BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.
B.Sc. Industrial Electronics– Course Structure under CBCS
(For the candidates admitted from the academic year 2008-2009 onwards)

Semester	Part	Course	Title	Instr Hours/ Week	Credit	Exam Hours	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)	Electricity & Magnetism	5	5	3	25	75	100
		Core Course – II (CC)	Practical - I	5	4	3	40	60	100
		First Allied Course –I (AC)		5	3	3	25	75	100
		First Allied Course – II (AC)		3	-	***	-	-	-
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 – III (CC)	Electronic Devices and Industrial Applications	6	4	3	25	75	100
		First Allied Course – II (AC)		3	3	3	25	75	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
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 Amplifiers and Oscillators	6	4	3	25	75	100
		Second Allied Course – I		5	4	3	25	75	100
		Second Allied Course – II		3	-	***	-	-	-

	IV	Skill Based Elective I		2	2	3	25	75	100
		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	Introduction to Digital Electronics	2	2	3	25	75	100
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)	Practical - II	4	4	3	40	60	100
		Core Course – VI (CC)	Theory of Circuits	4	4	3	25	75	100
		Second Allied Course - II		2	2	3	40	60	100
		Second Allied Course - III		4	4	3	25	75	100
	IV	Non Major Elective II - 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	Laser Physics and Fibre Optics	2	2	3	25	75	100
	IV	Skill Based Elective II		2	2	3	25	75	100
V	III	Core Course – VII (CC)	Digital Electronics	6	5	3	25	75	100
		Core Course – VIII (CC)	Linear ICs and Operational Amplifiers	5	4	3	25	75	100
		Core Course – IX (CC)	Practical III	5	5	3	25	75	100
		Core Course – X (CC)	Instrumentation	5	5	3	40	60	100
		Major based Elective – I	Radio & Television	5	5	3	25	75	100
	IV	Skill based Elective –III		2	2	3	25	75	100
		Skill based Elective – IV		2	2	3	25	75	100
VI	III	Core Course – XI (CC)	Microprocessors	5	5	3	25	75	100
		Core Course – XII (CC)	Communication Electronics	5	5	3	25	75	100
		Core Course – XIII (CC)	Practical - IV	6	6	3	25	75	100
		Major based Elective II	Biomedical Instrumentation	5	5	3	25	75	100
		Major based Elective III	Computer Hardware	5	5	3	25	75	100
	IV	Skill Based Elective – V		2	2	3	25	75	100
		Skill Based Elective - VI		2	2	3	25	75	100
	V	Extension activities		-	1	-	-	-	-
			Total	180	140				4000

List of Allied Subjects :

Allied I : Mathematics / Applied Statistics

Allied II : Computer Science

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 10th 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.

<u>கற்பிக்கும் கால அளவு</u>

மொழிப் பாடங்கள் - 1 மதிப்பீடு = 2 மணிநேரம் கற்பித்த்ல் வகுப்பு

கலை மற்றும் அறிவியல் பாடங்கள; 1 மதிப்பீடு =1 மணிநேரம் கற்பித்தல் வகுப்பு [Lecture]

= 2 மணிநேரம் பயிற்சி வகுப்பு [Tutorial]

= 2-3மணிநேரம் செய்முறை வகுப்பு [Practical]

CC – I – ELECTRICITY AND MAGNETISM

Unit – I: Electrostatics

Gauss's theorem and its applications – Coulomb's theorem – Force on the surface of a charged conductor – Electrostatic energy per unit volume in the medium.

Capacitors : Capacity of a conductor – Energy of a charged conductor – Principle of a capacitor – Capacity of spherical and cylindrical capacitors – Capacitors in series and in parallel – Sharing of energy between two capacitors.

Unit – II: Magnetic Effects of Electric Current.

Ampere's theorem and its applications – Field along the axis of a circular coil and solenoid – Force on a conductor placed in a magnetic field – Theory of moving coil galvanometer and ballistic galvanometer - Figure of merit.

Unit – III: Current Electricity.

Electromagnetic Induction: Faraday's laws – Lenz's law – Fleming's right hand thumb rule – Self inductance – Self inductance of a long solenoid – Experimental determination of self inductance by Rayleigh's DC bridge method – Mutual inductance – Mutual inductance between two solenoids – Determination of mutual inductance – Eddy current – Skin effect – Choke Coil.

