B.Sc. Part-I

INSTRUMENTATION Scheme of Examination

Max. Marks: 350

Semester -I

Theory Paper-I: Metrology and Mechanical Measurements-I **Max. Marks: 50**
(Internal Assessment: 10 Marks + External Examination: 40 Marks Time : 3 Hours)

Theory Paper-II: Elements of Electronics **Max. Marks:50**
(Internal Assessment: 10 Marks + External Examination: 40 Marks Time : 3 Hours)

Semester –II

Theory Paper-I: Metrology and Mechanical Measurements-II **Max. Marks: 50**
(Internal Assessment: 10 Marks + External Examination: 40 Marks Time : 3 Hours)

Theory Paper-II: Digital Techniques **Max. Marks: 50**
(Internal Assessment: 10 Marks + External Examination: 40 Marks Time : 3 Hours)

Paper-III: Practical **Max. Marks: 100** **Time: 3+3 Hours (on two days)**
(Internal Assessment: 20 Marks + External Examination: 80 Marks Time : 3 Hours)
(Details of the Conduct of Practical Examination is noted below)

On- job-Training Viva-Voce **Max. Marks:50 (on two days)**

Practical examinations will be held at the end of even semesters i.e., in 2nd, 4th and 6th Semesters.

Note*: Instructions for paper setter for theory papers*.

1. The syllabus in each theory paper is divided in 5 units. 10 questions are to be set. Two questions are to be set from each unit and the students are to attempt any 5 selecting at least one from each unit. A student is to attempt 5 questions in all.
2. 20% numerical problems are to be set .
3. Use of simple(non-Programmable) calculator is permissible.
4. Instructions should be imparted using SI System of Units .
   Familiarity with CGS system of units should also be ensured.

Note: Practical examinations will be held at the end of even semesters i.e., in 2nd, 4th and 6th semesters.

1. The practical examination will be held in two sessions of three hours each(first session starting in the evening of the first day and the second session in the following morning).
2. Distribution of Marks:

Experiments (Two)	25+25 Marks
Viva Voce	30 Marks
Laboratory Record	20 Marks (Internal Assessment)

3. Laboratory notebook will be assessed by both external examiners. Marks for each experiments, laboratory record and viva voce examination concerning the experiments in the syllabus for each session will be as indicated above.
4. Use of simple(non-Programmable) calculator is permissible

Note: On Job Training: The training will be one month duration and will be undertaken in an industry on a topic approved by the college. The candidates will be required to submit a project report and viva voce will be conducted on the basis of this report .

Syllabus & Courses of Reading
Semester I

Paper-I: **Metrology and Mechanical Measurements-I** Max. Marks: 50
(Internal Assessment: 10 Marks + External Examination: 40 Marks Time : 3 Hours)

Note: Two questions are to be set from each unit and the students are to attempt any 5 selecting at least one from each unit.

Unit- I

Standards of Measurements, Standard of length vernier calipers, vernier height and inside depth gauges. Cast iron surface plate and its uses. Description and Specification of Micrometer parts, micrometer depth gauge. Limits, Fits & Tolerance.(Basic idea)

Unit-II

Types of Application of Measurement, Functional elements of an instrument, measurement of displacement-using Resistive Potentiometer, Capacitive transducer, variable inductance transducer, LVDT,

Unit-III

Measurement of pressure using dead weight gauge manometers, bourdon tubes, diaphragms, Resistive transducers, photo electric and piezo- electric methods. Low pressure measurement (vacuum) by Mc Leod gauge, pirani gauge,ionisation gauge , high pressure measurement.

Unit-IV

Measurement of temperature using thermo couples, Platinum resistance thermometer, Semi Conductor thermometer, thermistors, Measurement of humidity using resistive Hygrometer, Aluminium oxide hygrometer, crystal hygrometer, capacitive hygrometer.

Unit-V

Total radiation pyrometers and infra red pyrometers. Disappearing type filament optical pyrometer. Measurement of linear velocity using electromagnetic transducers. Measurement of angular velocity by electrical tachometers , stroboscope .

