. Understand the limitations of Digital processors and to handle various Quantization noises due to finite word length problems.
4. Understand to Decimate and interpolate the signal to convert the sampling rate of the known signal.
5. Know the various type of Digital Signal Processors and their special hardware descriptions.

UNIT - I DFT and FFT

Discrete convolutions - Linear and circular. [Discrete Fourier Transform DFT and its properties. Relationship between z - transform & L-Transform, DTFT and DFT. Introduction to radix-2 Fast Fourier Transform [FFT]. Decimation in-time radix-2 FFT. Decimation-in-frequency radix -2 FFT. Computation of Inverse DFT through FFT.

UNIT - II FINITE-IMPULSE RESPONSE [FIR] FILTERS

Introduction to Digital Filters, Advantages and Disadvantages of FIR Filters, Poles-Zeros of Linear Phase sequence, Magnitude response and phase response of digital filters. Linear phase response. Design techniques for FIR filters - Fourier series method and Frequency sampling method. Linear phase designs. Windows - Rectangular, Hamming. Hanning and Kaiser.

UNIT - III INFINITE IMPULSE-RESPONSE[IIR] DIGITAL FILTERS

Review of the properties of Butterworth and Chebychev filters of the continuos - time type . IIR digital filter design from continuos-time filters using Impulse Invariance technique and Bilinear transformation, Advantages and Disadvantages of IIR filters.

UNIT - IV FINITE WORD-LENGTH EFFECTS IN DIGITALFILTERS

Fixed-point arithmetic. Effect of Quantization of the input data due to finite word-length. Coefficient in accuracy. Product round off. Need for scaling. Zero - input limit-cycle oscillation. Limit cycle oscillations due to overflow of address. Table - look up implementation to avoid multiplications.

UNIT - V ADSP – 2181 FAMILY PROCESSOR

Core Architecture- Computational Units – ALU, MAC, Barrel Shifter & Program Sequencer – Buses – On-chip Peripherals, Serial Ports, Timer, DMA Ports – Instruction Sets – Simple Programs – Addition, Subtraction, Circular Addressing, ASK etc.

TEXT BOOK:

1. Digital Signal Processing – Nagoor Kani, RBA Publishing.
2. ADSP – 218X DSP Hardware Reference – Analog Devices Manual. First Edition. February 2001.

REFERENCE BOOKS:

1. Oppenheim and Schafer: Digital Signal Processing [PHI] 1994
2. Rabiner and Gold: Digital Signal Processing - Theory and Applications. [PHI] 2001
3. Antoniou: Digital Filter Design, TMH.2/e
4. Stanley: 'Digital Signal Processing', RESTON

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **V**

Sub. Code: **EI5T4** Credit: **3**

Subject: **POWER ELECTRONICS AND DRIVES**
(Common to EIE/ MECHATRONICS)

Prerequisite: Electronic Devices and Circuits

Aim

To introduce the application of electronic devices for conversion, control and conditioning of electric power.

Objectives

The course will enable the students to:

1. Have an overview of different types of power semi-conductor devices and their switching characteristics.
2. Understand the operation, characteristics and performance parameters of controlled rectifiers.
3. Study the operation, switching techniques and basic topologies of DC-DC switching regulators.
4. Learn the different modulation techniques of pulse width modulated inverters and to understand the harmonic reduction methods.
5. Understand the practical application for power electronics converters in conditioning the power supply

Outcome

At the end of the course students should able to do the following:

1. Choose the Power Devices based on the Application.
2. Selection and Design of AC to DC, AC to AC Controlled Converters
3. Design Choppers and Switching Regulators.
4. Understand Fixed DC to Variable AC converters, Various Modulation Techniques employed in Inverters and the Effect of Harmonics.
5. Apply Power Converters in a Power System such as HVDC Transmission and FACTS.

UNIT –I POWER SEMICONDUCTOR DEVICES

Power diodes – power transistor – characteristics of SCR, Triac, power MOSFET – IGBT – MCT – LASCR – SCR turn on, turn off characteristics – thyristor specifications – thyristor protection circuits. Thyristor trigger circuits

UNIT- II CONVERTER

Operation of 1ϕ half wave rectifiers with R, RL & RLE load.- 1ϕ Full wave rectifier with R, RL, & RLE load (fully controlled and half controlled) - effect of source inductance & load inductance – introduction to Cyclo converters.

UNIT –III INVERTER & CHOPPER

Voltage source inverters – series, parallel & bridge inverters – Current source inverters – PWM inverters. Commutation – Choppers – Control strategies – DC chopper – AC Chopper – Applications.

UNIT – IV DC DRIVES

Advantages, types & selection of electrical drives, Methods of speed control of DC motors – Armature control & Field control – Ward Leonard drives – converter fed & Chopper fed DC drives - Two quadrant & Four quadrant chopper drives.

UNIT – V INDUCTION MOTOR DRIVES

Induction Motor fundamentals – Speed control of Induction motors – Stator control: Voltage, Frequency, V/F control (AC chopper, Inverter fed drives) – Rotor resistance control – slip power recovery scheme – Introduction – Synchronous motor drive.

TEXT BOOK

1. Bhimbra. Dr.P.S., Power Electronics Khanna Publishers, 2001
2. Muhammad H. Rashid, Power Electronics – Circuits, Devices & Applications, Prentice Hall of India, New Delhi, 1995.
3. Dubey, G.K., et.al, Thyristorised Power Controllers, New Age International (P) Publishers Ltd., 2002.
4. Vedam Subramaniam, Power Electronics, New Age International (P) Publishers Ltd., 2000.
5. Dubey G.K., Fundamental of Electric Drives, Narosa publishing house 1995.
6. Pillai S.K., A first course on Electrical Drives, New Age International (p) Ltd., 1984

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **V**

Sub. Code: **ME5T6** Credit: **3**

Subject**: THERMO DYNAMICS AND FLUID MECHANICS**

Prerequisite: Basic Mechanical Engineering

Aim

This course provides the basic knowledge about thermodynamics and its application I.C. Engines, steam and gas turbines and fluid mechanics.

Objectives

At the end of the course, the student will be able to:

1. Understand and apply the basic concepts of first law second law of Thermo Dynamics.
2. Know about the basic principles of IC engines, Gas Turbines and fluid mechanics

Outcome

At the end of the course the student should be able to:

1. Develop through basic knowledge about thermodynamics.
2. Acquire knowledge on the applications IC engines.
3. Learn the usage of different types of Gas Turbines and flow of fluid mechanics.

UNIT – I BASIC CONCEPTS AND LAWS OF THERMODYNAMICS

Classical approach: Thermodynamic systems – Boundary - Control volume - System and surroundings – Properties - State-process – Cycle – Equilibrium - Work and heat transfer – Point and path functions - First law of thermodynamics for open and closed systems - First law applied to a control volume - SFEE equations [steady flow energy equation] - Second law of thermodynamics - Heat engines - Carnot cycle - Carnot theorem - Clausius inequality - Concept of entropy

UNIT – II IC ENGINES AND GAS TURBINES

Air standard cycles: Otto and diesel cycles - comparison of efficiency - Working Principle of four stroke and two stroke engines - Working principle of spark ignition and compression ignition engines - Applications of IC engines - Normal and abnormal combustion Open and closed cycle gas turbines – Ideal and actual cycles - Brayton cycle - Cycle with reheat, intercooling and regeneration (only description)– Applications of gas turbines for aviation and power generation.

UNIT – III REFRIGERATION AND AIR CONDITIONING

Formation of steam - Properties of steam – Use of steam tables and charts – Steam power cycle (Rankine) Unit of refrigeration - Basic functional difference between refrigeration and air conditioning – Various methods of producing refrigerating effects (RE) – Vapour compression cycle: P-H and T-S diagram - Saturation cycles - Effect of subcooling and super heating - (qualitative treatment only) Airconditioning systems – Basic psychrometry - Simple psychrometric processes - Types of airconditioning systems -Selection criteria for a particular application (qualitative treatment only).

UNIT – IV BASIC CONCEPTS, PROPERTIES AND FLOW OF FLUIDS

Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges Fluid dynamics - equations of motion - Euler's equation along a streamline - Bernoulli's equation – applications

UNIT – V DIMENSIONAL ANALYSIS AND PUMPS

Dimensional analysis - Buckingham's π theorem- applications - similarity laws and models. Pumps: Definition - classifications and working principles of Centrifugal pump, Jet pump, Reciprocating pump and Submergible pump

TEXT BOOKS

1. P.K. Nag, 'Basic and Applied Engineering Thermodynamics', Tata McGraw Hill, New Delhi, 2002.B.K. Sachdeva, 'Fundamentals of Engineering Heat and Mass Transfer (SI Units)', New Age International (P) Limited, Chennai, 2003.
2. Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", McGraw-Hill, 1983.
3. Kumar, K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd, New Delhi (7^{th} edition), 1995.
4. Vasandani, V.P., "Hydraulic Machines - Theory and Design", Khanna Publishers.1992

REFERENCE BOOKS

1. Rogers and Mayhew, 'Engineering Thermodynamics – Work and Heat Transfer', Addision Wesley, New Delhi, 1999.
2. Eastop and McConkey, 'Applied Thermodynamics', Addison Wesley, New Delhi. 1999.
3. M.L. Mathur and F.S. Metha, 'Thermal Engineering', Jain Brothers, New Delhi, 1997.
4. B.K. Sankaar, 'Thermal Engineering', Tata McGraw Hill, New Delhi, 1998.
5. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", (5^{th} edition), Laxmi publications (P) Ltd, New Delhi, 1995
6. White, F.M., "Fluid Mechanics", Tata McGraw-Hill, 5^{th} Edition, New Delhi, 2003.
7. Ramamirtham, S., "Fluid Mechanics and Hydraulics and Fluid Machines", Dhanpat Rai and Sons, Delhi, 1998.

8. Som, S.K., and Biswas, G., “Introduction to Fluid Mechanics and Fluid Machines”, Tata McGraw-Hill, 2nd Edition, 2004.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **V**

Sub. Code: **SA5T5** Credit: **1**

Subject: **SANSKRIT & INDIAN CULTURE - V**

Unit I – (2) Samskaras or Sacraments – Important occasions & significance; Sixteen important Samskaras in due course of human life.

Unit II – (1) Responsibilities of Human - four Ashrama Dharmas .

Unit III – (2) significance of social gatherings & celebrations of different occasions. – Worship – personal and public rituals & their significance; (2) soi-cultural significance of festivals and impact on culture. (1) Significance of sound science – *Gandharvaveda* (Music) & Dance.

Unit IV – (2) Significance of Yoga in daily life.

Unit V – (2) Scientific heritage - importance and significance of Upavedas. (3) Special reference to Ayurveda and Arthasastra.