Electrical measurements : Potential difference – Electric current – Ohm's law – Resistance – Resistances in series and in parallel – Ammeters and voltmeters – Kirchhoff's laws.

Unit – IV : Magnetic and Electric Properties of Materials.

Susceptibility and Magnetisation – Dia, para and ferro magnetic materials. Hysterisis – Experimental method for B-H curve – Energy loss.

Insulators and conductors – resistivity – metals and thermistors

Unit – V : X-Rays

Production and properties of X-rays – Uses – Miller indices – Two and three dimensional Bravais lattices – Structures of simple substances – Diamond, NaCl, CsCl and Zns – Crystal Structure determination by Laue's powder photograph and rotating crystal methods.

Books for Study :

1. Electricity and Magnetism – Brijlal and Subrahmanyam – Ratan Prakashnan Mandir – 1995.
2. Modern Physics – R. Murugesan – S.Chand & Co., 1994.

Books for References:

1. Electricity and Magnetism – D.N. Vasudeva – S.Chand & Co.,
2. Electricity and Magnetism – Khare and Srivastava – Atmaram and sons – New Delhi.
3. Modem Physics – J.B. Rajam – S.Chand & Co.

CC II – Practical I

1. Characteristics of LED, LDR and photo transistor.
2. Verification of Kirchhoff's laws.
3. Series and parallel resonant circuit.
4. Characteristics of zener regulated power supply.
5. Characteristics of transistor – Common Emitter configuration.
6. Characteristics of transistor – Common Base configuration.
7. Characteristics of JFET.
8. Characteristics of UJT.
9. Characteristics of SCR.
10. Regulation Characteristics of half wave rectifier, with and without filter – Study of waveform using CRO.
11. Regulation Characteristics of full wave rectifier, with and without filter – Study of waveform using CRO.
12. Regulation Characteristics of full wave bridge rectifier, with and without filter.
13. Common emitter amplifier.
14. Emitter follower circuit.
15. Common source FET amplifier.

CC – III – ELECTRONIC DEVICES AND INDUSTRIAL APPLICATIONS

Unit – I : Diodes and BJT.

Intrinsic and extrinsic semiconductors – P type and N type – Semiconductor diode – V – I Characteristics – Diode as a rectifier – Zener diode characteristics – Transistor types – Transistor action – Transistor as an amplifier – CB, CE configurations – Fixed and voltage divider biasing – Operating Point – Thermal runaway.

Unit – II: FET and UJT.

Structure of JFET – JFET characteristics – JFET parameters – Advantages of FET-FET as an amplifier – UJT – Equivalent circuit of UJT – Characteristics of UJT – UJT as a relaxation oscillator.

Unit – III: Thyristors.

Thyristor – SCR – Theory of Operation – Characteristics – Two transistor analogy – SCR – Half and full wave rectifiers – 90 degrees phase control using SCR – DIAC – Characteristics – TRIAC – Characteristics.

Unit – IV : Opto Electronic Devices.

Photo electric theory – Kinetic energy of emitted electrons – Photo emissive cell – Photo multiplier – Photo conductive devices – Avalanche photo diode – Photo field effect transistor – Photovoltaic cells – Photo resistive devices – Photo potentiometric device - Light emitting diode sources – LDR – Photo transistor.

Unit – V: Industrial Applications.

Heating – Resistance welding – Seam welding – Induction heaters – High voltage DC transmission – Static circuit breaker-Over voltage protection-SCR current limiting circuit breaker-Flasher circuits – Time delay circuits – Fan regulator using TRIAC.

Books for study:

1. Basic electronics – B.L Theraja – S. Chand & Co – 1991
2. Principles of electronics – V.K. Mehta – S. Chand & Co - 1991
3. Industrial and power electronics – C. Harish – Raj Umesh Publications – 4th Edn. 1992.

Books for Reference:

1. Basic electronics and linear circuits – N.N. Bhargava, D.C.Kulsheshtha and S.C.Gupta – Tata McGraw Hill - 1987.
2. Industrial electronics – G.K. Mithal, Khanna Publications – Delhi – 15th Ed. 1992.

CC – IV – ELECTRONIC AMPLIFIERS AND OSCILLATORS.

Unit – I: Amplifiers – I

Single stage transistor amplifier – Amplifying action – Graphical analysis of transistor amplifier – Load line analysis – Voltage gain – Current gain – Frequency response of an amplifier.