Books:

1. Engineering Metrology R.K.Jain, Khanna Pub. Delhi.
2. A course in Electrical & Electronic Measurements and Instrumentation By A.K.Sawhney. Dhanpat Rai & Co.
3. Doebelin E.O. Measurement system TATA McGraw Hill
4. Instrumentation, Devices & System C.S.Rangan, G.R.SARMA, TATA McGraw Hill , New Delhi.

Paper-II : Elements of Electronics Max. Marks : 40

(Internal Assessment: 10 Marks + External Examination: 40 Marks Time : 3 Hours)

Note: Two questions are to be set from each unit and the students are to attempt any 5 selecting at least one from each unit.

Unit-I

Resistors:General information, symbol, color-code, types such as carbon, metal film, thin film, thick film, wire sound, variable potentiometers, logarithmic linear multi-turn. Physical properties: Temperature dependence (thermistor),Light dependent(LDR), Voltage Dependent(VDR).

Inductors : General information, symbol , types(air core, iron core, ferrite core) Frequency response. Method of measurement, (Universal Bridge).

Capacitors : General information, Symbol Color Code. Type (Air paper, electronic, mica, tantalum, polysterene). Fixed and variable capacitors. Specifications, power factors, working voltage , Measurement of capacitance.

Unit -II

A.C. Fundamentals : Resistors capacitors and inductors in series and parallel. Kirchhoff current and voltage law. Network Theorems : Superposition, Maximum power transfer. Thevenins theorem, nortons theorem. Millman's theorem.

Unit-III

Semiconductors p-type, n-type, pn junction diodes, pn junction as a circuit element, its characteristics, half wave and full wave and bridge type rectifier circuits basic filter circuits, Doide as voltage multiplier, clipper & clamper circuit. Zener diode as a voltage regulator.

Unit-IV

Transistors and Characteristics of transistors in different configuration. Concept of d.c. and a.c. load line and operating point selection. Various amplifiers configurations their h-parameter equivalent circuits determination of voltage gain current gain input resistance and output resistance & power gain. Concept of feedback in amplifiers, different oscillators circuits (without analysis)

Unit-V

Black box concept , terms such as common mode and differential signals, common mode rejection ratio (CMRR). Analysis of single ended and differential input , single ended and differential output, differential amplifiers. Constant Current source, parameter of differential amplifier:Input bias and offset current. Transfer characteristics.

Books:

1. Basic Electronics by Bernar Grob.
2. Basic Electronics by Malvino.
3. Electrical Measurements by Golding
4. Integrated Electronics By Millman Halkias

Syllabus & Courses of Reading
Semester II

Paper-I: **Metrology and Mechanical Measurements-II** Max. Marks: 40

(Internal Assessment: 10 Marks + External Examination: 40 Marks Time : 3 Hours)

Note: Two questions are to be set from each unit and the students are to attempt any 5 selecting at least one from each unit.

Unit-I

Characteristics of instruments(i.e. Static Sensitivity Accuracy, precision, linearity, Hystresis , threshold, Dead time, Dead zone and loading effects). Principle, construction and working of autocollimator, sine principle and uses of sine bars, tool makers microscope , horizontal & vertical optical projectors,

Unit-II

Surface roughness measurement by inspection, comparison method, Tomlinson surface meter, pneumatic method, Read type Mechanical comparators, Free Air Flow and Back pressure type comparators, Electrical and Electronic comparators. Measurement of vibrations using seismic transducer, LVDT & piezo electric Accelerometers.

Unit-III

Measurement of Force using strain gauge , Differential transformers & piezoelectric transducers. Torque measurement using strain gauge, Inductive transducer Magneto-strictive transducers. Shaft power by servo controlled dynamometer. Measurement of strain by resistance strain gauge and wheat stone bridge

Unit-IV

Measurement of sound, Microphones & sound level meter. Flow Measurement using pitot tube, venturi tube , orifice meter, rotameter, Hotwire & Hot film anemometers, Ultrasonic flow meter Vortex flow meter.

