BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.
B.Sc. Applied Physics [Instrumentation] - Course Structure under CBCS
(For the candidates admitted from the academic year 2010-2011 onwards)

Semester	Part	Course	Title	Instr Hours/ Week	Credit	ExamHours	Marks		Total
							Int.	Extn.	
I	I	Language Course – I (LC) – Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course-I(ELC)		6	3	3	25	75	100
	III	Core Course – I (CC)	Basic Concept of Instrumentation	6	5	3	25	75	100
		Core Course – II (CC)	Major Practicals - I	4	-	***	-	-	-
		First Allied Course –I (AC)		5	4	3	25	75	100
		First Allied Course – II (AC)		3	-	***	-	-	-
		TOTAL		**30**	**15**				**400**
II	I	Language Course – II (LC) - – Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course – II (ELC)		6	3	3	25	75	100
	III	Core Course – II (CC)	Major Practicals - I	2	3	3	40	60	100
		Core Course – III (CC)	Fundamentals of Electronics and Devices	5	5	3	25	75	100
		First Allied Course – II (AC)		2	2	3	40	60	100
		First Allied Course – III (AC)		5	4	3	25	75	100
	IV	Environmental Studies		2	2	3	25	75	100
	IV	Value Education		2	2	3	25	75	100
		TOTAL		**30**	**24**				**800**
III	I	Language Course – III (LC) – Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course - III (ELC)		6	3	3	25	75	100
	III	Core Course – IV (CC)	Electronic Circuits and their applications	6	5	3	25	75	100
		Core Course – V (CC)	Major Practical - II	3	-	***	-	-	-
		Second Allied Course – I (AC)		5	3	3	25	75	100
		Second Allied Course– II (AC)		2	-	***	-	-	-
	IV	Non Major Elective I - for those who studied Tamil under Part I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	Energy Physics	2	2	3	25	75	100
		TOTAL		**30**	**16**				**500**

IV	I	Language Course –IV (LC) - Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course – IV (ELC)		6	3	3	25	75	100
	III	Core Course – V (CC)	Major Practical - II	2	4	3	40	60	100
		Core Course – VI (CC)	Instrumentation Analysis	5	5	3	25	75	100
		Second Allied Course - II		2	3	3	25	75	100
		Second Allied Course – III		5	4	3	25	75	100
	IV	Non Major Elective II - for those who studied Tamil under Part I I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	Laser Physics	2	2	3	25	75	100
		Skill Based Elective I		2	**4**	3	25	75	100
		TOTAL		**30**	**28**				**800**
V	III	Core Course – VII (CC)	Industrial Instrumentation	5	5	3	25	75	100
		Core Course – VIII (CC)	Electrical and Electronic Instrumentation	5	5	3	25	75	100
		Core Course – IX (CC)	Digital electronics	5	5	3	25	75	100
		Core Course – X (CC)	Major Practical III	3	-	***	-	-	-
		Core Course – XI (CC)	Major Practical IV	3	-	***	-	-	-
		Major based Elective – I	Electrical Machine	5	5	3	25	75	100
	IV	Skill based Elective –II		2	**4**	3	25	75	100
		Skill based Elective – III		2	**4**	3	25	75	100
		TOTAL		**30**	**28**				**600**
VI	III	Core Course – X (CC)	Major Practical III	3	4	3	40	60	100
		Core Course – XI (CC)	Major Practical IV	4	4	3	40	60	100
		Core Course – XII (CC)	Process Control	6	5	3	25	75	100
		Core Course – XIII (CC)	Computer Programing	6	5	3	25	75	100
		Major based Elective II	Matériels Technology	5	5	3	25	75	100
		Major based Elective III	Biomedical Instrumentation	5	4	3	25	75	100
	V	Extension activities		-	1	-	-	-	-
		Gender Studies		1	1	3	25	75	100
		TOTAL		**30**	**29**				**700**
		GRAND TOTAL		**180**	**140**				**3800**

List of Allied Courses :

Group – I : Physics

Group – II : Mathematics

செய்முறை பாடங்கள் உள்ள இயைபுப் பாடங்களுக்கு (4+2+4) தரபுள்ளிகள்

செய்முறை பாடங்கள் இல்லாத இயைபுப் பாடங்களுக்கு(3+3+4) தரபுள்ளிகள்

Note : Either group of Allied course may be offered in the I year / II year.

