Dharmsinh Desai University

Faculty of Technology

Department of Instrumentation and Control Engineering

Detailed Syllabus Book

Detailed Syllabus for Under Graduate Course of

Instrumentation and Control Engineering

Faculty of Technology Dharmsinh Desai University, Nadiad

B.TECH. [IC] CBCS w.e.f AY 2016

Department of Instrumentation & Control Engineering
Faculty of Technology,
Dharmsinh Desai University, Nadiad – 387 001,
Gujarat state, India.
Website: *http://www.ddu.ac.in*

Dharmsinh Desai University

Faculty of Technology

Department of Instrumentation and Control Engineering

Teaching, Credit and Exam scheme

Semester I

SEMESTER- I [IC]												
SUBJECT CODE	SUBJECT	TEACHING SCHEME			CREDIT STRUCTURE		TOTAL CREDIT	Exam Scheme (Marks)				
		LECT	TUT	PRA	L+T	P		Theory (3 hrs)	Sessional (1 hrs 15 min)	Practical	T/W	Total
AF-111	Mathematics-I	4	0	0	4	0	4	60	40	--	--	100
AF-114	Engineering Mechanics	3	0	2	3	1	4	60	40	25	25	150
AX-115	Elements of Mechanical Engineering	4	0	2	4	1	5	60	40	25	25	150
AF-122	Basic Electrical & Electronic Engineering	4	0	2	4	1	5	60	40	25	25	150
AX-123	Programming in 'C'	4	0	2	4	1	5	60	40	25	25	150
AF-126	Workshop-I	0	0	2	0	1	1	--	--	50	--	50
AM-110	Engineering Economics and Principles of Management	3	0	0	3	0	3	60	--	--	40	100
							27					**850**

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Teaching, Credit and Exam scheme

Semester II

SEMESTER- II [IC]												
SUBJECT CODE	SUBJECT	TEACHING SCHEME			CREDIT STRUCTURE		TOTAL CREDIT	Exam Scheme (Marks)				
		LECT	TUT	PRA	L+T	P		Theory (3 hrs)	Sessional (1 hrs 15 min)	Practical	T/W	Total
AF-201	Mathematics-II	4	0	0	4	0	4	60	40	--	--	100
AF-214	Mechanics of Solids	3	0	2	3	1	4	60	40	25	25	150
CT-216	Electronic Work Shop	0	0	2	0	1	1	--	--	--	50	50
CT-212	Engineering Graphics	4	0	3	4	1.5	5.5	60	40	--	50	150
AF-212	Electronics Principles	4	0	2	4	1	5	60	40	25	25	150
AX-223	Advanced C Programming	4	0	2	0	1	5	60	40	25	25	150
ES-210	Environmental Sciences	3	0	0	3	0	3	60	--	--	40	100
							27.5					**850**

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Semester III

SEMESTER- III [IC]												
SUBJECT CODE	**SUBJECT**	**TEACHING SCHEME**			**CREDIT STRUCTURE**		**TOTAL CREDIT**	**Exam Scheme (Marks)**				
		LECT	**TUT**	**PRA**	**L+T**	**P**		**Theory (3 hrs)**	**Sessional (1 hrs 15 min)**	**Practical**	**T/W**	**Total**
AF-301	Mathematics-III	4	0	0	4	0	4	60	40	--	--	100
AF-310	Financial and Managerial Accounting	3	0	0	3	0	3	60	--	--	40	100
CI-308	Linear Electronics-I	4	0	2	4	1	5	60	40	25	25	150
IC-301	Electronic Measurement	4	0	2	4	1	5	60	40	25	25	150
EL-304	Network Analysis	4	0	2	4	1	5	60	40	25	25	150
IC-302	Digital Electronics	4	0	2	4	1	5	60	40	25	25	150
							27					**800**

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Semester IV

SEMESTER- IV [IC]												
SUBJECT CODE	**SUBJECT**	**TEACHING SCHEME**			**CREDIT STRUCTURE**		**TOTAL CREDIT**	**Exam Scheme (Marks)**				
		LECT	**TUT**	**PRA**	**L+T**	**P**		**Theory (3 hrs)**	**Sessional (1 hrs 15 min)**	**Practical**	**T/W**	**Total**
AF-401	Mathematics-IV	4	0	0	4	0	4	60	40	--	--	100
IC-407	Control Theory	4	0	2	4	1	5	60	40	25	25	150
CI-418	Linear Electronics-II	4	0	2	4	1	5	60	40	25	25	150
IC-406	Power Electronics	4	0	2	4	1	5	60	40	25	25	150
CI-416	Electrical Machines and Power	4	0	2	4	1	5	60	40	25	25	150
IC-408	Control Technology: Components and Systems	4	0	2	4	1	5	60	40	25	25	150
							29					**850**

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Semester V

SEMESTER- V [IC]												
SUBJECT CODE	**SUBJECT**	**TEACHING SCHEME**			**CREDIT STRUCTURE**		**TOTAL CREDIT**	**Exam Scheme (Marks)**				
		LECT	**TUT**	**PRA**	**L+T**	**P**		**Theory (3 hrs)**	**Sessional (1 hrs 15 min)**	**Practical**	**T/W**	**Total**
IC-514	Micro Processor and Micro Controller	4	0	2	4	2	5	60	40	25	25	150
IC-519	Industrial Electronics & Drives **Program Elective-I**	4	0	2	4	1	5	60	40	25	25	150
IC-515	Simulation Tools **Program Elective-I**							60	40	25	25	150
IC-516	Measurement Techniques	4	0	2	4	1	5	60	40	25	25	150
IC-517	Process Measurement	4	0	2	4	1	5	60	40	25	25	150
IC-518	Communication Systems	4	0	2	4	1	5	60	40	25	25	150
AF-501	Professional Communication-I	1	0	2	1	1	2	50	--	50	--	100
							27					**850**

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Teaching, Credit and Exam scheme

Semester VI

SEMESTER- VI [IC]												
SUBJECT CODE	**SUBJECT**	**TEACHING SCHEME**			**CREDIT STRUCTURE**		**TOTAL CREDIT**	**Exam Scheme (Marks)**				
		LECT	**TUT**	**PRA**	**L+T**	**P**		**Theory (3 hrs)**	**Sessional (1 hrs 15 min)**	**Practical**	**T/W**	**Total**
IC-610	Micro Controller Applications	4	0	2	4	1	5	60	40	25	25	150
IC-611	Instrumentation Systems	4	0	2	4	1	5	60	40	25	25	150
IC-619	Smart Instruments **Program Elective-II**	4	0	2	4	1	5	60	40	25	25	150
IC-620	Analytical Instrumentation **Program Elective-II**											
IC-612	Power Plant Automation **Program Elective-II**											
IC-613	Process Instrumentation and Control	4	0	2	4	1	5	60	40	25	25	150
IC-616	Automation systems Integration	4	0	2	4	1	5	60	40	25	25	150
AF-601	Professional Communication-II	1	0	2	1	1	2	50	--	50	--	100
							27					**850**

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Semester VII

SEMESTER- VII [IC]

SUBJECT CODE	SUBJECT	TEACHING SCHEME			CREDIT STRUCTURE		TOTAL CREDIT	Exam Scheme (Marks)				
		LECT	TUT	PRA	L+T	P		Theory (3 hrs)	Sessional (1 hrs 15 min)	Practical	T/W	Total
IC-709	Biomedical Instrumentation	4	0	2	4	1	5	60	40	25	25	**150**
IC-710	Advanced Control Theory & System Design	4	0	2	4	1	5	60	40	25	25	**150**
IC-711	Digital Signal Processing **Program Elective-III**	4	0	2	4	1	5	60	40	25	25	**150**
IC-712	Modeling, Simulation and Evolutionary Techniques **Program Elective-III**	4	0	2	4	1	5	60	40	25	25	**150**
IC-713	Embedded Systems **Program Elective-III**	3	1	2	4	1	5	60	40	25	25	**150**
IC-714	Process Control	4	0	2	4	1	5	60	40	25	25	**150**
IC-715	Robotics Engineering	4	0	2	4	1	5	60	40	25	25	**150**
IC-716	Industrial Exposure and Practices	0	0	6	0	3	3	--	--	25	25	**50**
							28					**800**

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Semester VIII

SEMESTER- VIII [IC]												
SUBJECT CODE	**SUBJECT**	**TEACHING SCHEME**			**CREDIT STRUCTURE**		**TOTAL CREDIT**	**Exam Scheme (Marks)**				
		LECT	**TUT**	**PRA**	**L+T**	**P**		**Theory (3 hrs)**	**Sessional (1 hrs 15 min)**	**Practical**	**T/W**	**Total**
AF-801	Project and Industrial Training	0	0	28	0	14	14	--	--	300	100	**400**
AF-802	Seminar	0	0	8	0	4	4	--	--	-	100	**100**
							18					**500**

Total Credit for B.Tech I.C Engineering Programme = 210.5

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MATHEMATICS-I (AF-111)

SEM-I (1st Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
4	-	-	60	40	-	--	100	4	--	--	4

A. OBJECTIVES OF THE COURSE

- Ability to analyse and solve problems in both familiar and unfamiliar situations including those in real-life contexts with better accuracy.
- Able to apply knowledge of key theories, concepts, tools and techniques of Mathematics to solve structured and unstructured Engineering problems.
- Understand and be able to use the language, symbols and notation of mathematics
- Use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- Generate and/or analyze information, find relationships and patterns, describe these mathematically as general rules, and justify or prove them.

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B. DETAILED SYLLABUS
DIFFERENTIAL CALCULUS :

Applications of differential calculus to geometrical problems,equation of tangent & normal, angle between two curves, subtangent, subnormal, length of tangent & length of normal,pedal equation, radius of curvature of plane curves in cartesian, polar and parametric equations, radius of curvature at origin by newton's method and by method of expansion.

SUCCESSIVE DIFFERENTATION :

Leibnitz's theorem, Maclaurin's theorem, Taylor's theorem, Applications to obtain expansion of functions.

INTEGRAL CALCULUS:

Curve Tracing, applications for finding area, length of arc, volume and surface area of solids of revolutions.

REDUCTION FORMULA FOR

$\sin x\,dx$, $\cos x\,dx$, $\sin x \cos x\,dx$, $\tan x\,dx$ and $\cot x\,dx$ etc.

BETA AND GAMMA FUNCTION:

Definition, properties, relation between Beta and Gamma functions, use in evaluation of definite integrals.

ELLIPTIC AND ERROR FUNCTIONS:

Definitions and Properties and use in evaluation of definite integrals.

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FIRST ORDER DIFFERENTIAL EQUATION:

Formation of differential equations, general and particular solution, equations of first order & first degree of the type variables separable, homogenous, reducible to homogenous, linear & exact and reducible to these forms. Application to geometrical and physical problems.

C. LEARNING OUTCOMES

- To answer at least about the convergence or divergence of integral when integral is not easily evaluated using techniques known.
- Able to evaluate the volume and surface area of the solid generated by revolving the solids by Integration.
- Apply the knowledge of differential equation to solve some practical problems such as electrical circuits, Newton's Law of cooling and problem related to orthogonal trajectories.
- Apply the knowledge of differentiation to obtain the series of function.
- Able to evaluate curvature of the given function.

D. RECOMMENDED TEXTBOOKS

1) Engineering Mathematics-II By : Shanti Narayan, S. Chand & Company (PVT.) Ltd. Ram nagar, Delhi

2) Higher Engineering Mathematics. By : Dr. B.S.Grewal, Khanna publishers, Delhi

E. REFERENCE BOOKS

1) Engineering Mathematics-I, By : Shanti Narayan, S. Chand & Company (PVT.) Ltd.

2) Applied Mathematics, By : P.N. & J.N. Wartikar,

3) Engineering Mathematics-I By : I.B. Prasad

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

Not applicable

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ENGINEERING MECHANICS (AF-124)

SEM-I (1st Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	-	2	60	40	25	25	150	3	--	1	4

B. DETAILED SYLLABUS

A. STATICS :
Introduction, engineering and S.I. units, accuracy in engineering calclations, Vectors composition and resolution, concept of Rigid Body. Resultant of a force system:
i) Concurrent Coplanner Force System

ii) Non concurrent Coplanner Force System
(a) parallel and (b) non parallel Using analytical as well as graphical methods. iii) Simple cases of concurrent force system in space. Concept of internal force, free body diagram. Equilibrium of force system listed above. Friction : Friction on an inclined plane, ladder friction, wedge friction, screw friction, belt and rope drive. Centre of gravity of lines, plane figures, volumes, bodies and Pappu's Theorem. Principle of Virtual Work and its application. Types of Beams, Types of Supports, Support Reaction for statically determinate beams.
B. DYNAMICS:
Rectilinear motion, Circular motion, Projectiles, Relative velocity, Instantaneous centre in plane motion. Laws of Motion, Motion along an inclined plane, Principle of conservation of Momentum, Mass Moment of Inertia in Rotational Motion, Motion of connected

bodies, Impulse and Momentum, Impact, work power and Energy, D Alembert's principle, vibrations of SDOF systems. Motion along a smooth curve and super elevation.

C. LEARNING OUTCOMES

After completion of the course students should be able to:

1. Understand and describe concept of rigid body
2. Describe resultant force systems using analytical and graphical methods
3. Describe concept of internal forces
4. Describe various types of motions like rectilinear, circular. Projectile etc.
5. Understand and describe laws of motion and its applications

D. Text Books:

1. Mechanics for Engineers - Statics By : F.P.Beer and E.R.Johnston Jr.
2. Mechanics for Engineers - Dynamics By :F.P.Beer and E.R.Johnston Jr.
3. Engineering Mechanics: Statics & Dynamics By: A.K.Tayal

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ELEMENTS OF MECHANICAL ENGINEERING (AX-124)

SEM-I (1st Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	-	2	60	40	25	25	150	4	--	1	5

A. OBJECTIVES OF THE COURSE:

Students belonging to all branches of engineering are made to learn certain fundamental topics related to mechanical engineering so that they will have a minimum understanding of mechanical processes and basic equipment like boilers, compressors, I.C. engines, refrigeration and air conditioning etc...

B. DETAILED SYLLABUS

1 INTRODUCTION

Systems of units, Pure and working substance, properties of substance, energy, thermodynamic system, surroundings and system boundary, Path and point functions, Thermodynamic equilibrium, law of conservation of energy, Specific heat capacity, thermodynamic process and cycle

2 PROPERTIES OF STEAM:

Distinction between gas and vapour, Steam formation, Sensible heat, Latent heat, Total heat and super heat of steam, Condition of steam, Dryness fraction, Properties of steam i.e. Enthalpy, Internal energy, Density and Specific volume, Critical pressure and temperature of steam, External work of evaporation and internal latent heat. Combined separating and throttling calorimeter

3 PROPERTIES OF GASES

Zeroth, first and second laws of thermodynamics, laws of perfect gases (Boyle's law, Charle's law, Regnault's law, Joule's law), Characteristic equation of gas, gas constants, internal energy, specific heat at constant pressure and specific heat at constant volume, relationship between specific heats, thermodynamic processes of perfect gases (constant volume, constant pressure, constant temperature, isentropic and polytropic)

4 FUELS AND COMBUSTION

Introduction, Classification of Solid fuels, Liquid Fuels, Gaseous fuels, LPG, CNG and bio fuels, Calorific values, Combustion of fuels, Minimum air required for combustion of fuels

5 REGRIGERATION AND AIR CONDITIONING

Introduction, Evaporation, Refrigerating effect, Unit of refrigeration and COP, Important refrigerants, Refrigerating systems i.e. Air refrigerating system, Ammonia absorption refrigerating system and Vapour compression refrigerating system, Analysis of vapour compression refrigeration system, i.e. COP, mass flow rate, heat rejected from condenser, power consumption etc. Window and split air conditioners: principles and working

6 BOILERS

Introduction, Classification, Cochran & Babcock-Wilcox boiler, Evaporation in boiler, Equivalent evaporation, Boiler efficiency, Functioning of boiler mountings and accessories. Boiler draught, Classification and comparison of boiler draught systems

7 I. C. ENGINES

Prime mover and its classification, advantages of I.C. engines over E.C. engines, classification of I.C. engines, thermodynamic air cycles i.e. Carnot cycle, Constant volume OTTO cycle and Diesel cycle, Air standard efficiency, construction and working of 2–stroke

and 4–stroke cycle engines, p-v diagrams, I.C. engine performance. Calculations of Indicated power, brake power, efficiencies, specific fuel consumption

8 AIR COMPRESSORS

Introduction, Classification, Working of reciprocating air compressors, air compressor terminology, Work of compression, Reciprocating compressor efficiency, Introduction and classification of rotary air compressors, Comparison between reciprocating and rotary compressor

C. LEARNING OUTCOMES

After successful completion of this course, students belonging to all branches of Engineering would be able to understand fundamental aspects related to important mechanical processes and basic equipment like boilers, compressors, I.C. engines etc...

D. RECOMMENDED TEXTBOOKS

1. Elements of Heat Engines (S.I. Units) Vol. 1, R. C. Patel & C. J. Karamchandani, Acharya Book Depot, Vadodara

2. Elements of Mechanical Engineering, A. V. Mehta, Everest publishing house, Pune

3. Elements of Mechanical Engineering, P. S. Desai & S. B. Soni, Atul Prakashan, Ahmedabad

E. REFERENCE BOOKS

1. Heat Engine, P. L. Ballaney, Khanna Publishing Company

2. A course in Thermal Engineering, Domkundwar, S and Kothandaraman, C. P., Dhanpat Rai and Sons

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

Term work/ Practicals contents shall be based on above syllabus contents.

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WORKSHOP – I (AF-136)

SEM-I (1st Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
--	-	2	--	--	--	50	50	--	--	1	1

A. OBJECTIVES OF THE COURSE:

Students belonging to all branches of engineering are made understand workshop layout, importance of various sections/shops of workshop, General safety rules and work procedure of work shop

Students belonging to all branches of engineering are made understand importance or workshop practice in engineering and are given exposure to use practically by themselves of basic tools and equipment used for performing basic operations related to carpentary, tin smithy and plumbing individually.

B. DETAILED SYLLABUS

1 INTRODUCTION TO WORKSHOP

Workshop layout, importance of various sections/shops of workshop, type of jobs done in each shop, General safety rules and work procedure of work shop

2 TIN SMITHY (ONE JOB)

Tin smithy tools like –hammers, stakes, scissors etc. sheet metal operations such as shearing, bending, joining, safety precautions, demonstration of various operations

3 CARPENTRY (ONE PRACTICE JOB AND ONE JOINT JOB)

Carpentry tools like –saw, planner, chisels, hammers, pallet, making gauge, vice, tee square, rule etc., carpentry operations such as marking, sawing, planning, chiselling, grooving, boring, joining, type of woods and carpentry hardware, safety precaution, demonstration of various operations by using hardware

4 PIPE FITTING (ONE JOB)

Pipe fitting tools, pipe fitting operations such as marking, cutting, bending, threading, assembling, dismantling etc. Types of various spanners such as flat, fix, ring box-adjustable etc, Safety precautions, demonstration of various operations.

C. LEARNING OUTCOMES

After successful completion of this course, students belonging to all branches of engineering would be able to understand and able to use themselves of basic workshop tools used in carpentry, tin smithy and plumbing.

D. TEXT BOOKS

1. Manual Developed by Mechanical Engineering Department.
2. Work shop technology, A. K. Hajrachaudhari & S. K. Hajrachaudhari

E. REFERENCE BOOKS

1. ITB Hand book, Engineering industry training board
2. Work shop Technology Vol. I & II, Gupta & Kaushik

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BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (AF-122)

SEM-I (1st Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
4	-	2	60	40	25	25	150	4	--	1	5

A. OBJECTIVES

To expose the students to the concepts of various types of electrical, electronic and magnetic circuits and their applications.

B. DETAILED SYLLABUS

[1] FUNDAMENTALS OF CURRENT ELECTRICITY AND DC CIRCUITS

Introduction, Computation of Resistance at constant temperature, Temperature dependence of Resistance, Computation of Resistance at different temperatures, Ohm's law statement, Illustration and limitation, Kirchhoff's laws-statement and illustration, Resistance in parallel and current division technique, Method of solving a circuit by Kirchhoff’s laws.

[2] MAGNETIC CIRCUITS

Introduction, Definition of Magnetic quantities, Magnetic circuit, Leakage flux, Fringing effect, Comparison between magnetic and electric circuits.

[3] ELECTROMAGNETIC INDUCTION

Introduction, Magnetic effect of electric current, Current carrying conductor in magnetic field, Law of electromagnetic induction, Induced emf, Self-Inductance (L), Mutual Inductance (M), and Coupling coefficient between two magnetically coupled circuits (K), inductor in series.

[4] AC FUNDAMENTALS

Introduction, Waveform terminology, Concept of 3-phase emf generation, Root mean square (RMS) or effective value, Average Value of AC, Phasor representation of alternating quantities, Analysis of AC circuit.

[5] SINGLE PHASE AC CIRCUITS

Introduction, j operator, Complex algebra, Representation of alternating quantities in rectangular and polar forms, RL series circuit, RC series circuit, RLC series circuit, Admittance and its components, Simple method of solving parallel AC circuits, Resonance.

[6] ELECTRICAL MACHINES

Working principles of DC machine, Transformer, Three phase Induction Motor.

[7] DIODE THEORY

Semiconductor theory, Conduction in crystals, Doping source, The unbiased diode, Forward bias, Reverse bias, Linear devices, The diode graph, Load lines, Diode approximations, DC resistance of a diode.

[8] DIODE CIRCUITS

The sine wave, The transformer, The half wave rectifier, The full wave rectifier, The bridge rectifier, The capacitor input filter, Diode clipper and clamper circuit.

[9] SPECIAL PURPOSE DIODES

The Zener diode, The Zener regulator, Optoelectronic devices

C. LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Analyse the various electric and magnetic circuits.
- Understand 1-phase and 3-phase supply terminology.
- Understand the effect of R, L and C in single phase ac circuit.
- Compare various diode circuits and rectifier circuits.
- Understand significance of resonance in series and parallel RLC circuit.
- Identify the various parts of electrical machines and their working.

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D. TEXTBOOKS

1. Basic Electrical, Electronics and Computer Engineering Authors : R. Muthusubramanian, S. Salivahanan, K. A. Muraleedharan Edition : 2nd Edition Publisher : Tata McGraw Hill

2. Electronics Principles Authors : Albert Paul Malvino Edition : 6 th Edition Publisher : Tata McGraw Hill

E. REFERENCE BOOKS

1. Electrical Engineering Authors : B. L. Theraja Edition : 23 rd Edition Publisher : S. Chand & Company Ltd

2. Electrical Machines Authors : B. L. Theraja Edition : 23 rd Edition Publisher : S. Chand & Company Ltd

F. LIST OF EXPERIMENTS

1. Basic Electronic Devices
2. Verification of Ohm's Law
3. Resistance, Inductance and Power Factor of Single Phase Circuit
4. Charging and Discharging of a Capacitor
5. R-L and R-C Circuit
6. Resonance in R-L-C Series Circuit
7. Diode Characteristic
8. Half Wave and Full Wave and Bridge Rectifier Circuits
9. Clipper Circuit and Clamper Circuit

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PROGRAMMING IN C (AX-123)

SEM-I (1st Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	-	2	60	40	25	25	150	4	--	1	5

A. OBJECTIVES

Introduction of C programming. In addition, students should acquire skills for programming using C features such as Operators, Decision Making And Branching and Looping, Arrays, Character Strings and User Defined Functions, etc.