Unit – II: Amplifiers – II

Multistage amplifier – RC coupled amplifier – Transformer coupled amplifier – Direct coupled amplifier – Negative feedback in amplifiers – Advantages of negative feedback – Gain and bandwidth of negative feedback amplifier.

Unit – III: Power Amplifiers.

The Power BJT – Thermal resistance – Dissipation – Operation curve – Maximum power hyperbola –Second breakdown – Thermal runaway – Class A large signal amplifier – The transformer coupled audio power amplifier – Efficiency – Push pull amplifiers – Class B – Class AB and transformerless types – Class C power amplifiers.

Unit – IV: Oscillators – I

Sinusoidal oscillator – Barkhausen criterion for oscillations – Transistor oscillator – Tuned collector oscillator – Tuned base oscillator – Hartley oscillator – Colpitt's oscillator – Phase shift oscillator – Expression for frequency and condition for sustained oscillations for all oscillators.

Unit – V: Oscillators – II

Crystal oscillator – Wien's bridge oscillator using transistor – FET oscillator – Limitations of LC and RC oscillators – Oscillator frequency stability. Concepts of monostable, astable and bistable multivibrators.

Books for Study:

1. Integrated electronics – Millman and Halkias – Tata McGraw Hill – 1993.
2. Basic electronics – B.L. Theraja – S.Chand & Co. (1991).

Books for References:

1. Electronic Circuits and Systems – Bapat – Tata McGraw Hill. – 1982.
2. Basic Electronics and Linear Circuits – N.N. Bhargava and others.- Tata McGraw Hill.
3. Electronic Devices and Circuits – Allen Mottershead – Prentice Hall of India
4. Basic Electronics for Scientists – James J Brophy – McGraw Hill International Edn. – 1990.
5. Integrated Circuits – K.R. Botkar – Khanna Publishers.
6. Functional Electronics – K.V. Ramanan – Tata McGraw Hill.
7. Integrated Circuits – Deboo and Burrous - McGraw Hill.

NON MAJOR ELECTIVE I
INTRODUCTION TO DIGITAL ELECTRONICS

Unit I – Basics and Number systems

Digital signals – Basic Digital circuits – NAND, NOR, EX-OR – Universality of NAND and NOR – Number systems – Conversions

Unit II – Combinational Logic Design

Boolean Algebra – Demorgan's Theorem – Karnaugh Map – Don't care condition – Multiplexer – Demultiplexer

Unit III – Flipflops

Rs flipflop – JKFF – D FF – T FF – Master slane FF – Applications

Unit IV – Shift Registers and counters

Registers – Left shift, Right shift, Parallel in parallel out
Counters – Ripple counter, Decade counter – Modulo counters

Unit V – Memories

RAM – static, Dynamic – Diode ROM – PROM – EPROM – E^2 PROM

Book for Study:

1. Modern Digital electronics : R.P. Jain, TataMcGraw Hill 1997
2. Digital Electronics, V.K. Puri, Tata Mc Graw Hill
3. Computer System Aaraachitecture, 2nd Edition, M. Marris mano, Prentice Hall, 1998

CC V – PRACTICALS --II.

1. Amplifier with voltage series feedback.
2. Amplifier with current shunt feedback.
3. Two Stages RC coupled amplifier.
4. Hartley oscillator
5. Colpitt's oscillator.
6. Wien bridge oscillator.
7. Crystal oscillator.
8. Class 'A' power amplifier.
9. Clipper and clamper circuits.
10. Astable multivibrator using BJT.
11. Monostable multivibrator using BJT.
12. Bistable multivibrator.
13. Phase Shift Oscillator.
14. 555 timer astable multivibrator and applications.
15. timer monostable multivibrator and applications

CORE COURSE VI - OPTOELECTRONICS

Unit I – LIGHT SOURCES AND DETECORS

Introduction – LED – The Processes involved in LEDs – Structures of LED – LED materials – Output characteristics of LED – Fibre – LED coupling – Modulation Bandwidth of LED – Spectral emission of LEDs. LASER: Laser operation – Semi conductor laser diode – Spatial Emission pattern of Laser – operation – Semi conductor laser diode – Spatial Emission pattern of Laser –

Current Vs output power characteristics of Laser – White LED – Organic LEDs – OLED structure and operation – photo detectors – Characteristics of Photo – detectors photo emissive photo detectors - Photo conductive devices – Photo – Voltaic devices – Prejunction photodetector – PIN photo – diode avalanche photo – diode(APQ) – Photo transistor – Bit – Error rate.