Note:

	Internal Marks	**External Marks**
1. Theory	25	75
2. Practical	40	60

3. Separate passing minimum is prescribed for Internal and External marks

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

* for those who studied Tamil upto +2 (Regular Stream)

** Syllabus for other Languages should be on par with Tamil at Degree level

those who studied Tamil upto 10^{th} or +2, but opt for other languages in degree level under Part I should study special Tamil in Part IV

*** Examination at the end of the next semester.

Extension activities shall be out side the instruction hours.

குற்பிக்கும் கால அளவு

மோழிப் பாடங்கள் - 1 மதிப்பீடு = 2 மணிநேரம் கற்பித்தல் வகுப்பு

குலை மற்றும் அறிவியல் பாடங்கள் :1 மதிப்பீடு = 1 மணிநேரம் கற்பித்தல் வகுப்பு

[Lecture]

= 2 மணிநேரம் பயிற்சி வகுப்பு

[Tutorial]

= 2-3 மணிநேரம் செய்முறை வகுப்பு

[Practical]

****

CC – I : BASIC CONCEPTS OF INSTRUMENTATION

UNIT – I: BASIC PRINCIPLES OF MEASUREMENT

Aims of measurement - Classification of measurement Characteristics of measuring instruments, Primary sensing elements, Conversion elements, indicating and storing elements - Conversion elements, Indication and storing elements - Factors in the selection of measuring instruments - Static measurements - Scale and pointer type indicating instruments - The basic elements in measurements - Calibration procedure - Temperature problems - Intrinsic safety – Electrical noise and its elimination

UNIT – II: STANDARDS OF MEASUREMENTS AND THEORY OF ERRORS

Primary standards - Derived standards and units Standard samples - Radiation standard - Basic electrical standards - Derived electrical standards.

Errors - known errors - Gross error - Systematic error - Instrumental error – Environmental errors - Observational error - Random error - standard deviation – Variance - Gaussian curve of errors

UNIT - III : STATIC CHARACTERISTICS

Static calibration , accuracy, precision and bias - Combination of component errors in overall system - Accuracy calibration - Static sensitivity - Linearity - Threshold, resolution, hysteresis and dead space, scale reliability, span and static
Stiffness - Input Impedance, Impedance matching

UNIT - IV: DYNAMIC CHARACTERISTICS

Dynamic characteristics - Dynamic response of first order and second order type instruments - Dynamic accuracy - Response to a step function of function of displacement - Response to a constant velocity – response to a constant acceleration – Response to a sinusoidal input

UNIT - V: TRANSDUCERS

Analog transducers, Resistance, Inductive and Capacitative Transducers- Strain gauges – Opto electronic transducers – Digital transducers

BOOKS FOR STUDY AND REFERENCE

1. Measurement Systems - Application and Design Ernest O. Doeblin – McGraw Hill – International Edn- 1990
2.. Mechanical and Industrial instruments – R.K. Jain - Khanna Publishers - Delhi – 1992
3.. Instrumentation Devices and Systems - G.S. Rengan, G.R. Sarma and V.S.V. Mani - TMH - 1993

****

CC – II – MAJOR PRACTICAL – I

1. Characteristics of a junction diode and zenor diode
2. Characteristics of a transistor – CE configuration
3. Characteristics of a transistor – CB configuration
4. Characteristics of LED, LDR and Photo transistor
5. Characteristics of FET
6. Characteristics of UJT
7. AND, OR and NOT gates- Verification of truth tables using discrtete compenets.
8. Construction of half & full wave rectifiers and regulation
9. Construction of bridge rectifiers and regulation
10. Voltage doubler
11. Feedback amplifier
12. Study of series and parallel resonant Circuits
13. Variable resistance transducer
14. Variable inductance transducer
15. Variable capactance transducer