Unit V

Measurement of liquid level using float , ultrasonic method , Gamma ray method, Resistive method & Inductive method. Basic Digital Frequency meter, Time interval measurement

Books:

1. Engineering Metrology R.K.Jain, Khanna Pub. Delhi.
2. A course in Electrical & Electronic Measurements and Instrumentation By A.K.Sawhney. Dhanpat Rai & Co.
3. Doebelin E.O. Measurement system TATA McGraw Hill
4. Instrumentation, Devices & System C.S.Rangan, G.R.SARMA, TATA McGraw Hill , New Delhi.

Paper-II: **Digital Techniques** Max. Marks: 40

(Internal Assessment: 10 Marks + External Examination: 40 Marks Time : 3 Hours)

Note: Two questions are to be set from each unit and the students are to attempt any 5 selecting at least one from each unit.

UNIT-I

Number system and codes, Introduction to decimal, binary, octal, hexadecimal number system, BCD codes, Inter conversion of binary, decimal, BCD, Octal and hex. Parity, Excess-3, grey and Johnson code. Simple binary arithmetic. Introduction to Excess- 3 arithmetic.

Unit-II

Logic Gates: OR, AND gates, inverter circuit, the inhibit (enable) operation, XOR circuits, De Morgan's Laws, NAND & NOR gates. Logic Hardware: DTL, TTL, RTL, ECL, DCTL, CMOS Logic and their characteristics

UNIT-III

Signed binary numbers, Boolean relations, sum of products method, algebraic simplification, k-Maps, pairs, quads and octets, Karnaugh simplifications, Don't care conditions, binary addition, binary subtraction, 2's complement method. Logic circuit designing using SOP method.

UNIT-IV

Binary Adders (Half Adder, Full adder). Flip flops: RS Latches, Level clocking (Clocked SR flip flop), D latch, Edge triggered JK Flip Flop, JK Master Slave flip flop, T type Flip Flop.

Unit -V

Registers- Shift Registers and Buffer registers, synchronous & Asynchronous counters, Binary module counters, Applications of Counters.

Reference Books :

1. Digital Electronics by Gothman, Prentice-Hall
2. Digital Principals & Applications by Malvino & Leach, TMH
4. Digital Computer Electronics by A.P.Malvino, TMH
5. Analog and Digital Electronics by Peter.H.Beards.
6. Integrated Electronics by Millman & Halkias, McGraw Hill

B.Sc. Part-II
INSTRUMENTATION
Scheme of Examination

Max. Marks: 350

Semester -III

Theory Paper-I: Instrumentation Mechanisms and optical instrumentation –I Max. Marks: 50
(Internal Assessment: 10 Marks + External Examination: 40 Marks Time : 3 Hours)

Theory Paper-II: Measurement techniques and Transducers Max. Marks:50
(Internal Assessment: 10 Marks + External Examination: 40 Marks Time : 3 Hours)

Semester –IV

Theory Paper-I: Instrumentation Mechanisms and optical instrumentation –II Max. Marks: 50
(Internal Assessment: 10 Marks + External Examination: 40 Marks Time : 3 Hours)

Theory Paper-II: Signal conditioners and Vacuum Instrumentation Max. Marks:50
(Internal Assessment: 10 Marks + External Examination: 40 Marks Time : 3 Hours)

Paper-III: Practical **Max. Marks: 100** **Time: 3+3 Hours (on two days)**
(Internal Assessment: 20 Marks + External Examination: 80 Marks Time : 3 Hours)
(Details of the Conduct of Practical Examination is noted below)

On- job-Training Viva-Voce **Max. Marks: 50** **(on two days)**

Practical examinations will be held at the end of even semesters i.e., in 2nd, 4th and 6th Semesters.

Note*: Instructions for paper setter for theory papers*.

4. The syllabus in each theory paper is divided in 5 units. 10 questions are to be set. Two questions are to be set from each unit and the students are to attempt any 5 selecting at least one from each unit. A student is to attempt 5 questions in all.
5. 20% numerical problems are to be set .
6. Use of simple(non-Programmable) calculator is permissible.
4. Instructions should be imparted using SI System of Units . Familiarity with CGS system of units should also be ensured.

Note: Practical examinations will be held at the end of even semesters i.e., in 2nd, 4th and 6th semesters.