B. DETAILED SYLLABUS

[A] INTRODUCTION : Introduction to Computer Hardware & OS, Introduction to DOS commands & languages, Introduction to Programming in C

[B] CONSTANTS, VARIABLES AND DATA TYPES: Constants , Variables & Data types in C, Declaration & Initialization of C variable, Basic C programs , Defining symbolic constants

[C] OPERATORS AND EXPRESSIONS : Operators in C, Operators in C & The ? : operator, Arithmetic Expressions & Precedence Rule, Type conversion in C, Mathematical Functions

[D] MANAGING INPUT AND OUTPUT OPERATORS: Reading / Writing characters, Formatted Input operations, Formatted Output operations

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[E] DECISION MAKING AND BRANCHING: Decision making with If & If .. Else statements, If .. Else statements (Nested …. Ladder), The Switch & go to statements

[F] DECISION MAKING AND LOOPING: The while statement, The break statement & The Do.. While loop, The FOR loop, Jump within loops – Programs

[G] ARRAYS : Development of simple programs using loops, Introduction to one dimensional array, Array Programs

TERM WORK: The laboratory and termwork will be based on above topics.

C. LEARNING OUTCOMES

At the completion of the course, students will be able to …

1. Get familiar with C programming language.
2. Understand Basics features of C Language.
3. Implement programming solutions using other features of the C language including Operators, Arrays, Character Strings and User Defined Functions.

D. Text Books:

1 PROGRAMMING IN ANSI C By E. BALAGURUSAMY 2nd Edition TMH Publications

E. Reference Books:

1 Let us C. By : Yashwant Kanitkar

2. Programming in C By: Venugopal

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F. LIST OF EXPERIMENTS

- Write and Execute a Simple C Program.
- Demonstrate standard Input /Output Functions.
- Defining appropriate Operators and Expressions.
- To study various Formatted Input /Output operations.
- Implementing Decision Making and Branching (IF…Else).
- Implementing Decision Making and Branching (Switch…Case).
- Develop a C program using goto and continue.
- Implementing Decision Making and Looping (While and Do…While).
- Implementing Decision Making and Looping (for).
- Demonstrate use of Single Dimensional Array.
- Demonstrate use of Multidimensional Array.
- Use of Character Array as a String.
- Develop a C program with the help of User-Defined Functions.

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ENGINEERING ECONOMICS AND PRINCIPLES OF MANAGEMENT (AM-110)

SEM-I (1st Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
3	-	-	60	--	40	--	100	3	--	--	3

Objective: The need to understand the basics concepts of economics & management are important for the allocation of scarce resources of economy and proper utilization to generate the required products and services. Demand analysis and consumer behavior are the factors which teach about the equilibrium price. Types of markets, product pricing and factor pricing leads to a better understanding of a particular product or service demanded by the consumers. Production cost and revenue analysis is important for operation of a profitable business. Monetary & fiscal policies are important for the understanding of consumption, government expenditure, investment, exports and imports. It also educates us about the ways in which the government generates revenue and handles its expenditure for a stable economy.

Learning Outcomes:

After completion of this course students will be able to understand:

- Students will understand the definitions of economics, micro & macroeconomics, utility, money, wealth, consumer and producer surplus
- Students will understand demand, function of demand, elasticity, factors of production, supply & demand equilibrium

- Students will understand types of markets, price discrimination, dumping and kinked demand curve
- Students will understand production, short & long run production function, cost analysis, fixed cost, variable cost, revenue, breakeven analysis
- Students will understand monetary policy, fiscal policy, banking, instruments of monetary policy, liberalization, globalization, privatization, role of government in policy making and business cycles

Detailed Syllabus:

Unit 1- Basic concepts and definitions: **(4 lectures)**

1. Marshall, Robbins and Samuelson's definition of economics
2. Positive and normative economics, micro and macroeconomics
3. Utility, goods and services
4. Money and wealth
5. Consumer and Producer surplus

Unit 2- Demand analysis and consumer behavior: **(6 lectures)**

6. Demand function
7. Law of demand
8. Elasticity of demand and its types
9. Price, income and cross-elasticity

10. Measures of demand elasticity

11. Factors of production

12. Advertising elasticity

13. Law of supply and demand, equilibrium between demand and supply

Unit 3- Markets, product pricing and factor pricing: **(9 lectures)**

14. Concepts of perfect competition

15. Monopoly and monopolistic competition (meaning and characteristics)

16. Control of monopoly

17. Price discrimination and dumping

18. Concept of Duopoly and Oligopoly

19. Kinked demand curve (price leadership model with reference to oligopoly)

Unit 4- Production cost & revenue analysis: **(8 lectures)**

20. Production and production function

21. Short run & long run production function

22. Cost analysis

23. Various concepts of cost

24. Total fixed cost, total variable cost

25. Average fixed cost, average variable cost, average cost & marginal cost opportunity cost

26. Basic concepts of revenue

27. Relationship between average revenue and marginal revenue

28. Breakeven analysis; meaning and explanation

Unit 5- Money: **(9 lectures)**

29. Meaning, functions, types, monetary policy

30. Meaning, objectives, tools, fiscal policy

31. Meaning, objectives, tools, Banking; meaning, types, functions, central bank- RBI, it's function, concepts, Cash reserve ratio, bank rate, repo rate, reverse repo rate, statutory liquidity ratio, functions of central & commercial banks, inflation, deflation, stagflation, monetary cycles, new economic policy, liberalization, globalization, privatization, fiscal policy of the government.

Termwork: **(40 marks)**

- Students will be required submit assignment based on topics covered in the syllabus such as calculation of breakeven point, demand analysis of a product or service, GDP, and inflation.

Text Books:

- Ahuja, H. L. Modern economics; S.Chand: New Delhi, 2002
- Dewett, K. K. Modern economics theory; S Chand: New Delhi, 2006
- Seth, M. L. Monetary economics; Lakshmi Narain Agarwal: Agra, 2018

Reference Books:

- Paneerselvam, R. Engineering economics; PHI publication: New Delhi, 2014
- Robbins, S.; Decenzo, D. A. Fundamentals of management: Essential concepts and applications; Pearson education: New Jersey, 2015
- Mankiw, N. G. Economics: Principles of economics; Cengage learning: USA, 2017
- Williamson, T. R. Introduction to economics; D.C. Health & Company: Chicago, 1923

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MATHS – II (AF-201)

SEM-II (1st Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
4	-	-	60	40	--	--	100	4	--	--	4

A. OBJECTIVES OF THE COURSE

- Ability to analyse and solve problems in both familiar and unfamiliar situations including those in real-life contexts with better accuracy.
- Able to apply knowledge of key theories, concepts, tools and techniques of Mathematics to solve structured and unstructured Engineering problems.
- Understand and be able to use the language, symbols and notation of mathematics
- Use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- Generate and/or analyze information, find relationships and patterns, describe these mathematically as general rules, and justify or prove them.

B. DETAILED SYLLABUS

PARTIAL DIFFERENTIATION & ITS APPLICATIONS :

Partial derivatives, Homogenous functions Euler's theorem, Total derivatives-Differentiation of implicit functions, Change of variables, errors and approximations, Maxima & Minima of functions of two variables, Lagrange's method of undetermined multipliers.

MULTIPLE INTEGRALS & THEIR APPLICATIONS :

Double integrals, definition evaluation, change of order of integration, double integrals in polar co-ordinates, area enclosed by plane curves, Triple integrals, change of variables, volume of solids.

INFINITE SERIES :

Introduction, Definitions, Convergence, divergence and Oscillation of a series, P-test, Comparision test, Ratio test, Root test, Higher ratio test, Rabbe's test, Log test, Alternating Series, Leibnitz's rule.

COMPLEX NUMBER :

Definition, elementary operations, Argan's diagram, De-Moivre's theorem, and its applications To expand Sinné, Cosné in powers of siné, cosé respectively, To expand sinné , Cosn and Sinmé. Cosné in a series of Sines or Cosines of multiples of é, Hyperbolic functions, Formulae of hyperbolic functions,Inverse hyperbolic functions, Logarithm of complex quantities.Separation of real and imaginary parts. C + iS method.

LAPLACE TRANSFORMS :

Introduction, Definition Transforms of elementary functions, properties of Laplace transforms, Inverse transforms, Note on partial fractions, Transforms of derivatives, Transforms of integrals. Multiplication and division by t, convolution theorem.

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C. LEARNING OUTCOMES: At the end of the course student should be able to

- Obtain Laplace transform of standard Mathematical functions.
- Evaluate Partial Derivatives and apply the knowldege to solve some practical problems such has constrined optimization problems and other problems involving Partial Differentiation.
- Understand the concept of Multiple Integration and its applications viz. Area and Volume.
- Obtain the bahaviour of Infinte series.
- Evaluate Exponential,Trignometric and Hyperbolic Functions of a complex number

D. RECOMMENDED TEXTBOOKS

1) Higher Engineering Mathematics By : Dr. B.S. Grewal, Khanna publisers,Delhi.

E. REFERENCE BOOKS

1) Applied Mathematics for Engineers and Physicists. By : Pipes & Harvill,Mc-Graw Hill Kogakusha Ltd.

2) Applied Mathematics By : P.N. & J.N. Wartikar

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

Not applicable

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MECHANICS OF SOLIDS (AF-214)

SEM-II (1st Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	-	2	60	40	25	25	150	3	--	1	4

[A] SIMPLE STRESSES AND STRAINS :
Introduction, stress, strain, tensile, compressive and shear stresses, Elastic limit, Hooke's law, Poisson's Ratio, Modulus of Elasticity, Modulus of Rigidity, Bulk Modulus, Bars of Varying sections, Extension of tapering rods, Bars of uniform strength, temperature stresses, Hoop stress, stress on oblique sections, State of simple shear, Relation between Elastic constants.

[B] MECHANICAL PROPERTIES OF MATERIALS:
Ductility, Brittleness, Toughness, Malleability, Behavior of ferrous and non ferrous metals in tension and compression, shear and bending tests, Standard test pieces, Influence of various parameters on test results, True and nominal stress, Modes of failure, Characteristic stress-strain curves, Strain hardening, Hardness, Different methods of measurement, Izod, Charpy and tension impact tests, Fatigue, Creep, Correlation between different mechanical properties, Effect of temperature. Testing machines and special features, Different types of extensometers and compressometers, Measurement of strain by electrical resistance strain gauges.

[C] BENDING MOMENT AND SHEAR FORCE :
Bending moment, shear force in statically determinate beams subjected to uniformly distributed, concentrated and varying loads. Relation between bending moment, shear force and rate of loading.

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[D] MOMENT OF INERTIA :
Concept of moment if Inertia, Moment of Inertia of plane areas, polar moment of Inertia, Radius of gyration of an area, Parallel Axis theorem, Moment of Inertia of composite Areas, product of Inertia, Principal axes and principal Moments of Inertia.

[E] STRESSES IN BEAMS:
Theory of simple bending, Bending stresses, moment of resistance, modulas of section, Built up and composite beam section, Beams of uniform strength, Distribution of shear stress in different sections.

[F] TORSION :
Torsion of circular. solid and hollow section shafts, shear stress angle of twist, torsional moment of resistance, power transmitted by a shaft, keys and couplings, combined bending and torsion, close coiled helical springs.

[G] PRINCIPLE STRESSES AND STRAINS :
Compound stresses, principle planes and principle stresses, Mohr's circle of stress, priciple strains, Angle of obliquity of resultant stresses, principle stresses in beams, principle stresses in shafts subjected to bending, torsion and axial force.

Text Books :
1. Strength of Materials By: Timoshanko (Vol.1 & 2)
2. Strength of Material By: Popov
3. Mechanics of structure By: Junnarkar S.B.
4. Strength of Materials By:S.Ramamrutham.

INTENDED LEARNING OUTCOMES:
After completion of the course students should be able to:
1. Understand the concept of stress and strain
2. Describe various mechanical properties of materials
3. Describe bending moment and shear force, moment of inertia
4. Describe stresses in beams

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ELECTRONIC WORKSHOP (CT-217)

SEM-II (1st Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
--	-	2	--	--	50	--	50	--	--	1	1

- Introduction to Electrical Components : Switches, MCB, ELCB, Tube-light, Bulb, parallel connection of electrical components, wiring in fan and motor
- Introduction to Electronic Components : active and passive components
- Use of basic source & measuring instruments (Power supply, function generator, CRO, DMM)
- Measure voltage, current, frequency, phase difference, power, power factor for single and three phase supply
- Identify various types of ports, cables and connectors
- Linux installation
- Network cabling and crimping for wired and wireless network

- PCB layout design (like proteus) Software installation and layout design using the same ◦ Solder and de-solder electronic components on PCB ◦ Identify and rectify open circuit and short circuit faults in PCB/system.
- Test assembled electronic circuit for various parameters and faults

MINI Project :

Apart from above experiments a group of students has to undertake a mini project. Following are some examples for the same :

- To design a device for charging small battery during door opening and closing.
- To design a mobile charger using solar PC cell panel for offices and house hold.
- To design/develop an electronic weighing machine.
- To design/develop an electronic lock for house in the workshop.
- To design/develop and innovative electrical bell using electronics components

Ref. Books :

1) Electronic Principles, Albert Malvino and David J. Bates , McGraw Hill (7th Edition)

2) Electronic Devices, Thomas L. Floyed, Pearson (7th Edition)

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ELECTRONICS PRINCIPLES (AF-212)

SEM-II (1st Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	-	2	60	40	25	25	150	4	--	1	5

A. OBJECTIVES

To present a perceptive understanding of the fundamentals of a bipolar junction transistor and its application. Further, nurturing the ability to design and analyze the performance of transistor amplifier using different types of biasing techniques. Expose the students to the concepts of various types of digital circuit as well as concept of signal and systems.

B. DETAILED SYLLABUS

[1] BIPOLAR JUNCTION TRANSISTOR

The unbiased transistor, The biased transistor, Forward-reverse bias, The CE connection, Transistor characteristics, The Base and Collector curves.

[2] TRANSISTOR FUNDAMENTALS

DC load lines, Base bias, Emitter bias, The Operating Point, The Transistor switch.

[3] TRANSISTOR BIASING

Voltage divider bias, VDB analysis, VDB load line, Two-supply emitter bias, other types of bias, PNP Transistors.

[4] AC MODELS

Base biased amplifier, Coupling and bypass capacitors, The superposition theorem for amplifiers, AC resistance of the emitter diode, AC beta, The grounded emitter amplifier, The AC model of a CE stage, Introduction to h - Parameters & Comparison with T & PI models.

[5] VOLTAGE AMPLIFIERS

Voltage gain, The loading effect of input impedance, Multistage amplifiers, Swamped amplifier.

[6] CC AND CB AMPLIFIERS

The CC amplifier, the AC model of an Emitter Follower, Types of coupling, Direct coupling, Darlington connections.

[7] CLASS A AND B POWER AMPLIFIERS

The AC load line of a CE amplifier, AC load lines of other amplifier, Class A operation.

[8] OSCILLATORS

Theory of sinusoidal oscillation.

[9] FREQUENCY DOMAIN

The Fourier series, The spectrum of a signal, Frequency spectrum of periodic signal

[10] FREQUENCY MIXING

Nonlinearity, Medium-signal, operation with one sine wave, Medium signal operation with Two sine waves.

[11] AMPLITUDE MODULATION

Basic idea, Percent modulation, AM spectrum, the envelope detector, the super heterodyne Receiver.

[12] DIGITAL CIRCUITS

Number systems, Complements, Error detecting codes, Boolean algebra, Logic gate ICs, RTL & DTL logic circuits, and Simple Combinational circuits, Half adder, Full adder

C. LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Analyse and designing of the various transistor amplifier circuits.
- Understand the importance of R_E, R_C, C_B and C_E in transistor circuit.
- Compare various biasing techniques and its importance in design of circuit.
- Understand significance of feedback in amplifier circuit.
- Build their notion about the digital electronics circuit and its applications.
- Gain insight of the signal and its frequency spectrum for random signal.
- Understand the concept of the modulation and its application in wireless communication.

D. TEXT BOOK:

(1) Electronic Principles (Third Edition) By : Albert Paul Malvino Tata McGraw Hill Publishing Co.Ltd, New Delhi.
(2) Basic Electrical, Electronics & Computer Engg. By-R.Muthusubramanian, S.Salivahanan, K.A.Muraleedharan. Tata McGraw Hill Co, Ltd, New Delhi.

E. REFERENCE BOOKS

1. Electronic Devices and Circuit Theory Authors: Robert Boylestad and Louis Nashelsky Edition : 7th Edition

Publisher : Prentice Hall of India

2. Digital Electronics Authors : Anand Kumar Edition : 1st Edition Publisher : Prentice Hall of India

F. LIST OF EXPERIMENTS

1. Study and performance of different types of logic gates.
2. Performance verification of NAND and NOR as universal gate.
3. Application of transistor as a switch.
4. Computation of voltage gain in transistor as an amplifier.
5. Significance of Emitter Resistance (RE) and Collector Resistance (RC) on voltage gain of CE amplifier.
6. Multistage amplifier using BJT.
7. Study loading effect on multistage amplifier using emitter follower as a buffer.
8. Analysis of common base configuration of transistor amplifier.
9. Binary to Gray code and Gray to Binary code conversion using combinational circuit.

10. Performance analysis of Half adder and Full adder using basic logic gates.
11. Combinational circuit analysis of half and full subs tractor using basic logic gates.
12. Study of amplitude modulation for different modulation index.

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ENGINEERING GRAPHICS (CT-212)

SEM-II (1st Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
4	-	3	60	40	25	25	150	4	--	1.5	5.5

A. OBJECTIVES OF THE COURSE

- The course is aimed at developing basic graphic skills in preparation of basic drawings
- Developing skills in reading and Interpretation of engineering drawings to efficiently communicate ideas graphically
- To understand dimension and annotation two-dimensional engineering drawings
- To understand objects in two-dimensional views to improve visualization skills
- Comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional

B. DETAILED SYLLABUS

1 ENGNEERING CURVES: Introduction to different curves & their applications, constructions of curves used in engineering such as Conics (Ellipse, Parabola, Hyperbola), Cycloidal curves (Cycloid, Epi-Cycloid, Hypo-Cycloid), Involutes, Archemedian spirals with tangents & normals. 2 PROJECTIONS OF POINTS AND STRAIGHT LINES: Introduction to principal planes, Projections of points, Projections of Lines, construction for H.T. & V.T. Simple applications of projection of points and lines

3 PROJECTIONS OF PLANES: Introduction to different types of planes, Projections of regular planes such as square, rectangle, triangle, circle, pentagon, hexagon, rhombus etc

4 PROJECTIONS OF SOLIDS: Introduction to different types of solids, Projections of Right & Regular Solids (Prisms, Pyramids, Cylinder and Cone)
5 ORTHOGRAPHIC PROJECTIONS: First angle projection method and third angle projection method.Dimensioning techniques and methods, Conversion of pictorial views into Orthographic Projections with dimensions, Sectional orthographic projection, Orthographic vies with full and half section, special sections.
6 ISOMETRIC PROJECITIONS: Introduction to Isometric planes, Isometric scale, Conversion of Orthographic views into Isometric Projections and views
7 DEVELOPLMENT OF SURFACES: Introduction, methods of development, Development of lateral surfaces of right regular solids (Prism, Cylinder, Pyramid and Cone)

C. RECOMMENDED TEXTBOOKS

1. Engineering Drawing, N. D. Bhatt, Charotar Publication
2. Engineering Drawing Vol.1 & Vol. 2., P. J. Shah

D. REFERENCE BOOKS

1. Fundamentals of Engineering Drawing, Luzadder
2. A Text Book of Geometrical Drawing, P. S. Gill, S. K. Kataria Publication
3. A Text Book of Machine Drawing, P. S. Gill, S. K. Kataria Publication

E. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

The term work contents shall be based on the above syllabus.

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ENVIRONMENT SCIENCE (ES-210)

SEM-II (1st Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	-	-	60	-	40	-	100	3	--	--	3

Objective: The objective for this course is to bring awareness about sustainable development is a key to the future of mankind. Continuing problems of pollution, solid waste disposal, degradation of environment, issues like economic productivity and national security, global warming, the depletion of ozone layer and loss of biodiversity have made everyone aware of environmental issues. Managing environmental hazards have become very important. It is now even more critical than ever before for mankind as a whole to have a clear understanding of environmental concerns and to follow sustainable development practices.

Learning Outcomes:
After completion of this course students will be able to understand:

1. The meaning of environment, ecology, ecosystems, biotic & abiotic components, food chains & webs
2. Natural resources, biodiversity, hotspots, threats to biodiversity
3. Factors causing environmental pollution, prevention of pollution, role of an individual in pollution control & abatement and disaster management
4. Social issues related to environmental science, water conservation, rain water harvesting, environmental ethics, climate change, wasteland reclamation, consumerism and waste products, environment protection act and public awareness
5. Issues of population growth, population explosion, human health and rights
6. Field work related to ecosystems, polluted sites, and species

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Detailed Syllabus:

Unit 1: The multidisciplinary nature of environmental studies **(2 lectures)**

Definition, scope and importance & Need for public awareness

Unit 2: Natural resources **(8 lectures)**

- **Renewable and non-renewable resource**: **Natural resources and associated problems**
- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams, and their effects on forests and tribal people
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefit and problems
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies
- Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies
- Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies
- Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification
- Role of an individual in conservation of natural resources. Equitable use of resources of sustainable lifestyles

Unit 3: Ecosystems **(8 lectures)**

- Concept of an ecosystem, Structure and function of an ecosystem, producers, consumers and decomposers, Energy flow in the ecosystem
- Ecological succession, Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 4: Biodiversity and its conservation **(8 lectures)**

- Introduction definition: Genetic, species and ecosystem diversity
- Bio-geographical classification of India

- Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels
- India as a mega-diversity nation, Hot-spots of biodiversity, Threats to biodiversity, habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India
- Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity

Unit 5: Environmental Pollution **(8 lectures)**

- Definition, Causes, effects and control measures of:
- Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards
- Solid waste management, causes, effects and control measures of urban and industrial wastes
- Role of an individual in prevention of pollution, Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

Unit 6: Social issues and the environment **(8 lectures)**

- From unsustainable to sustainable development, Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people: its problems and concerns. Case studies
- Environmental ethics: Issues and possible solutions
- Climate change: Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.
- Case studies
- Wasteland reclamation, Consumerism and waste products
- Environment Protection Act: Air (Prevention and Control of Pollution) Act, Water (Prevention &Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness

Unit 7: Human Population and the Environment **(8 lectures)**

- Population growth, variation among nations, population explosion, Family Welfare Program, environment and human health, human rights, Value education
- HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environmental and human health
- Case studies

Unit 8: Field work

- Visit to a local area to document environmental assets (river/forest/grassland/hill/mountain)
- Visit to a local polluted site - Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems – pond, river, hill, slopes etc.

Termwork: **(40 marks)**

1. Students will be required submit assignment based on field work related to biodiversity of the ecosystems, waste management, environmental pollution, and social issues of environment.

Text Books:

- Erach Bharucha *Textbook of Environmental Studies*; Second Edition, Universities Press: Hyderabad, 2013.
- Poonia, M. P.; Sharma, S. C. *Environmental studies*; Khanna Publishing House: New Delhi, 2017.
- Rajagopalan, R. *Environmental Studies*; Oxford University Press: India, 2015.

Reference Books:

1. Varandani, N. S. *Basics of Environmental studies*; Lambert Academic Publishing: Germany, 2013.
2. Basak, A. *Environmental Studies*; Dorling Kindersley: India, 2009.
3. Dhameja, S. K. *Environmental studies*; S. K. Kataria and Sons: New Delhi, 2007.
4. Rao, C. S. *Environmental Pollution Control Engineering*; Wiley publishers: New Delhi, 2006.
5. Brunner, R. C. *Hazardous Waste Incineration*; McGraw Hill: Michigan, 1989.
6. Clark, R. S. *Marine Pollution*; Clanderson Press Oxford: Bath, 2001.
7. Trivedy, R. K. *Handbook of Environmental Laws, Acts, Guidelines, Compliances & standards*; B. S. publications: Hyderabad, 2005.