****

CC - III - FUNDAMENTALS OF ELECTRONICS AND DEVICES

UNIT - I : ELECTRON EMISSION AND DYNAMICS

Motion of a charged particle in an electric field - Motion in a magnetic field- Motion under the influence of both types of fields - fields - Electrostatic and electromagnetic deflections in a CRT – Basic principles of electrostatic and magnetic lenses

UNIT - II: SEMI CONDUCTOR DEVIES (DIODES)

Band theory of solids - Classification of solids on the basis of theory - Intrinsic and extrinsic semi conductors - PN junction characteristics - Applications of continuity equation for the study of junction behaviour – Avalanche and zener breakdown of PN junction diodes and tunnel diodes

UNIT – III: SEMI CONDUCTOR DEVIES (TRANSISTORS)

PNP and NPN transistors - Current flow - Characteristics - Transistors - parameters - Small signal equivalent circuits - Hybrid model - Determination and measurement of hybrid parameters - photo transistor – FET - Characteristics and theory of operation of JFETs, MOSFETs and VMOS

UNIT - IV: RECTIFIERS

Half wave and full wave rectifier circuits - Performance characteristics of rectifier circuits - Filter considerations - Capacitor, Inductor, L section & RC section filter

UNIT - V: REGULATED POWER SUPPLY

Shunt and series type regulators and their comparison - Feed back type series regulators - Analysis and design - Protection circuits for voltage regulators - Switching mode voltage regulators

BOOKS FOR STUDY

1. Principles of Electronics - V.K. Mehta - S. Chand & Co
2. A Text book on Applied Electronics - R.S. Sedha - S. Chand & Co - 1994

BOOKS FOR REFERENCE

1. Electronic Devices and Circuits - Millman and Halkias - Tata McGraw Hill - 1991
2. Microelectronics - Jacob Millman - McGraw Hill
3. Electronics - Jacob Millman and Samuel Seely - McGraw Hill
4. Integrated Electronics - Milman and Halkias - TMH - 1993
5. Electronics Fundamentals and Applications for Engineers and Scientists – Millman and Halkias - McGraw Hill

****

CC - IV - ELECTRONIC CIRCUITS AND THEIR APPLICATIONS

UNIT - I: AMPLIFIERS - I

Small signal amplifiers - Graphical analysis and load line concepts - Selection of operating point and biasing – RC coupled amplifier - Feed back amplifier - The feed back concept - Gain with feedback - General characteristics of negative feedback amplifiers - Bias types of feed back and their effect of gain – Multistage feed back amplifiers

UNIT - II: AMPLIFIERS II

Power amplifier - power BJT - Thermal resistance - Maximum power hyperbola - Thermal runaway - Class A, Class B, Class AB and Class C amplifiers - Basic operational amplifier- Differential amplifier

UNIT - III : OSCILLATORS

Basic principles of oscillators - Multivibrators - Function generators - Sinusoidal, Square, Rectangular, Triangular , Ramp and Pulse wave forms generation - Hartley, colpitt and crystal oscillators - Derivation for frequency of oscillations - Applications of sine and square wave oscillators - Multivibrators using transistor / IC operational amplifier – The wave forms at the base and the collector Expression for the periods of oscillations - Miller and Boot Strap time base generators - Blocking oscillators - Schmitt trigger circuits and their use

UNIT - IV : HIGH FREQUENCY DEVICES

Electromagnetic theory - Field vectors - Micro wave generators - Klystron and Magnetron oscillators - Principles of RADAR

UNIT - V: INTEGRATED CIRCUITS

Monolithic integrated circuit technology - The planar processes- Bipolar transistor fabrication - Fabrication of FETs - CMOS technology - Monolithic diodes- The Op-Amp - Op-Amp parameters – Comparator – Inverting , non inverting, summing and subtracting amplifiers – Integrator - Differentiator

BOOKS FOR STUDY AND REFERENCE

1. Microelectronics - Jacob Millman and Grabel – McGraw Hill II edu. – 1987
2. Integrated Electronics – Jacob Millman and Halkias- McGraw Hill – TMH
3. Electronic Circuits, Linear and Digital – Bapat - Tata McGraw Hill, 1991

****

CC – V - MAJOR PRACTICAL – II:

1. Single stage transistor amplifier – RC coupled
2. Feedback amplifier – Transistor
3. FET amplifier
4. Power amplifier- Transistor
5. Two Stage amplifier using transistors
6. Tuned collector oscillator
7. Hartley oscillator- Transistor
8. Colpitt's oscillator-Transistor
9. Astable multivibrator using transistors
10. Astable multivibrator using Op-Amp.
11. Monstable multivibrator using transistors
12. Phase shift oscillator
13. Characteristics of Op-Amp
14. Summing and Difference Op-Amp
15. Integrator and differentiator using Op-Amp.
16. Schmitt trigger using transistor
17. Schmitt trigger using Op-Amp
18. Astable multivibrator using 555 times

******

NON MAJOR ELECTIVE I – ENERGY PHYSICS

Unit I: Conventional Energy Sources

World's reserve - commercial energy sources and their availability – various forms of energy – renewable and conventional energy system – comparison – Coal, oil and natural gas – applications – Merits and Demerits

Unit II: Solar Energy

Renewable energy sources – solar energy – nature and solar radiation – components – solar heaters – crop dryers – solar cookers – water desalination (block diagram) Photovoltaic generation – merits and demerits

Unit III: Biomass energy fundamentals:

Biomass energy – classification – photosynthesis – Biomass conversion process

Unit IV: Biomass Utilization

Gobar gas plants – wood gasification – advantages & disadvantages of biomass as energy source

Unit V: Other forms of energy sources

Geothermal energy – wind energy – Ocean thermal energy conversion – energy from waves and tides (basic ideas)

Books for Study:

"Renewable energy sources and emerging Technologies", by D.P. Kothari, K.C. Singal & Rakesh Ranjan, Prentice Hall of India pvt. Ltd., New Delhi (2008)

Books for Reference:

"Renewable Energy sources and their environmental impact" – S.A. Abbasi and Nasema Abbasi PHI Learning Pvt. Ltd., New Delhi (2008)

****

CC - VI : INSTRUMENTATION ANALYSIS

UNIT – I: VISIBLE, UV AND IR SPECTROSCOPY

Electromagnetic spectrum - Spectroscopic principles instruments - Fundamentals-Visible, UV and IR radiation sources Monochromators - Filters – Prism- Grating types - Detectors - various types of instrument s - Applications in industry

UNIT – II: X- RAYS AND LASER

X-ray production - Instruments – Medical equipment Laser principle - Different types - Applications – Fibre optics and its applications

UNIT – III: RAMAN AND NMR SPECTROSCOPY

Principles of NMR - Description of NMR spectrometer - Types - Applications - Raman spectra - Applications

UNIT – IV: GAS CHROMATOGRAPHY AND MASS SPECTROMETERY

Gas chromatographic principle - Description of the instruments – Applications

Mass spectrometer principle - Description of the instrument - Magnetic deflection and time of flight methods - Electrophoresis – Principle – Instruments - Applications

UNIT - V: ANALYZING INSTRUMENTS

Saccharimeter - pH meters – Conductivity cell – Oxygen analyzer - Polarimeter

BOOKS FOR STUDY AND REFERENCE

1. Instrumental methods of chemical analysis – B.K. Sharma - Goel Publishing House - Meerut
2. Instrumental method of analysis - Willard, Merrit, Dean and Settle – CBS Publishers and Distributors - Delhi

****

Non Major Elective II – LASER PHYSICS

Unit I: Fundamentals of LASER

Spontaneous emission – stimulated emission – meta stable state – Population inversion – pumping – Laser Characteristics

Unit II: Production of LASER

Helium – Neon Laser – Ruby Laser – CO_2 Laser – Semiconductor Laser

Unit III: Industrial Applications of LASER

Laser cutting – welding – drilling – Hologram – Recording and reconstruction of hologram

Unit IV: Lasers in Medicine:

Lasers in Surgery – Lasers in ophthalmology – Lasers in cancertreatment

Unit V: Lasers in Communication

Optic fibre communication- Total internal reflection – Block diagram of fibre optic communication system – Advantages of fibre optic communication

Book for Study:

An introduction to LASERS – N. Avadhanulu, S. Chand & Company (2001)

Books for Reference:

1. Laser fundamentals – William T. Silfvast Cambridge University Press – Published in South Asia by foundation books, 23, Ansari Road, New Delhi
2. LASER Theory and Application – K. Thyagarajan and A.K. Ghatak, Mac millan, India Ltd.