5. The practical examination will be held in two sessions of three hours each(first session starting in the evening of the first day and the second session in the following morning).
6. Distribution of Marks:

Experiments (Two)	25+25 Marks
Viva Voce	30 Marks
Laboratory Record	20 Marks (Internal Assessment)

7. Laboratory notebook will be assessed by both external examiners. Marks for each experiments, laboratory record and viva voce examination concerning the experiments in the syllabus for each session will be as indicated above.
8. Use of simple(non-Programmable) calculator is permissible

Note: On Job Training: The training will be one month duration and will be undertaken in an industry on a topic approved by the college. The candidates will be required to submit a project report and viva voce will be conducted on the basis of this report .

Syllabus & Courses of Reading
Semester III

PAPER – I: INSTRUMENTATION MECHANISMS & OPTICAL INSTRUMENTATION -I.

Max. Marks: 50
External Examination: 40 Marks
Time: 3 Hours
Internal assessment: 10Marks

Unit – I

Introduction:

Material for Instrumentations, bearings, machine bearings vs. instruments bearings. Different types of bearings and guides.

Locks and Stops:

Locks, unidirectional locks, stops, stops for linear motion, switching stops, stops for rotary motion.

Unit II

Couplings:

Rigid couplings, couplings for shafts with longitudinal shift, coupling for shafts with off set of centers, coupling for shafts with angular misalignment, flexible couplings.

Clutches:

Claw clutches, friction clutches, clutch engaging devices, special clutches, torque limiting clutches, centrifugal, clutches, over running clutches, single revolution clutch, clutches with permanent magnets.

Unit-III

Surface texture measurements and gauging:

Testing of screw threads:

Pitch and angle error, External and Internal thread gauges. Testing of gears, involutes geometry, runout, pitch, profile, lead, backlash, and tooth thickness, roundness measurements, lobbing of cylinders, Management inspection and quality control. Automatic dimensional controls manufacturing processes.

Energy storing elements:

Mass springs; leaf springs, spiral springs, torsion springs, conical disc springs.

Unit-IV

Optical components and their characterization:

Plane mirrors, Achromatic prisms, Direct vision prisms, Right angle prisms, roof prisms, erecting prism systems, cube comer prisms, beam splitter cubes, curved mirrors, lenses, ophthalmic lenses.

Unit V

Optical materials and fabrication techniques:

Optical glasses and their characteristics, crystalline materials.

Optical Machinery:

Grinding, Polishing, Drilling, trepanning, spherical curve generator, optical tools, abrasives and materials.

Making Optical Components:

Flats mirrors, parallel plates mirrors, lenses, prisms, polishing crystals.

Books:

1. Manufacturing Science-Amitabha Ghosh & Ashok Kumar Malik, - East-West Press.
2. Manufacturing Process and Systems - Ostwald, Munoz , John Wiley.
3. Workshop Technology, Vol. 1, 2 & 3 – Chapman, WAJ, Edward Arnold.
4. Workshop Technology Vol. I &II - Hazra & Chaudhary, Asian Book Comp., New Delhi
5. Fundamentals of Optics- Jenkins and White, Mc Graw Hill 1957
6. Optics and Atomic Physics- Satyaprakash

PAPER – II MEASUREMENT TECHNIQUIES AND TRANSDUCERS

Max. Marks: 50
External Examination: 40 Marks
Time: 3 Hours
Internal assessment: 10Marks

Unit- I

Introduction:

Basis concepts of measurements. System configuration (generalized). Problem analysis (Minimum performance required etc.) Basic characteristics of measuring devices such as accuracy, precision, error, intringic absolute and relative errors; uncertainty and random errors, Systematic and instrumental errors, operational errors (human errors).

Unit II

Transducer Classification:

Definition, Classification (active – passive), classification of electrical transducers, dimensional relationship such as force with density, stress etc. Basic requirements of transducer (ruggedness) linearity. Explain static and dynamic response.

Unit III

Transducers: Temperature;

Temperature sensors, Classification of temperature sensors based on temperature ranges, Thermo emf, Selection criteria of different types thermocouples, RTDs, Thermistors.

Unit IV

Strains gauges, Classification of strain gauges, Different bridge configurations. (Wheat-Stone quarter bridge, half bridge, full bridge) Methods of balancing and typical load cell example.