Unit II - OPTICAL FIBRES

What are optical fibres? - Importance of optical fibres – propagation of light waves in an optical fibre – Basic structure of an optical fibre and propagation of light wave through it – Acceptance angle and acceptance core of a fibre – Application of fibres – Fibres classification – Stepped index fibre – Stepped – Index monomode fibre – Disadvantage of monomode fibre – Graded index multimode fibre – Plastic fibres.

Unit III - FIBRE FABRICATION, FIBRE LOSSES

Fibre fabrication – External CVD – Axial vapor deposition (AVD) – Internal Chemical Vapour Deposition (IVCD) – Characteristics of all these methods – Fibre drawing and coating – Double – Crucible method – Attenuation in optic fibres – Material loss – Absorption loss – Leaky modes – Bending losses radiation induced losses – Inherent defect losses - Inverse square law losses -Transmission losses – Temperature dependence of fibre losses – Core and cladding losses – Dispersion in optical fibres – Inter – model dispersion – Mixing of modes.

Unit IV-OPTICAL COUPLERS – SPLICING AND MEASUREMENT ON OPTIC FIBRES

Types of optical couplers – Biconically tapered direction coupler – Beam splitting directional couples – T Couplers – Calculations on couplers – Splicing – Mechanical splicing – Steps involved in splicing procedures – Loss comparision – Losses in splices and connectors Measurement of numerical aperture and its related terms – OTDR – Working of OTDR – Applications of OTDR – Fibre loss measurement by OTDR – Limitations – Advantages.

Unit V MODULATION AND DETECTION

Introduction – LED analog modulation – Digital modulation – Laser modulation (Analog and Digital) – formats of modulation – Pulse code modulation (PCM) – Merits and demerits of PCM. Intensity modulation

(IM) – External optical modulators – Electro optic modulator – Acousto optical modulator – Demodulation methods – Direct detection methods – Heterodyne detection receiver.

Books for Study:

Subir Kumar Sarkar – Optical fibres and fibre optic communication systems Fourth revised edition , S.Chand & Company Ltd.
M.Mukunda Rao – Optical Communication, (For Unit V)

Books for Reference:

Wilson and Hawkes – Optoelectronics, Prenctice Hall of India, New Delhi.
Battacharya P._Semiconductor Opto Electronics, PHI, New Delhi.
Ajoy Ghatak and K.Thyagaran – Introduction to Fibre Optics.

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NON MAJOR ELECTIVE II- LASER PHYSICS AND FIBRE OPTICS

Unit I LASER PHYSICS

Basic principles of Laser – Einstein Coefficients Condition for light amplification – Population inversion – Threshold condition – Line shape function – Optical resonators (Qualitative only) – Three level & four level systems.

Unit II TYPES OF LASERS AND OUTPUT MODULATION METHODS

Ruby Laser Nd – YaG Laser – He Ne Laser , CO_2 Laser – Dye Laser – Semi conductor Laser – Q switching & mode locking (Qualitative) – Experimental methods.

Unit III APPLICATION OF LASER

Application of Laser in industry – Cutting – Welding – Drilling – Surface hardening – Medical applications – Laser as diagnostic & therapeutic tool – Holography – Theory of recording & reconstruction – Applications of holography – Holography interferometry in non destructive testing, Acoustic holography and Holographic microscopy – Laser in compact disc players.

Unit IV OPTIC FIBRES

Basic structure of an Optic fibre – Acceptance angle – Numerical aperture – Propagation of light through an optical fibre – Theory of modes formation – Classification of fibres – Step index & graded index fibres – Comparision of the two types – Single mode & multimode fibres – Losses in fibres – Dispersion in fibres – Fabrication of fibres.

Unit V FIBRE OPTIC COMMUNICATION

Optical communication – advantages – Light sources – Modulation methods – Photo detectors – Optical couplers – Splicing – Communication systems (Block diagram) – Repeaters – Fibre cables – Measurements of numerical aperture & optical time domain reflectometers.

Books for study:

K.Thyagaran, A.K.Ghatak – Lazer theory and applications, Cambridge university press.
Avadhanulu M.N. – An introduction to Lasers, theory & applications, S.Chand & Co, New Delhi 2001.
Subir Kumar Sarkar – Optical fibres & Fibre optic communication systems, S.Chand & Co., New Delhi, 2001.
R.K.Gaur & S.L. Gupta (eight edition) – Engineering Physics, Dhanpat rai publication, New Delhi.
P.K.Palanisamy – Physics for Engineering , Scitech Publications private Ltd.