****

CC – VII : INDUSTRIAL INSTRUMENTATION

UNIT – I: MEASUREMENTS OF MOTION

Motion measurements – Relative motion measuring devices – Absolute motion measuring devices.

UNIT – II : PRESSURE MEASUREMENTS

Force and torque measurements – Pressure measurements – Moderate, high and low pressure measurements – Calibration.

UNIT – III: TEMPERATURE MEASUREMENTS

Measurements of temperature – Non electrical methods – Electrical methods – Pyrometry

UNIT – IV: ACOUSTIC MEASUREMENTS

Acoustic measurements – Sound measuring system – Phon-Acoustic filters – Equalizers – Types – Microphones.

UNIT – V: MEASUREMENT OF FLOW

Mechanical flow meters – Displacement type – Reciprocating piston type – Nutating disc – Oscillating piston – Helix and gear meters – Inferential type – Propeller types – Propeller types with electronic counter combination meters – Calibration set up.

Differential type – Orifice plate – Venturi type – dall tube – Flow –Flow nozzle – Pitot tube – Annular flow element manometers – Magnetic flow meters – Principles of operation – Construction details – Characteristics – Application.

Ultrasonic flow meters – Principles of operation.

Dopler flow meter in characteristic application and advantages.

Shunt flow meter – Target flow meter – Turbine flow meter.

BOOK FOR STUDY:

Instrumentation: Measurements and Analysis – Nakra and Choudry – T M H –1988

BOOKS FOR REFERENCE:

1. Measurement system – E.D. Doeblin – McGraw Hill – International Student Edition – 1990.
2. Mechanical and Industrial Instrumentation – R.K.Jain – Khanna Publishers – 1992.
3. Industrial Instrumentation – Donald D Eckmer – Wiley Eastern Ltd., 1983.

****

CC – VIII: ELECTRICAL AND ELECTRONIC INSTRUMENTATION

UNIT – I: BRIDGES

Principles of network theorems – Thevenin's and Norton's theorem – Bridges : Kelvin's double bridge – AC bridges – Maxwell, Owen, Schering and deSauty's bridges – Wien bridges.

UNIT – II: ELECTRONIC INSTRUMENTS – I

Amplified D.C. meter – Chopper stabilized amplifier – A.C. Voltmeter using rectifiers – Electronic multimeter – Differential voltmeter – Digital voltmeters – Component measuring instruments – Sources of error – Q meter – vector impedance meter – Vector voltmeter – R.F. power and voltage measurements.

UNIT – III: ELECTRONIC INSTRUMENTS – II

Signal conditioning systems – DC and AC carrier systems – Instrumentation amplifiers – Vibrating capacitor amplier – Analog to digital data and sampling – A/D and D/A convertor (successive approximation, ladder and dual slope conversions) – Simple programs of microprocessor based measuring system – Magnetic tape recorders – EM recording – Digital recording.

Unit IV – Recording Devices

Recorders necessity – Recording requirements – Analog recorders – Graphic recorders – strip chart recorders – Galvanometer types recorders – Null type recorders – Potentio metric recorders – Single and multipoint recorders – X-Y recorders – Magnetic tape recorders – Frequency modulated recorders and digital tape recorders.

Unit V – CRD

CRD – Construction and action – Bean transit time and frequency limitations – Measurement of potential, current, resistance, phase and frequency – Special purpose oscilloscopes – Sampling storage oscilloscope.

Books for Study

1. Electronic Instrumentation and Measurement techniques – W.D. Cooper and A.D. Helfrick – PHI – Third edn. – 1989

Books for Reference:

1. A course in electrical and electronic measurements and Instrumentation – A.K. Sawhmey – Dhanpat Rai and Sons – 1990.
2. Electronic measurements and instrumentation – Oliver Cage – Mc Graw Hill – 1975.