Reference Books

1. Acharya, D. 1999. *Dharnuveda* (sub-Veda of Yajurveda). Hindi. Vijaya Kumar Govindram Harsanand. Delhi.
2. Kangle, R.P. 1992 (rp). *The Kautilya Arthasastra.* Delhi.
3. Rao, S.K.R. 1994. *Nityarchana*. Agama-kosha (Agam Encyclopaedia). Kalpatharu Research Academy Publications. Vol X. Banglore.
4. Ray, P. (tr). 1997. *Vasistha's Dhanurveda Samhita*. J.J. Publishing House. Delhi.
5. Shalini, K. 1997. *Vedic Leguminous Plants* (Medical and Microbiological Study). Classical Publishing Company. New Delhi.
6. Swami Satyananda Saraswati. 1997 (rp). *Asanas Pranayama Mudra Bandha*. Bihar Yoga Bharati. Bihar.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **V**

Sub. Code: **ME5P6** Credit: **2**

Subject**: THERMO DYNAMICS AND FLUID MECHANICS LAB**

THERMODYNAMIC LAB

1. Valve timing and port timing diagrams for IC Engines.
2. Performance test on a petrol Engine.
3. Performance test on a Diesel Engine.
4. Heat Balance test on a IC Engine.
5. Performance test on a Refrigerator (Determination of COP)

FLUID MECHANICS LAB

1. Flow measurements using venture meter.
2. Test to estimate losses in pipe flow.
3. Test on positive displacement pump for obtaining its characteristics curves and parameters.
4. Test on jet pump for obtaining its characteristics curves and design flow parameters.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **V**

Sub. Code: **EC5P7** Credit: **2**

Subject: **POWER ELECTRONICS AND DRIVES LAB**

1. SCR, MOSFET & IGBT Characteristics – Study.
2. UJT, R, RC Firing circuits for SCR.
3. SCR based half controlled & fully controlled converters.
4. SCR based DC Voltage Commutated chopper.
5. SCR based DC Current Commutated chopper.
6. SCR based Series Inverter.
7. SCR based Parallel Inverter.
8. Simulation of above Experiments using PSIM.
9. Simulation of closed loop control of converter fed DC motor using PSIM.
10. Simulation of closed loop control of chopper fed DC motor using PSIM.
11. Simulation of VSI fed 3-phase induction motor using PSIM.
12. Simulation of 3-phase synchronous motor drive using PSIM.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **V**

Sub. Code: **EE5P8** Credit: **2**

Subject: **CONTROL SYSTEMS LAB**

1. Analysis of Step, Ramp, Impulse and Parabolic response of First Order System
2. Analysis of Step, Ramp response of Second Order System
3. Analysis of Time domain specifications of Second Order System
4. Stability analysis of Linear System using graphical methods (Time and Frequency Domain)
5. Design and Simulation of P, PI, PD, PID Controllers for the given system using Cohen-Coon Method.
6. Design and Simulation of P, PI, PD, PID Controllers for the given system using Ziegler Nichols Method.
7. Design and Simulation of Lag, Lead and Lag-Lead Compensators
8. Tuning of PID Controllers using Ziegler Nichols Method in SIMULINK.
9. Study the response of various control schemes in SIMULINK (Feedback, Feed Forward, and Cascade Control).
10. Study the relationship between controllability, Observability and transfer function.

VI - SEMESTER

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VI**

Sub. Code: **MG6T1** Credit: **3**

Subject: **OPERATIONAL RESEARCH**

UNIT -I LINEAR PROGRAMMING AND SIMPLEX METHOD

Mathematical formulation of the problem - Graphical solution method - Exceptional cases - General linear programming problem - Canonical and standard forms of linear programming problem - The simplex method - Computational procedure : The simplex algorithm - Artificial variable techniques : Big M method, Two phase method - problem of degeneracy.

UNIT -II TRANSPORTATION, ASSIGNMENT AND ROUTING PROBLEMS

Mathematical formulation of the transportation problem - Triangular basis - Loops in a transportation table - Finding initial basic feasible solution (NWC, IBM and VAM methods) - Moving towards optimality - Degeneracy in transportation problems- Transportation algorithm (MODI method) - Unbalanced transportation problems - Mathematical formulation of the assignment problem - Assignment algorithm : Hungarian assignment method - Routing problems : Travelling salesman problem.

UNIT –III GAME THEORY AND SEQUENCING PROBLEMS

Two person zero sum games - Maxmin Minmax principle - Games without saddle points (Mixed strategies) - Solution of 2 X 2 rectangular games - Graphical method - Dominance property - Algebraic method for m x n games - Matrix oddments method for m x n games - Problem of sequencing - Problems with n jobs and 2 machines - Problems with n jobs and k machines - Problems with 2 jobs and k machines.

UNIT -IV INTEGER PROGRAMMING AND INVENTORY CONTROL

Gomory's All I.P.P method - Gomory's mixed integer method - Branch and bound method - Reasons for carrying inventory - Types of inventory - Inventory decisions - Economic order quantity - Deterministic inventory problem - EOQ problem with price breaks - Multi item deterministic problem.

UNIT- V REPLACEMENT PROBLEMS AND PERT/CPM

Replacement of equipment or asset that deteriorates gradually - Replacement of equipment that fails suddenly - Recruitment and promotion problem - Network and basic components - Rules of network construction - Time calculations in networks - Critical path method (CPM) - PERT - PERT calculations - Negative float and negative Slack - Advantages of network (PERT/CPM).

TEXT BOOK

1. Kanti Swarup, P.K.Gupta and Man Mohan, Operations Research, Eighth Edition, Sultan Chand & Sons, New Delhi, 1999.

REFERENCES

1. H.A.Taha, Operations Research, Sixth Edition, MacMillen.
2. Richard Bronson, Operations Research, (Schaum's Outline Series, McGraw Hill Company, 1982.
3. J.K.Sharma, Operation Research (Theory and Applications), Mac Millen Ltd., 1997.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VI**
Sub. Code**: EC6T3** Credit: **3**

Subject: **MICROPROCESSOR AND MICROCONTROLLER**
(Common to the branches EEE/ EIE / MECHATRONICS)

Pre-requisite: Basic knowledge of computer, digital electronics

Aim

To excel in the Architecture of 8086 & 8051 and to develop skill in simple program writing, to study simple applications.

Objectives

The objective of the course is to impart knowledge on:

1. The Architecture of 8086 & 8051.
2. The addressing modes & instruction set of 8086 & 8051.
3. The need & use of Interrupt structure.
4. Simple program Skills.
5. Commonly used peripheral / interfacing ICs.

Outcome

After completion of the course the students are expected to be able to:

1. Understand the functional block diagram, Timing Diagram, Interrupt structure and Multiprocessor configurations of 8086Microprocessor.
2. Develop the Programming skills using Loop structure with counting & Indexing, Look up table, Subroutine instructions stack.
3. Interface ICs 8255 PPI, 8259 PIC, 8257 DMA, 8251 USART, 8279 Key board display controller and 8253 Timer/ Counter, A/D and D/A converter.
4. Comprehend the Functional block diagram ,Instruction format and addressing modes, Interrupt structure ,I/O Ports and Serial communication of 8051 Microcontroller.
5. Develop the programming skills in PID control algorithm, square, triangular and sine wave form generation, closed loop control of servo motor and stepper motor control.

UNIT I INTRODUCTION TO MICROPROCESSOR- 8085

Comparison of microcomputer with "mini" and "large" Computers-Advantages and limitations of Microprocessor based system design -8085 Microprocessor architecture-Addressing modes- Instruction set-Programming the 8085- interrupts – Memory and I/O

UNIT II 16 – BIT MICROPROCESSOR – 8086

Intel 8086 microprocessor - Architecture - Instruction Set-Addressing Modes-- Assembly Language Programming-Procedures- Interrupts

UNIT-III MULTIPROCESSOR CONFIGURATIONS

Coprocessor Configuration – Closely Coupled Configuration – Loosely Coupled Configuration –8087 Numeric Data Processor – Data Types – Architecture –8089 I/O Processor –Architecture –Communication between CPU and IOP

UNIT- IV INTERFACING AND SYSTEM DESIGN USING MICRO PROCESSOR

1. 8255-Programmable peripheral Interface along with 8085-Both Mode 0 and Mode 1, detailed study.
2. 8254 - Programmable Interval Timer along with Intel 8086 - Both Mode 0 and Mode 3 to be studied.
3. Need for the following ICs: (a) 8251 - USART; (b) 8257 - Direct Memory Access Controller; (c) 8259-Programmable Interrupt Controller; (d) 8279 - Keyboard / Display Interface
4. Case studies – Traffic light control, washing machine control- Motor Control- Relay, PWM, DC & Stepper Motor

UNIT- V MICROCONTROLLERS

Architecture of 8051 Microcontroller – signals – I/O ports – memory – counters and timers – serial data I/O – interrupts-
Interfacing -keyboard, LCD,ADC & DAC

TEXT BOOKS:

1. Ramesh S. Gaonkar ,"Microprocessor – Architecture, Programming and Applications with the 8085" Penram International Publisher , 5th Ed.,2006
2. Yn-cheng Liu,Glenn A.Gibson, "Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design", second edition, Prentice Hall of India , 2006 .
3. LA Levant Hal, Introduction to Microprocessor, Software, Hardware, Programming, PHI, Inc.1978.
4.. Kenneth J.Ayala, 'The 8051 microcontroller Architecture, Programming and applications' second edition ,Penram international.

REFERENCES:

2. Douglas V.Hall, " Microprocessors and Interfacing : Programming and Hardware", second edition , Tata Mc Graw Hill ,2006.

3. A.K.Ray & K.M Bhurchandi, "Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing", Tata Mc Graw Hill , 2006.

4. Mohamed Ali Mazidi,Janice Gillispie Mazidi," The 8051 microcontroller and embedded systems using Assembly and C",second edition, Pearson education /Prentice hall of India , 2007.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VI**

Sub. Code: **EI6T3** Credit: **4**

Subject**: PROCESS CONTROLINSTRUMENTATION**

Pre-requisite: Basic knowledge of transducers.

Aim

To provide basic knowledge about of controllers, find control element and the processes.

Objectives

The objective of the course is to impart knowledge on:

1. To study the basic characteristics of first order and higher order processes.
2. To get adequate knowledge about the characteristics of various controller modes and methods of tuning of controller.
3. To study about various complex control schemes.
4. To study about the construction, characteristics and application of control valves.
5. To study the five selected unit operations and a case study of distillation column control

Outcome

After completion of the course the students are expected to be able to:

1. Understand the characteristics of higher order processes, controller modes and methods of tuning of controller.
2. Gain knowledge about complex control schemes and control valves.
3. Get some basic knowledge about the fuzzy logic.

UNIT -I MATHEMATICAL MODELLING OF PROCESSES

Need for process control – Mathematical model of first order liquid level and thermal processes – First and second order process – Process with dead time, process with inverse response – Interacting and non-interacting systems – Continuous and batch process – Servo and regulator operation.

UNIT- II CONTROLLER CHARACTERISTICS & TUNING

Basic control action – Characteristics of ON-OFF, proportional, integral and derivative control modes – Composite control modes – P+I, P+D and P+I+D control modes – Electronic controllers to realize various control actions – Evaluation criteria – IAE, ISE, ITAE and ¼ decay ratio – Tuning of controllers – Ziegler-Nichol's method and - Cohencoon method – Damped oscillation method.

UNIT –III CONTROL SYSTEMS WITH MULTIPLE LOOPS

Cascade control – Feed forward control – Ratio control – Selective control systems – Split range control – Adaptive and inferential control. MIMO controller.