Books for Reference:

Ajoy Ghjatak & K.Thygaran, - Introduction to Fibre Optics, Cambridge University Press.
P.K.Palanisamy – Solid State Physics, Scitech Publication (India) Private Ltd.

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CORE COURSE VII - DIGITAL ELECTRONICS

Unit I – Basics and Number Systems

Digital signals – basic digital circuits – NAND, NOR and EXOR – Boolean algebra. Binary number systems – signed binary numbers – binary arithmetic – 2's complement arithmetic. Octal number system – hexadecimal number system. Codes – error codes.

Unit II - Combinational Logic Design

Standard representation for logical functions – Karnaugh map – representation of logical functions – simplification – SOP and POS – Don't care conditions – five and six variable Karnaugh maps. Multiplexer – demulplexer – adder – subractor.

Unit III – Digital Comparator and Flip-flops

BCD arithmetic – ALU – digital compartor – parity generator / checker. Code converter – priority encoder. Clocked SR FF – JK FF – D FF – T FF – excitation table for flip flops – flip-flop design – edge and level triggered FFs – Master Slave FFs. Applications.

Unit IV – Sequential Logic Design and Timing Circuits

Registers – applications of shift registers – asynchronous counters – synchronous counters – sequential circuit design – timing circuits – Schmitt trigger ICs – monostable multivibrator – 555 timer as a timing device.

Unit V – Converters, Memories and Programmable Logic Devices

DAC- ADC – ROM, RAM – charge coupled device. Memory – PLD – PLA – PAL – field programmable gate array – applications.

Books for Study :

1. Modern Digital Electronics (2nd Edition), R.P.Jain, Tata McGraw Hill, 1997.
2. Computer System Architecture, 2nd Edn., M.Morris Mono, Prentice Hall, 1998.
3. Digital Electronics, V.K.Puri, Tata McGraw Hill.

CC – VIII – LINEAR ICs AND OPERATIONAL AMPLIFIERS

Unit – I: IC Fabrication.

Evolution of ICs – SSI, MSI, LSI and VLSl – The Monolithic IC – IC components – Methods of fabricating ICs – Complementary symmetry MOS IC.

Unit – II: Operational Amplifiers.

General amplifier characteristics – Operational amplifier – ideal operational amplifier – Practical operational amplifier – Comparator – Inverting and non-inverting amplifier – CMRR – Offset error voltages and currents.

Unit – III: Measurement of Opamp Parameters.

Open loop differential voltage gain – Output resistance – Input offset voltage – Differential input resistance – Input bias current – CMRR – Slew rate – Frequency response of operational amplifiers and compensation techniques.

Unit – IV: Linear Analog Systems.

Basic Opamp applications – Sign changer – Scale changer – Phase shifter – Summing amplifier – Subtractor – Voltage to current converter – Current to voltage converter – DC voltage follower – Differential DC amplifier – Bridge amplifier – Integrator – differentiator - Opamp Wien Bridge oscillator – Square wave generator – Triangle wave generator – Schmitt trigger.

Unit – V: IC 741 and 555 Timer:

A general purpose IC Opamp – IC 741 details – Voltage controlled Oscillator (VCO 566) – Opamp voltage regulator – IC 723 introduction

555 Timer – Description of functional diagram – Monostable and astable modes of operation – Schmitt trigger using 555 IC timer.

Books for Study:

1. Linear ICs – D. Roy Choudhury, Sherif, Jain – Wiley Eastern.
2. Integrated Electronics – Millman and Halkias – Tata McGraw Hill– 1993.
3. Electronics devices and circuits – Allen Mottershead – Prentice Hall India

Books for Reference :

1. Integrated Circuits - K.R. Botkar – Khanna Publishers.
2. Functional Electronics – K.V. Ramanan – Tata McGraw Hill.
3. Integrated Circuits and Semiconductor Devices – Theory and Applications – Deboo and Burrous - McGraw Hill – 1987.
4. Operational Amplifier and Linear Integrated Circuits, 3rd Edition, Ramakant and Gayakwad, Prentice Hall, India.