****

CC – IX : Digital Electronics

Unit I

Number System and Logic Gates

Binary, octal, decimal and hexadecimal number systems – code conversion – weighted binary code – Non –weighted binary code – Gray code – Error detection code – Alphanumeric code.

Boolean algebra – Fundamental concepts – Basic laws of Boolean algebra – Duality theorem de Morgan's theorem – Basic logic gates – universal gates.

Unit II

Simplification of Logic Expressions

Introduction to combinational logic – SOP and POS forms of expressions – Minterms and maxterms – Reducing Boolean expressions using Boolean laws – Karnaugh map – Karnaugh map Simplification – Incompletely specified functions.

Unit III

Combinational Logic Systems
Half adder – Full adder – Half Subtractor – Full subtractor – Full subtractor 2's complement adder, subtractor circuit – BCD adder – Decoder – Encoder – Multiplexer – Demultiplexer.

Unit IV – Sequential Logic Systems

R-S flip flop using NAND gates – R-S flip flop using – Master slave – J-K flip flop – 3 bit register using flip flops – controlled shift register – Counters – Up counter – Down counter – Ring counter – Mod – 10 counter.

Unit V – Digital Instrumentes, A/D, and D/A conversion

Time – Interval meter – Frequency meter – Digital volt meter – Digital filter – Signal correlators – Digital oscillators

A/D and D/A conversion – Flash converter

Books for Study :

1. Digital computer electronics – Albert Paul Malvino – TMH
2. Digital Electronics – Tokheim – Schaum Series
3. Basic Electronics for Scientists – James J.Brophy - McGraw Hill International Series – 1990 – V edn.

Books for Reference:

1. Modern digital electronics – R.P. Jain – TMH.

****

CC – X - MAJOR PRACTICAL – III

1. Conversion of a galvanometer into Ammeter and Voltmeter.
2. Anderson's Bridge
3. Absolute capacity of condenser B.G.
4. Determination of mutual inductance-B.G.
5. Determination of the displacement of the rod using LVDT
6. PID Controller characteristics
7. D/A Converter (R-2R ladder method)
8. D/A Converter –binary weighted resistor method
9. Half adder and full adder
10. Decoder-Seven Segment display
11. Universal gates- NAND and NOR
12. Multiplexer
13. Control valve characteristics
14. Speed control of DC motor
15. Watt meter-Energy measurement
16. Frequency response of second order instruments

Microprocessor:

17. 8 bit addition, multiplication, subtraction
18. Finding biggest and smallest element
19. Arranging in ascending and descending order
20. Block transfer and sum of the transferred data
21. Code conversion (decimal to hexa and hexa to decimal)

****

CC - XI - MAJOR PRACTICAL IV

BASIC AND FORTRAN LANGUAGE

1. Solving quadratic equation
2. Arranging names in alphabetical and ascending order
3. Arranging numbers in descending and ascending order
4. Calculation of mean, mean deviation, standard deviation
5. Solving systems of linear algebraic equations by Gauss elimination method
6. Picking largest & smallest the given set of numbers
7. Addition, subtraction and multiplication of matrices
8. Sequential file handling
9. Preparation of payroll
10. Inventory control
11. Determination of correlation and regression coefficient
12. Sum of Series – Sine series
13. Fibbonacci series
14. Testing for prime numbers
15. Marks sheet preparation.

****

MAJOR BASED ELECTIVE I -ELECTRICAL MACHINES

Unit – I: DC MACHINES

Constructional details of DC machines-Operation of DC generators- EMF equation – Characteristics of different types of generators-Commutation – Armature reaction- Operation of DC motors – Torque equation – Characteristics of different types of DC motors.

Unit II: TRANSFORMERS

Principle –Types-General constructional features of single phase transformers-phasor transformer-phasor diagram and equivalent circuit – Regulation and efficiency – Auto transformers.

Unit III: SYNCHRONOUS MACHINES

Principle-Type and general constructional features – Synchronous generators –characteristics – EMF equation – Armature reaction –Regulation-Power angle curve –Phasor diagram of synchronous motor.