UNIT- IV FUZZY LOGIC CONTROL SYSTEM

Fuzzy logic controller - fuzzification interface - knowledge base- - decision making logic - defuzzification interface - design of fuzzy logic controller case study

UNIT –V FINAL CONTROL ELEMENT

I/P and P/I converter – Pneumatic,hydralic and electric actuators – Valve positioned including smart positioning – Control valves characteristics – Classification of control valves – Control valve sizing – Cavitations and flashing – Selection of control valves – pressure relief valve,self regulating valve,solenoid.

TEXT BOOKS

1. Donald P. Eckman, 'Automatic Process Control', Wiley Eastern Ltd., New Delhi, 1993.
2. G.Stephanopoulis, 'Chemical Process Control', Prentice Hall of India, New Delhi, 1990.
3. Klir G.J., and Yuan B.B., Fuzzy sets and fuzzy logic, Prentice Hall of India, New Delhi, 1997.
4. Donald R. Coughanowr,'Process System Analysis and Control',Mcgraw Hill,1991.

REFERENCE BOOKS

1. B.G.Liptak, 'Process Control', Chilton Book Company, 1994.
2. Curtis D. Johnson, 'Process Control Instrumentation Technology', 7th Edition,Pearson Education, New Delhi, 2002 / PHI.
3. J.G.Balchen and K.J.Mumme, 'Process Control structures and Application', Vannostrand Reinhold Co., New York, 1988

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VI**
Sub. Code: **EI6T4** Credit: **3**

Subject**: INDUSTRIAL CHEMICAL PROCESS**

Pre-requisite: Nil.

Aim

To provide basic knowledge about Industrial chemical processes.

Objectives

The objective of the course is to impart knowledge on:

1. To study the basic manufacturing various chemicals.
2. To get adequate knowledge about the Mass transfer/ Distillation/ extraction/ leaching process.
3. To study the characteristics of chemical reactors.
4. To study about various Automation techniques.

Outcome

After completion of the course the students are expected to be able to:

1. Understand the basic manufacturing various chemicals.
2. Get adequate knowledge about the Mass transfer/ Distillation/ extraction/ leaching process.
3. Understand characteristics of chemical reactors.
4. Understand about various Automation techniques.

UNIT- I

Overview of a chemical process Industries-Manufacture of H_2 SO4,NaoH,NH3, Edible oil, pulp and paper, pertolecem, refining plastics (P.E; PVC), polyester fibre - These process industries cover: Inorganic (H_2 SO4,NaoH,NH3) organic (Edible, pulp & paper), petroleum, polymer (PE, PVC) & fibre

UNIT -II

Mass transfer - mechanism - Distillation Absorption, extraction, leaching, adsorption, drying, and crystallization.

UNIT- III

Chemical reactors, mixing, size reduction, filtration, other separations membrane separation, solvent extraction, centrifugation-P&I diagram, Chemical engineering symbols,SAMA.

UNIT -IV

Concept of material, energy momentum balance, case study of process variables and control in typical unit operation as distillation, absorption, reactors, heat exchangers

UNIT -V

Automation of Assembly lines- Concept of automation in industry,mechanization and automation.

Automation using Hydraulic systems – Design aspects of various elements of hydraulic systems such as pumps, valves, filters, reservoirs, accumulators, actuators and intensifiers.

Automation using pneumatic systems – Pneumatic fundamentals – Introduction to Automation using pneumatic systems.

TEXT BOOKS

1. Dryden‘s outlines of chemical technology by Gopal Rao,East West Publishers 1997,New Delhi.
2. Shreve‘s chemical process industries Mc Grew Hill,Auckland,1984
3. Unit operations of chemical engg - Mccabe , J.smith & P.Harriott, Mc Graw Hill,7th Edition,2004.

REFERENCES

1. Perry‘s chemical engg‘s hand book - Mc Graw Hill,8th Edition ,2008.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VI**
Sub. Code:**EI6T5** Credit: **3**

Subject: **ANALYTICAL INSTRUMENTATION**

Prerequisite: Electronic Devices and Circuits

Aim

To equip the students with an adequate knowledge about number of analytical tools which are useful for various applications.

Objectives

The course will enable the students to:

1. To understand various techniques and methods of analysis which occur in the various regions of the spectrum.
2. To study important methods of analysis of industrial gases.
3. To understand the important radio chemical methods of analysis.

Outcome

At the end of the course students should able to do the following:

4. Understand various techniques and methods of analysis.
5. Understand various methods of chromatography and gas analyzers.
6. Get adequate knowledge about radio chemical methods of analysis.

UNIT- I COLORIMETRY AND SPECTROPHOTOMETRY

Spectral methods of analysis– Beer-Lambert law – Colorimeters – UV-Visible spectrophotometers – Single and double beam instruments , Sources and detectors – IR Spectrophotometers – Types – Attenuated total reflectance flame photometers – Atomic absorption spectrophotometers – Sources and detectors – FTIR spectrophotometers – Flame emission photometers – Fluorescence spectrophotometer

UNIT- II CHROMATOGRAPHY

Different techniques – Techniques by chromatographic bed shape- Column chromatography-Planer Chromatography-Paper Chromatography-Thin layer Chromatography-Applications - Techniques by physical state of mobile phase- Gas chromatography – Sources- Detectors – Liquid chromatographs – sources- detectors- Applications – High-pressure liquid chromatographs – sources-detectors-Applications- Techniques by separation mechanism-Ion exchange chromatography-size-exclusion chromatography-Applications

UNIT -III INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS

Types of gas analyzers – Oxygen, NO2 and H2S types, IR analyzers, thermal conductivity analyzers, analysis based on ionization of gases. Air pollution due to carbon monoxide, hydrocarbons, nitrogen oxides, sulphur dioxide estimation - Dust and smoke measurements.

UNIT -IV PH METERS AND DISSOLVED COMPONENT ANALYZERS

Principle of pH measurement, glass electrodes, hydrogen electrodes, reference electrodes, selective ion electrodes, ammonia electrodes, biosensors, dissolved oxygen analyzer – Sodium analyzer – Silicon analyzer.

UNIT-V NUCLEAR MAGNETIC RESONANCE AND MICROSCOPIC TECHNIQUES

NMR :– Basic principles , NMR spectrometer and Applications - Electron spin Resonance spectroscopy: – Basic principles, Instrumentation and applications. Scanning Electron Microscope (SEM) :- Basic principles, Instrumentation and applications. Transmission Electron Microscope (TEM):– Basic principles – Instrumentation and applications. Mass spectrometers :– Different types and Applications.

TEXT BOOKS:

1. R.S. Khandpur, Handbook of Analytical Instruments, Tata McGraw Hill publishing Co. Ltd., 2nd edition, 2006.
2. G.W. Ewing, Instrumental Methods of Analysis, Mc Graw Hill, 2004.
3. Liptak, B.G., Process Measurement and Analysis, CRC Press, 2005.

REFERENCES:

1. Braun, R.D., Introduction to Instrumental Analysis, Mc Graw – Hill, Singapore, 2006.
2. H.H.Willard, L.L.Merritt, J.A.Dean, F.A.Settle, Instrumental methods of analysis, CBSpublishing & distribution, 1995.
3. James keeler ; Understanding NMR Spectroscopy, Second Edition John Wiley & Sons, 2010.
4. John H.Nelson , Nuclear Magnetic Resonance Spectroscopy, Prentice Hall/Pearson Education,2003.
5. Frank G. Kerry Industrial Gas Handbook: Gas Separation and Purification, Taylor and francis group, 2007.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VI**
Sub. Code: **EI6T6** Credit: **3**

Subject: **FIBER OPTICS & LASER INSTRUMENTS**

Aim

To provide knowledge about the Industrial applications of optical fibers and laser instruments.

Objectives

The course will enable the students to:

1. Get exposed to the basic concepts of optical fibers and their properties.
2. Acquire adequate knowledge about the Industrial applications of optical fibers.
3. Acquire knowledge about Laser fundamentals and Industrial application of lasers.
4. Get adequate knowledge about holography & Medical applications of Lasers.

Outcome

After completion of the course the students are expected to be able to:

1. Specify and operate optical test instrumentation, for example, optical spectrum analyzers and laser beam profilers.
2. Align, maintain and operate optical components and support and positioning equipment.
3. Survey a laser work area, citing unsafe conditions present.
4. Gain knowledge about Holographic techniques and medical applications of laser

UNIT -I OPTICAL FIBERS AND THEIR PROPERTIES

Principles of light propagation through a fiber-Different types of fibers and their properties - Transmission characteristics of optical fiber-absorption losses-Scattering losses-Dispersion - Optical sources - Optical detectors - LED -LD - PIN and APD

UNIT -II INDUSTRIAL APPLICATION OF OPTICAL FIBERS

Fiber optic sensors - Fiber optic Instrumentation system - Different types of modulators- Detectors- Application in Instrumentation - Interferometric method of measurement of length- Moire fringes - measurement of pressure, temperature, current, voltage, liquid level and strain - fiber optic gyroscope

UNIT – III LASER FUNDAMENTALS

Fundamental characteristics of Lasers - three level and four level lasers - properties of laser- laser modes - resonator configuration - Q- switching and mode locking - cavity dumping - Types of lasers Gas lasers, solid lasers, liquid lasers - semiconductor lasers

UNIT – IV INDUSTRIAL APPLICATION OF LASERS

Laser for measurement of distance, length, velocity, acceleration, current, voltage and atmospheric effect - material processing - laser heating, welding, melting and trimming of materials - removal and vaporization

UNIT - V HOLOGRAM AND MEDICAL APPLICATION

Holography - Basic principle - Methods - Holographic interferometry and application,Holography for non – destructive testing- Holographic components - Medical applications of lasers,- Laser instruments for surgery, removal of tumors, brain surgery, plastic surgery, Eye surgery.

Text Books

1. Jasprit Singh, Semi Conductor Optoelectronics, McGraw Hill,1995
2. Ghatak A.K. and Thiagarajar K, Optical Electronics Foundation book , TMH, Cambridge University Press, 1989
3. J.M. Senior, Optical Fiber Communication - Principles and Practice, Prentice Hall of India, 2005.
4. J. Wilson and J.F.B. Hawkes, Introduction to Opto Electronics, Prentice Hall of India, 2001.

Reference Books

1. John and Harry, Industrial Lasers and their Applications, McGraw Hill 1974
2. John F Ready,. Industrial Applications of Lasers, Academic Press, 1997
3. Monte Ross, Laser Applications, McGraw Hill, 1968
4. Donald J.Sterling Jr, Technicians Guide to Fiber Optics, 3rd Edition, Vikas Publishing House, 2000.
5. M. Arumugam, Optical Fiber Communication and Sensors, Anuradha Agencies, 2002.
6. Monte Ross, Laser Applications, McGraw Hill, 2004.
7. G. Keiser, Optical Fiber Communication, McGraw Hill, 2006.
8. Mr. Gupta, Fiber Optics Communication, Prentice Hall of India, 2004.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VI**

Sub. Code**: SA6T6** Credit: **1**

Subject: **SANSKRIT & INDIAN CULTURE - VI**

Unit I – (2) Social significance of religion - evolution of religious thoughts and ritual practices; (1) different philosophical Schools.

Unit II – (1) structural evolution for ritual practices; significance of temples & other constructions. (2) Civil engineering skill & construction technologies; scientific aspects in *Vastusastra* .

Unit III – (1) Important personalities and their Contribution – Devarishies, Maharishies, Rishies, Seers and contribution of their institutions to protect the cultural heritage.