CC IX - Practical III

(Any 20 of the following experiments to be done)

1. Logic gates using discrete components.
2. IC gates (AND, OR, NOT, NOR and NAND)
3. NAND and NOR as universal gates

4. Verification of DeMorgan's and Boolean expressions.
5. Operational amplifier parameters
6. Arithmetic operation using Op-Amp.
7. Half adder and Full adder
8. Half subtractor and Full subtractor
9. Shift register
10. Divide by 'N' counter using Flip-flops
11. Waveform conversion using Op-Amp.
12. Unclocked and clocked RS Flip-flops using NAND
13. JK flip-flops using NAND.
14. D flip-flop and T flip-flop
15. D/A converter using binary weighted resistor.
16. Encoder using diodes and gates
17. Decoder using diodes and gates
18. Multiplexer and Demultiplexer
19. 7 – segment display / driver
20. R-2R ladder D/A converter
21. K-map simplification
22. Magnitude comparator
23. BCD adder
24. Ripple counter
25. Study of ALU
26. 1X1, 1X2, 2X1 RAM cells – study
27. Adder subtractor using 9's complement

CORE COURSE X
ELECTRONIC INSTRUMENTATION AND MEMS

Unit I : Primary Sensing Elements and Transducers:

Transducers – Advantages of Electrical Transducers – Classifications of Transducers – Resistive Transducers – Potentiometers – Resistance type Strain Gauges – Temperature Sensors (Thermistor & RTD) – Inductive

Transducers – LVDT – Eddy Current Sensors – Capacitive Transducers – Hall effect Transducers.

Unit II Electronic Instruments and Oscilloscopes:

Amplified DC meters – AC voltmeter using rectifiers – True RMS responding Voltmeter – Digital Voltmeter – Ramp type DVM – Successive Approximation conversion.
Oscilloscope types – Dual Trace CRO – Digital Storage Oscilloscopes – Sampling Oscilloscope, Instrumentation amplifier – Measurement using instrumentation amplifier – Measurement of small resistance change.

Unit III Counters and Timers:

Digital Counters and Timers – Different modes of operation – Frequency measurements – Frequency ratio measurements – Period measurements – Time interval and pulse width measurements – Inherent mode errors – Errors dependent on the functional mode – Automation in Voltmeters – Digital Multimeters – Accuracy in Digital Voltmeters.

Unit IV Data Acquisition Systems and Recorders:

Instrumentation Systems – Types of Instrumentation Systems – Components of Analog data acquisition system – Components of Digital data acquisition system – Uses of data acquisition systems.
Recorders – Recording requirements – Analog recorders – Graphic recorders (x-t),(x-y) – Oscillographic recorder (Ultra Violet type) – Magnetic tape recorders – Components of a Tape recorder – Digital Tape recorders – Recording techniques (Return to Zero Return to Zero)

Unit V Overview of MEMS and Microsystems:

MEMs and Microsystems – Typical MEMS and Micro system products – Evolution of Micro fabrication – Microsystems and Micro electronics – The Multidisciplinary nature of Microsystems and Miniaturization system modeling and properties of material : Introduction need for modeling (an example with micro systems) System types – basic modeling elements in mechanical system, electrical system, fluid system and thermal system.
Applications of Microsystems in the automotive Industry – Applications of Microsystems in telecommunications.

Text Books:

A Course in Electrical & Electronic Measurements & Instrumentation – A.K.Sawhey Dhanpat Rai & Co (P) Ltd., (Unit 1,2,5)
Modern Electronic Instrumentation & Measurement Techniques – Albert D.Helfrick, William D.Cooper – Prentice Hall of India (Unit 2)
Operational Amplifiers and Linear Integrated Circuits – Robert F.Coughlin, Fredrick F.Driscoll – Prentice Hall of India (Unit3)
Digital Instrumentation – A.J.Bouwens (Unit 4)

MEMS & Microsystems Design and Manufacture – Tai – Ran Hsu &
MEMS – Nitaigour Premchand Mahalik – the Graw Hill Companies (Unit 5)

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CORE COURE XI – MICROPROCESSOR

Unit I - Microprocessor Architecture

Intel 8085 – ALU-timing and control Unit – Registers – Data and Address Bus – Pin configuration – opcode and operation- Instruction cycle – Fetch operation, Execute operation – Machine cycle and state – Instruction and data Flow–Timing diagram – Timing diagram for opcode Fetch cycle Memory read – I/O Read – Memory write – I/O write.