Unit IV: INDUCTION MACHINES

Types-Principles of operation – Types of single phase, induction motor- phasor diagrams and equivalent circuit – Slip torque characteristics – Starting, breaking and speed control methods.

Unit V: MISCELLANEOUS MACHINES (Qualitative study only)

DC/AC Servo motors –Stopping motors- Brushless motors –Reactance and hysteresis motors-Linear induction motors- Cross field machines

BOOKS FOR STUDY AND REFERENCE:

1. A text Book of Electrical machines – R.K. Rajput-Lakshmi Publications –1991.
2. A text Book of Electrical technology – Vol II – AC and DC Machines – Theraja and Theraja - S. Chand & Co., 1990.
3. Electrical Technology – Edward, Hughes – ELBS – 1957
4. Electrical Technology- Cotton – CBS – Delhi 1995.

****

CC – XII : Process Control

Unit I : Introduction

Basic control systems with examples – Open loop and closed loop systems – Basic elements in control systems – methods of analysis of physical systems – Historical development – Manual, semi automatic, automatic and complex controls.

Unit II : Process Dynamics

Differential equation, transfer function and block diagram – Block diagram reduction techniques – signal flow graph – model for sample process – Elements of process control – Process variables – degree of freedom – Dynamics of physical system – Liquid, gas and thermal processors – Mathematical modeling.

Unit III : Frequency Response

Bode plot, polar plot, closed loop, response form open loop system – Nichol's chart.

Unit IV : Controllers and Actuators

Characteristic of two position, multiplication, proportional, integral an derivative control modes – composite control modes – P, P plus I, P plus D and P plus I Plus D control modes – Examples.

Unit V

Final control elements – Electrical, pneumatic signal conversion – Electronic pneumatic and hydraulic actuators – controls valves – Valve positioners.

Books for study and reference:

1. Automatic control engineering – H.Francis - McGraw Hill – Third Edition
2. Process control – A Pollard Heinman – Educational Book London.
3. Process control – P. Harriot - McGraw Hill
4. Principles of process control – D Patranbis – TMH – 1987.
5. Handbook of applied instrumentation – Douglas M Considence - McGraw Hill
6. Automatic process control – Donald P Eckman – Wiley Eastern Ltd.

****

CC – XIII -- COMPUTER PROGRAMMING

Unit I : INTRODUCTION

Character set – Constants – Variables – Arithmetic expressions – Library functions – Arithmetic Statements – FORMAT specifications – READ and WRITE statements unformatted I/O statements.

Unit II : CONTROL STATEMENTS

Unconditional GOTO and computer GOTO – Arithmetic and Logical IF – IF …THEN ..ELSE statements – DO loops – DATA statements – logical and complex statements – String manipulations – WHILE structure.

Unit III : ARRAYS AND SUBPROGRAMS

Array declarative statements – Implied DO loops – One dimensional array – Multidimensional array – Function sub – programs – Subroutine subprograms – COMMON – EQUIVALANCE.

C LANGUAGE

Unit IV : CONTROL STATEMENTS

Variables – Data type – Constants – Declarations – Arithmetic and relational operators – Type conversion – Increments and decrements operation – Assignment operation – Bitwise logical operation – Order of equation – Associativity – Control structures – IF, IF ELSE, Switch, FOR, WHILE, DO WHILE, breake, continue - Label and goto statements

Unit V : ARRAYS AND POINTERS

Functions – Formal and actual argument – Return statement storage classes scope – Arrays – Pointer – Arithmetic – Array of strings – String functions – Pointer and structure – Nested structure – Type definition – Unions Files – Simple programs.

Books for study and Reference:

1. Programming with FORTRAN 77 – Ram Kumar – TMH – 1986
2. The C Primer – Les Hancock and Horries Krieyer - McGraw Hill – 1986
3. FORTRAN 77 with applications to Science and Engineering – R.K.Jain and R.P. Suri – TMH – 1986
4. Programming with FORTRAN 77 – Dhaliwal, Agarwal and Gupta – Wiley Eastern Ltd – 1991.
5. C Programming Principles and Practices – Tun Grady M - McGraw Hill – 1989
6. FORTRAN 77 and Numerical methods – Paul Xavier – Wiley eastern – 1994.