8. Jadhav, H.; Bhosale, V. M. *Environmental Protection and Laws*; Himalaya Pub. House: Delhi, 1995.
9. Agarwal, K. C. *Environmental Biology*; Nidi Publ.: Bikaner, 2001.
10. Bharucha, E. *The Biodiversity of India*; Mapin Publishing: Ahmedabad, India, 2002.
11. Cunningham, W.P.; Cooper; Gorhani, T. H. E.; Hepworth, M.T., *Environmental Encyclopedia;* Jaico Publ. House: Mumbai, 2001.
12. De, A. K. *Environmental Chemistry;* Wiley Eastern: New Delhi, 2006.
13. Gleick, H. P. Water in crisis, Pacific Institute for Studies in Dev., *Environment & Security*; Stockholm Env. Institute Oxford Univ. Press: New York, 1993.
14. Hawkins, R.E., *Encyclopedia of Indian Natural History*; Bombay Natural History Society: Bombay, 1987.
15. Heywood, V. H.; Waston, R. T. *Global Biodiversity Assessment;* Cambridge Univ. Press: Cambridge, 1995.
16. Mckinney, M.L.; School, R.M. *Environmental Science systems & Solutions*; Web enhanced edition: USA, 1996.
17. Miller, T.G. Jr.; Spoolman, S. E. *Environmental Science*; Cengage learning: Wadsworth, 2014.
18. Odum, E.P. *Fundamentals of Ecology*; W.B. Saunders: USA, 1971.
19. Rao, M. N.; Datta, A.K. *Waste Water treatment*; Oxford & IBH Publ.: New Delhi, 1987.
20. Sharma, B. K., *Environmental Chemistry*; Goel Publ. House: Meerut, 2001.
21. Townsend, C., Harper, J.; Michael, B. *Essentials of Ecology*; Blackwell: Oxford, 2008.
22. Trivedi, R. K., *Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards*, Vol I and II; B. S. Publications, Hyderabad, 2010.
23. Trivedi, R. K.; Goel, P. K. *Introduction to air pollution*; ABD Publishers: Jaipur, 2003.
24. Wanger, K. D., *Environmental Management;* W.B. Saunders Co. Philadelphia, USA, 1998.

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ADVANCED C PROGRAMMING (AX-223)

SEM-II (1st Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
4	-	2	60	40	25	25	150	4	--	1	5

A. OBJECTIVES

The purpose of this course is to

- Provide the deep knowledge of Advanced topics of C programming language
- Learn about advanced programming concepts like Pointers, File handling, Preprocessor, Macro, etc.
- Learn about advanced programming concepts like graphics and mouse programming.

B. DETAILED SYLLABUS

[1] STRUCTURES AND UNIONS

Introduction, Structure definition, Giving values to members, Structure initialization, Comparison of structure variables, Arrays of structures, Arrays within structures, Structures within structures, Structures and functions, Unions, Size of structures, Bit fields, Case studies on structures and unions.

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[2] POINTERS

Introduction, Understanding pointers, Accessing the address of a variable, Declaring and initializing pointers, Accessing a variable through its pointer, Pointer expressions, Pointer increments and scale factor, Pointers and arrays, Pointers and character strings, Pointers and functions, Pointers and structures, Pointers on pointers, Case studies on pointers.

[3] FILE MANAGEMENT IN C

Introduction, Defining and opening a file, Closing a file, Input/ Output operations on Files, Error handling during I/O operations, Random access to files, Command line arguments, Case studies on file management.

[4] DYNAMIC MEMORY ALLOCATION AND LINKED LISTS

Introduction, Dynamic memory allocation, Concept of linked lists, Advantages of linked lists, Types of linked lists, Pointers revisited, Basic list operations, Application of linked lists, Case studies on Dynamic memory Allocation and linked lists.

[5] THE PREPROCESOR

Introduction, Macro Substitutions, File inclusion, Compiler control directives, ANSI Additions.

[6] C GRAPHICS AND MOUSE PROGRAMMING

Introduction to C Graphics and Mouse Programming.

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C. INTENDED LEARNING OUTCOMES:

At the completion of the course, students will be able to …

- Have deep knowledge of C language.
- Apply his programming knowledge to develop C programs on Pointers, File handling, Preprocessor, Macro, etc.
- Able to implement C Codes on graphics and mouse programming.

D. TEXT BOOK :

1. Programming in ANSI C Authors : Bala guruswamy Edition : 3rd Edition Publisher : Tata McGraw Hill

E. REF.BOOK:

1. Let Us C Authors : Yashvant Kanetkar Edition : 12th Edition Publisher : BPB Publication
2. Journey to C Authors : Punit Ganshani Edition : 1st Edition Publisher : Mahajan Publication House
3. The C Programming Language Authors : Brian W. Kernighan Edition : 2nd Edition Publisher : Prentice Hall of India

F. LIST OF EXPERIMENTS

1. Structure & Union
2. Introduction to Pointers
3. Pointers and Arrays
4. Advanced Features of Pointers
5. File Handling
6. Command Line Arguments
7. Dynamic Memory Allocation
8. Linked List
9. Macros as Preprocessor Directives
10. C Graphics
11. Mouse Programming

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MATHEMATICS-III (AF-301)

SEM-III (2nd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
4	-	-	60	40	-	--	100	4	--	--	4

A. OBJECTIVES OF THE COURSE

- Ability to analyse and solve problems in both familiar and unfamiliar situations including those in real-life contexts with better accuracy.
- Able to apply knowledge of key theories, concepts, tools and techniques of Mathematics to solve structured and unstructured Engineering problems.
- Understand and be able to use the language, symbols and notation of mathematics
- Use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- Generate and/or analyze information, find relationships and patterns, describe these mathematically as general rules, and justify or prove them.

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B. DETAILED SYLLABUS
FOURIER SERIES :

Euler's Formulae, condition for a Fourier expansion, functions having points of discontinuity, change of interval, odd & even functions, Expansion of odd & even periodic functions, Half-range series.

MATRICES:

Fundamental concepts, operations, associated with matrices, matrix method of solution of simultaneous equations, Rank of Matrix, Linear dependence of vectors, consistency of a system of linear equations, characteristic equations, Eigen vectors and Eigen roots, Cayley Hamilton theorem.

ORDINARY DIFFERENTIAL EQUATIONS:

Linear differential equations of higher order with constant coefficients, equations reducible to linear equations with constant coefficients, Simultaneous linear equations with constant coefficients. Application to engineering problems.

PARTIAL DIFFERENTIAL EQUATIONS :

Introduction, formation, linear equation of first order, non-linear equations of first order-Charpit's method, homogenous linear equations with constant coefficient to find the complementary functions & the particular integral, non-homogenous linear equations with constant coefficients. Method of separation of variables - vibrating string problem, Heat flow equation etc.

LAPLACE TRANSFORMS :

Application to differential equation, simultaneous linear equation with constant coefficients.

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C. LEARNING OUTCOMES: At the end of the course students are able to

- Obtain Fourier series of a periodic function into the sum of a (possibly infinite) set of simple oscillating functions, namely sines and cosines.
- Able to apply the method of solving linear system of equations, linear transformation and Eigen value problem as they arise, for instance from electrical networks, framework in mechanics, curve fitting, other optimization problems and processes in statistics.
- Model physical processes using partial and ordinary differential equation and same can be solved analytically as well numerically.
- Solve basic initial value problems, directly without determining a general solution with the help of Laplace Transformation.
- Characterize the solutions of a differential equation with respect to initial values and analyze the behavior of solutions.
- Solve wave and heat equation.

D. RECOMMENDED TEXTBOOKS

1) Higher Engineering Mathematics, Dr. B.S.Grewal

E. REFERENCE BOOKS

1) A Text Book of Applied Mathematics, P.N. & J.N. Wartikar

2) Mathematics for Engineering, Chandrika Prasad

3) A Text Book of engineering Mathemetics, Dr. K.N.Srivastva & G.K.Dhawan

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FINANCIAL AND MANAGEMENT ACCOUNTING (AF-310)

SEM-III (2nd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
3	-	-	60	--	40	--	100	3	--	--	3

Objective: The need to understanding concepts of accountancy is essential in daily life of individuals as well as company where engineering is applied. Thus for better decision making, principles of accounting are applied to produce financial statements which can be appealing to the prospective stakeholders. Traditional and modern approach provides learning to understand different perspectives of accountancy which have evolved over the years. Management accounting is for understanding the Cost-Volume-Profit analysis. Concepts such as ratio analysis along with breakeven analysis are important to compare different companies of the same industry, to do fundamental analysis of a company's financial statements.

Learning Outcomes:

After completion of this course students will be able to understand:

- Concepts and principles of accounting, double-entry bookkeeping, limitations and objectives of accounting.
- Process of accounting
- Balance sheet, profit & loss statement, cash flow statement, and contents of an annual report.
- Breakeven point, marginal cost and breakeven analysis
- Concepts of time value of money, present value, future value, annuity, growing annuity, and perpetuity.

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Unit 1- Financial Accounting – An Introduction: **(5 lectures)**

- Introduction
- Meaning of Accountancy
- Book-keeping and Accounting
- Accounting Process
- Objectives for accounting
- Differences between book-keeping and accounting
- Users of accounting information
- Limitations of Accounting
- Basic terminologies

Unit 2- Accounting Concepts, Principles, Bases and Policies: **(4 lectures)**

Introduction
Accounting Concepts
Principles
Policies and Standards
Types of accounting concepts

- Business Separate entity concept
- Going concern concept
- Money measurement concept
- Periodicity concept
- Accrual concept
- Accounting Principles

- Principle of Income recognition
- Principle of expense
- Principle of matching cost and revenue
- Principle of Historical costs
- Principle of full disclosure
- Double aspect principle
- Modifying Principle
- Principle of materiality
- Principle of consistency
- Principle of conservatism or prudence
- Accounting Policies
- Changes in Accounting Policies
- Disclosure in case of changes in Accounting Policies
- Accounting Standards
- Scope and functions of Accounting Standards Board
- International Financial Reporting System

Unit 3- Double Entry Accounting: **(5 lectures)**

- Introduction
- Meaning of double entry accounting
- Classification of accounts under Traditional approach
- Classification of accounts under Accounting Equation approach
- Comparison of traditional approach with Modern approach equal approach
- Accounting Trail

- Transactions and events
- Meaning and roles of debit and credit
- Accounting equation

Unit 4- Secondary Books: **(3 lectures)**

- Introduction
- Secondary books
- Purchases Book/Purchases Day book
- Cash discount, Trade discount
- Difference between cash discount and trade discount, Sales Book or Sales Day book
- Purchase Returns Book
- Sales Returns Book
- Bills receivable book
- Bills payable book
- Cash book
- Posting to Ledger accounts

Unit 5-Trial Balance: **(4 lectures)**

- Introduction
- Meaning
- Objectives of preparing a trial balance
- Methods of preparing a trial balance
- Preparation of Trial balance

- Adjusting Entries
- Errors and their rectification
- Errors disclosed by Trial Balance
- Errors not disclosed by Trial Balance
- Steps to locate the errors

Unit 6- Final Accounts: **(3 lectures)**

- Introduction
- Adjustments before preparing final accounts
- Depreciation
- Bad Debts and accounting treatment of bad debts
- Provision for doubtful debts
- Reserves for Discount on Debtors
- Reserve for Discount on Creditors
- Closing Stock
- Trading Account
- Profit and Loss Account
- Balance Sheet

Unit 7- Introduction to Management Accounting: **(3 lectures)**

- Introduction
- Meaning of Management accounting
- The Role of Management Accounting

- Management Accounting Framework
- Functions of Management Accounting
- Tools of Management Accounting
- The Balanced Scorecard
- Cost Management System
- Value Added Concept
- Merits of Management Accounting
- Demerits of Management Accounting
- Distinction between Management Accounting and Financial Accounting

Unit 8- Financial Statement Analysis: **(3 lectures)**

- Introduction
- Meaning of Ratio
- Steps in Ratio Analysis
- Classification of Ratios
- Du Pont Chart
- Solved Problems
- Advantages of Ratio Analysis
- Limitation of Ratio analysis

Unit 9- Cash Flow Analysis: **(4 lectures)**

- Introduction
- Meaning of Cash Flow Statement
- Purpose of Cash Flow Statement

- Preparation of Cash Flow Statement
- Format of Cash Flow Statement (AS3: Revised Method)
- Cash Flow from Operating Activities
- Cash Flow Statement under Direct Method
- Different between Cash Flow Analysis and Fund Flow Analysis
- Uses of Cash Flow Statement

Unit 10- Marginal Costing and Break Even Analysis: **(3 lectures)**

- Introduction
- Concept of Marginal Costing
- Characteristics of Marginal Costing
- Difference between Absorption Costing and Marginal Costing
- Marginal Cost
- Contribution
- Cost Volume Profit (CVP) Analysis
- Break Even Chart
- Break Even Point
- Profit Volume ratio or MCSR
- Target profit
- Margin of Safety
- Application of Marginal cost
- Limitations of Marginal cost
- Solved Problems

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Unit 11- Basics of Financial Management: **(3 lectures)**

- Introduction of Financial Management
- Objectives of financial management
- Role of finance manager
- Functions of financial management
- Concept of time value of money
- Present value
- Future value
- Annuity concept
- Solved problems

Term work: **(40 marks)**

1. Students will be required submit assignment based on the topics covered in the syllabus such as ratio analysis for a company, calculation of breakeven point for a product, time value of money

Text Books:

1. Bhattacharya, S. K.; Dearden, J. *Accounting for Management – Text book & cases*; Vikash Publishing House: New Delhi, 2009.
2. Kishore, R. M. *Advanced Management Accounting*; Taxman: New Delhi, 2018.

Reference Books:

1. Arora, M. N. *A Text Book of Cost Accountancy*; Vikas Publishing: Mumbai, 2010.
2. Horngren, C. T.; Foster, S. M.; Datar, G. *Cost Accounting – A Managerial Emphasis*; Prentice Hall: New Jersey, 1997.
3. Prasad, N. K.; A.K. Prasad *Cost Accounting*; Book Syndicate: Kolkata, 2016.
4. Edmonds, T. P.; Edmonds, C. D.; Tsay, B,-Y *Fundamental Managerial Accounting Concept*; Irwin McGraw Hill: Boston, 2013.
5. Bhattacharya, A. *Principles and Practice of Cost Accounting*; Sultan Chand: New Delhi, 2004.
6. Pillai, R. S. N.; Bhagavati, V. *Cost and Management Accounting*; Sultan Chand: New Delhi, 2010.
7. Banerjee, B. *Cost Accounting – Theory & Practices;* Sultan Chand: New Delhi, 2014.
8. Saxena V. K.; Vashist, C. D. *Advanced Cost & Management Accounting – Problems & Solutions*; Prentice Hall of India: New Delhi, 2015.
9. Maheshwari, S. N. *Studies in Cost Management*; Sultan Chand & Sons: New Delhi, 2013.
10. Rao, M. E. T. *Cost and Management Accounting*; New Age International: New Delhi 2004.
11. Rao, M. E. T. *Management Accounting*; New Age International: New Delhi 2003.

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LINEAR ELECTRONICS-I (CI 308)

SEM-III (2nd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	-	2	60	40	25	25	150	4	--	1	5

A. OBJECTIVES OF THE COURSE

1. To understand the basic physical structure, principles of operation, electrical characteristics and circuit models of semiconductor devices like, various diodes, transistors and field effect transistors.
2. To understand and analyze the effect of temperature on operating point stability of BJT.
3. To introduce combination of devices in integrated-circuit form as basic system building blocks.

B. DETAILED SYLLABUS

[A] JUNCTION-DIODE CHARACTERISTIC:
The Temperature Dependence of the V/I Characteristics, Diode Resistance, Space- Charge, or Transition Capacitance CT, Charge controlled Description, Diffusion Capacitance, Junction-Diode Switching Times, Breakdown Diodes, Tunnel Diodes, Sampling gate.
[B] BIPOLAR TRANSISTOR CHARACTERISTICS: The Junction Transistor, Transistor Current Components, The Transistor as an Amplifier, Transistor Construction, The Common-Base (CB) Configuration, The Common-Emitter (CE) Configuration, The CE Cutoff Region, Currents, The CE Saturation Region, Typical Transistor-Junction Voltage Values, Common-Emitter Current Gain, Common Collector
Configuration, Inverted Mode of Operation, Transistor Ratings, Additional Transistor Characteristics, Transistor Switching Times.

[C] TRANSISTOR BIASING & THERMAL STABILIZATION:
The Operating Point of a BJT, Bias Stability, Self-Bias or Emitter Bias, Stabilization against variations in Ico, VBE and, β, Bias Compensation, Biasing Technique for Linear Integrated Circuits, Thermistor & Sensistor Compensation.

[D] FREQUENCY RESPONSE OF AMPLIFIERS:
Transistor Hybrid Model, The h Parameters, Conversion Formula For The Parameters of the Three Transistor Configurations, Analysis of Transistor Amplifier Circuit Using h Parameters, The Emitter Follower, Comparison of Transistor Amplifier Configurations, Miller's Theorem and its Dual, The Hybrid Pi Common Emitter Transistor Model at high Frequency, Hybrid Pi Conductance, Hybrid Pi Capacitances, Validity of Hybrid Pi Model, Variation of Hybrid Pi Parameters, The CE Shot Circuited Current Gain, Current Gain with Resistive Load, Single Stage CE Transistor Amplifier Response, The Gain Bandwidth Product, Emitter Follower At High Frequency, Step Response of an Amplifier, Band pass of Cascaded Stages.

[E] INTEGRATED-CIRCUITS: FABRICATION AND CHARACTERISTICS
Integrated Circuit (Microelectronic) Technology, Basic Monolithic Integrated Circuits, Epitaxial Growth, Masking and Etching, Diffusion of Impurities, Transistors for Monolithic Circuits, Monolithic Diodes, The Metal Semiconductor Contact, Integrated Resistors, Integrated Capacitors, Characteristics of Integrated Components.

[F] FIELD-EFFECT TRANSISTORS:
Construction & characteristics of JFETs, Transfer characteristics, Depletion type MOSFET, Enhancement-type MOSFET, MOSFET Handling, VMOS, CMOS, JFET biasing circuits, Depletion-type MOSFET biasing circuits, Enhancement-type MOSFET biasing circuits, FET Small signal model, AC analysis of different types of biased FET amplifiers.

C. LEARNING OUTCOMES

1. Students will be able to analyze and design circuits containing elements such as
2. diodes, transistors, and field effect transistors using the concepts of load lines,
3. Operating points and small signal low frequency and high frequency analysis.
4. Students will be able to design a biasing circuit for BJT for a specified stability.
5. Students will get basic idea of fabrication and characteristics of integrated circuits.

D. RECOMMENDED TEXTBOOKS

1. Integrated Electronics, 1st Edition By: Millman & Halkians Publisher: Tata McGraw Hill
2. Electronic Devices & Circuit Theory, 8th Edidtion By: Robert L. Boylestad & Louis Nashelsky Publication: Prentice Hall of India

E. REFERENCE BOOKS

1. Integrated Circuits, 9th Edition By: K. R. Botkar Publication: Khanna Publications

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

1. Characteristics of PN Junction Diode.
2. Characteristics of Zener Diode to obtain Dynamic Resistance.
3. Implementation of Zener Regulator circuit using Data Sheet.
4. Drain and Transfer Characteristics of FET.
5. Four Diode Bridge Sampling Gate Circuit.
6. Input and Output Characteristics of CE Configuration.
7. Input and Output Characteristics of CC Configuration.
8. Frequency Response of RC coupled CE Amplifier.
9. Gain Bandwidth product of Multistage Amplifier
10. Square Wave Response of CE Amplifier.

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ELECTRONIC MEASUREMENT (IC-301)

SEM-III (2nd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
4	-	2	60	40	25	25	150	4	--	1	5

A. OBJECTIVES OF THE COURSE

- To familiarize with the technology and practices in the area of Electrical & Electronic Measurement & Instrumentation.
- To develop different type of skills leading to the achievement of following competency, Operation & maintenance of various Electronic,
- Test and Measuring Instrument Measurement of different electrical parameters using variety of instruments

B. DETAILED SYLLABUS

[A] MEASUREMENT AND ERROR: Definitions, Accuracy and Precision, Significant Figures Types of Error, Statistical Analysis, Probability of Errors Limiting Errors.

[B] SYSTEM OF UNITS OF MEASUREMENT: Fundamental and Derived Units, Systems of Units, Electric and magnetic Units, International System of Units, Other Systems of Units, Conversion of Units.

[C] STANDARDS OF MEASUREMENT : Classification of Standards, Standards for Mass Length, and Volume, Time and Frequency Standards, Electrical Standards, Standards of temperature and Luminous Intensity, IEEE Standards.

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[D] DIRECT-CURRENT INDICATING INSTRUMENTS : Suspension Galvanometer, Torque and Deflection of the Galvanometer, Permanent-Magnet Moving-Coil Mechanism, DC Ammeters, DC Voltmeters, Voltmeter Sensitivity, voltmeter, Ammeter Method of Measuring Resistance, Series-Type Ohmmeter Shunt-Type ohmmeter, Multimeter or VOM, Calibration of DC Instruments, Alternating-Current indicating instruments Thermo instruments, Electrodynamometers in Power Measurements Watt-hour Meter, Power- Factor Meter, Instrument Transformers.

[E] BRIDGES AND THEIR APPLICATION: Introduction, Wheatstone Bridge, Kelvin Bridge,
Guarded Wheatstone Bridge, AC Bridges and Their Application, Comparison Bridges, Maxwell Bridge, Hay Bridge, Schering Bridge, Unbalance Conditions, Wien Bridge, Wagner Ground Connection, Potentiometer.

[F] ELECTRONIC INSTRUMENTS FOR MEASURING BASIC PARAMETERS : Amplified DC Meter, AC Voltmeter Using Rectifiers, True RMS- Responding Voltmeter, Electronic Multimeter, Considerations in Choosing an Analog Voltmeter, Differential Voltmeters, Digital Voltmeters, Component Measuring Instruments, Q Meter, Vector Impedance Meter, Vector Voltmeter, RF Power and Voltage Measurement.

[G] OSCILLOSCOPES: Introduction, Oscilloscope Block Diagram, Cathode Ray Tube CRT Circuits, Vertical Deflection System, Delay Line, Multiple Trace, Horizontal Deflection System, Oscilloscope Probes and Transducers, Oscilloscope Techniques, Special Oscilloscopes.

C. LEARNING OUTCOMES

At the completion of the course, the students will be able to....

- Understand concept, system of units and standards of measurement.
- Measure various electrical parameters with accuracy, precision and resolution, in any electrical/electronic system.
- Use AC and DC Bridge for relevant parameter measurement.
- Use CRO, DSO, Multimeter and LCR meter for appropriate measurement
- Test and troubleshoot electronic circuit using various measuring instruments.