Unit V

Pressure transducers, Displacement transducers, Flow transducers, Hall effect devices and its applications.

Books:

1. Principles of Industrial Instrumentation by D.Patranabis, TMH
2. Instrumentation measurement & Analysis by Nakra, Chaudry, TMH
3. Instrumentation Devices & Systems by Rangan Mani Sarma, TMH
4. Instrumentation for Engineers by J.D.Turner

Syllabus & Courses of Reading
Semester IV
PAPER – I: INSTRUMENTATION MECHANISMS & OPTICAL INSTRUMENTATION -II.

Max. Marks: 50
External Examination: 40 Marks
Time: 3 Hours
Internal assessment: 10Marks

Unit I

Overview of Locks and Stops, Clutches, Energy Storing Elements, couplings, Bearings.

Joining:

Adhesive and cemented joints. Joints by elastic deformation, joints by wedge effect, screw joints, press fitted joints, spring joints by plastic deformation, beaded joints, folded joints, lapped joints, embossed joints, spreaded joints, joints by embedding.

Unit-II

Elements of workshop technology:

Simple manufacturing processes machines tools like lathes, drilling machines, milling machines, shaping machines, metal forming and casting.

Unit III

Functional Mechanisms:

Gear mechanisms, friction wheel mechanism, wedge and screw mechanisms, linkage mechanisms, integrating mechanisms, differential quantity integrator, rate quantity integrator.

Elements in high speed mechanisms:

Inertia, Friction and Energy.

Unit- IV

Testing Optical Components:

Newton's interferoscope, Fizeau interferometer Twyman Green interferometer, Mach- Zehnder interferometer.

Multiple beam interferometers, Fabry-pero interferometer, polarization interferometer shearing interferometer, Autocollimators, Rochi grating test. Foucault knife edge test, Haitmann and other screen tests. Distance measuring interferometers, Bull- testing comparators.

Unit V

Fibre Optics:

Principles of optical fibres. Materials for optical fibre. Production of optical fibres, sources, detectors, couplings. Application of fibre optics – illuminators imaging bundle, endoscopy, communications, fibre optics sensors.

Optical Instruments:

Compound microscopes, binocular microscope, projection microscope, binoculars, Telescopes- terrestrial and astronomic, profile projectors. The odolites.

Books:

1. Manufacturing Science-Amitabha Ghosh & Ashok Kumar Malik, - East-West Press.
2. Manufacturing Process and Systems - Ostwald, Munoz , John Wiley.
3. Workshop Technology, Vol. 1, 2 & 3 – Chapman, WAJ, Edward Arnold.
4. Workshop Technology Vol. I &II - Hazra & Chaudhary, Asian Book Comp., New Delhi
5. Fundamentals of Optics- Jenkins and White, Mc Graw Hill 1957

6. Optics and Atomic Physics- Satyaprakash

PAPER – II SIGNAL CONDITIONERS AND VACUUM INSTRUMENTATION

Max. Marks: 50
External Examination: 40 Marks
Time: 3 Hours
Internal assessment: 10Marks

Unit I

Signal Generation and Processing:

Sine wave generation and amplitude stability, linear frequency control and quadrature output. Saw tooth wave (linear), Square wave generator. Staircase generator. Op amp based filters.

Unit – II

Detectors:

Circuit diagrams and applications of Precision rectifiers, peak detectors, sample and hold circuits (aperture time, acquisition time etc.) comparators and qualitative importance of logarithmic amplifiers. Isolation amplifiers, optical isolators, Reference voltage and current

Unit – III

Signal Conditioners:

Instrumentation amplifiers, Characteristics, modulation, frequency modulation, pulse width modulators. Emphasis on phase sensitive detectors and their importance extracting signals buried under noise.

Unit –IV

Introduction to vacuum – fundamentals:

Gas flow mechanisms, conductance calculations, concept of throughput and pumping speed. Rotary, roots and oil free pumps. Diffusion and sorption pump. Thermo molecular, cryo and ion-pumps. Pressure measurement by hydrostatic, thermal conductivity and ionization gauges. Gauge calibration using spinning rotor diaphragm and selected gauges.