Unit IV – (3) Vedic Mathematics, Astrology & Astronomy, etc. early Indian works and its importance in day to day life.

Unit V – (5) project work - ancient Indian technological thoughts with modern applications in different fields.

Reference Books

1. Datta, B. & A.N. Singh. 1962(rp). History of Hindu Mathematics. 2 Vols. Asian Publishing House. Bombay.
2. Jagadguru Swami Sri Bharati Krishna Tirthaji Maharaj. 1994 Vedic Mathematics. Motilal Banarasidas. New Delhi.
3. Kulkarni, R.P. 1983. Geometry according to Sulba Sutra. Samsodhana Mandal. Pune.
4. Radhakrishna, S. 1993(rp). Indian Philosophy. Vol I & II. Oxford University Press. Delhi.
5. Rao, J. 1960. Principles and Practices of Medical Astrology. Raman Publications. Banglore.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VI**
Sub. Code: **EC6P7** Credit: **2**

Subject: **MICROPROCESSOR AND MICROCONTROLLER LABORATORY**

Pre-requisites:

Digital Electronics and Number System Conversion

List of Experiments:

EXPERIMENTS IN MICROPROCESSOR 8085:

1) Write a ALP to perform basic arithmetic operation on two 8 bit numbers
2) Write a ALP to find the square of a given number using Look up Table Technique
3) Write a ALP to sort the given array of numbers in Ascending/Descending Order
4) Write a ALP to search for a given number and display the number of occurrences of the given number
5) INTERFACING USING 8085
    a) Study the various modes of 8255 interfaced with 8085 microprocessor
    b) Generation of Square, Triangular and Saw tooth waveform using DAC interfaced with 8085 microprocessor
    c) Write a ALP to control the speed and direction of Stepper motor

EXPERIMENTS IN MICRPROCESSOR 8086:

1) Write a ALP to perform basic arithmetic operation on two 16 bit Numbers
2) Write a ALP to study the addressing modes in 8086

EXPERIMENTS IN MICROCONTROLLER 8051:

1) Write a microcontroller program to perform basic arithmetic operation on two 8 bit numbers
2) Study and analyze the interfacing of Seven Segment Display with Microcontroller 8051
3) Study and analyze the interfacing of Keyboard with Microcontroller 8051.
4) Study and analyze the interfacing of Traffic Light Control with Microcontroller 8051.
5) Study and analyze the interfacing of 16 x 2 LCD Display with Microcontroller 8051 using Keil µVision.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VI**

Sub. Code: **EI6P8** Credit: **2**

Subject: **SIMULATION LAB**
(Using PSPICE, MATLAB and ORCAD)

Experiments using PSPICE

1) Verification of Rectifier Circuits (Half wave and Full wave rectifier)
2) Verification of Clippers and Clampers
3) Design and Verification of Class A and Push Pull Power Amplifier
4) Design and Verification of Voltage Regulators

Experiments using ORCAD

1) Design of Oscillators (RC, WeinBridge, Hartley, Colpitts)
2) Applications of Operational Amplifiers (Circuits for ADC, DAC and Instrumentation Amplifier)
3) Design of Multivibrator Circuits using 555 Timer (Astable, Monostable and Bistable)

Experiments using MATLAB

1) Design of FIR and IIR Filters
2) Design of AM and FM Modulation and Demodulation Techniques
3) Design of ASK and FSK Modulation and Demodulation Method

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VI**

Sub. Code: **EI6P9** Credit: **2**

Subject**: INDUSTRIAL AND PROCESS CONTROL LAB**

1. Operation of interacting and non-interacting systems
2. Responses of different order processes with and without transportation lag
3. Response of on-off controller
4. Response of P+I+D controller
5. Characteristics of control valve with and without positioner
6. Operation of on-off controlled thermal process
7. Closed loop response of flow control loop
8. Closed loop response of level control loop
9. Closed loop response of temperature control loop
10. Closed loop response of pressure control loop
11. Tuning of controllers
12. Study of complex control system (ratio / cascade / feed forward)

VII - SEMESTER

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VII**

Sub. Code: **EC7T1** Credit : **3**

Subject: **VLSI DESIGN**
(Common to EIE/ECE)

Pre - requisite: Electronic devices and circuits, Digital Electronics.

Aim: To introduces the technology and concepts of VLSI.

Objectives :

1. To introduce MOS theory / Manufacturing Technology.
2. To study inverter / counter logic / stick / machine diagram / sequential circuits.
3. To study address / memory / arithmetic circuits.
4. To introduce FPGA architecture / principles / system design.

Outcome:

1. Understand the principles of CMOS-VLSI technology.
2. Adequate knowledge about design issues involved at circuit, logic, layout, system level and to learn programmable logics.

UNIT – I

INTRODUCTION TO VLSI AND MOS TRANSISTOR THEORY: Evolution of IC Technologies: SSI, MSI, LSI, VLSI, ULSI, and GLSI. The Moore's Law.

MOS THEORY: The MOS as switch – nMOS and pMOS. CMOS logic and its features. The nMOS enhancement Transistor – Working and Characteristics. Threshold voltage and Body effect of MOS. MOS device design equations (First order effects).

MOS INVERTERS: The CMOS inverter Transfer characteristics, Noise margin. The nMOS and pseudo-nMOS inverter. The BiCMOS Inverter. The CMOS Transmission gate.

UNIT – II

CMOS PROCESSING TECHNOLOGY AND LAYOUTS: Silicon Semiconductor fabrication technology, Fabrication of nMOS and CMOS (Basic n-WELL process).

LAYOUTS AND DESIGN RULES: Layout based rules, Simple CMOS Stick Layout diagrams - Inverter, NAND/NOR gates and Multiplexer. Scaling: Constant Field, and Constant voltage.

UNIT – III

MOS Circuit performance and CMOS Logic circuits: Sheet Resistance definition, MOS device capacitances – model. Distributed RC effects. Switching characteristics - Rise time, Fall time, and Delay time. Stage ratio. Simple examples of Combinational and Sequential circuits using CMOS: NAND/ NOR gates, and Compound gates, Latches, and Registers.

UNIT- IV

Sub System Design, and Testing: General System Design–Design of ALU subsystems, Adder and Multipliers Memories – Static RAM, Control Logic Implementation using PLA's. Testing of VLSI circuits –Need for Testing, Fault models, and ATPG. Design for Testability (DFT)– Scan Based and Self-test approaches.

UNIT – V

Programmable Logic's: Basic ROM structures, PLAs, PALs, PLDs, Implementation of Traffic Light controller using PLD. FPGAs and CPLDs: XILINX and ALTERA series.

TEXT BOOK:

1. Neil Weste and Kamran Eshraghian "Principles of CMOS VLSI Design "- Addison Wesley, 1998.
2. Charles H Roth, Jr. "Digital Systems Design using VHDL"- Thomson Learning, 2001

REFERENCE BOOKS:

1. VLSI Design Principles- John P. Uyemura, John Wiley,2002
2. E. Fabricious , Introduction to VLSI design, McGraw-Hill 1990
3. Wayne Wolf, Modern VLSI Design, Pearson Education 2003

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VII**

Sub. Code: **EI7T2** Credit : **3**

Subject: **EMBEDDED SYSTEMS**

(Common to EIE/ MECHATRONICS)

Prerequisite: Microprocessor and Microcontroller, Basics of C programming.

Aim

To give an insight of Embedded Systems

Objectives

The course will enable the students to:

1. Get introduced to features that build an embedded system.
2. Learn about the various components within an embedded system.
3. Learn the techniques of interfacing between processors & peripheral device related to embedded processing
4. Do the efficient programs on any dedicated processor.

Outcome

The students should be able to:

1. Understand Basic building blocks of embedded systems
2. Interface various peripherals to processors
3. Program embedded systems
4. Use the basic concepts of systems programming like operating system, assembler compliers etc. and to understand the management task needed for developing embedded system.

UNIT –I EMBEDDED COMPUTING

Challenges of Embedded Systems – Embedded system design process. Embedded processors – 8051 Microcontroller, ARM processor – Architecture, Instruction sets and programming.

UNIT -II MEMORY AND INPUT / OUTPUT MANAGEMENT

Programming Input and Output – Memory system mechanisms – Memory and I/O devices and interfacing – Interrupts handling.

UNIT -III PROCESSES AND OPERATING SYSTEMS

Multiple tasks and processes – Context switching – Scheduling policies – Interprocess communication mechanisms – Performance issues.

UNIT- IV EMBEDDED SOFTWARE

Programming embedded systems in assembly and C – Meeting real time constraints – Creating an Embedded Operating Systems - Multi-state systems and function sequences

UNIT -V EMBEDDED SYSTEM DEVELOPMENT

Design issues and techniques –Using the Serial Interface - Case studies – Intruder Alarm Systems – Controlling a Mobile Robot.

TEXT BOOKS

1. Wayne Wolf, “Computers as Components: Principles of Embedded Computer System Design”, Elsevier, 2006.
2. Michael J. Pont, “Embedded C”, Pearson Education, 2007.

REFERENCES

1. Steve Heath, “Embedded System Design”, Elsevier, 2005.
2. Raj Kamal, “Embedded Systems Architecture, Programming and Design”, Second Edition.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VII**

Sub. Code**: EI7T3** Credit: **3**

Subject**: PRINCIPLES OF MANAGEMENT AND PROFESSIONAL ETHICS**
(Common to EIE/ECE/EEE/ MECHATRONICS)

Prerequisite: Nil

Aim

The students are expected to learn the basics of management functions and realize the ideal characteristics of a manager. The impetus of this subject is to make the students familiarize with the professional skills required to be an effective manager.

Objectives

The course should enable the students to:

4. Knowledge on the principles of management is essential for all kinds of people in all kinds of organizations.
5. Have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling.
6. To understand global business and diversity.
7. Students will also gain some basic knowledge on international aspect of management.
8. To understand the concepts of computer ethics in work environment.

Outcomes

At the end of the course the student should be able to:

1. Helps to examine situations and to internalize the need for applying ethics principles, values to tackle with various situations.
2. Develop a responsible attitude towards the use of computer as well as the technology.
3. Able to envision the societal impact on the products / projects they develop in their career.
4. Understanding the code of ethics and standards of computer professionals.
5. Analyze the professional responsibility and empowering access to information in the work place.

UNIT- I INTRODUCTION TO MANAGEMENT

Definition of Management, process of Management- Planning, Organizing, leading, Controlling Classical Approach-Contribution. and Limitation, Management Science Approach,Skills, Roles and Performance: Types of managers Managerial Skills,- Technical Skill, Analytical SkillDecision Making skill, Human Relation skill, Communication skill. Managerial Roles –Interpersonal Role, Informational Role, Decisional Role.

UNIT – II PLANNING FUNCTION

Elements of Planning-Objectives, Action, Resource, Implementation. Managerial Decision Making: Types of Decision, Process of Decision Making, Decision Making-Certainty Condition, Uncertainity Condition, Selecting Alternative.Managing Information System; Need for Decision Support System, MIS and DSS Strategic Planning –Organizational Strategy, Business Portfolio Matrix.