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RECOMMENDED TEXTBOOKS

1. Electronic Instrumentation and Measurement Technique, 5th Edition By: Wlliam D. Cooper & Albert D. Helfrick Publisher: Prentice Hall of India

REFERENCE BOOKS

1. Electrical & Electronic Measurement & Measuring Instruments, 17th Edition By: A.K. Sawhney Publisher: Dhanpat rai & Co.
2. Electronics Measurement & Instrumentation,1st Edition By: R.K.Rajput Publication: S. Chand & Company Ltd

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

1. To determine the resolution and internal resistance of Multimeter by measuring different electrical quantities in various ranges.
2. To study the operation and applications of CRO and DSO.
3. To determine the deflection sensitivity of CRT.
4. To study operation of LCR meter and to measure unknown value of component using LCR meter.
5. To measure unknown value of resistance using Wheatstone bridge.
6. To extend the range of an Ammeter.
7. To extend the range of a Voltmeter.
8. To Calibrate the D'Arsonval movement as a series type ohmmeter.
9. To determine frequency and phase using Lissajous Pattern on CRO/DSO.
10. To find modulation index of a modulated wave on CRO/DSO.
11. To measure high resistance using loss of charge method.
12. Design series type ohmmeter for a given half scale position resistance

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NETWORK ANALYSIS (EL-304)

SEM-III (2nd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
4	-	2	60	40	25	25	150	4	--	1	5

A. OBJECTIVES OF THE COURSE

To offer profound understanding about analysis of electrical networks in time domain and using Laplace transforms. The course also aims at describing various theorems and methods for solution of the networks in theory and through hands on.

B. DETAILED SYLLABUS

[A]DEVELOPMENT OF THE CIRCUIT CONCEPT:

Introduction, Charge and Energy, The Relationship of Field and Circuit Concepts, The Capacitance Parameter, The Inductance Parameter, The Resistance Parameter, Units and scaling, Approximation of a Physical System as a circuit.

[B] CONVENTIONS FOR DESCRIBING NETWORKS:

Reference Directions for Current and Voltage, Active Element Conventions, the Dot Convention for Coupled Circuits, Topological Description of Networks.

[C] NETWORK EQUATIONS

Kirchhoff's Laws, The Number of Network Equations, Source Transformations, Examples of the Formulation of Network Equations Loop Variable Analysis, Node Variable Analysis, Determinants: Minors and the Gauss Method, Duality, State Variable Analysis.

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[D] FIRST ORDER DIFFERENTIAL EQUATIONS:
General and particular solutions, Time constants, the integrating factor, More Complicated Networks
[E] INITIAL CONDITIONS IN NETWORKS:
Why Study Initial Conditions? , Initial Conditions in Elements, Geometrical Interpretation of Derivatives, A Procedure for Evaluating Initial Conditions, Initial State of a Network
[F] DIFFERENTIAL EQUATIONS (CONTINUED)
Second order equations ;Internal Excitation, Higher order equations ;Internal Excitation, Networks Excited by External Energy Sources, Response as related to the s-Plane Location of Roots, General Solutions in terms of S,Q and ωn
[G] THE LAPLACE TRNASFORMATION
Introduction, The Laplace Transformation, Some Basic Theorems for the Laplace Transformation, Examples of the solution of problems with the Laplace Transformation, Partial Fraction Expansion, Heaviside's Expansion Theorem, Examples of Solutions by the Laplace Transformation
[H] TRANSFORMS OF SPECIAL SIGNAL WAVEFORMS:
The Shifted Unit Step Function, The Ramp and impulse Functions, Waveform Synthesis, The Initial and Final Value of f (t) from F(s), The Convolution Integral, Convolution as Summation.
[I] IMPEDANCE FUNCTIONS AND NETWORK THEOREMS: The concept of Complex Frequency, Transform Impedance and Transform Circuits, Series and Parallel Combinations of Elements, Superposition and Reciprocity, Thevenin's Theorem and Norton's Theorem.

[J] NETWORK FUNCTIONS: POLES AND ZEROS

Terminal Pairs or Ports, Network Functions for One Port and Two port. The Calculation of Network Function (1)Ladder Networks (2) General Networks, Poles and Zeros of Network Functions, Restrictions on Pole and Zero Locations for Driving-Point Functions, Restrictions on Pole and Zero locations for Transfer Functions, Time-domain Behavior from the Pole & zero plot
[K] TWO PORT NETWORKS
Relationship of two port variables, short circuit admittance parameters, the open circuit impedance parameters, transmission parameters, the hybrid parameters, relationship between parameter sets, parallel connection of two port networks.

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C. LEARNING OUTCOMES

At the completion of the course, students will be able to …

1. Understand behaviour of basic circuit elements- R, L, C.
2. Apply Kirchhoff's Laws to find currents, voltages and power in typical DC electric circuits using a variety of analytical methods.
3. Simplify complicated circuits into the Thevenin's and Norton's equivalent circuits.
4. Represent and analyse networks by differential equations and Laplace transforms.
5. Evaluate the time response of basic circuits with one energy storage element to the sudden application of DC voltage or current as well as to the sudden change in the circuit configuration.
6. Define basic parameters describing a sine wave and evaluate the steady state time response of R, L and C elements supplied by sinusoidal voltage or current sources.
7. Determine two port network parameters and their relationships
8. Develop the concept of Transform Impedance, Transform Admittance and Transfer Functions.

D. RECOMMENDED TEXTBOOKS

1. Network Analysis, 3rd Edition By: M.E. Van Valkenburg Publisher: Prentice Hall of India Private Limited

E. REFERENCE BOOKS

1. Network Analysis and Synthesis, 3rd Edition By: U. A. Patel Publisher: Mahajan Publication House
2. Circuit Theory- Analysis & Synthesis, 1st Edition By: A. Chakrabarti Publication: Dhanpat Rai & Company

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1. To verify the Kirchhoff's voltage law (KVL) and Kirchhoff's current law (KCL).
2. Transient and steady state behaviour of R-C circuit.
3. To verify the Thevenin's Theorem.
4. To verify the Norton's Theorem.
5. To verify the Superposition Theorem.

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6. To verify the Reciprocity Theorem.
7. To verify the Maximum Power Transfer Theorem.
8. To find the Open circuit impedance (Z) Parameters for two port networks.
9. To find the short circuit admittance (Y) parameters for two port networks.
10. To find the hybrid (h) parameters for two port networks.
11. To find the Transmission (ABCD) parameters for two port networks.
12. To study Network Functions: Poles and Zeros.

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DIGITAL ELECTRONICS (IC-302)

SEM-III (2nd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	-	2	60	40	25	25	150	4	--	1	5

A. OBJECTIVES OF THE COURSE

B. DETAILED SYLLABUS

[A] BINARY SYSTEMS: Introduction to digital computers and Digital systems, Binary numbers, Number Base Conversion, Octal and Hexadecimal Numbers, Compliments, Binary Codes, Binary Storages and Register, Binary Logic, Integrated Circuits.
[B] BOOLEAN ALGEBRA AND LOGIC GATE: Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Property of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations and Digital Logic Gates, IC Digital Logic Families.
[C] SIMPLIFICATIONS OF BOOLEAN FUNCTIONS: The Map Method, Two and Three Variable Maps, Four Variable Map, Five and Six Variable Maps, Product of Sum Simplifications, NAND and NOR Implementations, Don't-Care Conditions, The Tabulation Method, Determinations of Prime–Implicates, Selection of PrimeImplicates, Concluding Remarks.
[D] COMBINATIONATIONAL LOGIC: Introduction, Design Procedure, Address, Subtractor, Code conversion, Analysis Procedure, Multilevel NAND Circuits, Multilevel NOR Circuits, Exclusive OR and Equivalence Functions.

[E] COMBINATIONAL LOGIC WITH MSI AND LSI: Introduction, Binary Parallel Adder, Decimal Adder, Magnitude Comparator, Decoders, multiplexers, Read Only Memory (ROM), Programmable Logic Array(PLA), Concluding Remarks
[F] SEQUENTIAL LOGIC: Introduction, Flip-Flops, Triggering of Flip-flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignments, Flip-Flop Excitation tables, Design Procedure, Design of Counters, Design of State Equations.
[G] REGISTERS, COUNTERA AND THE MEMORY UNIT Introduction, Registers, Shift Registers, Ripple Counters, Synchronous Counter, Timing Sequence, The Memory Unit, Examples of Random Access Memories.
[H] DIGITAL INTEGRATED CIRCUITS: Introduction, Bipolar Transistor characteristics, RTL and DTL Circuits Integrated-Injection Logic, Transistor-Transistor Logic, Emitter-Couple Logic, Metal Oxide Semiconductor, complimentary MOS.

C. INTENDED LEARNING OUTCOMES: After completion of the course students should be able to:

- Study and understand binary systems
- Understand basics of Boolean algebra and logic gates
- Study and understand combinational logic
- Study and understand sequential logic
- Study and understand basics of sequential logics
- Study and understand basics of registers, counters and memory units
- Study and understand basics digital integrated circuits

D. TEXT BOOK : (1) Digital Logic and Computer Design By M.Morris Mano

E. REF.BOOK: (1) Microelectronics By Jacob Millman & Arvin Grabel McGraw-Hill International Edition

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Department of Instrumentation and Control Engineering

MATHEMATICS-IV (AF-401)

SEM-IV (2nd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
4	-	-	60	40	-	--	100	4	--	--	4

A. OBJECTIVES OF THE COURSE

- Ability to analyse and solve problems in both familiar and unfamiliar situations including those in real-life contexts with better accuracy.
- Able to apply knowledge of key theories, concepts, tools and techniques of Mathematics to solve structured and unstructured Engineering problems.
- Understand and be able to use the language, symbols and notation of mathematics
- Use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- Generate and/or analyze information, find relationships and patterns, describe these mathematically as general rules, and justify or prove them.

B. DETAILED SYLLABUS

FUNCTIONS OF COMPLEX VARIABLE :

Analytic functions, Cauchy -Rieman equations, Harmonic functions, orthogonal system, complex potential function, Determination of conjugate function, conformal transformation, some standard transformations, bilinear transformation,line integral, properties of complex integration, Cauchy's theorem and Cauchy's integral formula.

NUMERICAL METHOD :
Solution of algebraic and transcendental equations, by Newton - Raphson method, Direct iteration method, false position method, Solution of linear simultaneous equation :(1) Gauss - elimination (2) Gauss - jordan (3) Gauss - siedal method , Numerical methods to solve first order and first degree ordinary differential equations by Picard's method &Taylor's series method, Modified Euler's Method, Milne's Method, Runge's method, Runge kutta method.

FINITE DIFFERENCES & DIFFERENCE EQUATIONS :
Finite difference, Interpolation, Newton's forward and backward and central differences and Lagrange's formula, Strling & bessel's formula, Numerical differentation & Integration, Trapezoidal rule, Simpson's (both) rules, Difference equations with constant coefficient.

VECTOR CALCULUS :
Vector function of a single scalar variable, Differentiation of vectors, simple applications to plane, motion, scalar and vector point functions, Del applied to scalar point function (gradient) Divergence of a vector point function, curl of a vector, second order expressions, line integrals, surface integrals, Gauss theorem and stoke's theorem.

STATISTICAL METHODS :
Binomial distribution, poission distribution, normal distribution, calculation of errors, probable errors, standard error, coefficient of correlation, lines of regression.

C. LEARNING OUTCOMES:

- Proficient to apply the theory and concepts of vector differential calculus and vector integral calculus in problems related to fluid flow, heat flow, electro static and so on.

- Understanding concept of Complex numbers and Complex functions and able to check the analyticity based on Cauchy-Riemann equations.
- Able to evaluate the complex integration and real integrals of practical interest.
- Able to interpolate and extrapolate the data with the help of numerical methods.
- Use numerical methods to find an approximate solution of algebraic and transcendental equations using appropriate method.
- Able to handle data numerically or graphically, in order to see what properties data have and what kind of information we can extract and if data influenced by chance student may apply the concepts and rules of probability theory.

D. RECOMMENDED TEXTBOOKS

1) Higher Engineering Mathematics, Dr. B.S.Grewal

E. REFERENCE BOOKS

1) A Text Book of Applied Mathematics, P.N. & J.N. Wartikar & Chandrika Prasad.

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

Not applicable

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Faculty of Technology

Department of Instrumentation and Control Engineering

CONTROL THEORY (IC-407)

SEM-IV (2nd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	-	2	60	40	25	25	150	4	--	1	5

A. OBJECTIVES OF THE COURSE

To prepare students to have knowledge of various types of control systems with characteristics, Transfer function of any control system with different techniques and mathematical model for physical systems, various stability criteria, define system specifications in time and frequency domain, identify stable/unstable systems and relative/ marginally stable various time and frequency domain stability analysis techniques, time-frequency domain concepts, calculate system specifications and solve control problems.

B. DETAILED SYLLABUS

[A] INTRODUCTION: Open-loop and closed loop control system, Servomechanism, Historical development of control system, sampled data & digital control system, Multivariable control system, Application in non-engineering field.

[B] MATHEMATICAL MODELS OF PHYSICAL SYSTEMS: Introduction, Differential equation of physical systems, Transfer functions, Block diagram algebra, signal flow graph. (Note: Problems on electrical, mechanical & electromechanical systems only.)

[C] FEEDBACK CHARACTERISTICS OF CONTROL SYSTEMS: Feedback and non feedback systems, reduction of parameter variations by use of feedback, control over system dynamics by use of feedback, effects of disturbance signals by use of feedback, linearizing effect of feedback, regenerative feedback, Basics of Feed forward Control System with example.

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[D] TIME RESPONSE ALALYSIS, DESIGN SPECIFICATION AND PERFORMANCE INDICES CONCEPTS OF STABILITY AND ALGEBRAIC CRITERIA: Introduction, standard test signals, time response of first order system, time response of second order system, steady state errors and error constants, effects of adding zero to a system, design specifications and constructions for second and higher order systems, performance indices, examples, concepts and conditions for stability, Huwitz's and Routh's stability criteria, relative stability criteria.

[E] THE ROOT LOCUS TECHNIQUE: Introduction, Rules of construction of root loci, sketching of root locus and applications

[F] FREQUENCY DOMAIN ANALYSIS & STABILITY: Frequency domain specifications, correlation between time and frequency domain specifications, Bode plot, Polar plot. Concept of stability, R-H criterion, Nyquist stability.

C. LEARNING OUTCOMES

1. The students shall be able to judge the best stable system by implementing the various techniques.
2. The students shall understand and analysis LTI Systems using various stability analysis techniques.
3. The students shall be able to solve control problems based on system specifications calculations.

D. RECOMMENDED TEXTBOOKS

a) Control System Engineering: By - Nagrath & Gopal

E. REFERENCE BOOKS

1. Control systems Engineering: By – U. A. Patel, Mahajan Publishing House
2. Problems and Solutions of Control Systems With Essential Theory: by Jairath, CBS Publisher
3. Modern Control Engineering: By - K. Ogata , Prentice Hall
4. A course in control engineering: By - A. Subbarao and Parag R. Desai. Dhanpat Rai Publications Ltd.
5. Automatic Control System: By - S.N.Verma , Khanna Publications
6. Feedback Control Systems: By - Di Staffeno

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F. LIST OF EXPERIMENTS

1. To Generate & Study Standard Test Signals using Function generate & DSO
2. Design, Determine & Plot Transient response of First Order System using Scilab & RC Circuit. Required Plat Form: Scilab for Simulation and Function Generator, DSO, Resistors, capacitors, DMM & Probes
3. Design, Determine & Plot Transient response of Second Order System using Scilab & RC Circuit. Required Plat Form: Scilab for Simulation and Function Generator, DSO, Resistors ,capacitors, DMM & Probes
4. Design, Determine, compare & Plot transient response of Type-0, Type-1 & Type-2 system using Scilab & RC Networks. Required Plat Form: Scilab for Simulation and Function Generator, DSO, Resistors , capacitors, DMM & Probes
5. Design, Simulate & Plot Frequency response (Bode Plot) of First Order System. Compare Scilab Results with Practical Results. Required Plat Form: Scilab for Simulation and Function Generator, DSO, Resistors , capacitors, DMM & Probes
6. Design, Simulate & Plot Frequency response (Bode Plot) of Second Order System. Compare Scilab Results with Practical Results. Required Plat Form: Scilab for Simulation and Function Generator, DSO, Resistors, capacitors, DMM & Probes
7. Design & Plot Frequency response of Second Order system for damping factor – 0.1, 0.5 & 1 for second order RC filter using OPAMP.
8. Draw transient response of Under Damp, Over Damp system with respect to Step Input.
9. Design & Sketch Polar Plot for First Order & Second Order System. Required Plat Form: Scilab for Simulation and Function Generator, DSO, Resistors, capacitors, DMM & Probes
10. Simulate Root Locus for first Order & Second Order System for different value of K;0 also observe the effect of K on Position of Poles.

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Department of Instrumentation and Control Engineering

LINEAR ELECTRONICS – II (CI-418)

SEM-IV (2nd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	-	2	60	40	25	25	150	4	--	1	5

A. OBJECTIVES OF THE COURSE
To offer a profound understanding of the design, analysis, and applications for analog electronics circuits.

B. DETAILED SYLLABUS

[A] P0WER CIRCUITS AND SYSTEMS:
Amplifier Classification, Distortion in Amplifiers, Large-Signal Amplifiers, Harmonic Distortion, , Efficiency of a Class A Amplifier, Push-Pull Amplifiers, Class B amplifiers, Class AB Operation, Regulated Power Supplies, Series Voltage Regulator.

[B] FEEBACK AMPLIFIER CHARACTERISTIC:
Classification of amplifiers, the feedback concept, The Transfer Gain with Feedback, General Characteristics of negative-feedback amplifiers, Input Resistance, Output Resistance, Method Analysis of a feedback amplifier, Voltage-series feedback, Current-series feedback, Current-Shunt feedback, Voltage-shunt feedback.

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[C] OSCILLATORS USING TRANSISTOR:
Sinusoidal Oscillators, The phase-shift Oscillators, Resonant-circuit Oscillators, A general form of Oscillator circuits, Colpitt's Oscillator, Hartley's Oscillator, Clapp's Oscillator, Crystal Oscillators.

[D] OPERATIONAL AMPLIFIER CHARACTERISTICS:
Differential amplifier, DC and AC analysis of bipolar differential Amplifier, The ideal operational amplifier, Inverting and Non-inverting Amplifiers, Op-Amp Parameters, Measurement of Op-Amp Parameters, General description of various stages of Op-Amp, Open-loop and Closed-loop Frequency response, Op-Amp Stability, Frequency Compensation.

[E] LINEAR APPLICATIONS OF OP-AMP:
Summing and Difference amplifiers, Integrator and Differentiator, Current-to-voltage converters, Voltage-to-current converters, Current Amplifiers, Voltmeters and Current meters, Instrumentation Amplifiers, Transducer Bridge Amplifiers, Ideal and realistic frequency response of various filters, Basic first-order low-pass and high-pass filters, first order wideband band pass filters(phase-shifter), Second-order low-pass filters, Secondorder high-pass filters, Second-order Band-pass filters, Second-order Band-reject filters.

[F] NON-LINEAR APPLICATIONS OF OP-AMP: Precision half-wave rectifiers, Precision full wave rectifiers, Log amplifiers, Antilog amplifiers, Zero crossing detector, level detectors, Voltage magnitude comparator and window detector, Basic peak detectors using Op-Amps and comparators, Basic Sample and Hold circuits, Digital-to-Analog (D/A) Converters, Analog-to- Digital (A/D) Converters.

[G] WAVESHAPING & WAVEFORM GENERATORS: The Op-Amp as Voltage comparator, Some Applications of a comparator using Op-
Amp, Schmitt trigger circuit, Basic Triangular wave generator, Astable and Monostable multivibrator using Op-Amp, Introduction to 555 Timer, Timer 555 used in Astable and Monostable mode.

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C. LEARNING OUTCOMES

At the completion of the course, students will be able to

1. Understand the fundamentals and datasheet parameters of Op – Amp.
2. Design and analyze linear, non-linear, and waveform generating applications using Op – Amp.
3. Design various amplifier and oscillator circuits using feedback concepts.
4. Design and develop various applications using 555 timer in astable and monostable modes.
5. Design voltage regulator and different class of power amplifier circuits.

D. RECOMMENDED TEXTBOOKS

1. Integrated Electronics, 1st Edition By: Millman & Halkians Publisher: Tata McGraw Hill
2. Op- Amp and Linear Integrated Circuits, 4th Edition By: Ramakant A. Gayakwad. Publication: Pearson Education

E. REFERENCE BOOKS

1. Integrated Circuits, 9th Edition By: K. R. Botkar Publication: Khanna Publications

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

1. Inverting - Non Inverting Amplifier
2. Op-amp as a Summer Circuit and a Differential Amplifier
3. Feedback Amplifiers
4. Frequency Response Parameters
5. Integrator and Differentiator
6. Comparator Applications and Schmitt Trigger
7. RC Phase-Shift Oscillator
8. Square wave and Triangular wave Generator
9. Frequency Response of Low-pass Butterworth Filter
10. Monostable and Astable Multivibrator
11. Regulated Power Supply

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Faculty of Technology
Department of Instrumentation and Control Engineering

POWER ELECTRONICS (IC-406)

SEM-IV (2nd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	-	2	60	40	25	25	150	4	--	1	5

A. OBJECTIVES OF THE COURSE

To prepare the students to gain knowledge about the construction, operation & characteristics of Power Semiconductor Devices,
To analyze behavior of different power electronics switches for selection of components for design applications.

B. DETAILED SYLLABUS

[A] POWER SEMICONDUCTOR DEVICES:

Power Electronics Applications, Introduction, Power Semiconductor Converters, Thyristor Applications, Types of Power Diode, Series & Parallel operation of Diodes, Power MOSFET, Hybrid devices, IGBT, GTO, DIAC, TRIAC, and LASCR & Shockley Diode.

[B] THYRISTOR PRINCIPAL AND CHARACTERESTICS:

Introduction, Principal of Operation of SCR, Static Characteristics, Two Transistor Model of SCR, Construction, Gate Characteristics, Gate Circuit Parameter, Dynamic Characteristic, Measurement of Thyristor parameter, Series & Parallel Operation of Thyristor, Thyristor Rating.

THYRISTOR PROTECTION:

Introduction, Over Voltage and Current Protection, dv/dt & di/dt Protection, Gate Protection, Thermal Protection.

[C] RECTIFYING CIRCUITS, CONTROLLED RECTIFIER AND FILTERS:
Review of Half wave, Full wave & Bridge rectifiers with filter circuits, Introduction to Single Phase Controlled Rectifier, Control Techniques, Single Phase Half Wave Controlled Rectifier, Single Phase Full Wave Controlled Rectifier, and Single Phase Half Controlled Bridge Rectifier.