Unit – V

Vacuum components: traps, baffles, valves, seals and feed troughs. Vacuum material and fabrication techniques. Leak detection techniques, Mass spectrometer and residual gas analysis. High vacuum system design.

Thin film deposition techniques (thermal evaporation and modifications), sputtering (techniques, advantages, limitations) and various modifications.

Film thickness measurement and monitoring. Vacuum application: Freeze drying, food processing industry, lamp industry, vacuum metallurgy, vacuum impregnation.

Books:

1. Principles of Industrial Instrumentation by D.Patranabis, TMH
2. Instrumentation measurement & Analysis by Nakra, Chaudry, TMH
3. Instrumentation Devices & Systems by Rangan Mani Sarma, TMH
4. Instrumentation for Engineers by J.D.Turner
5. Vacuum Deposition of Thin Films- Bousing and Chapman and Hall
6. Vacuum Technology- A Guthrie, John Wiley and Sons

Paper – III List of Experiments (Practical)

Max Marks: 100
Time: 6 Hours
(Two Sessions)
(Internal Assessment: 20 Marks + External Examination: 80 Marks)

Section – I

(i) To measure variable high pressure using transducers and draw pressure linearity curve.
(ii) To Measure the variable stress and surface using transducer.
(iii) To measure the variable strain using transducers.
(iv) To study Thermistor or diode as temperature senor and record the temperature of hot bodies.
(v) To study the fortune LVDT.
(vi) To study the load cell.
(vii) To measure Noise level and vibration at a place.

Section- II

(i) To find the focal length of concave lens by combing it with a suitable convex lens.
(ii) To find the radius of Curvature of a spherical curved lens or mirror by speedometer.
(iii) To find the focal length of combination of lenses place at a distance.
(iv) To set up a microsope and index the refractive index of water with it.
(v) To find thickness of film by Interference.
(vi) To set up a Fresnal's Biprism and find wave length of light by measurement fringe width.
(vii) To open a rotary pump and set it up again by cleaning it.
(viii) To study pump speed of rotary pump and measure the vacuum produced by it.
(ix) To study the pump speed of diffusion pump and measure vacuum produced by it.

B.Sc. Part-III
INSTRUMENTATION
Scheme of Examination

Max. Marks 350

Semester -V

Theory Paper-I: Microprocessors –I Max. Marks: 50
(Internal Assessment: 10 Marks + External Examination: 40 Marks Time : 3 Hours)

Theory Paper-II: Instrumentation Systems-I Max. Marks: 50
(Internal Assessment: 10 Marks + External Examination: 40 Marks Time : 3 Hours)

Semester –VI

Theory Paper-I: Microprocessors –II Max. Marks: 50
(Internal Assessment: 10 Marks + External Examination: 40 Marks Time : 3 Hours)

Theory Paper-II: Instrumentation Systems-II Max. Marks: 50
(Internal Assessment: 10 Marks + External Examination: 40 Marks Time : 3 Hours)

Paper-III: Practical **Max. Marks: 100** **Time: 3+3 Hours (on two days)**
(Internal Assessment: 20 Marks + External Examination: 80 Marks)
(Details of the Conduct of Practical Examination is noted below)

On- job-Training Viva-Voce **Max. Marks: 50** **(on two days)**

Practical examinations will be held at the end of even semesters i.e., in 2nd, 4th and 6th semesters.

Note*: Instructions for paper setter for theory papers*.

7. The syllabus in each theory paper is divided in 5 units. 10 questions are to be set. Two questions are to be set from each unit and the students are to attempt any 5 selecting at least one from each unit. A student is to attempt 5 questions in all.
8. 20% numerical problems are to be set .
9. Use of simple(non-Programmable) calculator is permissible.
4. Instructions should be imparted using SI System of Units .
   Familiarity with CGS system of units should also be ensured.

Note: Practical examinations will be held at the end of even semesters i.e., in 2nd, 4th and 6th semesters.