UNIT –III ORGANIZING FUNCTION

Organizational Structure- Job Design, Departmentation, Span of Control, Delegation of Authority,Decentralized authority, Chain of Command and Authority, Line and Staff concept Matrix organizational Design

UNIT –IV ENGINEERING ETHICS

Senses of 'engineering ethics' – variety of moral issues – types of inquiry – moral dilemmas – moral autonomy – kohlberg's theory – Gilligan's theory – consensus and controversy – professions and professionalism – professional ideas and virtues – theories about right action – self-interest – customs and religion – uses of ethical theories

UNIT – V ENGINEER'S RESPONSIBILITY FOR SAFETY

Safety and risk – Assessment of safety and risk – Risk benefit analysis – Reducing risk – The three mile Island and chernobyl case studies

TEXT BOOKS

1. Mike Martin & Roland schinzinger "Ethics in engineering" Mc Graw Hill 2009.
2. Govindarajan M, Natarajan. S.Senthil kumar V.S, "Engineering Ethics", Prentice Hall of India,2004

REFERENCE BOOKS

1. Charles D.Fleddermamm, "Engineering Ethics", Pearson Hall(2004)
2. Charles E.Haris, Michael S.Protchard & Michael J.Rabins, " Engineering Ethics- concepts and cases", Wadsworth Thompson Learning
3. Jhon R.Boartright, " Ethics and conduct of Business", Pearson Education(2003)
4. Edmund G.See Bauer & Robert L.Bany, "Fundamental of Ethics for Scientists and Engineering", Oxford University

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VII**
Sub. Code: **EI7T4** Credit : **4**

Subject: **COMPUTER CONTROL OF PROCESSES**

Prerequisite: Control systems.

Aim

To give an insight about computerized control in industries.

Objectives

The course will enable the students to:

1. To study the analysis of discrete data system
2. To learn about the various digital control algorithm.
3. To study the techniques of DAS, DDC, AI and SCADA.
4. To learn about PLC and programming some basic applications.

Outcome

The students should be able to:

1. Understand the analysis of discrete data system
2. Understand about the various digital control algorithm.
3. Learn the techniques of DAS, DDC, AI and SCADA.
4. Understand about programming of PLC.

UNIT-I ANALYSIS OF DISCRETE DATA SYSTEM

State-space representation of discrete data systems – Selection of sampling process – Selection of sampling period – Review of z-transform – Pulse transfer function – Modified z-transform - Stability of discrete data system – Jury's stability test.

UNIT-II DESIGN OF DIGITAL CONTROLLER

Digital PID – Position and velocity form – Deadbeat's algorithm – Dahlin's algorithm – Kalman's algorithm - Pole placement controller – Predictive controller.

UNIT-III COMPUTER AS A CONTROLLER

Basic building blocks of computer control system – Data acquisition systems – SCADA – Direct digital control – Introduction to AI and expert control system – Case study - Design of computerized multi loop controller.

UNIT-IV PROGRAMMABLE LOGIC CONTROLLER

Evolution of PLC's – Components of PLC – Advantages over relay logic - PLC programming languages – Ladder diagram – Programming timers and counters – Design of PLC.

UNIT-V APPLICATIONS OF PLC

Instructions in PLC – Program control instructions, math instructions, sequencer instructions – Use of PC as PLC – Application of PLC – Case study of bottle filling system.

TEXT BOOKS

1. P.B. Deshpande, and R.H.Ash, 'Computer Process Control', ISA Publication, USA, 1995.
2. Petruzella, 'Programmable Controllers', McGraw Hill, 1989.

REFERENCE BOOKS

1. C.M.Houpis, G.B.Lamount, 'Digital Control Systems Theory, Hardware and Software', International Student Edition, McGraw Hill Book Co., 1985.
2. G. Stephanoupoulis, 'Chemical Process Control', Prentice Hall of India, New Delhi, 1990.
3. T.Hughes, 'Programmable Logic Controllers, 3rd Edition,ISA press.
4. Singh, 'Computer Aided Process Control', Prentice Hall of India, 2004.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VII**
Sub. Code: **EI7P7** Credit :**2**

Subject**: COMPUTER CONTROL LAB**

PLC

1. Logic gate operations, Timing operations, counter operations and math operation using PLC.
2. Control of battle filling system and sequential operation of motors using PLC.
3. Programming a PLC to demonstrate an operation of batch process.

DESIGN PROJECT

4. Design of instrumentation Amplifier.
5. Design of control valve.
6. Design of signal conditioning circuits for strain gauge and RTD.
7. Design of PID controller using operational amplifier.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VII**

Sub. Code: **EI7P8** Credit : **2**

Subject: **VIRTUAL INSTRUMENTATION LAB**

MATLAB

1. Time responses of various system compensation, stability and analysis using MATLAB.
2. Simulation of complex control system using MATLAB.
3. Design of filters and resonant circuits.

LAB VIEW

4. Creating virtual instrumentation for simple applications.
5. Programming exercises for loop and charts.
6. Programming exercises for clusters and graphs.
7. Programming exercises on case and sequence structure, file input/output.
8. Data acquisition through virtual instrumentation.
9. Simulating reactor control using virtual instrumentation.
10. Real time temperature control using virtual instrumentation.
11. Real time sequential control of any batch process.

VIII - SEMESTER

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VIII**

Sub. Code:**EI8T1** Credit : **3**

Subject: **ROBOTICS AND AUTOMATION**
(Common to EIE/ MECHATRONICS)

Prerequisite: Basic Physics, Sensors and Transducers

Aim

To expose students to Robotics and its application in the field of Automation.

Objectives

The course will enable the students to:

1. Understand the various kinematics and inverse kinematics of robots.
2. Study the Euler, Lagrangian formulation of Robot dynamics.
3. Study the trajectory planning for robot.
4. Study the control of robots for some specific applications.

Outcome

At the end of the course the students will be able to

1. Explain forward and inverse kinematics of Robotics is learned by which of robotic arm shall be calculated.
2. Explain Dynamic behavior of Robots is learned by which Velocity kinematics is studied in detail.
3. Understand trajectory planning the path travelled by robotic arm from initial position to final position is planned.
4. Explain the Applications of Robotics in various industries are studied.

UNIT-I

Robots introduction - Asimov's laws of robotics -Basic components-Classification—Characteristics-Work volume, spatial resolution and repeatability, Coordinate system- Drives & Control systems –Actuators-Control loop, Feedback system.

UNIT-II

Transducers & Sensors-Tactile sensors-Proximity & Range sensors-Image Processing & Analysis-Image Data reduction-Feature extraction-Object Recognition

UNIT-III

End effectors – Wrist configuration, Pitch, Yaw, Roll – Types-Mechanical Grippers-Vacuum Cups-Magnetic Grippers -Robot/End effectors Interface-Software for industrial robots.

UNIT-IV

Robot motion analysis–Kinematics-Homogenous Transformations-Robot Dynamics Configuration of Robot controller

UNIT-V

Industrial Robots – Programming –welding painting-Assembly-Remote Controlled Robots for Nuclear, Thermal, 3and Chemical plants-Industrial Automation-Typical EGS of automated industries.

Text Books

1. Oran Koren, “Robotics for Engineers”, McGraw Hill, 1985. ISBN -0-07-100534-X
2. Mikell P. Groover, “Industrial Robots – Technology Programming & Applications” McGraw Hill Ltd., 2012. ISBN-0-07-100442-4
3. Deb.S.R.”Robotics Technology and Flexible Automation”, Tata McGraw Hill, 2010.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VIII**

Sub. Code: **EI8T2** Credit: **3**

Subject: **BIOMEDICAL INSTRUMENTATION**

Aim

To make the student understand about the construction, working and operation of various biomedical instruments.

Objectives

The course will enable the students to:

1. Understand the Physiology of the heart, lung, blood circulation and respiration including different transducers used.
2. Learn about various sensing and measurement devices of electrical and non-electrical origin.
3. Understand modern methods of imaging techniques.
4. Study about medical assistance techniques and therapeutic equipments

Outcome

At the end of this course the students should be able to:

1. Know the basic concepts of Anatomy & Physiology
2. Have adequate knowledge about different types of Electrodes, Transducers and Amplifiers
3. Understand the important and modern methods of imaging techniques
4. Comprehend about the Human Assist Devices and Therapeutic Equipments

UNIT -I FUNDAMENTALS OF BIOMEDICAL ENGINEERING

Cell and its structure – Resting and Action Potential – Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems- Respiratory systems -Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues - Basic mechanics of spinal column and limbs -Physiological signals and transducers - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors.

UNIT- II NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers, pH of blood –measurement of blood pCO2, pO2, finger-tip oxymeter - ESR, GSR measurements.

UNIT -III ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS

Electrodes – Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro, needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier - ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms - Electrical safety in medical environment, shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipments.

UNIT -IV IMAGING MODALITIES AND ANALYSIS

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – PET-SPECT-Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometric systems - Analysis of digital images

UNIT- V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system - Nano Robots - Robotic surgery – Advanced 3D surgical techniques- Orthopedic prostheses fixation.

TEXT BOOKS:

1. Leslie Cromwell, Biomedical Instrumentation and Measurement, Prentice hall of India, New Delhi,2007.
2. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.
3. Khandpur R.S, Handbook of Biomedical Instrumentation, , Tata McGraw-Hill, New Delhi, 2 Edition, 2003.

REFERENCES:

1. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, NewYork, 1998.
2. Duane Knudson, Fundamentals of Biomechanics, Springer, 2nd Edition, 2007.
3. Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., Health Care Systems, Technology and Techniques, Springer, 1st Edition, 2011.
4. Ed. Joseph D. Bronzino, The Biomedical Engineering Hand Book, Third Edition, Boca Raton, CRC Press LLC, 2006.
5. Joseph J.carr and John M. Brown, Introduction to Biomedical Equipment Technology, John Wiley and sons, New York, 4th Edition, 2012.

ELECTIVE - I

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VII**

Sub. Code: **EI7E2** Credit : **3**

Subject**: INSTRUMENTATION AND CONTROL IN PAPER INDUSTRIES**

Prerequisite: Process Control Instrumentation

Aim

To provide a window of applications of instrumentation and automation in processing industries to students with specialization in Instrumentation Engineering.

Objectives

To enable the students to

1. Have an in-depth understanding of the various unit operations in the industry
2. Find the alternative sensors and transducers for various measurements
3. Evolve the appropriate controls and schematics for specific applications

Outcome

At the end of this course the students should be able to:

1. Know the role of Instrumentation Engineer in such industries
2. Understand the importance of safety to plant and personnel
3. Economic and social implications of the industry

UNIT -I

Raw materials-pulping process – chemical recovery process – paper making process – converting.

UNIT- II

Measurements of basic weight – density – specific gravity – flow – level of liquids and solids – pressure – temperature – consistency – moisture – pH – oxidation – reduction potential – graphic displays and alarms

UNIT -III

Blow tank controls – digester liquor feedpump controls – brown stock wacher level control – stock chest level control – basic weight control – dry temperature control

UNIT -IV

Dissolving tank density control – white liquor classifier density control – white liquor flow control – condensate conductivity control

UNIT- V

Computer applications in pulping process control, liquid level control and input stock control

References

1. B.G. Liptak – Instrumentation in the Processing industries – Ghilton Book Co., 1973.
2. D.M. Considine – Handbook of applied Instrumentation.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VII**
Sub. Code: **EI7E3** Credit : **3**

Subject**: ADVANCED CONTROLSYSTEMS**

Prerequisite: Basic Control system

Aim

To gain knowledge in compensator and controller design, state variable analysis, non-linear systems and optimal control.