[D] REGULATORS & POWER SUPPLIES: Introduction, Voltage Regulation & Ripple Voltage, Voltage Multiplier Circuits, Discrete
Voltage Regulators, Zener Voltage Regulators, Basic Operation of Switching Regulators Transistorized Regulators, Current Regulator, IC Voltage Regulators.
[E] GATE TRIGGERING DEVICES & CIRCUITS: Introduction, Firing of Thyristor, Pulse Transformers, Optical Isolators, Gate Triggering Circuits (R & RC triggering) , UJT & PUT (Basic Operation, Mathematical Analysis & Firing Circuits), Phase Control using Pedestal & Ramp Triggering, Microprocessor Interface to Power Thyristor**.**

[F] THYRISTOR COMMUTATION CIRCUITS: Introduction, Turn of Mechanism, Turn-off Methods (Class-A Circuit with Mathematical Analysis, Class-B Circuit, Class-C Circuit, Class-D Circuit, Class-E Circuit, Class-F Circuit, Jones Turn-off Circuits & Design Examples)

C. LEARNING OUTCOMES
At the completion of the course, students will be able to

1. Understand construction operation & behaviour of different power semiconductor devices and design various power converter circuits with protection
2. Design triggering circuits & commutation circuits
3. Design power supply using Linear & Switching Regulators

D. RECOMMENDED TEXTBOOKS

[1] Power Electronics: Devices, Circuits, Systems & Applications By: H.C.Rai , Galgotia Publication Pvt. Ltd.
[2] Power Electronics By: M.D. Singh, K.B. Khandchandani Tata McGraw-Hill

E. REFERENCE BOOKS

[1] Power Electronics By: P. C. Sen, Tata McGraw-Hill Education
[2] Thyristor: Theory and Applications By: R. K. Sugandhi & K. K. Sugandhi , New Age International (P) Limited
[3] Introduction to Thyristors & their Applications By: Ramamurthy , East West Books (Madras) Pvt Ltd
[4] Thyristor Engineering By: M.S.Berde , Khanna Publishers

F. LIST OF EXPERIMENTS

1. DSO &lab station
2. Characteristic of SCR
3. Characteristic of DIAC
4. Characteristic of TRIAC
5. Characteristics of MOSFET
6. Measurement of latching and holding current
7. UJT as oscillator
8. PUT as oscillator
9. R & RC Triggering Circuits
10. Class A type of commutation
11. Class B type of commutation
12. Class C type of commutation
13. Class D type of commutation
14. Linear & Switching regulator devices

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ELECTRICAL MACHINES & POWER (CI-416)

SEM-IV (2nd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	-	2	60	40	25	25	150	4	--	1	5

A. OBJECTIVES OF THE COURSE

To offer a profound understanding of different electrical machines .Also to learn concepts of electrical power generation, transmission and distribution.

B. DETAILED SYLLABUS

PART-I: ELECTRICAL MACHINES

[A] DC MACHINES:

DC Generator

Types of Generator, Iron Losses in Armature, Total Losses in Generator, Stray Losses, Constant Losses, power stages, condition for maximum efficiency and power, No load saturation characteristics, loadsaturation curve, internal, external characteristics of separately excited generator, critical speed & resistance. All ofthese characteristics without mathematical treatment.

DC motor

Principle and basic theory

[B] AC MACHINES:

Transformer

(1 phase Transformer) Working principle, construction, elementary theory of ideal transformer,E.M.F.equation, transformer on no load and load, transformer with winding resistance but no magnetic leakage, equivalent resistance, magnetic leakage, transformer with leakage reactance and resistance, exact volt drop,equivalent circuit, O.C. & S.C. tests, efficiency & regulation, why transformer are rated in kVA?, losses, conditionfor maximum efficiency, all day efficiency, concepts of auto transformer, define Buchholz relay, basic of 3-phasetransformer & their types of connections

Three Phase Motors

Classification, merits & demerits, construction, why does rotor rotate, slip, frequency of rotorcurrent, Relation between torque & rotor p.f., starting torque of squirrel cage & slip ring motors, condition formaximum starting torque, effect of change in supply voltage on starting torque, torque slip characters, effect of voltage on torque & speed, Induction motor as a generator, power stages, torque, mechanical power & rotoroutput, analogy with mechanical clutch &DC motor, Linear induction motor.

AC Starter

DOL Starter, primary res. Starter, Auto transformer, Star delta (only theory).

Single Phase Motors

Types, Double Field Revolving Theory, Making motor self-starting, AC Series, Universal motors.

Alternators

Basic principle, difference with DC generator, construction, damper winding, factors affectingalternator size, Alternator on load, synchronous reactance, vector diagram of a loaded Alternator, determination ofvoltage regulation by EMF method, Parallel operation of alternators.

PART–II: ELECTRICAL POWER

[A] GENERATING STATIONS

Schematic arrangement of Power plants- thermal, hydro, nuclear, diesel and gas turbine.

[B] VARIABLE LOAD ON POWER STATIONS Structure of electric power system, load curves, important terms and factors, unit generated per annum, loadduration curves, types of loads, typical demand and diversity factors.

[C] POWER FACTOR IMPROVEMENT

Power factor, Power triangle, Disadvantage of low p.f., causes, (Significance of low and high power factor), (KVAR)calculations, power factor improving equipment, importance of p.f. improvement, Most economical power factor.

[D] MECHANICAL DESIGN OF OVER HEADING LINES

Main components, conductor materials, line supports, types of insulators, string Efficiency and its improvement.

[E] PERFORMANCE OF TRANSMISSION LINE

Classification of overload transmission line, important terms, Performance of short transmission line.

[F] UNDER GROUND CABLES

Construction of cables, insulating materials, classification.

[G] INTRODUCTION TO SWITCH GEAR

Switchgear, essential features of switchgear, switchgear equipments, bus bar arrangement, short-circuits currents, faults in power system.

[H] CURCUIT BREAKER

Arc phenomenon, principle and methods of arc quenching, important terms

[I] FUSES

Fuses, desirable characteristics of fuse element, Fuse element material, important terms, and types of fuse.

[J] RELAY

Protective relays, Fundamental requirements of protective relaying, relay timing, important terms, Time/P.S.M.curve, and calculation of relay operating time.

[K] PROTECTION OF ALTERNATORS & TRANSFORMERS

Differential protection of alternators, Protection of transformer, earth-fault protection

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C. LEARNING OUTCOMES

Compare the various types of power stations for generation of power and comparative Merit/Demerits. Analyze the performance of various units involved in the power plants.

1. Design power system components for a specified system and applications.
2. Calculate electrical power and plot the power /Energy demand in the form of graph.
3. Understand working of electrical machines and their applications.
4. Differentiate electrical machines
5. Understand different types of circuit breakers, fuses and protective relaysfor protecting power system equipments.

D. RECOMMENDED TEXTBOOKS

1. Electrical Technology (Vol: II), Authors : B. L. Theraja&A.K.Theraja Edition : 23rdEdition Publisher : S. Chand & Company Ltd
2. Principles of Power System Authors : V. K. Mehta&Rohit Mehta Edition :4th Edition, Publisher: S. Chand & Company Ltd

E. REFERENCE BOOKS

1. Theory and Performance of ElectricalMachine Authors : V.B. Gupta Edition : 13th Edition Publication: Laxmi
2. Electrical Engineering Authors : R.K. Rajput Edition : 1st Edition Publication: Laxmi
3. Course in Power System Authors : J. B. Gupta Edition : 10th Edition Publication: S. K. Kataria& Sons
4. Switchgear and Protection Authors : J. B. Gupta Edition : 2nd Edition Publisher: S. K. Kataria& Sons

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

1. Study of DC Generator
2. Transformer Open Circuit Test and Short Circuit Test
3. Load Test on Single Phase Transformer
4. Transformer Sumpner's Test
5. DC Shunt Generator Characteristics
6. DC Series Generator Characteristics
7. DC Compound Generator Characteristics

8. DC and AC starter
9. No-load and Block rotor test on 3-Phase Squirrel Cage Induction Motor
10. Load Test on 3-Phase Squirrel Cage Induction Motor
11. To find out the Regulation of Alternator by Synchronous Impedance Method.
(OC & SC Test and Load Test of 3-Phase Alternator)

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CONTROL TECHNOLOGY: COMPONENTS & SYSTEMS (IC-408)

SEM-IV (2nd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	-	2	60	40	25	25	150	4	--	1	5

A. OBJECTIVES OF THE COURSE

To prepare the students to gain knowledge about construction & operation of Control Systems Components and to determine basic structure of Control System Problem.

B. DETAILED SYLLABUS

[A] INTRODUCTION TO CONTROL PROBLEM

Control systems: Terminology and basic structure, the genesis and essence of feedback control theory, Feedback control structure, and Multivariable control systems.

[B] MECHANICAL COMPONENTS:

CAMS AND FOLLOWERS:

Introduction, Components of Cam, Types of Cam, Types of Followers, Classifications, Cam Motions, Cam Terminology, Cam Profile , Cam as a Mechanical Function Generator

GEARS, CLUTCHES, BREAKS:

Brief introduction of Integrators, Gears, Clutches, Break etc.

[C] OPTO-ELECTRONIC DEVICES:
Classification, Photoconductive, Photo Voltaic & Photo-emissive sensors with applications. Liquid Crystal Display device.

[D] ELECTRO-MECHANICAL COMPONENTS:
POTENTIOMETER:
Introduction, Type of Potentiometers, Applications, Selection of Potentiometers
TACHOMETERS:
Introduction, Characteristics requirement, DC Tachogenerator, AC Tachogenerators,
Tachometer Applications, characteristics of Tachogenerator
SERVO MOTOR:
Introduction, DC Servomotors, AC Servomotors
RELAYS:
Introduction, Classification of Relays, Relay Circuits, Construction of Relay, Logic Relay, Optoelectronic Relay, Relay Problems & Remedies, Relay Race, Actuation & Release Time, Characteristics of Electromechanical Relay, Dynamic Characteristics of Reed Relay, Merits & Design Features of Reed Relay
STEPPER MOTORS:
Introduction, PM type Stepper Motor, VR type Stepper Motor, Hybrid Stepper Motor, Disc Magnet Stepper Motor, Applications of Stepper Motors, Drive Circuits for Stepper Motor
SOLENOIDS:
Construction, Selection & Different types of Solenoid.
UNIVERSAL MOTOR:
Construction, Operation, Speed control
SWITCHES:
Single pole, double pole, elect mechanical, thumbwheel etc.

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[E] HYDRAULIC SYSTEMS & VALVES:
Introduction, Advantages & Disadvantages of Hydraulic Systems, Components of Hydraulic System, Classification of Hydraulic Systems, Control with Pump-Controlled Hydraulic System, Pump Controlled Hydraulic Motor, Hydraulic Transmission Lines , Hydraulic Power Supply, Different types of Hydraulic Valve

C. LEARNING OUTCOMES
At the completion of the course, students will be able to
1. Explain construction, operation & behaviour of different control system components
2. Identify different control problem

D. RECOMMENDED TEXTBOOKS
[1] Control systems principle and design By: M.Gopal, Tata McGraw-Hill Education publication
[2] Electronic Devices & Circuits – An Introduction By: Mottershed, Prentice hall publication
[3] Modern control Technology: Components and systems By: Kilian, Cengage Learning publication
[4] Control systems components By: M.D. Desai, PHI publication

E. REFERENCE BOOKS
[1] Electro-Mechanical System Components By: Edward S. Charkey, John Wiley & Sons Canada Limited publication
[2] Control System Components By: Gibson & Tuteur, Ernest otto doebelin Publication
[3] Handbook of Gear design By: Gitin M. Maitra, Tata Mcgrow Hill Publication
[4] Servomechanism Practice By: Ahrendt & Savant, McGraw-Hill
[5] Mechanical & Industrial Measurements By: R. K. Jain, Khanna Publishers
[6] Electro-Mechanical Components for Servo Mechanism By: Davis & Ledgerwood, McGraw-Hill publication

F. LIST OF EXPERIMENTS
1. Operation &Construction of Stepper Motor
2. Characteristic of a Relay
3. Hysteresis of DC Relay

4. Cams & Followers
5. Speed Measurement using Photoelectric type sensor
6. Speed Measurement using Magnetic type Sensor
7. Potentiometer as an Error Detector
8. Opto Transmitter &Receiver Devices
9. Gears, Breaks & Clutches

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MICROPROCESSOR & MICROCONTROLLER (IC-514)

SEM-V (3rd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

- To prepare the students to gain application level knowledge about microprocessor & microcontroller

B. DETAILED SYLLABUS

[A] INTRODUCTION TO MICROPROCESSOR & MICROCONTROLLER

Introduction to Microprocessors, Basic information about Instruction Set & Assemble Language, Introduction to CISC & RISC Architecture, Difference between Microprocessor & Microcontroller and Example Application Discussion

[B] MICROPROCESSOR 8085 ARCHITECTURE, MEMORY & I/O DEVICES INTERFACING

Microprocessor Architecture & Its Operation, Memory Devices, I/O Devices, Logic Devices for Interfacing, Memory Interfacing, I/O Interfacing, Timing diagram & Applications

[C] AVR Architecture & Assembly Language Programming

Architecture, Memory Map & Registers of AVR, Assembly Programming, Data Move Instructions and I/O Port Programming, Branch & Call Operations, Arithmetic Instructions and Programs

[D] AVR Timer, Interrupt

Programming Timers 0, 1 and 2, Counter Programming, Timer Programming in C, AVR Interrupts, Programming of Timer & External Hardware Interrupts, Interrupt Priority, Interrupt Programming in C, Serial Port Connection of ATMEGA & Programming in C and Assembly Language

[E] Serial Port, SPI & I2C Bus

Serial Port of ATMEGA32 & Programming using Assembly & C SPI Bus Protocol and Programming I2C Bus Protocol and Programming

C. LEARNING OUTCOMES

At the completion of the course, students will be able to

- Explain basic operation and architectural difference between of microprocessor & microcontroller

- Integrate memory devices & Input output devices with 8085

- Explain timing diagram of various instructions of 8085

- Do basic programming of 8085 in Assembly language

- Utilize various features of AVR microcontroller for building up various applications

- Do basic & application level of programming of AVR Controller in Assembly & C Language

- Develop basics application using AVR microcontroller

D. RECOMMENDED TEXTBOOKS

1. Microprocessor Architecture, Programming and Applications with the 8085, by R. S. Gaonkar, Penaram International Publishing (India) Private Limited

2. The AVR Microcontroller & Embedded Systems, by Mahuammad Ali Mazidi, Sarmad Naimi, Sepehr Naimi, Pearson Publication

3. Embedded Systems, by B. Kanta Ra, PHI

E. REFERENCE BOOKS AND STUDY MATERIAL

1. Microprocessor Application in Control & Instrumentation by Bibbero

2. Programming and Customizing the AVR Microcontroller by Dhananjay Gadre

F. LIST OF EXPERIMENTS

1. Importance of Microprocessor & Microcontroller

2. Architecture of 8085 & Interfacing of Memory Devices, Input Devices & Logic Devices with 8085

3. Interrupts & Timing Diagram of 8085

4. Basic 8085 Assembly Programming

5. AVR Architecture

6. Getting Started with AVR Studio (Free Version) for programming of AVR Controller

7. Simulation of Data Move Instructions and I/O Port Programming, Branch & Call Operations, Arithmetic Instructions using AVR Studio in Assembly & C

8. AVR Timer Programming & Simulation using AVR Studio

9. AVR Interrupt Programming & Simulation using AVR Studio

10. AVR Serial Port Programming & Simulation using AVR Studio

11. Mini Project Part-1 using AVR Microcontroller (Shall be demonstrated in practical exam)

Dharmsinh Desai University

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Department of Instrumentation and Control Engineering

SIMULATION TOOLS (IC-515)

SEM-V (3rd Year)

Program Elective-I

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

- To develop the ability in students for use of simulation tools in order to apply for better theoretical understanding.
- To apply use of such tools to experiments, projects etc. for implementation and detailed analysis of the same.

B. DETAILED SYLLABUS

Computing with Scilab

[A] Introduction to Scilab
Basics of Scilab, Numbers, Constants, Syntax

[B] Matrices
Entering Matrices, Subscripts, The Colon Operator, Concatenation, Special Matrices, Size of a Matrix

[C] Matrix Algebra
Transpose, Adding and Subtracting Matrices, Multiplication and Powers of Matrices, The Dot Operator, Mathematical Functions

[D] Programming in Scilab

FOR loops, Functions, Returning Multiple Values, Local and Global Variables, Comparison and Logical Operators, WHILE Loops, IF Statements, Graphs, Simple Graphs, Styles, Multiple Curves, Multiple Plots, Other Features, 3D Curves, Histograms

[E] Working with Files in Scilab

Function Files, Script Files, Exporting Data, Importing Data

Virtual Instrumentation using LabVIEW

[F] Introduction to Virtual Instrumentation

What is VI?, How to use Computer in VI?, LABVIEW & Virtual Instrumentation
Conventional & Graphical Programming
Components of LABVIEW, Tools & other Pallets, Color coding Code debugging,
Creating sub – VIs

[G] For and While Loop

The FOR & WHILE loop, Loop Behavior & Inter loop communication, Local & Global

[H] The Structures

Sequence structures, Case structures, Formula Nodes

[I] Arrays and Clusters

Arrays, Clusters, Inter conversions of Arrays & Clusters

[J] Charts and Graphs

Wave form charts, Resetting plots, Use of cursors, X-Y graphs

[K] State machines

What is a state machine, A simple state machine, Event structures, Full state machine

[L] File input output

File formats, File I/O functions, Path functions, File WRITE and READ

[M] String handling

String functions, LABVIEW string formats, Parsing of strings, Examples

[N] Basics of data acquisition

Classification of signals, Real world signals, Analog interfacing, Connecting the signal to the board, Bridge signal source

[O] Data acquisition with LabVIEW, DAQ and Vis

Measurement & Automation Explorer, The wave form data type, Use of simple VIs & DAQmx, Intermediate Vis, Express VI's-DAQ assistant, Analysis, Instrumentation

[P] Interfacing instruments GPIB and RS 232

RS 232 vs. GPIB – Handshaking, GPIB Interfacing, RS232c/RS485 Interfacing VISA

[Q] Advanced topics in labVIEW

Inter process communication,
Front panel activity, Data socket, programmatically controlling VI's

C. LEARNING OUTCOMES

At the completion of the course, students will be able to:

- perform computational and numerical calculations using simulation tools
- acquire, analyze and present data
- programmatically log data
- perform file level operations

D. RECOMMENDED TEXTBOOKS

[1] Virtual Instrumentation using LabVIEW, Jovitha Jerome, Prentice Hall India

[2] Programming in Scilab 4.1 By- Vinu V.Das, Newage publication

E. REFERENCE BOOKS & NOTES

[1] Notes on Scilab, Gary Bunting

[2] Introduction to Scilab, Michael Baudin, Scilab Consortium

[3] Virtual Instrumentation using LabVIEW, Sanjay Gupta & Joseph John, Tata McGraw Hill

F. LIST OF EXPERIMENTS

1) Introduction to LabVIEW
2) Using loops in LabVIEW
3) Arrays and Clusters in LabVIEW
4) Decision Making using Case Structures in LabVIEW
5) File Handling in LabVIEW
6) Introduction to Scilab
7) Matrix Algebra in Scilab
8) Using loops, logical operators in Scilab
9) Graphical data presentation in Scilab
10) File Handling in Scilab

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Department of Instrumentation and Control Engineering

INDUSTRIAL ELECTRONICS & DRIVES (IC-519)

SEM-V (3rd Year)

Program Elective-I

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

- To teach the students different types of thyristor Applications
- To make the students aware about core concepts of Power converters and their applications at industries
- To teach fundamental concepts of how to select suitable values and ratings of power devices for designing power converters like 3 phase rectifiers, All types of inverters, choppers etc.
- To make the students aware about fundamental concepts of DC drives ,their industrial Applications and speed control techniques of DC drives
- To make the students aware about fundamental concepts of AC drives ,their industrial Applications and speed control techniques of AC Drives

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B. DETAILED SYLLABUS

[A]POLYPHASE RECTIFIERS: Three phase controlled converters, Three pulse Converters(M3 Connection), Six Pulse Converters, Three Phase fully Controlled Bridge Converters, Three phase half Controlled Bridge Converter, Selection of Converter Circuits

[B] CONVERTERS & INVERTERS: Chopper Classification & Operation, Chopper Control Strategies, Chopper Configuration, Thyristor based Chopper Circuits, AC Choppers, Classifications of Inverters, Single phase Voltage source inverters, Performance Parameters of Inverters, PWM Inverter, 3 Phase Inverter, Thyristor based Inverters, Series Inverter, Self Commutated Inverter, Parallel Inverter, Current Source Inverter

[C] AC & DC DRIVES: Introduction, Speed Control of Induction Motors, Stator Voltage Control, Variable Frequency Control, Schemes for DC motor Speed Control, PLL Control of DC Drives, DC Chopper Drives

[D] INDUSTRIAL APPLICATIONS: Introduction, Introduction Heating, Dielectric Heating, Welding, HVDC Transmission, Smart UPS, Hybrid and Electrical Vehicles

[E] CYCLOCONVERTER & DUAL CONVERTER: Introduction, Basic Principle of Cycloconverters and Dual Converters, Single phase to single phase cycloconverter, Dual converter with and without circulating current Operation, Dual mode dual Converter

C. LEARNING OUTCOMES

After successful completion of this course, student shall be able to:

- Understand the application of Induction heating& Dielectric Heating
- Understand the concepts of different types of resistive welding

- Develop designing skill of different types of choppers , invertersand polyphase rectifiers
- Understand the circuit operation and application of Cycloconverter&Dual converter
- Aware about industrial applications of DC & AC Drives

D. RECOMMENDED TEXTBOOKS

1. A Text book on Power Electronics – Devices, Circuits, Systems and Applications, 2 nd Edition, by Dr. H. C. Rai
2. Industrial Electronics and Control, PHI Publication, Biswanath Paul
3. Power Electronics By: M.D. Singh, K.B. Khandchandani Tata Mcgrawhill, 2nd Edition

E. REFERENCE BOOKS

1. Industrial Electronics, 11th Edition, by G. K. Mithal
2. Calculations in Industrial Electronics and Instrumentation, by V. K. M. John
3. Engineering Electronics, by John D. Ryder
4. Thyristor Engineering, by M. S. Berde
5. Power Electronics, by P. C. Sen
6. Electric Motor Drives - Modeling, Analysis, And Control, by R. Krishnan

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F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

List of laboratory experiments:

1. To perform the operation of forced commutation Class A, Class- B and Class –C
2. To perform the operation of forced commutation Class Dand Class -E
3. To perform the operation of DC motor Speed Control
4. To perform the operation of Jone's Chopper
5. To perform the operation of Morgan's Chopper
6. To study single Phase full wave Controlled bridge Rectifier with R Load
7. To study single Phase full wave Controlled bridge Rectifier with RL Load
8. To perform the operation of Series Inverter
9. To perform the operation of Parallel Inverter
10. To perform the operation of Cycloconverter

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MEASUREMENT TECHNIQUES (IC-516)

SEM-V (3rd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

- To make the students aware about importance of measurement in control system design-development along with classification and terminologies of measurement Techniques
- To teach the students about specifications, selection criteria and characteristics of instrumentation measurement systems
- To teach the students about analytical parameter measurement methods and applications of relevant sensing-transduction instruments
- To teach the students about physical and industrial process parameter measurement methods and applications of relevant sensing-transduction instruments

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B. DETAILED SYLLABUS

[A] Fundamentals of Instrumentation

Basic concepts of measurement , Fundamental elements of measurement system, Applications of instrumentation systems, Classification of Instruments, Standards & calibration, Errors & Uncertainties in performance parameters, Static performance parameters, Impedance loading & matching, Selection of the instrument, Formulation of system equations, Dynamic response.

[B] Industrial Measurements

Displacement Measurement:

Introduction, Principles of transduction (variable resistance, inductance, reluctance and capacitance type transducers), digital transducers, measurement of Acceleration

Speed Measurement:

Introduction, Mechanical tachometers: Revolution counter, Centrifugal force tachometer, Resonance tachometers, Electric tachometers: Eddy current type tachometers, Electric Generator type tachometers, Contactless type tachometers, Frequency type tachometers, Ignition type tachometers, Stroboscopic tachometers, Pneumatic type speed transmitting elements, Measurement of Speed, Frequency and Short Time Intervals by direct application of frequency standards by comparative methods.

[C] Process Parameters measurement: Measurement of Humidity, Specific gravity and Viscosity, Measurement of pH & conductivity.