9. The practical examination will be held in two sessions of three hours each(first session starting in the evening of the first day and the second session in the following morning).
10. Distribution of Marks:

Experiments (Two)	25+25 Marks
Viva Voce	30 Marks
Laboratory Record	20 Marks (Internal Assessment)

11. Laboratory notebook will be assessed by both external examiners. Marks for each experiments, laboratory record and viva voce examination concerning the experiments in the syllabus for each session will be as indicated above.
12. Use of simple(non-Programmable) calculator is permissible

Note: On Job Training: The training will be one month duration and will be undertaken in an industry on a topic approved by the college. The candidates will be required to submit a project report and viva voce will be conducted on the basis of this report.

Syllabus & Courses of Reading
Semester V

Theory Paper-I: Microprocessors –I

Max. Marks: 50
External Examination: 40 Marks
Time: 3 Hours
Internal assessment: 10Marks

Unit – I

1. Introduction: Microprocessor its need in instrumentation. Advantages of microprocessor based instrumentation over conventional instrumentation

Unit II

2. Review of digital Electronics: Shift registers, counters, decoders, encoders, tristate buffer and multiplexed display systems.

Unit-III

Memory & Register organization in Microprocessor :

(i) Memory organization: Types of memories (RAM, EPROM, ROM, PROM, DRAM). Basic concepts of memory organization (Number of address lines require, arrangement of memory cells, control lines, memory extension). Concept of control lines such as Read/Write chip enables Register to Register transfer via Data Bus).

(ii) Arithmetic and Logic Unit (ALU) Function of ALU, Detail design of a small ALU. An ALU which perform four basic (4-bit) operations(ADD, SUBT, OR, AND). Need for instruction decoder,. Integration of ID with "ALU" to form an "ALU" with control signals.

(iii) Control and timing unit: Need for this unit, concept of sequence of execution of an instruction. Detail design of control unit.

Unit-IV

3. Introduction to 8085 Architecture:
Block Diagram, Address Bus, Control Bus, Data Bus, need to multiplex address and data bus. Memory organization (with emphasis on multiplexing address and data bus during memory read or memory write). Control and timing Unit, ALu details, registers Flags, memory mapped I/O and I/O mapped I/O.

Unit V

4. Instruction Set:
Introduction, classification of instruction set, op-code format, some basic instructions.

(i) Data transfer instructions, this must include-
a) Immediate addressing b) Register addressing
c) Direct addressing d) Indirect addressing

(ii) Arithmetic and Logic Instructions:
ADD, SUB, AND, OR, XOR, CMP

Books:

1. Microprocessor Architecture, Programming and Application by Gaonkar
2. Digital Computer Electronics by Albent Paul Malvino (TMH) 1st Edition
3. Microprocessors and Applications by Mathur

Theory Paper-II: Instrumentation Systems-I
Analytical Instrumentation:

Max. Marks: 50
External Examination: 40 Marks
Time: 3 Hours
Internal assessment: 10Marks

Unit – I

1. Introduction to Instrumentation systems, need for an integrated approach. Zero order, First order, second order systems; dead time element, specification and testing of dynamic response.
   Multiplexer, Demultiplexer, Decoder, Encoder, Tristate buffer, Priority Encoder,
2. Displays and display drivers, Analogue to digital and digital analogue conversion.

Unit II

3. Display systems LED, LCD, Seven segment, CRT, DOT Matrix
4. Filters: passive and active filters, types of filters: first order and second order, low pass, band pass, band reject, and their frequency and phase response.
   (For higher order filters qualitative explanation & not mathematical)

Unit-III

5. Analytical Instruments: Working principle, operation, and data analysis of the following: Spectrophotometer, atomic absorption spectrometer, electron microscopes

Unit-IV

6. Nuclear Magnetic resonance Spectrometer: Principles of operation, sample preparation and data analysis, stability of magnetic fields and electronics.
7. Mass Spectrometer: Application areas, working principles of static and dynamic instruments, analysis of data

Unit V

8. X-ray techniques and dynamic instruments, analysis of X-ray techniques and their application radiography, fluorescence and diffractometry. Interpretation of Data.
9. Mossbauer Spectrometer: Principles of operation, measurement of radioactivity, analysis of data.