Objectives

1. To design cascade compensators in time domain and design PID controllers in time domain and frequency domain
2. To understand and develop state space model for different systems
3. To analyse the controllability and observability of a system and to design controllers and observers.
4. To give a basic knowledge in non-linearity and methods to find the stability of non-linear systems
5. To understand the need of optimality and solving problems

Outcome

At the end of the course the student should be able to:

1. Develop through basic knowledge about controller design.
2. Acquire knowledge on the applications of non-linearity system.

UNIT –I MODELING OF DYNAMIC SYSTEMS

Centrifugal Governor – Ground vehicle- Permanent Magnet stepper motor- Inverted Pendulum – Numerical methods – Liberalization of Differential Equation –Describing function method.

UNIT- II LINEAR SYSTEM ANALYSIS

Reachability and controllability – Observability and constructability –Companion forms – Controller / Observer form – State feed-back control – State estimator – Full order and reduced order Estimator

UNIT-III STABILITY

Definition of stability – Stability of linear system – Hurwitz and Routh stability criteria – Stability of Nonlinear system – Lyapunov's Indirect method

UNIT- IV OPTIMAL CONTROL

Performance Indices – Calculus of variation – Linear Quadratic Regulator – Dynamic programming – Pontrgagin's minimum principle

UNIT- V HEURISTIC AND EVOLUTIONARY CONTROL SYSTEMS

Fuzzy systems – ANN – Genetic Algorithms – Based Controllers

Text Books:

1. Stanislaw Zak, 'Systems and Control', Oxford University Press, 2003, ISBN 0195150112
2. Norman S.Nice, 'Control Systems Engineering', John Wiley and Sons, 2000m ISBN 0471366013
3. Ogata.K, 'Modern Control Engineering', Prentice-Hall Publication, 1996, ISBN 0130609072

Reference Books:

1. Godwin. C, Graebe.F, and Salgado., 'Control System Design', Prentice Hall, New Jersey, 2001, ISBN 0139586539.
2. William S. Levine, 'The Control Hand Book', IEEE and CRC Press, USA, 2000, ISBN 0849385709
3. Friedland, B, 'Control System Design', McGraw Hill, 1987, ISBN 0070224412
4. Atherton D.P.,'Stability of Nonlinear Systems',Prentice Hall,1980, ISBN 0442304862
5. Peter Cook.A, 'Nonlinear Dynamic Systems', Prentice Hall, 1991

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VII**

Sub. Code: **EI7E4** Credit : **3**

Subject: **VIRTUAL INSTRUMENTATION**

Prerequisite: Digital Electronics and C Programming..

Aim

To provide the students with LabVIEW software to suit the industrial applications.

Objectives:

1. To understand various methods of l o o p s a n d c h a r t s .
2. To study important methods of Data acquisition and control.
3. To understand the LabVIEW based advanced control system.

Outcome:

At the end of this course the students should be able to:

1. Know the basic concepts of LabVIEW.
2. Have adequate knowledge about different types of controls in LabVIEW.
3. Understand the methods of Data acquisition and control..
4. Design the LabVIEW based advanced control system

UNIT- I INTRODUCTION

Programming paradigms- Virtual Instrumentation- Definition to Virtual Instrumentation (VI)– LabVIEW software- LabVIEW basics- LabVIEW environment- Simple problems

UNIT-II VI USING LABVIEW

Creating, Editing and debugging a VI in LabVIEW- Creating a sub VI- Loops and charts-Case and sequence structures- File I/O- VI customization- Simple problems

UNIT-III DATA ACQUISITION AND CONTROL IN VI

Plug-in DAQ boards- Organization of the DAQ VI System- Performing analog input and analog output- Scanning multiple analog channels - Driving the digital I/Os - Buffered data acquisition-Simple problems

UNIT- IV LABVIEW FOR ADVANCED SYSTEMS

Bio-bench control and simulation using LabVIEW- Integrated design Environment for dynamic systems- LabVIEW based fuzzy logic and genetic algorithms

UNIT- V LABVIEW AND AUTOMATION TECHNOLOGY

Mathematics and simulation in LabVIEW- Commercial communication applications- Fourier transform analysis- Time frequency analysis of signals- Designing digital filters- Quality, Reliability and maintenance of LabVIEW programs

Text Books

1. Rahman, and Herbert Pichlik,, 'LabVIEW – Applications and Solutions', National Instruments Release, ISBN 0130964239
2. National Instruments LabVIEW Manual

Reference Books

1. Lisa K. Wells Jeffrey Travis, 'LabVIEW for Everyone', National Instruments Release, ISBN 013065096
2. 'Sensors and Transducer and LabVIEW', National Instruments Release, ISBN 0130811556

ELECTIVE - II

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VII**

Sub. Code: **EI7EA** Credit : **3**

Subject**: INSTRUMENTATION AND CONTROL IN PETROCHEMICAL INDUSTRIES**

Aim: To make the students to have a clear idea about petrochemical industries.

Objective

To enable the students to

1. Learn the complete operation of Petrochemical Industries.
2. Acquire basic understanding of reaction & control of this Industry.

Outcome

At the end of this course the students should be able to:

1. Deals with various equipments involved in the Petrochemical Industries.
2. Deals Distillation Column, Reactor, Heat exchangers, Evaporators.
3. Deals with performance of the pumps also.

UNIT – I

Instrumentation and control in distillation columns: Distillation equipment, variables and degrees of freedom, measurement and control of column pressure, liquid distillate, vapour distillate and inserts, control of feed in reboiler and reflux, cascade and feed forward controls.

UNIT – II

Instrumentation and control in chemical reactors: Temperature and pressure control in batch reactors. Instrumentation and control in dryers: Batch dryers and continuous dryers.

UNIT – III

Instrumentation and control in heat exchangers: Variables and degrees of freedom, liquid to liquid heat exchangers, steam heaters, condensers, reboilers and vaporisers, use of cascade and feed forward control

UNIT – IV

Instrumentation and control in evaporators: Types of evaporators, measurement and control of absolute pressure, density,conductivity, differential pressure and flow.

UNIT – V

Instrumentation and control in effluent and water treatment: Chemical oxidation, chemical reduction, neutralization, precipitation and biological control.

Text Books

1. Liptak B. G, Process Control, Third edition, Chilton Book Company, Pennsylvania,1995. ISBN–0–7506–2254-7
2. Liptak B. G, Process Measurement and Analysis, Third edition , Chilton Book Company, Pennsylvania, 1995. ISBN-07506-2255-5
3. Shreve‘s chemical process industries Mc Grew Hill, Auckland, 1984

References

1. Considine D.M., ‘Process / Industrial Instruments and Control Handbook’, Fourth edition, McGraw Hill, Singapore, 1993. ISBN-0-07-012445-0

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VII**

Sub. Code: **EI7EB** Credit : **3**

Subject: **INSTRUMENTATION IN IRON AND STEEL INDUSTRIES**

Aim

To provide a window of applications of instrumentation and automation in processing industries to senior students with specialization in Instrumentation Engineering.

Objectives

To enable the students to

1. Have an in-depth understanding of the various unit operations in the industry
2. Find the appropriate sensors and transducers for various measurements
3. Evolve the appropriate controls and schematics for specific applications

Outcome

At the end of this course the students should be able to:

1. Know the role of Instrumentation Engineer in such industries
2. Understand the importance of safety to plant and personnel
3. Economic and social implications of the industry

UNIT – I

Flow diagram and description of the processes: Raw materials preparation, iron making, blast furnaces, stoves, raw steel making, basic oxygen furnace, electric furnace.

UNIT – II

Casting of steel: Primary rolling, cold rolling and finishing.

UNIT – III

Instrumentation: Measurement of level, pressure, density, temperature, flow weight, thickness and shape, graphic displays and alarms.

UNIT – IV

Control and systems: Blast furnace stove combustion control system, gas and water controls in BOF furnace. Sand casting old control.

UNIT – V

Computer applications: Model calculation and logging, rolling mill control, annealing process control Computer (center utilities dispatch computer).

Text Books

1. Tupkary R.H, Introduction to Modern Iron Making , Khanna Publishers, New Delhi, 1986 - II Edition
2. Tupkary R.H., Introduction to Modern Steel Making, Khanna Publishers, New Delhi,1989 – IV Edition.

Reference Books

1. Liptak B. G, Instrument Engineers Handbook, volume 2, Process Control, Third edition, CRC press, London, 1995
2. Considine D.M, Process / Industrial Instruments and Control Handbook, Fourth edition, McGraw Hill, Singapore, 1993 – ISBN-0-07-012445-0

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VII**

Sub. Code: **EI7EC** Credit : **3**

Subject: **NEURAL NETWORKS AND FUZZY LOGIC CONTROL**

Prerequisite: It is highly recommended to have some knowledge on crisp set theory and be familiar with Matlab/Simulink.

Aim

This course provides a way to understand the concepts of Artificial Intelligence, ANN , Genetic Algorithms and Fuzzy systems and its applications .

Objectives

1. To expose the students to the concepts of feed forward neural networks.
2. To provide adequate knowledge about feedback neural networks.
3. To teach about the concept of fuzziness involved in various systems.
4. To provide adequate knowledge about fuzzy set theory.
5. To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.
6. To provide adequate knowledge of application of fuzzy logic control to real time systems.

Outcome

At the end of the course the student should be able to:

1. Develop through basic knowledge about analysis of learning systems in conjunction with feedback control systems
2. Acquire knowledge on the applications of Computer simulation of intelligent control systems.
3. Learn the usage of different types of algorithms.

UNIT – I

Introduction to neural networks, different architectures of neural networks, Rosenblott's perceptrons, multi layer perceptrons, back propagation algorithm, Hopfield's networks, Kohnen's self organizing maps, adaptive resonance theory.

UNIT – II

Neural networks for control systems: Schemes of neuro-control, identification and control of dynamical systems , case studies(Inverted Pendulum, Articulation Control)

UNIT – III

Introduction to fuzzy logic: Fuzzy sets, fuzzy relations, fuzzy conditional statements, fuzzy rules, fuzzy learning algorithms.

UNIT – IV

Fuzzy logic for control systems : Fuzzy logic controllers, fuzzification interface,knowledge/rule base, decision making logic, defuzzification interface, design of fuzzy logic controllers, case studies(Inverted Pendulum, Articulation Control)

UNIT – V

Neuro-fuzzy and fuzzy-neural control systems: Adaptive fuzzy systems , optimizing the membership functions and the rule base of fuzzy logic controllers using neural networks, fuzzy transfer functions in neural networks.

Text Books

1. Kosko, B, Neural Networks and Fuzzy Systems : A Dynamical Approach to Machine Intelligence, Prentice Hall, New Delhi , 1991.
2. Wasserman P.D, Neural Computing Theory & Practice ,Van Nortland Reinhold,1997.
3. J.Ross,Fuzzy Logic with Engineering Applications, 1997 – ISBN-0-07-144711-X

References`

1. Jacek M. Zurada, 'Introduction to Artificial Neural Systems', Jaico Publication House,1995.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VII**

Sub. Code: **EI7ED** Credit : **3**

Subject**: COMPUTER AIDED INSTRUMENTATION**

Aim

This course aims to familiarize students with the use of PC for simple control and interfacing applications.