[D] Strain Measurement

Introduction, Factors affecting strain measurements, Types of strain gauges, Theory of operation of resistance strain gauges, Types of electrical strain gauges, Materials for strain gauges, Gauging techniques and other factors, Strain gauge circuits, Temperature compensation, Applications

[E] Vibration Measurement

Introduction, Characteristics of vibration, Analysis of vibration sensing devices, Vibration sensing devices, Signal conditioners, Shock measurements, System characteristics, Vibration exciters, Calibration

[F] Basics of Analytical Instruments

Basic elements of analytical instruments, Basic Introduction mass Spectrometers, IR Spectrophotometers and UV Spectrophotometers, Introduction of chromatography – Gas Chromatography

C. LEARNING OUTCOMES

After successful completion of this course, student shall be able to:

- develop awareness about needs of measurement systems along with their design-development, classification and associated technical terminologies
- learn specifications and salient characteristics based choice making of instrumentation measurement systems
- learn methods and applications in the field of analytical instrumentation
- learn measurement methods and applications of physical and industrial parameter

D. RECOMMENDED TEXTBOOKS

- Instrumentation Devices & Systems by Rangan, Sharma & Mani, 2nd edition-2005
- Mechanical & Industrial Measurement by: R.K. JAIN, 11h Edition- 2004
- Handbook of Analytical Instruments by: RS Khandpur, 16th reprint -2005
- Instrumentation Measurement & Analysis by: B.C. NAKRA & K. K. CHAUDHRY,3rd edition-2013

E. REFERENCE BOOKS

- Practical Instrumentation Transducers by: OLIVER
- Mechanical & Industrial Measurement by: R.K. JAIN, 11th Edition-2004
- Handbook of Analytical Instruments by: R. S. KHANDPUR
- Instrumentation devices & systems by RANGAN, SHARMA & MANI
- Industrial Instrumentation Fundamentals by: A.E.FRIBANCE

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

List of laboratory experiments:

1. To study the characteristics of Linear Variable Displacement Transformer
2. To study the characteristics of Light Dependent Resistor
3. To study the characteristics of Strain Gauge
4. To study the characteristics of Inductive Pick-up
5. To study the characteristics of Capacitive Pick-up
6. To study the characteristics of Piezoelectric Pick-up
7. To study the characteristics of Proximity Switch
8. To study the pH measurement & to measure the pH of different solutions
9. To study the digital conductivity meter
10. To study the Gas Chromatography

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COMMUNICATION SYSTEMS (IC-518)

SEM-V (3rd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

To prepare students to acquire knowledge about Analog & Digital Communication Systems, basic of Fiber Optic Communication and fundamental concept of Data Communication and Networking

B. DETAILED SYLLABUS

[A] INTRODUCTION TO COMMUNICATION SYSTEMS

Introduction to Communication, Elements of Communication System, Need for Modulation, Electromagnetic Spectrum & Typical Applications, Basic Terminologies in Communication Systems, Signal Representation & Analysis

[B] AMPLITUDE MODULATION

Principles of Amplitude Modulation (AM), AM modulating circuits, AM Modulator & Demodulator Circuits, Basics of AM Transmitters & Receivers.

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[C] ANGLE MODULATION

Introduction, Principal of FM, Sinusoidal FM & Analysis, Non-Sinusoidal Modulation : Deviation Ratio, Phase Modulation, Comparison between PM & FM, Sinusoidal PM, Digital PM, Angle Modulators & Demodulators, FM Transmitters & Receivers

[D] DIGITAL COMMUNICATION

Introduction, Information Capacity, Bits, Bit Rate, Baud, and *M*-ary Encoding, Amplitude-Shift Keying, Frequency-Shift Keying, Phase-Shift Keying, Quadrature-Amplitude Modulation, Bandwidth Efficiency, Carrier Recovery, Clock Recovery, Differential Phase-Shift Keying, Probability of Error and Bit Error Rate. Error Performance

[E] PULSE MODULATION

Introduction, Pulse Amplitude Modulation, Pulse Code Modulation, Differential PCM, Delta Modulation, Pulse Frequency Modulation, Pulse Time Modulation, Pulse Position Modulation, Pulse Width Modulation

[F] FIBER OPTICS

Introduction , History of Optical Fiber Communications, Optical Fibers versus Metallic, Electromagnetic Spectrum, Block Diagram of an Optical Fiber Communications System, Optical Fiber Types, Light Propagation, Optical Fiber Configurations ,Optical Fiber Classifications, Cable Facilities, Losses in Optical Fiber Cables, Light SourcesOptical Sources, Light Detectors, Lasers

[H]INTRODUCTION TO DATA COMMUNICATIONS AND NETWORKING

Introduction & History, Data Communications Network Architecture, Protocols and Standards, Standard Organization for Data Communication, Layered Network Architecture, Data Communication Circuits, Serial & Parallel Data Transmission, Data Communication Circuit Arrangement, Data Communication networks

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[I]FUNDAMENTAL CONCEPTS OF DATA COMMUNICATIONS

Introduction, Data Communications Codes, Bar Codes, Error Control, Error Detection, Error Correction, Character Synchronization, Data Communications Hardware, Data Communications Circuits, Line Control Unit, Serial Interfaces (RS232 & RS485), Data Communications Modems

C. LEARNING OUTCOMES

At the completion of the course, students will be able to

- Explain Amplitude Modulation –Demodulation Techniques , Frequency Modulation-Demodulation Techniques and applications
- Explore & Analyze various parameters for digital modulation techniques like Frequency Shift Keying, Amplitude Shift Keying, Phase Shift Keying, Differential Phase-Shift Keying, Pulse Amplitude Modulation, Pulse Code Modulation, Differential PCM, Delta Modulation, Pulse Frequency Modulation, Pulse Time Modulation, Pulse Position Modulation, Pulse Width Modulation
- Explain fundamental concept of Data Communications & Networking

D. RECOMMENDED TEXTBOOKS

1. Electronic Communication Systems By: George Kennedy, Tata McGraw-Hill Education Pvt. Ltd.
2. Advanced Electronic Communications Systems By: Wayne Tomasi, Pearson Education Limited.
3. Electronics Communication By: Roddy & Coolen, Pearson Prentice Hall, Inc.

E. REFERENCE BOOKS

1. Modern digital ananlog communication system By: B.P.Lathi
2. Electronic Communication Systems By: William Schweber, PHI Publication.

3. Communication systems By: Simon Haykins, John Wiley Publication.

F. LIST OF EXPERIMENTS

1. construct a triangular wave using Fourier series trainer
2. construct a Square wave using Fourier series trainer
3. Analysis of Harmonics on DSO
4. Audio Input / Output Amplifier
5. To perform Amplitude Modulation
6. To perform the Frequency Modulation
7. To perform Pulse Code Modulation
8. To perform FSK & ASK
9. ADC & DAC
10. To perform PAM, PPM and PWM
11. Serial Communication using RS232 & RS485
12. Introduction to Wireless Communication

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PROCESS MEASUREMENT (IC-517)

SEM-V (3rd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

To prepare the students to gain knowledge about the standards, principle, working and applications of process sensors and transducers

B. DETAILED SYLLABUS

[A] PRESSURE MEASUREMENT:
Manometers, Elastic type – Bourdon tube, diaphragm, bellows elements, Bell gauges, Solid State, Piezo- elastic and vibrating element type pressure transducer, Vacuum gauges Mechanical and electric types, differential pressure transmitter.

[B] FLOW MEASUREMENT:
Theory of flow system, Reynold's number, Variable pressure (Head) type meters-orifice, Orifice calculations and installation, Venturi tube, Pilot tube, Flow nozzle. Variable Area meters-rotameter, Open channel meters, Mass flow meters, Velocity meters, Quantity meters, Electomagnetic flow meter, turbine flow meters, Ultrasonic flow meters, Vortex flow, Anemometers, Flow markers, Laser anemometers, Flow measurement for solid materials.

[C] LEVEL MEASUREMENT:
Theory of level measurement, Float gauges, Differential pressure type level measurement technique, Level measurement by weighing, bubbler technique, thermal effect type, Capacitance type, Ultrasonic and radiation type level measurement techniques, level

measurement in open vessels and pressure vessels, Measurement of interface levels, Measurement of level of dry material.

[D] TEMPERATURE MEASUREMENT:

Liquid Gas and Vapour filled thermometers, Bimetal thermometers, Resistance Thermometers RTD, Thermisters, Thermo electric temperature measurement technique Thermocouples and thermopiles Radiation thermometers optical and electrical pyrometers Accuracy and response characteristic of different devices, Differential Temperature measurement.

C. Text Books:

1. Industrial Instrumentation By: D.P. Eckman. , CBS Publishers and Distributers
2. Principles of industrial instrumentation By: D Patranabis, Tata Mc Graw Hill
3. Instrumentation Devices and system By: Rangan, Sharma, Mani, McGraw Hill Education

D. Reference Books:

1. Instrumentation, Measurement and Analysis By: B.C. Nakra & K. K. Chaudhary , McGraw Hill
2. Mechanical And Industrial Measurements By: R. K. Jain, Khanna Publishers
3. Industrial Instrumentation Fundamentals By: Austin Fribance, Tata McGraw Hill publication
4. Industrial Flow Measurement, 3rd Edition, By: David W. Spitzer, ISA
5. Flow measurement methods and applications By: Jim E.Hardy, Jim O. Hylton, Tim E. McKnight, Carl J. Remenyik, Francis R. Ruppel, Wiley-Blackwell,
6. Temperature Measurement, 2nd Edition By: L Michalski, K Eckersdrof, J Kucharski, J McGhee, Wiley
7. Modern Sensors Handbook, By: Pavel Ripka, Wiley
8. Industrial Instrumentation- Principles & Design By: Tattamangalam R.Padmanabham, Springer
9. Instrumentation and Process Measurement By:W.Bolten, Universities Press
10. Instrumentation Measurement and Control By A.K. Ghosh, PHI

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E. LEARNING OUTCOMES:

After completing this course students should be able to:

- Describe standards for process measurements
- Explain various sensors used for measurement of Temperature for industrial applications
- Explain various sensors used for measurement of Pressure for industrial applications
- Explain various sensors used for measurement of Flow for industrial applications
- Explain various sensors used for measurement of Level for industrial applications

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

List of laboratory experiments:

1. To find out time response of first and second order system
2. To find out input output characteristic of RTD
3. To find out time constant of given RTD
4. To find out input output characteristic of Thermocouple
5. To find out time constant of given Thermocouple
6. To find out characteristic of Thermistor
7. To measure temperature of an object using non contact thermometer
8. To find out characteristics of given strain gauge pressure transducer
9. To find out characteristics of given piezoelectric pressure transducer
10. To measure flow using orifice plate
11. To measure flow using Venturi tube
12. To measure level in a tank using hydrostatic level sensor

13 To measure level in a tank using Ultrasonic level sensor

14 To determine ON-OFF control characteristic using Thermistor

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PROFESSIONAL COMMUNICATION-I (AF-501)

SEM-V (3rd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
1	0	2	50	-	-	50	100	1	0	1	2

Objectives:

- To develop confidence in the students for communicating at workplace.
- Develop their Listening, Speaking, Reading, and Writing Skills.
- To give exposure of communicating with public.
- How to develop fluency in English Language.
- To prepare students for placement.
- To teach how to be effective at the job.

Learning Outcomes:

After completion of this course students will be able to understand:

- Communication Process and framework
- Obstacles in Communication

- Possible remedies to barriers of communication
- Effective Listening, Reading, Writing and speaking skills
- Implementation of Non-Verbal features in the presentation
- Ways and manners Presentations, Speech, Group talk and Interview
- Competence in writing and reading

Unit 1- Introduction to Professional Communication:

- Importance
- Methods and Manners
- Need of Professional Communication
- Objectives of Professional Communication
- Skills required for Professional Communication
- Employers' Expectations

Unit 2- Communication and Barriers:

- Introduction
- Process
- Principles
- Components
- Types of Communication
- Main problems of Communication
- Verbal Communication
- Oral Communication

    - Written Communication
    - Advantages of Verbal Communication
    - Limitations of Verbal Communication
    - Non-Verbal Communication
    - Importance of Non-Verbal
    - Kinesics
    - Proxemics
    - Chronemics
    - Haptics
    - Oculesics
    - Paralanguage
  - Barriers of Communication
- Intrapersonal
- Inter-Personal
- Organisational
- Noises in Channel
- Physical
- Semantic
- Psychological
- Physiological

Unit 3- Language Proficiency:

- Introduction
- Basic Grammar Rule

- Vocabulary Building
- Language Games

Unit 4- Four Skills:

- Introduction
- Listening
  - -Process
  - -Types of Listening
  - -Six Stages of Listening
  - -Listening Criticism
  - -Characteristics of effective listening
- Speaking
  - -Elements of speaking skills
  - -Pronunciation
  - -Speech art
- Reading
- Skimming
- Scanning
- Intensive Reading
- Levels of Comprehension (Literal and Inferential)
- Techniques of Good Comprehension
- Improving Comprehension Skills
- Writing
  - -Developing Writing skills

-Letter and E-mail writing

Text Books:

1. Meenakshi Raman, Sangeeta Sharma. Technical Communication: Principles and Practice; Oxford University press: New Delhi, 2004.
2. Meenakshi Raman, Prakash Singh. Business Communication: Second edition; Oxford University Press: New Delhi, 2012.
3. Steve Hart, Arvind R. Nair, Veena Bhambhani. Embark: English for Undergraduates; Cambridge University Press: Delhi, 2016.

Reference Books:

1. T M Farhathullah. *Communication Skills for Technical Students;* Orient Longman Private Ltd.: Chennai, 2002.

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MICROCONTROLLER APPLICATIONS (IC-610)

SEM-VI (3rd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

- To prepare the students to design & develop microcontroller based applications using 8-bit AVR controllers

B. DETAILED SYLLABUS

[A] AN AVR MICROCONTROLLER DESIGN

A microcontroller Design, Testing the Design, Timing Subroutine, Lookup Tables Concept & Serial Data Communication

[B] BASIC APPLICATIONS & PROGRAMMING

Different types of Keyboard Interfacing & programming, Seven Segment Display interfacing & programming, LCD Interfacing & Programming, ADC Programming Keyboard, Internal ADC Programming & Sensor Interface, External Serial ADC & DAC, Relay, Optoisolator & Stepper Motor Interfacing & Programming, Input Capture & Wave Generation in AVR, PWM Programming & DC Motor Speed Control, MAX7221 Display Interface using SPI, DS1307 RTC Interface using I2C, RS232 & RS485 Bus Communication applications using UART

[H] INDUSTRIAL APPLICATICATIONS

MEASUREMENT OF ELECTRICAL QUANTITIES & PROTECTION:

Frequency, AC voltage, AC current, DC Voltage, DC Current, phase angle, power factor, AC Power, Over Current Relay

MEASUREMENT & CONTROL OF PROCESS PARAMETER:

Temperature, Pressure, Level & Flow

APPLICATION CASE STUDIES:

Traffic Control, Firing angle control of SCR, Process Controller, Machine Tool Control, Distributed Computer Control System, Industrial Control Boards

C. **LEARNING OUTCOMES**

At the completion of the course, students will be able to

- integrate & test Microcontroller based system
- write different application programs using Lookup table, Timing subroutine & Serial data subroutine
- interface & build applications using key board, LED Display, LCD Display, ADC, DAC , RTC with AVR Controllers
- use Serial Communications applications for networking applications
- build Industrial Applications using AVR Controller

D. RECOMMENDED TEXTBOOKS

1. The AVR Microcontroller & Embedded Systems, by Mahuammad Ali Mazidi, Sarmad Naimi, Sepehr Naimi, Pearson Publication
2. Embedded Systems, by B. Kanta Ra, PHI
3. Fundamentals of Microprocessors & Microcomputers,by B. Ram, Dhanpat Rai Publications

E. REFERENCE BOOKS AND STUDY MATERIAL

1. Microprocessor Application in Control & Instrumentation by Bibbero
2. Programming and Customizing the AVR Microcontroller by Dhananjay Gadre

F. LIST OF EXPERIMENTS

1. Study of AVR Studio & Getting started with Embedded C Programming
2. Time Delay Subroutine
3. Measurement & Generation of Frequency
4. Internal ADC Programming
5. Interfacing of External DAC & Waveform generation
6. Different type of Keyboard Interfacing & Programming
7. Seven Segment Display Interfacing & Programming
8. LCD Interfacing & Programming
9. Serial Port UART Programming
10. RTD Interfacing & Programming
11. Mini Project Part-2 using AVR Microcontroller (Shall be demonstrated in practical exam)

Dharmsinh Desai University

Faculty of Technology

Department of Instrumentation and Control Engineering

PROCESS INSTRUMENTATION AND CONTROL (IC-613)

SEM-VI (3rd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

- To make students acquire knowledge about the concept of controller principles, algorithms and tuning methods, different types of pneumatic control valve construction, applications, selection and valve sizing

- To prepare students to analyze and design discrete and continuous controllers

B. DETAILED SYLLABUS

[A] P/I AND P/I CONVERTERS: Manometric transducers, Torque balance design, Oscillator type, electro pneumatic transducers, Transducer positioners, magnetic converters, differential transformer converters

[B] CONTROLLER PRINCIPLES : Introduction, process characteristics, control system parameters, discontinuous controller modes, continuous controller modes, composite control modes

[C] CONTROL LOOP CHARACTERISTICS: Introduction, control system configuration, Single and multivariable control systems, Control system quality, Stability, Process loop tuning

[D] PNEUMATIC CONTROL VALVE AND ACTUATORS: Introduction, operating mechanism of control valves, direction control valves, construction and working of control valves, Pneumatic Actuators, Selection of control valves and actuators

[E] CONTROL VALVE CHARACTERISTICS: Characteristics of control valves, rangeability, control valve selection, Sizing of control valves

C. Text Books :

1. Process Control Instrumentation Technology, By: C. D. Johnson, Pearson Education Ltd

2. Industrial Instrumentation Fundamentals By: Austin Fribance, Tata McGraw Hill publication

3. Applied Instrumentation in Process Industries, Vol. II, By: W.G. Andrews/H.B.Williams, Gulf Publication Company

4. Control system components By: M.D.Desai, Pearson Prentice Hall, Inc

D. Reference Books :

1. Measurement systems : Applications & Design By: Ernest Doeblin, McGraw Hill

2. Instrumentation measurement & analysis By: B.C. Nakra & K. K. Chaudhary , McGraw Hill

3. Mechanical & Industrial Measurement, By: R. K. Jain, Khanna Publishers

4. Transducers & Instrumentation, By: D. V. S. Moorty, PHI Learning Pvt.Ltd

5. Instrumentation - Devices & Systems, By Rangan, Sharma & Mani, Tata McGraw Hill publication

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E. LEARNING OUTCOMES:

- After completing this course students will be able to:
- Explain different P/I and I/P converters
- Design and analyze P, PI, PD, PID Controllers
- Select and size appropriate pneumatic control valve based upon various selection parameters

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT

List of laboratory experiments:

1 Response of P Controller

2 Response of PI Controller

3 Response of PD Controller

4 Response of PID Controller

5 Study of control calve cut sections

6 To study pneumatic system components

7 To find out characteristics of I/P converter

8 To find out characteristics of P/I converter

9 Study of control valve characteristics

10 Instrumentation Amplifier characteristics

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Faculty of Technology

Department of Instrumentation and Control Engineering

INSTRUMENTATION SYSTEMS (IC-611)

SEM-VI (B.Tech, 3rd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

- To prepare the students to gain application level knowledge about microprocessor &

B. DETAILED SYLLABUS

[A] INTRODUCTION & SYMBOLS:

Introduction to instrumentation system, Standard instrumentation system symbols, Symbols for Distributed Control Systems, Standard P & I diagrams for typical instrumentation systems.

[B] CONTROL ROOM SUPPLY:

Uninterrupted Power Supply, Area classifications & safety standards, intrinsic safety.

[C] DISTRIBUTED DIGITAL CONTROL SYSTEMS:

Introduction, History, Architecture of DCS, Architecture of DCS components – like Process Control Units, Single Loop & Multi Loop Controllers, Man-Machine Interface, Key-board units, Engineering unit etc., Typical graphics display used in DCS, Architecture of

three popular DCS – Honeywell, Yokogawa and Foxboro. Computer networking fundamentals and standards, Communication protocols, Concept of open architecture, Introduction to OLE and OPC

[D] INSTALLATION PRACTICE:

Installation practice for commissioning, maintenance & renovation of a plant. Documents required for installation of instrumentation systems. Testing of different instruments. Industry Standards & Recommended Practices for the installation & maintenance of various Instruments.

[E] SAFETY DEVICES:

Pressure relief valves, Rupturing disc, Flame-arrester, and Pressure switch.

[F] INDUSTRIAL NETWORKING:

An introduction to networking in process automation, Serial Communication, communication formats, error checking, encoding, communication modes, Serial interface standards, RS-232, RS-422, RS-485, USB, IEEE1394, HART network, Fieldbuses , MODBUS, PROFIBUS, FOUNDATION FIELDBUS.