****

MAJOR BASED ELECTIVE II - MATERIALS TECHNOLOGY

Unit I: ENGINEERING METERIALS

Properties of engineering materials – Electrical, mechanical, magnetic, optical, thermal, dielectric, chemical and physical criteria for selection of materials for engineering applications.

Steels and cast iron: Classification – Effect of carbon, other alloying elements and heat treatment on mechanical properties.

Applications: Applications and importance of nonferrous metals: Alloys of copper, nickel, chromium, lead, magnesium and zinc

Unit II: ELECTRICAL AND MAGNETIC PROPERTIES

Conduction in metals – Effect of temperature on the electrical conductivity of metals-Thermal conductivity of metals-High conductivity materials – Nonmetallic conductors.

Delectrics – Dielectric materials – Ferroelectrics – Classification of magnetic materials –Origin of ferromagnetism – Ferromagnetic domains –Ferrites – Magnetostriction – Magnetic resonance. Superconductivity – Cryogenic or hyperconductors.

Unit III: MODERN ENGINEERING MATERIALS

Ceramics, polymers, plastics and high temperature materials- Electrical properties of polymeric materials – Types of polymeric materials, polythene, polystrone, polyvinyl chloride, Teflon polystors, bakelite-Application of polymers.

Varnishes and enamels – Types –Applications

Unit IV: MECHANICAL BEHAVIOUR

Creep: Fundamental components-Transient and viscous creep- Creep properties of metals and nonmetals –Stress relaxation.

Fatigue: Mechanism of fatigue – Fatigue properties – Fatigue damage – Fatigue stress concentration.

Hardness: Hardness and structure – Hardness measurement

Unit V: CHOICE OF MATERIALS

Elastic materials – Materials for spring , bellows, diaphragm – Bourdon tube – Selection criteria – materials for piping, pipe fittings, choice of materials for different operating conditions like temperature, pressure, humidity and corrosion – Materials for control valve body and trim – Selection Criteria – Materials for strain gauges, RTD' s , thermistors, orifice plates and rotameter – Corrosion – Prevention and Control.

BOOKS FOR STUDY AND REFERENCE

1. **A**n Introduction to electrical engineering materials- C.S. Indulkar – Chand & Co – 1981.
2. Engineering material science – C.W. Richards –PHI
3. Elements of material science – L.H. Van Vlack –PHI
4. Material science - M. Arumugam – Anuradha Agencies, -612 606, Kumbakonam.
5. Standards and practices for instrumentation – ISA HandBook –ISA 1986.

MAJOR BASED ELECTIVE III - BIO-MEDICAL INSTRUMENTATION

Unit I: INTRODUCTION TO PHYSIOLOGY AND ANATOMY

Cell and its function-Anatomy and physiology of respiratory system-cardio vascular system-Endocrine system-Central nervous system.

Bio-Electric phenomenon: Basic bio potentials-Bio electricity – Resting and action potentials-Sodium Pump generation- Characteristics of electric signals from heart, brain and muscle.

Unit II: ELECTRODES

Half cell potential-Electrode paste –Electrode material –Metal micro electrodes-Depth needle electrodes-Surface electrodes-Multi point and floating needle electrodes-Distortion in the measured signals-chemical electrodes.

Unit III: DIAGNOSING INSTRUMENTS

Computer axial tomography- Thermography –Blood pressure monitors-Respiration rate monitors-pH meters.

Unit IV: RECORDERS

Introduction – Characteristics – ECG – EEG – EMG – ERG – Electro oculograph (ECG) – high accuracy recorders – offline analyzers – Recorders.

Unit V: ASSISTING DEVICES

Introduction – Pace makers – Artificial heart valves- Defibrilators – Nerve and muscle – Stimulators – Heart lung machine –kidney machine.

BOOKS FOR STUDY AND REFERENCE

1. Medicine and Clinical engineering – B. Jacobson and J.G. Webster – Prentice Hall of India
2. Biomedical Instrumentation - Arumugam, Anuratha Agencies Publishers, II Edn, 1994.
3. Principles of Electronics & Medical research – D.W. Hill –Butterworths – London –1965

****