Objectives

1. Know the Concepts of Computerized instruments.
2. Know the design techniques and programming
3. Know the interfacing concepts
4. To design microcontroller for different applications.

Outcome

At the end of the course the student should be able to:

1. Design microcontroller for different application
2. The interfacing concepts for computer and instruments

UNIT -I

Data Acquisition and conversion – introduction – signal conditioning of the inputs- single & multi channel DAS – data conversion – A/D & D/A converters – multiplexers – sample and hold circuits.

UNIT- II

Micro Controllers and PC based DAS – Introduction –8051 microcontroller – Programming in 8051 – application of 8051 – PC based instrumentation – I/P & O/P displays – analog displays and recorders-digital I/O displays – display multiplexing and zero suppression.

UNIT -III

Graph theoretical concepts for computer vision – Introduction – Basic definition – graph representation of two dimensional digital images – matching – graph grammars – control basic – optimizing controls – analog versus digital instrumentation –converters – telemetry systems – transmitters – (electronic and intelligent) – fibre optic transmission – digital recorders – recorders – tape recorders – speech synthesis – voice recognition.

UNIT -IV

Computerized ECG-EEG-EMG-CAT – processing of ultra sound images in medical diagnosis – introduction – ultra sound imaging systems – processing the B-mode image- examples of image processing B-mode images – perspectives.

UNIT- V

Three dimensional fast full body scanning – evaluation of hardware & software – mechanical design – measuring process – ranges of applications – data acquisition by confocal microscopy – image restoration – detection –segmentation – graph construction – interpretation – results –magnetic resonance imaging in medicine – basic magnetic resonance physics – images acquisition – Reconstruction – fast imaging methods.

Reference Books:

1. Bernal Jahne, Horst Han Backer peter Geibler, “Handbook of Computer Vision and Application” Academic press san Diego , London, Boston, network, Tokyo, Toronto, 1999.
2. R.B.Khandpur, “Handbook of Biomedical Instrumentation”, Prentice Hall of India, 2001.
3. Zang-Hee Cho etall, “Foundations of Medical Imaging”, IEEE Press, 2000.

ELECTIVE- III

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VIII**

Sub. Code: **EI8E1** Credit : **3**

Subject**: DIGITAL CONTROL SYSTEMS**

Prerequisite: Digital Electronics and Control Systems.

Aim

To make the students to have relevant knowledge for the industrial requirements.

Objectives:

1. To understand various techniques and methods of analysis which occur in the various regions of the spectrum.
2. To understand system response and stability.
3. To study various applications of digital control systems.

Outcome:

At the end of this course the students should be able to:

1. Know the basic concepts of converters.
2. Have adequate knowledge about different digital control algorithms.
3. Understand the important of digital control design in real time applications.

UNIT -I SAMPLE THEORY AND CONVERTERS

Review of Sample theory - Shannon's sampling theorems - Sampled Data Control system, Digital to Analog conversion – Analog to Digital conversion, Ramp type A/D, Dual slope A/D, Successive approximation A/D. - A/D & D/A converters - Review of Z and Inverse Z transform - Reconstruction - Zero Order Hold.

UNIT -II SYSTEM RESPONSE

Response of sampled data systems to step and ramp inputs - Steady state errors - Z domain equivalent - Stability studies - Bilinear transformation - Jury's stability test.

UNIT -III FUNCTION REALISATION

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

UNIT- IV DIGITAL PROCESS CONTROL DESIGN

Digital PID algorithm - Positional and incremental forms - Dead-beat algorithm-Ringing - Dahlin's and Kalman's algorithms - Implementation of control algorithms using microprocessors - General description of microcontrollers - Digital quantization.

UNIT- V APPLICATIONS

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

Text Book

1. Gopal.M: “Digital Control Engineering”,Wiley Eastern Publications, 1988

Reference Books

1. Ahson, S.I., “Microprocessors with Applications in Process Control”, TMH, 1984.
2. Nagrath, J.J, and Gopal, M, “Control System Engineering”, Wiley & Sons. 1985
3. Constantine Houpis, and Garry Lamont., “Discrete Control systems” - Theory,Hardware and Software, McGraw Hill,1985.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VIII**

Sub. Code: **EI8E2** Credit : **3**

Subject**: WIRELESS SENSORS NETWORKS**

Prerequisite : Nil

Aim:

To explore the functionalities Wireless Sensor Networks

Objectives:

1. To review the architecture of WSN.
2. To study the various protocols layers of WSN.
3. To study the establishment of WSN infrastructure.

Outcomes:

At the end of this course the students should be able to:

1. Have adequate knowledge about architecture of WSN.
2. Understand the important of Protocols layers of WSN.

UNIT -I OVERVIEW OF WIRELESS SENSOR NETWORKS

Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.

UNIT -II ARCHITECTURES

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture -Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT -III NETWORKING SENSORS

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

UNIT -IV INFRASTRUCTURE ESTABLISHMENT

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT -V SENSOR NETWORK PLATFORMS AND TOOLS

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming

TEXT BOOKS:

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

REFERENCES:

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, And Applications”, John Wiley, 2007.
2. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VIII**

Sub. Code: **EI8E3** Credit : **3**

Subject**: AIRCRAFT INSTRUMENTATION**

Prerequisite: Measurements and Instruments.

Aim

The aim of this course is to understand the concepts and to familiarize the student with the principle of operation, capabilities and limitations of various Aircraft instruments so that he will be able to operate these instruments effectively.

Objectives

The course should enable the students to:

1. Understand the Instrument display and Cockpit layout.
2. Understand the Operation of Flight instruments.
3. Study the characteristics of Gyroscopic Instruments.

Outcome

At the end of the course the student should be able to:

1. Develop basic knowledge on the behavior and the characteristics of various indicators in aircraft.
2. Acquire knowledge on the aircraft computer systems
3. Learn the usage of power plant instruments in an aircraft..

UNIT- I INTRODUCTION

Classification of aircraft- instrumentation -instrument displays, panels, cock- pit layout.

UNIT-II FLIGHT INSTRUMENTATION

Static & pitot pressure source -altimeter -airspeed indicator -machmeter -maximum safe speed indicator- accelerometer.

UNIT-III GYROSCOPIC INSTRUMENTS

Gyroscopic theory -directional gyro indicator arti ficial horizon -turn and slip indicator.

UNIT-IV AIRCRAFT COMPUTER SYSTEMS

Terrestrial magnetism, aircraft magnetism, Direct reading magnetic components- Compass errors gyro magnetic compass.

UNIT- V POWER PLANT INSTRUMENTS

Fuel flow -Fuel quantity measurement, exhaust gas temperature measurement and pressure measurement.

Text Books

1. Pallett, E.B.J : " Aircraft Instruments -Principles and applications", Pitman and sons, 1981.
2. Aircraft Instrumentation and systems, S.Nagabhushana, L.K.Sudha. I.K. International Publishing House Pvt., Ltd., S-25, Green Park Extensions, Uphaar Cinema Market, New Delhi – 110016(India), Info@ik international .com, ISBN : 978-93-80578-35-4

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VIII**

Sub. Code: **EI8E4** Credit : **3**

Subject**: DIGITAL INSTRUMENTATION**

Aim: To make the students to have depth knowledge in Digital instruments.

Objective:

1. To understand about digital methods of measurements.
2. To understand about recording and signal processing instruments.

Outcome:

At the end of the course the student should be able to:

1. Good knowledge in digital method of measurements.
2. Good knowledge in recording and signal processing instruments

UNIT -I INTRODUCTION

Digital codes - memory devices - basic building blocks - gates, FF and counters – discrete data handling - sampling - sampling theorem - aliasing errors -reconstruction - extrapolation - synchronous and asynchronous sampling.

UNIT -II DIGITAL METHODS OF MEASUREMENTS

Review of A/D, D/A techniques –F/V and V/F conversion techniques -digital voltmeters and multimeters-automation and accuracy of digital voltmeters and multimeters - digital phase meters -digital tachometers -digital frequency, period and time measurements-Low frequency measurements -automatic time and frequency scaling - sources of error -noise -inherent errors in digital meters, Hidden errors in conventional ac measurements- RMS detector in digital multimeters- mathematical aspects of RMS.

UNIT-III DIGITAL DISPLAY & RECORDING DEVICES

Digital storage oscilloscopes -digital printers and plotters -CDROMS -digital magnetic tapes, dot matrix and LCD display CROs, Colour Monitor, Digital Signal Analyser, and Digital Data Acquisition.

UNIT- IV SIGNAL ANALYSIS

Amplifiers, filters, transmitter, receiver, wireless base and mobile station test sets, noise figure meters, RF network analyser, and high frequency signal sources.

UNIT- V CURRENT TRENDS IN DIGITAL INSTRUMENTATION

Introduction to special function add on cards -resistance card -input and output cards -counter, test, and time of card and Digital Equipment construction with modular designing; interfacing to microprocessor, micro-controllers and computers. Computer aided software engineering tools (CASE) -use of CASE tools in design and development of automated measuring systems - interfacing IEEE cards -intelligent and programmable instruments using computers.

TEXT BOOKS

1. D.Patranabis, Principles of Electronic Instrumentation ,PH,2008
2. Bouwens, A.J. "Digital instrumentation" McGraw Hill 1984
3. John Lenk, D. "Handbook of Microcomputer Based Instrumentation and Control"; PH, 1984.

REFERENCES

1. Doebelin, Measurement System, Application & Design, IV Ed, McGraw Hill, 1990.
2. Albert.D.Helfrick, William D.Cooper, Modern Electronic Instrumentation and Measurement Techniques 3.Oliver&Cage , Electronic measurements & Instrumentation, McGraw Hill,1987

4.T.S.Rathore, Digital Measurement Techniques, Narosa Publishing House

ELECTIVE – IV

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VIII**

Sub. Code: **EI8EU** Credit : **3**

Subject**: AUTOMOTIVE INSTRUMENTATION**

Prerequisite: Basic measurement and Instruments

Aim

To provide an overview of the concepts involved Automotive Instrumentation.

Objectives

At the end of the course, the student will be able

1. To know about the Automotive.
2. To know about the warning Instruments and Control Switches.

Outcome

At the end of the course the student should be able to:

1. Develop through basic knowledge about Automotive.
2. Acquire knowledge on the applications of Automotive Instrumentation.
3. Learn the usage of modern Automotive Techniques.

UNIT-I AUTOMOBILE PANEL METERS AND SENSOR DESIGN

Ergonomics- Panel Meters- Controllers- Sensor for Fuel Level in Tank, Engine Cooling-Water Temperature Sensors Design, Engine Oil Pressure Sensor Design, Speed Sensor, Vehicle Speed Sensor Design, Air Pressure Sensors, Engine Oil Temperature Sensor.