C. LEARNING OUTCOMES

After successful completion of this course, student shall be able to:

- study and learn fundamental and latest concepts of industrial automation systems, with special focus on Distributed Control System (DCS) design and implementation in real life industrial process plants
- learn hierarchical advancements in industrial process plant automation systems
- study, interpret and prepare the instrumentation system documents and drawings
- understand the role for safety in industry

- learn industrial grade automation and communication technologies for industrial applications along with different industrial communication protocols and standards

D. RECOMMENDED TEXTBOOKS

1. Applied Instrumentation in Process Industries, Vol. I, by Andrews & Williams
2. Instrument Engineer's Handbook (Process Control), by B. G. Liptak
3. Mechanical & Industrial Measurements, 8th Edition, by R. K. Jain
4. Process Instrumentation Handbook, P. R. Srinivasan
5. Applied Instrumentation in Process Industries, Vol. II, by Andrews & Williams
6. Computer based industrial control, by Krishnakant, 1997 edition
7. Field Bus Technology: Industrial network standards for real time distributed control by Nitaigour Premchand Mahalik, Springer (2008)

E. REFERENCE BOOKS

1. Applied Instrumentation in Process Industries, Vol. III, by Andrews & Williams
2. Instrumentation, by Kirk & Rimboi
3. Industrial Instrumentation Fundamentals, by A. E. Fribance
4. Foundation field bus overview, National Instruments (May 2003)
5. Foundation field bus system engineering guidelines (Foundation field bus)

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F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

2. Instrumentation symbols, coding, diagrams and graphics and their interpretation
3. Instrument Air Supply System
4. Compressor
5. Pressure Switch
6. Air Filter Regulator
7. Strip chart recorder
8. Interfacing of strip chart recorder with RTD
9. Current-to-Pressure Transducer (I/P Convertor)
10. Pressure-to-Current Transducer (P/I Convertor)
11. HART Protocol and Smart Transmitter
12. Interfacing of Smart DP Transmitter with Digital Flow Indicating Totalizer
13. Single Loop Programmable Controller (SLPC)
14. Supervisory Control And Data Acquisition (SCADA)
15. Distributed Control System (DCS)

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AUTOMATION SYSTEM INTEGRATION (IC-616)

SEM-VI (3rd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

- To make the students aware about the concept of Automation, parts of automation system and their applications for developing automation application using PLC and SCADA

B. DETAILED SYLLABUS

[A] Programmable Logic Controller

- The PLC: A Over all look :-Introduction, Manufacturing and assembly process , PLC advantages and Disadvantages, Overall PLC system , CPU and Programmers , PLC Input/Output modules, Solid state memory
- General PLC programming Procedures
- Devices connected with PLC I/O modules :-Input/output on/off switching devices , Input/output Analog devices
- Programming on/off inputs to produce on/off outputs
- Relation to digital gate logic to contact/coil logic

- Creating ladder diagrams from process control descriptions
- PLC Basic functions :-PLC timer, counter, arithmetic functions
- PLC Intermediate functions :-PLC Number comparison functions , Numbering systems and PLC number conversion functions
- Data Handling Functions :-PLC skip and master control relay functions, JUMP functions, PLC data moves.
- PLC functions working with bits:- Digital bits, Sequential, controlling a robot with PLC, Matrix functions
- Advanced PLC functions :- Analog PLC operations, PID control of continuous process, networking of PLCs
- PLC Installation, Trouble shooting and maintenance
- PLC Auxiliary Commands and Functions Monitor Mode function, Force mode function, functions for different programming formats, print functions, Selection of PLC, Industrial control and rise of PLC, PLC versus PC, factors to consider in selecting a PLC
- PLC Installation Practices Installation Practices, Consideration of the operating environment, receiving check, testing and assembly, electrical connections, grounding and suppression considerations, circuit protection and wiring, troubleshooting PLC malfunctions, PLC maintenance

[B] Principles of Data Acquisition

Introduction of Data Acquisition system, sampling concept, digital to analog converters, analog to digital converters, Block diagram, Protections in DAS, Isolation in DAS, Data Acquisition Configuration

[C] System Integrity Level in Automation Systems :

Conceptual design stage, ISA conceptual design stage, IEC 615108 on conceptual design, skills and resources, basic SIS configuration, shared functions, technology choices, pneumatics relays, safety relay, solid state systems

[D] Safety PLC:

Programmable systems for the logic solver, upgrading of PLCs for safety applications, characteristics of safety PLCs, hardware characteristics of safety PLC, software characteristics of safety PLC, design of safety PLC, Triple Modular Redundant (TMR) systems, safety PLC with 1oo3 architecture, communication features of safety controllers, classification and certification , SIS architecture conventions

[E] Introduction and basics of SCADA and SCADA Configuration

Advance configuration of WONDERWARE SCADA, Detail study of SCADA configuration building blocks

C. LEARNING OUTCOMES

After completing this course students should be able to:

- Describe the features of Automation system
- Develop program for PLC and SCADA Systems and make small automation applications

D. Text Books:

1. Programming Logic Controllers- Principles and applications, By John W. Webb & Ronald Reis, PHI, fifth Edition (2006)

2. PC based Instrumentation – Concepts and practice By N.Mathivanan, PHI, 2007 Edition

3. Practical Industrial safety, Risk Assessment and Shutdown Systems By- Dave Macdonald, Elsevier science technology,

E. Reference Books:

1. User manual for Wonderware InTouch SCADA development software

2. Programming Logic Controllers- Programming methods and applications By John R. Hackworth & Frederick D. Hackworth Jr. , Pearson Education, Low Price Edition

3. Programming Logic Controllers and Industrial Automation – An Introduction, By Madhu chhanda, Samarjit sen Gupta, Tata Mc Graw Hill

4. Process Control Instrumentation By C. D. Johnson, Pearson Education Ltd

5. Digital measurement techniques, by- T. S. Rathore, Narosa, New Delhi, CRC Press

6. Instrument Engineers Handbook, third edition, volume-III, Process Software and Digital Networks, by- Bela G.Liptake, CRC Press,

7. Field bus Technology : Industrial network standards for real time distributed control By Nitaigour Premchand Mahalik ,Springer (2008)

8. Modicon MODBUS protocol reference guide, Modicon

9. Statement list Allen Bradley Micro logix 1000 & 1200 – Ref Manual-pdf

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F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT

List of laboratory experiments:

1 Introduction to Wonderware InTouch SCADA

2 Study of basic features of SCADA

3 Study of Advanced features of SCADA

4 Programming in SCADA using scripts

5 Study RSLogix 500 software.

6 Development of ladder program using bit instructions

7 Development of ladder program using Timer Functions

8 Development of ladder program using counter and compare Functions

9 Development of ladder program using Advance (Arithmetic) Functions

10 Development of ladder program using Advance (Analog) Functions

11 Development of ladder program using Advance (Program control and Sequencer) Functions

12 Project Development

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SMART INSTRUMENTS (IC-619)

SEM-VI (3rd Year)

Program Elective-II

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

- To make students aware about classification, fabrication and recent trends in sensor technologies as well as some special types of sensors
- To make students aware about sensor networking solutions and relevant design concepts of instrumentation transducers
- To teach students regarding wired-wireless networking techniques along with relevant terminologies and technical specifications
- To teach students wireless sensor networks along with relevant standards, protocols and technologies
- To teach students IEEE 1451 family of standards with each sub-standard information and their application for development of smart transducers

- To teach students concepts of intelligent instrumentation specifically aimed at data acquisition and monitoring

B. DETAILED SYLLABUS

[A] SMART SENSORS:

Sensors and their classification, Sensor fabrication techniques, Sensors fabrication process details and latest trends in sensor fabrication, some special types of sensors: Fiber optic sensors, Chemical sensors, Bio-sensors

Characterization of sensors

[B] SENSOR NETWORKS:

Basic concepts, Sensor networking, industrial networking, sensor networking solutions, ISO/OSI model of 7-layers, Smart Sensors, Smart Sensor manufacturing technologies, Smart transducers and smart valve actuators

[C] LAN: TECHNOLOGIES, PROTOCOLS AND TOPOLOGIES:

Wired and wireless networking, Various topologies, Wired network protocols, wireless network protocols

[D] WSNS AND THEIR APPLICATIONS:

Basic concepts, purposes, usage, Factors and considerations for applications, Practical implementation issues, WSN standard IEEE 802.15.4, WSN applications in emerging areas

[E] IEEE 1451 FAMILY OF STANDARDS:

Brief discussions on IEEE 1451.0 standard, IEEE 1451.1 standard, IEEE 1451.2 standard, IEEE 1451.3 standard, IEEE 1451.4 standard, IEEE 1451.5 standard, IEEE 1451.6 standard and IEEE 1451.7 standard

[F] INTELLIGENT INSTRUMENTATION:

Basic concepts, Modes of operation, Architectures of various Intelligent Instrumentation Systems, Microprocessor application techniques, Types and techniques of data transfer, Data acquisition and data delivery methods, Brief on IEEE 488 GPIB standard

C. LEARNING OUTCOMES

After successful completion of this course, student shall be able to:

- develop awareness regarding selection, production and modern updates in sensor technologies along with some special types of sensors
- develop awareness about basics of sensor networking and instrumentation transducers
- learn wired-wireless networking techniques along with relevant terminologies and technical specifications
- learn wireless sensor networks along with relevant standards, protocols and technologies
- study IEEE 1451 family of standards with each sub-standard information and their application for smart transducers development
- learn concepts of intelligent instrumentation for data acquisition and monitoring

D. RECOMMENDED TEXTBOOKS

1. Understanding Smart Sensors by R. Frank, 2000, Artech House
2. Smart Material Systems and MEMS: Design and Development Methodologies: Vijay K. Varadan, K. J. Vinoy, S. Gopalakrishnan , John Wiley & Sons Ltd.
3. Data and computer communication by William Stallings, 8th Edition, 2004, Pearson
4. Wireless Sensor Networks – Architecture and Protocols, by Edger H. Callaway, 2004, CRC Press
5. Measurement and Instrumentation: Theory and Application, by AS Morris, R Langari and Butterworth-Heinemannm, 2nd Edition, Elsevier
6. Intelligent Instrumentation, by G. Barney, 1985, PHI
7. Chemical Sensors and Bio-Sensors, by Brayan Eggins, 2003, John Wiley & Sons.
8. Fiber Optic Sensors, by Eric Udd, 1991, Wiley
9. Smart Sensors, by Chapman P., 1995, ISA Publications

E. REFERENCE BOOKS

1. John G. Webster, Editor-in-chief, “Measurement, Instrumentation, and Sensors Handbook”, CRC Press (1999).
2. Jacob Fraden, “Handbook of modern Sensors”, AIP Press, Woodbury (1997).
3. Sabrie Soloman, “Sensors Handbook”, McGraw-Hill , 1999
4. Sensors and Transducers by D. Patranabis, Prentice Hall of India (PHI), 2003.

5. Deshpande P.B and Ash R.H, Elements of Process Control Applications, ISA Press, New York, 1995.
6. Sensors and Signal Conditioning by John Wiley, (2001).
7. Electronic Instruments and Instrumentation Technology by MMS Anand, 2004, Prentice Hall of India (PHI).
8. Microprocessors and Interfacing: Programming and Hardware by DV Hall, 1992, Tata McGraw Hill
9. Microprocessors: Architecture, Programming and Applications by Ramesh S. Gaonkar, 2003, Wiley Eastern.

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

List of laboratory experiments:

1. Introduction to Smart Instrumentation, Smart Sensors and Smart Networks
2. Study of Smart Sensors Manufacturing Processes
3. Study of special types of sensors
4. Sensor Networking: Concepts, Design and Implementation of ISO/OSI Model
5. Smart Transducers and Smart Actuators
6. Wired Networking Technologies: Concepts and Design Criteria
7. Wireless Networking Technologies: Concepts and Design Criteria
8. IEEE 1451 Family of Standards and Design of Smart Transducers
9. Intelligent Instruments and Microprocessor based data acquisition design
10. IEEE 488 GPIB standard and GPIB data acquisition system design

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ANALYTICAL INSTRUMENTATION (IC-620)

SEM-VI (3rd Year)

Program Elective-II

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

- To make the students aware about importance of different instruments in Analysis & Testing field which are used for the measurement of different parameters along with classification and terminologies of techniques.
- To teach the students about specifications, selection criteria and characteristics of different analytical instruments for Analysis & Testing.
- To teach the students about various analytical instruments with their principle, working, types & its applications in various fields.

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B. DETAILED SYLLABUS

[A] Spectrophotometers: UV - VIS – IR

Electromagnetic radiation, beer-Lambert law, Absorption Instruments, Colorimeters, Spectrophotometers, Sources of error in Spectrophotometric Measurement, Calibration.

[B] Spectrophotometers: IR, Raman & Photo acoustic and photo thermal

Infrared Spectroscopy, Basic Components of Infrared Spectrophotometer, Sample Handling Technique Fourier Transform Infrared Spectroscopy, Calibration, Attenuated Total Reflection Technique, Raman Spectrometers, Photo acoustic and photo thermal Spectrometers.

[C] Gas Chromatograph, Liquid Chromatograph & Mass Spectrometers:

Chromatography, Basic Parts of a Gas Chromatograph, Methods of Measurements of Peak Areas, Liquid chromatography, types of LC, Amino Acid Analysers. Basic Mass Spectrometers, Types of Mass Spectrometry, Components of Mass Spectrometers, Resolution, Application of Mass Spectrometry.

[D] Flame Photometers & X-Ray Spectrometers:

Principle, Constructional Details of Flame Photometers, Clinical Flame Photometers, Accessories for Flame Photometers, Interferences in Flame Photometry, Procedure for Determination. X-ray Spectrum, X-Ray Spectrometry, X-Ray Diffractometer, Electron probe micro analyzer.

[E] Electron and Ion Spectroscopy:

Surface Spectroscopic Techniques, Electron Spectroscopy, Instrumentation for Electron Spectroscopy, Ion Spectroscopy, Instrumentation for Ion Spectroscopy, Radiochemical Instruments, Automated Biomedical Analysis Systems.

[F] Blood Gas Analyzer & Industrial Gas Analyzers

Blood pH measurement, pCO2 & pO2 Analyzer, gas analyzers, paramagnetic O2 analyzer, magnetic wind analyzer, IR gas analyzer.

C. LEARNING OUTCOMES

After successful completion of this course, student shall be able to:

- develop awareness about needs of different Analytical instruments for measuring different parameters for analysis and testing of the products, classification and associated technical terminologies.
- learn specifications and salient characteristics based choice making of analytical instruments.
- learn methods and applications in the field of Analytical instrumentation.
- develop awareness of measuring different strategies with analytical instruments and acquired the knowledge about its importance for the analysis and testing of any product/material with the help of different analytical instruments.

D. RECOMMENDED TEXTBOOKS

[1] Handbook of Analytical Instruments by: R. S. KHANDPUR

[2] Instrumentation methods by B. K. Sharma

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E. REFERENCE BOOKS

[1] Analytical Instrumentation by Bela G. Liptak
[2] Laboratory Instrumentation by Mary C. Haven (Author), Gregory A. Tetrault (Author), Jerald R. Schenken (Author)

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

List of laboratory experiments:

1. To study & perform the Gas Chromatograph.
2. To study & perform the UV Spectrometer.
3. To study & perform the Visible Spectrometer.
4. To study & perform the Liquid Chromatograph.
5. To study & perform the IR Spectrometer.
6. To study & perform the X-Ray Spectrometer.
7. To study & perform the Atomic Force Microscope.
8. To study & perform the Scanning Electron Microscope.
9. To study & perform the Transmission Electron Microscope.
10. To study & perform the Ion Chromatograph.

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POWER PLANT AUTOMATION (IC-612)

SEM-VI (3rd Year)

Program Elective-II

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

- To prepare students to acquire knowledge various types of power plants.
- To prepare students to acquire knowledge different control techniques for boiler and turbine.
- To prepare students to acquire knowledge about various interlocks and safety standards for turbine and generator.

B. DETAILED SYLLABUS

[A] Introduction to Power Plant:
Plant overview, Role of Control and instrumentation in power plant, Classification of power plants: thermal, hydro, combined cycle and nuclear.

[B] Boiler & Turbine Supervisory Control:
Introduction, Operation, Drum level control, Combustion control , Turbovisory system, Measurement and analysis of gas, Super-heated steam temperature, Level, Pressure and Flow. Coordinated controls of boiler and turbine.

[C] Power Plant Process:
Boiler process, Turbine process, Fuel Handling Plant, Air Compressor, etc.

[D] Power Plant Subsystem Automation:
Control of mill throughput, Mill temperature control, Forced draught control, Feed pump control, Boiler-following-turbine load control, Advanced Gas Cooled Reactors (AGRs) .

[E] Electrical Instruments and Metering:
Recorders and Industrial Displays, Electrical Instruments and Metering Working of meters, Meter calibration.

[F] **Plant Optimization:**
Performance optimization of power plant with integrated Controls, Plant Optimization Performance measurement of power plant.

[G]System Interlocks and Safety:
Turbine Interlock and Protections, Interlock and Protections for Generator.

C. LEARNING OUTCOMES

After completion of the course students should be able to:

- Classify various power plants and understand the role of control and Instrumentation in power plant.
- To apply supervisory control techniques for boiler and turbine.
- Learn different power plant processes, viz. Turbine process, boiler process, etc.
- Describe various recorders, Industrial Displays, working of meters and Meter calibration.
- Measure plant optimization performance parameters
- Describe turbine interlock and protections for generators.

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D. RECOMMENDED TEXTBOOKS

1. Modern Power Station Practice: Incorporating Modern Power System Practice: Vol - F Control and Instrumentation. / by British Electricity International.
2. Instrumentation Engg's Handbook on Process Control - Bela G. Liptak.
3. Power plant Engineering – P.K.Nag, Mc Graw Hill, 3rd edition

E. REFERENCE BOOKS & NOTES

1. Power plant instrumentation and control handbook – Swapan Basu and Ajaykumar Debnath, Academic Press, 1st edition
2. Standard Handbook of Powerplant Engineering – Thomas C. Elliot, Mc Graw Hill
3. Energy and Power Generation Handbook – K.R.Rao, ASME Press,

F. LIST OF EXPERIMENTS

1. Study of General layout of thermal power plant.
2. Study of Turbovisory system
3. Study of fuel handling system in coal based power plant.
4. Study of Control techniques for power plant process.
5. Study of drum level water control and swell and shrink phenomenon.
6. Study of air pollution by a thermal power plant.
7. Study of water pollution by a thermal power plant.
8. Study of various combustion process control.
9. Study of wireless monitoring of energy measurement.
10. Study of different Safety and Interlocking techniques for turbine and generator.

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PROFESSIONAL COMMUNICATION-II (AF-601)

SEM-VI (3rd Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
1	0	2	50	-	-	50	100	1	0	1	2

Objective:

- To develop confidence in the students for communicating at workplace.
- Develop their Listening, Speaking, Reading, and Writing Skills.
- To give exposure of communicating with public.
- How to develop fluency in English Language.
- To prepare students for placement.
- To teach how to be effective at the job.

Learning Outcomes:

After completion of this course students will be able to understand:

- Psychological aspects in communication
- Developing Positive Attitude and empathy

- Importance of team and how to work in a team
- Effective Listening, Reading, Writing and speaking skills
- Corporate Communication
- Writing Minutes, Notice, Proposal and Report
- Competence in writing and reading

Unit 1- Communication Skills:

- Intrapersonal Communication
- Interpersonal Communication
- Importance of Empathy in Communication
- Psychological Dealings in Communication
- Positive Attitude

Unit 2- Team Building:

- Introduction
- Meaning and importance of team
- Skills and qualities of a team member
- Techniques to be a good team member
- Working in Groups
- Leadership Qualities
- Negotiation Skills
- Adjustment level and Flexibility
- Understanding Team mates

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Unit 3- Effective Self Presentation through LSRW:

- Listening
  -active listening
- Speaking
  -Indianism
  Presentation
- Reading

- Speed Reading
- Reading Practice
- Levels of Comprehension (Evaluative and Applied)
- Comprehension practice

- Writing
  -Minutes
  - Notice
  - Proposal
  - Report Writing

Text Books:

1. Meenakshi Raman, Sangeeta Sharma. Technical Communication: Principles and Practice; Oxford University press: New Delhi, 2004.

2. Meenakshi Raman, Prakash Singh. Business Communication: Second edition; Oxford University Press: New Delhi, 2012.

3. Steve Hart, Arvind R. Nair, Veena Bhambhani. Embark: English for Undergraduates; Cambridge University Press: Delhi, 2016.

Reference Books:

1. T M Farhathullah. *Communication Skills for Technical Students;* Orient Longman Private Ltd.: Chennai, 2002.

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ADVANCED CONTROL THEORY AND SYSTEM DESIGN (IC-710)

SEM-VII (B.Tech, 4th Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	-	2	60	40	25	25	150	4	-	1	5

A. OBJECTIVES OF THE COURSE

- To introduce various state space models of control systems, nonlinear control systems and their analysis methods
- To apply different compensation designs to control systems in time and frequency domain
- To develop the ability in students to test positive real functions and synthesize one port passive networks (RLC).

B. DETAILED SYLLABUS

[A] State variable analysis

Introduction, State modes of linear continuous-time systems, Diagonalization, Solutions of state equations, Concept of controllability & Observability, Direct method of Liapunov's stability analysis.

[B] Non linear systems

Introduction to nonlinear systems, Common physical nonlinearities, The phase – plane methods, Singular points, Construction of phase – trajectories, The describing – function (D.F.) method, Derivation of DFS, Stability analysis by D.F. method, Jump resonance phenomena

[C] Optimal control systems

Introduction, Performance indices, Parameter optimization: Servomechanisms

[D] System compensation
Introduction to system compensation, Time domain compensation technique using root locus, Frequency domain compensation Techniques using Bode Plots, Minor-loop Design of Control System
[E] Network synthesis
Introduction, Positive Real Function, Synthesis of One Port LC, RC, RL and RLC passive networks

C. LEARNING OUTCOMES

After completion of the course students should be able to:

- Define State variables, build state model and learn state variable analysis techniques
- Solve Parameter optimization control problems
- Learn Nonlinear systems and their stability analysis
- Design and compensate a control system for given specifications using root locus technique and Bode plot.
- Synthesize a system network based on the driving point impedance functions.
- Describe positive real functions and their characteristics.

D. RECOMMENDED TEXTBOOKS

1. Control system engineering by I. J. Nagrath & M. Gopal
2. Modern Network Synthesis by Van Valkenburg
3. Control system principles and design by M. Gopal

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E. REFERENCE BOOKS & NOTES

1. State space analysis of control system by Ogata
2. Modern control theory by J. T. Tou
3. Modern control system theory by M. Gopal
4. Linear Control System (Analysis & Design conventional & Modern) by D'azzo & Houpis
5. Design of Feedback System by Thaler G. J.
6. Digital control and state variable methods by M. Gopal

F. LIST OF EXPERIMENTS

1. Introduction to state space models of control systems
2. State model Controllability and Observability
3. State model analysis
4. Introduction to Nonlinear systems and phase plan method
5. Describing function method
6. Introduction to Optimal control systems
7. Introduction to compensation in control systems
8. Compensation in Time domain
9. Compensation in Frequency domain
10. Testing driving point functions
11. Passive network synthesis

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DIGITAL SIGNAL PROCESSING (IC-711)

SEM-VII (B.Tech, 4th Year)

Program Elective-III

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

- To make the students aware about core concepts of signal, its properties and importance of signal processing (especially in digital domain)
- To teach basic and fundamental concepts of classification, identification and characteristics of various types of systems based on time and frequency domains
- To teach the students various transforms as tools and their specific applications for signal processing in digital domain
- To teach the students classification, applications and design aspects of various types of digital filters
- To make the students aware about importance and fundamentals sampling concepts and associated different types of signal conversion/condition processes

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B. DETAILED SYLLABUS

[A] DISCRETE-TIME SIGNALS AND SYSTEMS

Introduction, Representation of Discrete-Time Signals, Basic Operations on Sequences, Classification of Discrete-time Signals, Classification of Discrete-Time Systems [A. Anand Kumar,Pg. 1 to 66]

[B] DISCRETE CONVOLUTION AND CORRELATION

Impulse Response and Convolution Sum, Analytical evaluation of Discrete Convolution, Convolution of finite sequences, Methods to compute the convolution sum of two sequences, Deconvolution using tabular method, Interconnection of LTI System, Discrete Correlation[A. Anand Kumar Pg. 90 to 102, 122 to 127]

[C] THE Z-TRANSFORMS:

Z-transforms by summation of left, right and two-sided sequences, Regions of convergence and z-transform properties, inverse z-transforms [Katsuhiko OGATA Pg. 41to 89]

[D] SYSTEM REALIZATION

Introduction, Realization of discrete time systems, Structure for realization of IIR systems, Structures for Realization of FIR Systems[A. Anand Kumar Pg. 277-357]

[E] DISCRETE –TIME FOURIER TRANFORM

Discrete – Time Fourier Transform(DTFT), Existence of DTFT, Relation between Z-Transform and Fourier Transform, Relation between Z- Transform and Fourier Transform, Inverse DTFT, Properties of DTFT[A.AnandKumar Pg. 358 to 375]

[F] DISCRETE FOURIER SERIES AND DISCRETE FOURIER TRANSFORM

Discrete Fourier Series, Properties of DFS, Relation between DFT and Z transform,Comparision between DTFT and DFT, IDFT, Properties of DFT[A.AnandKumar Pg. 412 to 428, 431 to 444]

[G] INTRODUCTION OF INFINITE DURATION IMPULSE RESPONSE (IIR) FILTERS AND FIR FILTERS

Introduction, Requirements for Transformation, Design of IIR Filters, Specification of the Low-pass Filter, Design of digital low –pass butterworth and chebyshev filters, Characteristics of FIR filters [A.AnandKumar Pg. 548 to 617, 651 to 656]

C. LEARNING OUTCOMES

After successful completion of this course, student shall be able to:

- develop awareness about signal and digital signal processing
- learn, study and classify systems based on time and frequency domains
- learn different transforms as tools and their specific applications for signal processing
- study, select and design application specific digital filters
- develop awareness about sampling and associated signal conversion techniques

D. RECOMMENDED TEXTBOOKS

1. Digital Signal Processing: A. Anand Kumar, PHI Publication
2. Discrete Time Control Systems: Katsuhiko Ogata

E. REFERENCE BOOKS

10. Digital Signal Processing: A Computer-Based Approach, S. K. Mitra, McGraw-Hill, Third edition, 2006.
11. Analog and Digital Signal Processing by Ashok Ambardar, THOMSON Books/Ole
12. Discrete-Time Signal Processing by A. V. Oppenheim and R. W. Shafer, PHI,2/E, 2000
13. Digital Signal Processing: Principles, Algorithms and Applications, J. Proakis, D. Manolakis, Prentice-Hall, 2006 (4-th edition)
14. Digital Filters – Analysis, Design & Applications by Andreas Antoniou, Tata McGrow Hill, 2nd Edition

F. **LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)**

List of laboratory experiments:

1. Introduction to signals, systems, signal and their classification
2. Z-transforms and their applications in digital signal processing
3. Design of first order hold circuit
4. Design of ADC and DAC
5. Filters: classification, design specifications and applications
6. Fourier Transforms, Fast Fourier Transforms and their applications in digital signal processing
7. Design of Butterworth filters and applications

8. Design of Chebyshev filters and applications
9. Design of All pass, Band pass and Band reject filters and applications
10. Design of Averaging filters and applications

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Department of Instrumentation and Control Engineering

MODELING, SIMULATION AND EVOLUTIONARY TECHNIQUES (IC-712)

SEM-VII (B.Tech, 4th Year)

Program Elective-III

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

- To make the students aware about importance and fundamental concepts, terminologies and applications of modeling, simulation and evolutionary techniques
- To teach the students about classification and modeling of system models as well as basics of Sets and Fractals along with their specific behavioral characteristics
- To teach the students about fuzzy logic concepts and design-development of fuzzy based controllers
- To teach the students fundamentals of simulation study and its step wise procedures associated to selected simulation modeling and study techniques
- To teach the students basic concepts of artificial neural networks, Genetic Algorithms and step wise procedures associated to selected controller optimization techniques

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B. DETAILED SYLLABUS

[A] INTRODUCTION:

Introduction, Objectives of the course, Overview of the course, Classification of Systems, Models, Purposes of Modeling, Classification of Models, Modeling Techniques, System Variables.