Unit II – Instruction Set for Intel 8085

Instruction and data Formats – Addressing modes – Direct – Register indirect – Immediate and implicit addressing – Status Flags – Intel 8085 instructions – Data transfer group – Arithmetic group – Logical group – Branch group – Stack, I/O and machine control group.

Unit III – Assembly Language Programming

Machine Language – Assembly Language – One pass and two pass assembler – applications – Stacks – subroutines – MACRO – micro programming – Data transfer and data manipulation programs – Single byte and multibyte arithmetic – complement – shift – mask – lookup table – larger – smaller – sorting – Array manipulation – sum of series.

Unit IV – Peripheral Devices and Their Interfacing

Address space partitioning – Memory and I/O interfacing – data transfer schemes – I/O ports – programmable peripheral interface 8255 – DMA controller 8257 – Interrupts of Intel 8085 – Interrupt controller 8259 – Programmable interval Timer /Counter 8253 – Interfacing of A/D converter, DAC 0800.

Unit V – Microprocessor Applications

Delay subroutine–7 segment LED display – Measurement of Frequency – measurement of voltage and current – Temperature measurement and control – Water level indicator – Interfacing of stepper motor – Microprocessor based Traffic control – to generate a square wave or a pulse using I/O port.

Book for Study

1. Fundamentals of Microprocessors and Microcomputers. Ram, B. (4^{th} edn., Dhanpat Rai & Sons, Delhi, 1995).
2. Introduction to Microprocessors. Mathur, A.P. (3^{rd} edn., Tata McGraw, New Delhi, 1995)
3. Microprocessor Organisation and Architecture, L.A. Leventhal, Prentice Hall India.

CC – XII – COMMUNICATION ELECTRONICS.

Unit – I: Modulations.

Communication – Components of a communication system – Wireless communication system – Necessity for modulation – Modulation – Side bands – Bandwidth – Amplitude modulation principle – Frequency modulation principle – Modulation factor – Percentage of modulation – Assignable frequency spectrum.

Unit – II: AM Transmitter and Receiver Fundamentals.

Low level modulation – High level modulation – Exciter – Power amplifier – The driver – The modulator – Direct neutralization.

TRF receiver – Superheterodyne principle – Superheterodyne receiver – Double conversion receiver – Image frequency rejection – S/N ratio – Sensitivity – Selectivity – RF amplifier – Mixer – Local oscillator – IF amplifier working – AM detector – AGC – Audio amplifier.

Unit – III: Communication Elements.

Variable frequency oscillator – Reactance modulator- PLL – Frequency multiplier – Power output amplifier – FM limiter- The discriminator – The ratio detector - AFC.

Balanced modulator principle – Phase modulator – Frequency divider.

Unit – IV: Antennas and Propagation.

The half wave dipole – Its Characteristics -Impedance and radiation pattern – The folded dipole – Characteristic impedance and radiation pattern – Parasitic array antenna. Transmission line – Cable types – Co- axial and wire- pair – Maximum power transfer.

Unit – V: Communication Types.

RADAR principle – Satellite communication fundamentals – Up Link – Down Link – Transponder – Multiplexing technique – Basic PCM technique – Basic ideas of cell phone and FAX – Diode laser – Fibre optic communication fundamentals – Advantages and disadvantages.

Books for Study:

1. Electronic communication, Modulation and Transmission.- Robert J. Schoenbeck – Universal Book Stall, Delhi.
2. Electronic Communication Systems –George Kennedy, Tata McGraw Hill.

Books for References:

1. Principles of Communication Engineering – Anokh Singh, S.Chand &Co., Delhi.
2. Communication Electronics – N.D. Despande and others – Tat McGraw Hill.
3. Communication Electronics – Louis Fresnzel, McGraw Hill.
4. Electronic Communication, Dennis Roddy and John Coolen, Prentice Hall.

CC III - Practical IV

(At least 20 experiments to be done. All experiments are to be done using Microprocessor 8085)

1. Addition, Subtraction (8 bit).
2. Addition, Subtraction (16 bit).
3. Multiplication, division (8 bit).
4. Multiplication, division (16 bit).
5. To find the largest and smallest number in an array.
6. Searching for a number in an array and pattern comparison.
7. Real time clock.
8. Six letter word display.
9. Rolling Display.
10. LED interface to display a character.
11. To find the sum of series.
12. Interfacing – A/D converter.
13. Interfacing – D/A converter.
14. Interfacing – Traffic controller.
15. Interfacing – Keyboard.
16. Interfacing – Seven segment display to display any character.
17. Interfacing – Relay.
18. Square wave generator using 8255 and D/A converter.
19. Sine wave generator using D/A converter.
20. Ramp wave generator using D/A converter.
21. Microprocessor –Block of data transfer.
22. Program involving subroutine.