UNIT- II INDICATING INSTRUMENTATION DESIGN

Moving Coil Instrument Design, Moving Iron Instruments, Balancing Coil Indicator Design, Ammeter and voltmeter- Odometer and Taximeter Design. Design of Alphanumeric Display for Board Instruments

UNIT- III WARNING AND ALARM INSTRUMENTS

Brake Actuation Warning System. Traficators, Flash System, Oil Pressure Warning System, Engine Overheat Warning System, Air Pressure Warning System, Speed Warning System. Door Lock Indicators, Gear Neutral Indicator, Horn Design, Permanent Magnet Horn, Air Horn, Music Horns

UNIT-IV DASH BOARD AMENITIES

Car Radio Stereo, Courtesy Lamp, Timepiece, Cigar Lamp, Car Fan, Windshield Wiper, Window Washer, Instrument Wiring System and Electromagnetic Interference Suppression, Wiring Circuits for Instruments, Electronic Instruments. Dash Board Illumination

UNIT- V SWITCHES AND CONTROLS

Horn Switches, Dipper Switches, Pull and Push Switches, Flush Switches, Toggle Switches, Limit Switches, Ignition Key, Ignition Lock, Relay and Solenoid. Non-contact Switches

Text Books

1. Walter E, Billiet and Leslie .F, Goings, 'Automotive Electric Systems', American Technical Society, Chicago, 1971.
2. Judge.A.W, 'Modern Electric Equipments for Automobiles', Chapman and Hall, London, 1975.

Reference Books

1. Sonde.B.S., 'Transducers and Display System', Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1977.
2. W.F. Walter, 'Electronic Measurements', Macmillan Press Ltd., London.
3. E.Dushin, 'Basic Metrology and Electrical Measurements', MIR Publishers, Moscow, 1989

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VIII**

Sub. Code: **EI8EV** Credit : **3**

Subject**: MEMS AND NANO TECHNOLOGY**

Prerequisite: VLSI

Aim

This course is offered to students to gain basic knowledge on MEMS (Micro electro Mechanical System) and various fabrication techniques. This enables them to design, analyze, fabricate and test the MEMS based components.

Objectives

1. Introduction to MEMS and micro fabrication
2. To study the essential material properties
3. To study various sensing and transduction technique
4. To know various fabrication and machining process of MEMS
5. To know about the polymer and optical MEMS

Outcomes

At the end of the course the student should be able to:

1. Develop through basic knowledge about MEMS and fabrication techniques.
2. Acquire knowledge on the applications and testing of MEMS.
3. Learn the usage of MEMSTechniques.

UNIT –I INTRODUCTION

Historical background - development of microelectronics - evolutionof micro sensors – mems - emergence of micro machines - electronicmaterials – processing – introduction - electronic materials - theirdeposition - pattern transfer - etching electronic materials – doping semiconductors

UNIT – II MEMS MATERIALS AND PROCESSING

Overview, metals – semiconductors – ceramic - polymeric - composite materials - Silicon micro machining – bulk- etch-stop techniques - dry etching - buried oxide process - silicon fusion bonding - anodic bonding

UNIT – III SILICON MICRO MACHINING

Surface - sacrificial layer technology - material systems in sacrificial layer technology - plasma etching - combined IC technology -anisotropic wet etching

UNIT – IV MICRO SENSORS

Thermal sensors - radiation sensors - mechanical sensors – magnetic sensors - biochemical sensors - flow sensors - SAW devices – saw devices development - history, transducers in SAW devices -acoustic waves

UNIT – V NANOTECHNOLOGY

Scientific revolutions - types of nanotechnology – nanomachines - nano materials – atomic structure surfaces - dimensional space - molecular nanotechnology - nanopowders – nanomaterials - preparation and applications

TEXT BOOKS

1. Simon Sze, Semiconductor Sensors, John Wiley & Sons, Inc.New Delhi., 1994
2. Elwenspoek, M. and Wiegerink.R., Mechanical Microsensors,Springer-Verlag Berlin Heidelberg, 2001

REFERENCES

1. Poole, P. and Frank J. Owens., Introduction to Nano Technology., John Wiley & Sons., INC., 2003
2. Bharat Bhushan, Hand Book of Nano technology, SpringerPublication., 1st edition, 2004
3. Julian W. Gardner and Vijay K. Varadan, Microsensors, Mems,And Smart Devices, John Wiley & sons ltd., New Delhi, 2001
4. Massood Tabib-azar, microactuators - electrical, magnetic,thermal, optical, mechanical, chemical and smart structures,kluwer academic publishers, New York, 1997

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VIII**

Sub. Code: **EI8EW** Credit : **3**

Subject**: OPTIMAL CONTROL SYSTEMS**

Aim

This course is intended to introduce optimal control with enough theoretical background to justify the techniques and provide a foundation for advanced research.

Objectives

1. To formulate, solve and analyze solutions to certain optimal control problems and to certain related optimization problems.
2. To design optimal controllers for both linear and nonlinear systems.

Outcome

At the end of the course the student should be able to:

1. Solve Optimal Control Problems.
2. Design optimal controllers for both linear and nonlinear systems.

UNIT-I CALCULUS OF VARIATION

Functions and Functional- Maxima and minima of function- Variation of functional- Extremal of functional- Euler Lagrange equation

UNIT- II OPTIMAL CONTROL INTRODUCTION

Statement of optimal control problem -performance indices- Linear Quadratic Regulator (LQR)- State Regulator- output regulator- Control configuration

UNIT- III LQR DESIGN

Algebraic Riccati Equation (ARE)- Solving ARE using the Eigen vector method- Discrete Algebraic Riccati Equation- Pontryagin‘s minimum principle

UNIT- IV DYNAMIC PROGRAMMING NUMERICAL TECHNIQUES FOR OPTIMALCONTROL

Principle of optimality - computational procedure for solving optimal control problem - Dynamic programming application to discrete and continuous system- Numerical techniques for optimal control- Simplex method - Hill climbing - gradient - penalty function methods

UNIT-V MATLAB EXAMPLES FOR OPTIMAL CONTROL PROBLEMS

Infinite time Linear Optimal Regulator design- Optimum control of tracking system- Output weighed linear control- Terminal time weighing problem

Reference Books

1. Stanislaw Zak, Systems and Control, Oxford University Press, 2003 ISBN 0195150112
5. Rao, S.S. Optimization theory and applications, Wiley Eastern, New Delhi, 1992.
6. Gopal, M. Modern control System Theory, Wiley Eastern Limited, New Delhi, 1992.ISBN-81-224-0503-7
7. Ogata, K. Modern Control Engineering, Prentice Hall of India, New Delhi, 1992.ISBN-0-87692 -147

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VIII**

Sub. Code: **EI8EX** Credit : **3**

Subject**: ADVANCED DIGITAL PROCESS CONTROL**

Aim:

To establish theoretical foundation of Advanced Digital Process Control for the process industry.

Objectives

To know about

1. Process modeling and Simulation of Process Dynamics.
2. Methods to identify system parameters.
3. Kalman filter and Adaptive Predictive Control.

Outcome

At the end of the course the student should be able to:

1. Knowledge about digital controllers.
2. Functions of PLC in industries.

UNIT- I INTRODUCTION TO COMPUTER PROCESS CONTROL

Review of sample theory-Response of sample data system to step and ramp input- steady state error-Z domain equipment- Linear transformation- Pulse transfer function-Modified Ztransform-Sample data model for continuous system bilinear transformation- Jury's Stability Test

UNIT-II DESIGN OF DIGITAL CONTROLLER

Digital PID –Deadbeat- Dahlin's algorithms-Kalman's algorithms-Implementation of control algorithm using microprocessor- Position and Velocity forms-Dead time compensation and smith predictor algorithm

UNIT- III PROGRAMMABLE LOGIC CONTROLLER

Introduction- Overview of PLC systems- I/O Modules- Power supplies General PLC programming procedures- Programming ON-OFF outputs- Auxiliary commands and functions- Creating ladder diagrams from process control descriptions- PLC basic functions- Register basics-Timer and counter functions

UNIT- IV PLC INTERMEDIATE FUNCTIONS

Arithmetic functions- Comparison function-SKIP and MCR function-Data move system-PLC - advanced intermediate function- Utilizing digital bits- Sequencer functions- Matrix functions- PLC advanced function- Alternate programming language- Analog PLC operation- Networking of PLC- PLC installation- Design of interlocks and alarms using PLC- Three way traffic light problem- Annunciator problem-Trouble shooting and Maintenance

UNIT-V APPLICATIONS

Implementation of microprocessor based position and temperature control systems- Operational features of stepping motor- Drive circuits- Interfacing of stepper motor to computer- Interfacing of computer with temperature flow, level process

TEXT BOOKS:

1. Gopal M., 'Digital Control and State Variable Methods', Tata McGraw Hill Pub., 2003. ISBN 0070483027
2. HughesT.A., Programmable Logic Controllers, ISA Press, 2000 ISBN 1556177291

REFERENCE BOOKS

1 Despande P.B. and Ash R.H., Computer Process Control, ISA Publication, USA,1988 ISBN 155617005X

2 Houpis C.H, Lamont G.B., Digital Control Systems - Theory, Hardware, Software, McGraw Hill Book Co., 1991, ISBN 0070305005

3. Kuo.B, Digital Control Systems, Oxford University Press, 1991 ISBN 0030128846
4. John Webb, W, Ronald Reis, A.,: " Programmable logic controllers principles and applications", 3/e, Prentice hall Inc., New Jersey, 1995.

Department of Electronics and Instrumentation

Course: **BE** Branch: **EIE** Semester: **VIII**

Sub. Code: **EI8EY** Credit : **3**

Subject**: ADAPTIVE CONTROL**

Prerequisite: Control System.

Aim

To provide the knowledge about various advanced control techniques and their importance in industry.

Objectives:

1. To understand various techniques and methods of adaptive schemes and problems.
2. To study important methods of analysis of PID tuning.
3. To understand the important Practical Issues and Implementation.

Outcome:

At the end of this course the students should be able to:

1. Know the basic concepts of adaptive control schemes.
2. Have adequate knowledge about different types of tuning methods.
3. Understand the Practical Issues and Implementation of these controllers in industries.

UNIT -I INTRODUCTION

Linear Feedback- Effect of Process variations: Non-linear Actuators-Flow and speed variation – Variations in Disturbance Characteristics - Adaptive schemes- The Adaptive control Problem- applications

UNIT- II MODEL REFERENCE ADAPTIVE SYSTEMS

Introduction-MIT Rule- Determination of the Adaptation Gain-Lyapunov Theory-design of MRAC using Lyapunov Theory-Bounded input, bounded output Stability- Applications to Adaptive control-Output feedback-Relations between MRAC and STR- Nonlinear Systems

UNIT -III AUTO TUNING

Introduction- PID Control Auto tuning techniques-Transient Response methods: Ziegler-Nichols Step response method-Characterization of step response- Method based on relay feedback: Ziegler- Nichols closed loop method-Method of Describing function- relay oscillations

UNIT- IV GAIN SCHEDULING

Introduction-The principle- Design of gain scheduling Controllers- nonlinear Transformations- Applications of Gain scheduling: Ship steering-pH Control-Combustion control-Fuel Air control in car Engine-Flight control systems

UNIT -V PRACTICAL ISSUES AND IMPLEMENTATION

Introduction-Controller Implementation-Controller Design-Solving the Diophantine equation- Estimator Implementation-Square Root Algorithms-Interaction of Estimation and control- prototype algorithms-Operational issues

Text Books

1. Karl J. Astrom, Biorn Wittenmark, “Adaptive Control” Pearson Education Asia, Second Edition, 2001.
2. Gang Tao, “Adaptive Control design and Analysis”, John Wiley & Sons, New Jersey, 2003

Reference Book

1. Gang Tao, Adaptive Control Design And Analysis, John Wiley & Sons, 2003.