[B] SYSTEMS AND MODELING:

Fractals, Types of Fractals, The Sierpinski Triangle, Fractal and Scaling Similarity, Self-Similarity Dimension, Cantor Set, The Mandelbrot Set, Julia Set, Examples of The Mandelbrot Set, Julia Set and Fractals, The Chaos Theory, Basic Observations, Governing Rules of Chaos Theory, Chaotic Behavior of Logistic Equation, Example of Chaotic Behavior, Chaos and Fractals.

[C] FUZZY LOGIC:

Introduction, Fuzzification and Defuzzification of models, Fuzzy sets and set operations, Elementary Fuzzy Operators, Step-wise Procedure for Design of FLC using Matlab, Detailed Explanation of Matlab Fuzzy Logic Toolbox and its usage, Design of Fuzzy Controller, Design of Fuzzy Logic based PID Controller

[D] SIMULATION:

Explanations of System, Modeling and Simulation, Classification of System Models, Step-wise Procedure for Simulation Study, Advantages and Disadvantages of Simulation, Basic Flow Chart for Simulation Study

Monte-Carlo Simulation Technique, Step-wise Procedure for Monte-Carlo Simulation Technique, Verification and Validation of Simulation Models, Various techniques of model validation.

[E] ARTIFICIAL NEURAL NETWORKS (ANN):

Architecture Introduction to ANN, ADALIN, Learning method Delta Rule, MSE based Training to ADALIN, Adaptive Filtering, Tapped Delay Line, Adaptive Filter, Basic ANFIS, ANFIS Learning Algorithms, Step-wise Procedure to setup ANFIS using Matlab Takagi-Sugeno FIS, Mamdani FIS, Mamdani v/s Sugeno

[F] **EVOLUTIONARY TECHNIQUES:** Introduction to Genetic Algorithms (GA), Darwin's Observation, Darwin's Theory – Natural Selection, Terminology of GA, Applications of GA, PID controller optimization using GA, Kohonon's Self Organizing Map (SOM), Hopfield Neural Network

C. LEARNING OUTCOMES

After successful completion of this course, student shall be able to:

- develop conceptual awareness and applications of modeling, simulation and evolutionary techniques
- classify, characterize, select and model systems and learn behavior-specific characteristics of Sets and Fractals
- learn concepts of fuzzy logic and design-develop fuzzy based controllers
- learn fundamentals and development of simulation study along with modern simulation techniques
- learn and develop fundamental understandings of artificial neural networks, Genetic Algorithms and selected controller optimization techniques

D. RECOMMENDED TEXTBOOKS

1. Process Control–Principles and Applications by Surekha Bhanot, Publisher: Oxford University Press (2008), India.
2. Introduction to Artificial Neural Systems by Jacek M. Zurada, West Publishing Company, USA.
3. Advanced Control Engineering by Ronald S. Burns, Butterworth-Heinemann Publishers, USA.
4. Process Control and Optimization, Instrument Engineer's Handbook, Volume II by Bela G. Liptak, 2006 Edition, Taylor and Francis, CRC Press, USA.
5. Optimization of PID controller using Ant Colony and Genetic Algorithms by Unal, Tpuz and Erdal, 2013 edition, Springer
6. Design of Fuzzy Controllers by Jan Jantzen, Tutorial Paper, Department of Automation, Technical University of Denmark, Denmark.
7. Class Notes and Discussions in Theory and Laboratory Sessions

E. REFERENCE BOOKS

1. G. D. Sousa, B. K. Bose, "A Fuzzy Set Theory based Control of a Phase-controlled Convertor DC Machine Drive", IEEE Trans., Vol. IA – 30, no. I, pp. 34-44.
2. M. Godoy Simoes, Bimal K. Bose and Ronald J. Spiegel, "Fuzzy Logic based intelligent control of a variable speed cage machine wind generation system", IEEE Trans. on Power Electronics, Vol. 12, pp. 87-95, Jan. 1997.
3. Denn M. M., "Process Modeling", Longman, 1986.
4. Holland C. D., "Fundamentals and Modeling of Separation Processes", Prentice Hall., 1975.

5. Luyben W. L., "Process Modeling Simulation and Control for Chemical Engineers", 2nd Ed., McGraw Hill, 1990.
6. Najim K., "Process Modeling and Control in Chemical Engineering", CRC, 1990.
7. Aris R., "Mathematical Modeling, Vol. 1: A Chemical Engineering Perspective (Process System Engineering)", Academic Press, 1999.

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

List of laboratory experiments:

1. Introduction to Modeling and Simulation
2. Modeling of simple process control systems
3. Evolutionary techniques, classification and application criteria
4. Fuzzy Logic: Concepts, terminologies and application development
5. Fuzzy logic: Design and Implementation
6. Genetic Algorithms: Concepts, terminologies and application development
7. Genetic Algorithms: Design and Implementation
8. Artificial Intelligence and Neural Networks: Concepts, design and application development
9. Adaptive system design and tuning approaches
10. Comparative study of PID controller tuning using classical, Fuzzy logic, Genetic Algorithms and ANFIS

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EMBEDDED SYSTEMS (IC-713)

SEM-VII (B.Tech, 4th Year)

Program Elective-III

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
3	1	2	60	40	25	25	150	3	1	1	5

A. OBJECTIVES OF THE COURSE

To prepare the students to design & develop Embedded Systems Applications using ARM Cortex M0/M0+ & Family

B. DETAILED SYLLABUS

[A] Introduction to Embedded Systems

Importance of ARM Cortex M0 Processor, Applications of Cortex M0 Processors, Background of ARM Processors, Cortex M0 Processor Specifications & Architecture,

[B] ARM Cortex-M0 Architecture

Overview, Programming Model, Memory System, Stack Memory Operations, Exceptions & Interrupts, Nested Vectored Interrupt Controller, System Control Block

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[C] Introduction to Cortex M0 programming

Introduction to Embedded System Programming, Designing Embedded Programs, Inputs and Outputs, Development Flow, C Programming & Assembly Programming, Program Image, Cortex Microcontroller Software Interface Standard

[D] Instruction Set, Basic Examples & Programming Using Embedded C

Assembly Basics, Exception related Instructions & basic assemble examples, Detail overview of Embedded C

[E] Memory Systems, Exceptions and Interrupts

Memory Map & Register Boundary Addresses, Program Memory, Boot Loader, and Memory Remapping, Introduction to Exceptions & Interrupts, Exception Types of Cortex M0 , Exception Priority Definition & Vector Table

[F] Interrupt & System Control

Overview of the NVIC and System Control Block Features,Interrupt Control,Exception Masking Register,Interrupt Inputs and Pending Behaviour, System Control Registers

[G] Introduction to Cortex M0 Peripherals

Power Control, Reset & Clock Control, System Configuration Controller, General Purpose Digital I/O, Watch Dog Timer, Basic Timer, General Purpose Timers, Advanced Control Timers, Real Time Clock, Analog to Digital Converter, PWM & DMA Controller

[H] Introduction to Cortex M0 Serial Peripherals

UART, SPI, I2C & USB

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[I] **Getting Started with Integrated Development Environment& Application Programming

** Only for Laboratory Purpose

C. LEARNING OUTCOMES

At the completion of the course, students will be able to

- To explain ARM Processor Architecture& various features of Cortex M0 Processor
- To do programming of Cortex M0 Processor using Embedded C
- To build various applications by exploring strong peripherals like Watch DogTimer,16/32 bits Timers, ADC, DMA Controller, SPI, I2C , UART & USB

D. RECOMMENDED TEXTBOOKS

[1] The Defective Guide to the ARM Cortex M0 By: Joseph Yiu, Elsevier

[2] STM32F030x4/x6/x8/xC and STM32F070x6/xB advanced ARM^{R}-based 32-bit MCUs By: Reference Manual by ST Semiconductor

E. REFERENCE BOOKS

[1] Mastering STM32 ,A step-by-step guide to the most complete ARM Cortex-M platform, using a free and powerful development environment based on Eclipse and GCC By: Carmine Noviello

[2] Embedded Systems By: B. Kanta Rao , PHI Learning Private Limited

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F. LIST OF EXPERIMENTS

1	Getting Started with Integrated Development Environment
2	System Clock &Configuration Programming
3	Digital I/O Programming
4	General Purpose Timer & Time Delay Applications in C
5	Advanced Timer Applications Programming in C
6	DMA Application Programming in C ADC Application Programming in C
7	UART Application Programming in C
8	SPI & I2C Programming in C
9	Temperature Monitoring & Control Application
10	System Monitoring & Control using IOT Library

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PROCESS CONTROL (IC-714)

SEM-VII (B.Tech, 4th Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

- To teach the students fundamental concepts, terminology and evolution of process control along with control loop configuration
- To discuss the open and closed loop response of simple control systems and teach them the salient features and effects of P, PI, PD and PID control algorithms on the transient response of control systems
- To teach the students basics of complex control and level control explaining their importance
- To teach the students process details, identification of critical parameters, interaction among critical parameters as well as design of recommended control schemes for most widely utilized industrial process units using boiler, distillation column, steam turbine, compressor and heat exchanger as case study examples

- To make the students aware about limitations of basic PID control and necessities of control strategies for solving process control problems. To teach the students various control strategies such as Ratio, Cascade, Feed Forward, Split-range, Inverse derivative, Selector, etc. in problem-solution methodology
- To discuss higher level process complexities and teach the students the brief and introductory concepts of various advanced control strategies such as Adaptive control, Valve Position Control (VPC), Multi-variable control, Internal Model Control (IMC), Model Predictive Control (MPC), Artificial Intelligence (AI) and Fuzzy Logic Control (FLC)

B. DETAILED SYLLABUS

[A] INTRODUCTION TO PROCESS CONTROL AND FUNDAMENTAL CONCEPTS:

Introduction to process control, Evolution of process control, Laplace transforms in process control, open loop v/s closed loop systems, open loop response, feedback v/s feed forward control configuration

[B] STUDY OF OPEN LOOP RESPONSE OF SYSTEM AND ANALYSIS:

Open loop response of simple systems, Effects of P, PI, PD & PID controllers on the transient response of control systems, Complex control systems, Level control.

[C] STUDY OF TRANSIENT RESPONSE OF SYSTEM AND CONTROL DYNAMICS:

Transient response of control systems, Level control.

[D] CONTROL OF UNIT OPERATIONS:

Boiler controls, Distillation column controls, Compressor controls, Steam turbine controls, Heat exchanger controls

[E] CONTROL SCHEMES:

Ratio control, Cascade control, Feed-forward control, Selector control, Inverse-derivative control, Split range control, etc.

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[F] ADVANCED PROCESS CONTROL:

Advance Control Systems – Adaptive Control, Valve Position Control (VPC), Multi-variable control, Introduction to Internal Model Control (IMC), Introduction to Model Predictive Control (MPC), Introduction to Artificial Intelligence (AI) and Fuzzy Logic Control (FLC).

C. LEARNING OUTCOMES

After successful completion of this course, student shall be able to:

- learn fundamental concepts of process control and basic loop configuration
- understand and interpret the open and closed loop response of simple control systems, as well as various control algorithms and their impacts
- learn basics of complex control and level control
- learn to study process and systematic stepwise design aspects of process control and apply them to design control schemes selected industrial process units as case study examples
- develop awareness regarding limitations and needs of basic PID control and various control strategies in problem-solution methodology
- develop understanding about higher level process complexities and basic brief concepts of various advanced control strategies

D. RECOMMENDED TEXTBOOKS

1. Process Control, by Peter Harriot
2. Applied Instrumentation in Process Industries, Vo. I & II, by Andrews & Williams
3. Process Control-Principles and Applications, by Surekha Bhanot

4. Principles of Process Control, by Patranabis
5. Automatic Control of Power & Process, by Manifold
6. Instrument Engineer's Handbook (Process Control), by BG Liptak (Vol. II)
7. Process Modeling, Simulation & Control for Chemical Engineers, by W. Luyben

E. REFERENCE BOOKS

1. Chemical Process Control, by Stephanopoulos
2. Process Control, by Pollard
3. Principal of Industrial Measurements, by Patranabis
4. Applied Instrumentation in Process Industries Vol. II, by Andrews & Williams
5. Chemical Process Control, by Shinskey
6. Chemical Process Control, by Coughnour & Copel

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

1. To study the response of Bare Thermometer
2. To study the response of Thermometer with thermowell
3. To study the open loop response of first order system
4. To study the open loop response of second order system
5. To study the response of Ratio Control Scheme

6. To study the response of Cascade Control Scheme
7. To study the response of Feed Forward Control Scheme
8. To study the response of First order Mixing Process
9. To study the response of Transportation Lag
10. To study the response of Single Tank and Two Tanks Systems

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BIOMEDICAL INSTRUMENTATION (IC-709)

SEM-VII (B.Tech, 4th Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

- To make the students aware about importance of different instruments in Medical field which are used for the measurement of different parameters of human body along with classification and terminologies of measurement Techniques
- To teach the students about specifications, selection criteria and characteristics of instrumentation measurement systems of different Biomedical signals in Medical field.
- To teach the students about various Imaging techniques for different applications in biomedical field.

B. DETAILED SYLLABUS

[A] Measurement, Recording and Monitoring:

Fundamentals of Medical Instrumentation:

Anatomy and Physiology, Physiological system of Body, Sources of Biomedical Signals, Basic Medical Instrumentation System, Performance requirement of Medical Instrument system, General Constraints of Medical Instrument system, Regulations of Medical Devices

Bioelectric signals and Electrodes:

Origin of Bioelectric signals, Recording Electrodes, Electrodes for ECG, EEG,EMG, Electrical conductivity of electrodes jellies and creams, Microelectrodes, Skin surface electrodes and needle electrodes

Recording systems :

Basic recording system,General considerations for signal conditioners, Preamplifiers, Sources of noise in low level measurement,Biomedical signal analysis techniques, Signal processing techniques, The main amplifier and driver stage,Different types of recorders, VCG,PCG,EEG,EMG,ECG

Patient monitoring Systems:

System concepts, Cardiac monitor,Bedside Patient Monitoring system,Central Monitors, Measurement of Heart Rate,Measurement of Blood Flow, Measurement of Pulse Rate, Blood Pressure Measurement, Measurement of Temperature, Measurement of Respiration rate ,Catherization lab instrumentation

[B] Modern Imaging Systems:

X-Ray Machines and Digital Radiography:

X-Rays, X-Rays Machine, X-Ray Computed Tomography,Nuclear Medical Imaging

Systems, Emission Computed Tomography (ECT),Single Photon Emission Computed Tomography (SPECT),Positron Emission Tomography (PET), Magnetic Resonance Imaging (MRI)

Ultrasonic Imaging Systems:

Diagnostic Ultrasound, Physics of Ultrasonic waves, Medical Ultrasound, Basic Pulse echo apparatus, A- scan, Echocardiograph, Real time Ultrasonic Imaging Systems, Biological effects of ultrasound

[C] Therapeutic Equipments:

Cardiac Pacemakers:

Need for Cardiac Pacemakers, External Pacemakers, Implantable Pacemakers, Recent Development in Pacemakers

Cardiac Difibrillators:

Need for Cardiac defibrillator, DC Defibrillator, Implantable Defibrillator, Pacer-Cardioverter-Defibrillator

Instruments for Surgery:

Surgical Diathermy, Surgical Diathermy Machine, Safety aspects in Surgical Diathermy machine, Surgical Diathermy Analyzers

LASER Application in Biomedical Engineering:

What is LASER ? ,Different types of LASER,Effects of Tissues and related issues, Selection of LASER for surgery, Application in different areas,Safety Aspects

Physiotherapy and Electrotherapy Equipments:

Shortwave Diathermy, Microwave Diathermy ,Ultrasonic Diathermy, Pain relief through Electrical Stimulation

Haemodialysis machine:

Function of Kidneys, Artificial Kidneys, Dialyzer, Haemodialysis machine

Electrical Safety of Medical Equipment:

Physiological effect of electrical current, Shock hazard form electric equipment, Methods of accident prevention

Latest Issues in BME:

Biomaterials, Telemedicine, Artificial heart

C. LEARNING OUTCOMES

After successful completion of this course, student shall be able to:

- develop awareness about needs of different biomedical instruments for measuring different bioelectric signals along with their design-development, classification and associated technical terminologies.
- learn specifications and salient characteristics based choice making of biomedical instrumentation measurement systems
- learn methods and applications in the field of Biomedical instrumentation.
- develop awareness of measuring different body parameters and acquired the knowledge about its importance for body with the help of different biomedical instruments.

D. RECOMMENDED TEXTBOOKS

[1] Hand book of Biomedical Instrumentation by R. S. Khandpur.

[2] Biomedical Instrumentation and measurement by Cromwell, Weibell & Preiffer.

E. REFERENCE BOOKS

[1] Introduction to Biomaterials- by Sujata Bhatt (Narosa Publishing House)

[2] Introduction to Biomedical Equipment Technology- Joseph Carr and John Brown (Pearson Education)

[3] Biomedical Digital signal Processors- Wills J. Tompkins (PHI)

[4] Medical Instrumentation- Application and Design- John G. Webster (Wiley Student edition)

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

List of laboratory experiments:

1. To study & perform the Blood Pressure Measurement Unit.
2. To study & perform the Blood Flow Measurement.
3. To study & perform the Respiration Rate Meter.
4. To study & perform the Phonocardiograph System.
5. To study & perform the D.C. Defibrillator.
6. To study & perform the Heart Rate Indicator.
7. To study & perform the Single channel ECG Machine.
8. To study & perform the Medical Telemetry Machine.
9. To study & perform the Multi-parameter Monitor.
10. To study & perform the Tread Mill Tester.
11. To study & perform the External Pacemaker.

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ROBOTICS ENGINEERING (IC-715)

SEM-VII (B.Tech, 4th Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

A. OBJECTIVES OF THE COURSE

- To make the students aware about importance of Roboticsin every field along with classification and terminologies.
- To teach the students about specifications, selection criteria and characteristics of different robotic systems of different fields like as Industry, Space, Agriculture, Home sector, Automation etc.
- To teach the students about various applications of Robotics in various field.

B. DETAILED SYLLABUS

[A] Introduction

Evolution of Robot and Robotics, Laws of Robotics, Progressive advancement in Robot, Robot Anatomy, Human Arm characteristics.

[B] Co ordinate Frames ,Mapping & Transforms

Co ordinate frames, Description of objects in space, Transformation of vectors, Inverting of Homogeneous Transforms, Fundamental rotation Matrices.

[C] Modeling of robot –Direct kinematic model

Mechanical structure and notations, Description of links & joints, Kinematic modeling of the manipulator, Denavit- Hartenberg notation, Kinematic relationship between adjacent links Inverse Kinematics.

[D] Trajectory planning

Joint space techniques, Cartesian space techniques

[E] Robotic Actuators, sensor & vision

Sensors in robots , Actuators, Kinds of sensors used in Robotics, Robotic vision

[F] Robot Safety, Robot-Economy & installation

Introduction, plant survey, potential safety hazards ,Safety planning check list, safety guidelines

C. LEARNING OUTCOMES

After successful completion of this course, student shall be able to:

- Develop awareness about needs ofdifferent devices & instruments for developing any robot with their design-development, classification and associated technical terminologies.
- Learn specifications and salient characteristics based choice making of any robotic system.

- Learn methods and applications in the every field.

D. RECOMMENDED TEXTBOOKS

[1]Robotics and Control by I.K.Mittal & I.J.Nagrath ,Second reprint 2005 Tata Mc Grawhill

[2] Introduction to robotics by Saeed B.Niku ,first Indian reprint 2002, pearson education

E. REFERENCE BOOKS

[1]Robotics by K. S. Fu , R. C. Gonzalez & C.S. G. Lee.

[2] Robotics principles & practice by K.C.Jain & L.N.Aggarwal, khanna publishers 2003 edition

F. LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

List of laboratory experiments:

1. To study about Robotics, Mapping and Transforms.
2. To study about Kinematic Modelling-I.
3. To study about Kinematic Modelling-II.
4. To study about Inverse Kinematic Modelling.
5. To study about Trajectory Planning -I.
6. To study about Trajectory Planning -II.
7. To study about Robotic Sensors- I.
8. To study about Robotic Sensors-II.
9. To study about Robotic Applications-I.
10. To study about Robotic Applications- II

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INDUSTRIAL EXPOSURE AND PRACTICES (IC-716)

SEM-VII (B.Tech, 4th Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
-	-	6	-	-	25	25	50	-	-	3	3

The students will undertake vocational training in industries after completion of 6th semester for the period of minimum 4 week and maximum 6 week. They should understand the instrumentation engineer's role in industries. They are supposed to prepared and submit a project report as a part of their term-work for the industrial training and give seminars on their training work.

*** 2 Credit for the Industrial Training (Vocational Training) (Part of the 6th Semester)**

1 Credit for Minor Project done during 7th semester.

Dharmsinh Desai University

Faculty of Technology

Department of Instrumentation and Control Engineering

PROJECT/INDUSTRIAL TRAINING (IC-801)

SEM-VII (B.Tech, 4th Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
--	--	28	--	--	100	300	400	--	--	14	14

The students will undertake project work for the period of one semester. They should design/develop & fabricate the project. They are supposed to prepared and submit a project report as a part of their term-work for the project and give seminars on their project work. The students may be sent to the industry for their project and they are to timely report to the department regarding monitoring and necessary guidance. They should arrange for demonstration of the project work at the time of examination They are to be examined based on viva and/or demonstration.

Dharmsinh Desai University

Faculty of Technology

Department of Instrumentation and Control Engineering

SEMINAR (IC-802)

SEM-VII (B.Tech, 4th Year)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
--	--	8	-	-	100	--	100	--	--	4	4

Seminar

The students are required to present Seminar on Project/given topic at every week.