MAJOR BASED ELECTIVE I – RADIO AND TELEVISION

Unit – I : Radio Communications

Radio waves – Frequency & Wavelength – Modulation – Propagation of radio waves – Ground, Sky and Space waves – Fading – Radio Broadcast – Transmission and Reception.

Unit – II: Radio Transmission

Classification of radio waves – Amplitude modulation – Frequency modulation – Radio transmitter – AM transmitter – Antennas (transmitting antenna), Basic ideas.

Unit – III: Radio Reception

Reception and detection of amplitude modulated waves – Function of a radio receiver – Characteristics of a receiver – Super heterodyne receiver – FM Broadcast receiver.

Unit – IV: TV Transmission

TV broadcasting system – scanning – Synchronization – Blanking – Video Signal – Television band and channels – Camera tubes – Image orthicon Vision.

Unit - V :TV Reception

TV receiver – Tuner – Picture section – Receiver sweep section – Sound section power supply section – Color Mixing principles in color TV.

Text Books:

1. Basic Television and Video Systems, B.Grob, McGraw Hill
2. Electronics and Radio Engineering, F.E. Terman, McGraw Hill

Reference Book:

1. Monochrome and Color Television, R.R. Gulari, Wiley Eastern Ltd.,

MAJOR BASED ELECTIVE II

BIO MEDICALINSTRUMENTATION

Unit – I : Physiology

Nerve Physiology : Basic properties of Neurons and Axons – Membrane Potential and action potential – Function of nerves.

Muscle Physiology – Function of skeleton and smooth muscle – Cardiac muscle and rhythmic contraction.

Unit – II Heart and Central Nervous System

Heart Physiology : Dynamics of system blood flow – Electro physiology of the heart – Eithoven triangle.
Respiration : Mechanism and respiration.

Neurophysiology: Central nervous system – Function of the spinal cord and cord reflexes.

Unit – III Instruments and Diagnosis

Electrocardiogram (Qualitative Study Only) – Electroencephalogram (Recording techniques) – Patient Monitoring systems (Brief study) – Ultrasonic scanning modes.

Unit – IV Diagnosing Instruments

Computer axial tomography – Thermography – Blood pressure monitors – Respiration rate monitors (with respect to volume changes) – pH meters.

Unit – V Therapy Instruments

Iostopes (X-rays) – Pace makers – Defibrillators – Dialyzer – Respirator.

Books for study

1. Biomedical Instrumentation – Leslie Cromwell, Fred.J.Weibell and Erich A. Pfeiffer – Prentice Hall India – 2nd edition – 1990

Books for References

1. Biomedical Instrumentation – M. Arumugham , Anuradha Agencies Publishers, Kumbakonam

MAJOR BASED ELECTIVE – III COMPUTER HARDWARE

Unit – I : Number System and Gates

Binary – Decimal and Hexadecimal numbers – Half adder – Full adder – Half subtractor and Full subtractor – IC gates – Combination logic circuits – K-map of 4 variables.

Unit – II Flip-Flops

Sequential logic circuits – Flip-Flops- RS, D, T, JK. Types.

Unit – III Sequential Circuits

Shift Registers – Right and Left – Counter – Ripple counter – Decade Counter – Synchronous Counter(Qualitative).

Unit – IV Memory

RAM - ROM – EPROM – Secondary Memory.

Unit – V Microprocessor

Input and output devices – Computer Architecture – CPU – Evolution – Function – ALU – Timing and Control Units – Address bus – Data bus – Memory and its size – cache memory – Hard disk drive – Floppy disk drive – CD drive.

Text Books:

1. Computer System Architecture, M.Morris Mano, PHI
2. Digital logic and Computer design, M. Morris Mano, PHI

Reference Books:

1. Digital Computer Fundamental, T.C. Bartee, McGraw Hill
2. Computer Organization, V.C. Hamachaer, Z.G. Vranesic & S.G. Zaky, McGraw Hill
3. Digital Principle and Applications, Albert Paul Malvino & Donald P. Leach, Tata McGraw Hill

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