Books:

1. Instrumental Methods of Analysis: H Willard, LL Merritt, JA Dean, FA Seattle

Syllabus & Courses of Reading
Semester VI

Theory Paper-I: Microprocessors –II

Max. Marks: 50
External Examination: 40 Marks
Time: 3 Hours
Internal assessment: 10Marks

Unit – I

Introduction to 8085 Architecture:

1. Control and Timing:
   Sequence of execution of instruction, Concept of instruction cycle and macjhine cycle. Various types of machine cycles along with associated control and status signals (Opcode, etch, memory read, memory write, I/O read, I/O write, IO/M, SO, SI, MR, MW/ Detail timing diagram of some instructions).

Unit II

2. Advance Instructions:
   Branching, conditional and unconditional subroutines conditional and unconditional concept of stack, need for stock pointer

Unit-III

3. Interfacing:
   Interrupts, classification interrupts, various types of hardware interrupts Software interrupts RSTO to RST7. Instruction associated with interrupts (RIM, SIM, EI, DI) Typical Examples illustration usage.

Unit-IV

4. Interfacing with Peripherals:
   Concept of Input and Output ports. Study of 8255, 8279, 8253(General description, how to programme, usage) Interfacing of A/D and D/A converters

Unit V

5. Introduction to 8086:
   Architecture block diagram, instruction set. Interfacing applications.

Books:

1. Microprocessor Architecture, Programming and Application by Gaonkar
2. Digital Computer Electronics by Albent Paul Malvino (TMH) 1st Edition
3. Microprocessors and Applications by Mathur

Theory Paper-II: Instrumentation Systems-II
Bio-Medical and Environmental Instrumentation

Max. Marks: 50
External Examination: 40 Marks
Time: 3 Hours
Internal assessment: 10Marks

Unit – I

1. Bio-Medical Instrumentation: EEG, ECG and other potential working principle and precaution.
2. Blood pressure measurement, introduction to thermodynamics

Unit II

3. Introduction to ultra sound and tomographic techniques. Interpretation of data and precaution for measurements. Introduction to working principle and operation of pacemakers, diffribillators, heart-lung and other ICU instrumentation.

Unit-III

4. Environmental Instrumentation: General Introduction to physical environment. Physical aspect like pressure, temperature, humidity, noise, visibility, air quality, and water quality.
5. Humid atmosphere, hygrometers, and dew point instruments, controlled humidity environment. Wind velocity and effect on dispersion of pollution. Cup-anemometer, Hot-wire anemometer, Radar.

Unit-IV

6. Particulate matter in air, soiling index and visibility.
7. Sound level meter, tape recorders, noise dosimeters, sound level monitors, and acoustical calibrators.
8. Thermal comfort meter, heat stress monitor, and temperature monitors, solar flux, pyrnometers, and pyreheliometers.

Unit V

9. Water quality by turbidity meter, calorimeter, pH meter, microscopes, atomic absorption spectroscopy.
10. Air-quality measurement, using gas chromatography, high pressure liquid chromatography, gas chromatography, mass spectrometer, conductivity meter, Congenial environment for work, artificial lightening, acoustic consideration, and air-conditioning,.

BOOKS:

1. Air-Pollution: Physical and Chemical Fundamentals, JH Seinfeld, Mc-Graw Hill, New York, 1975
2. Meteorological Instruments: WE Knowles, Middleton and AF Spilhass, University of Toronto Press, 1953.
3. Environmental Instrumentation: LJ Frichtschen, and LW Gay
4. Thermal Comfort: PO Fanger, Robert, E., Krieger Publishing Company

Paper – III (Practical)
List of Experiments

Max Marks: 100
Time: 6 Hours
(Two Sessions)

(Internal Assessment: 20 Marks + External Examination: 80 Marks)

Section – I

(viii) Design a half-adder using NAND Gates
(ix) Design a 4-bit adder.
(x) Design a 4-bit adder using 7483.
(xi) Design a 4-bit parallel Adder/ Subtractor using 7483 and 7486 .
(xii) Design a code converter (BCD to cyclic codes) using NAND gates
(xiii) Design the decoder circuit using NAND Gates
(xiv) Design a 8:1 multiplexer using NAND Gates
(xv) Generate f(x,y,z)-xy+yz=xyz on the 8:1 multiplexer
(xvi) Use SN 74LS 151 as a parallel to serial converter.
(xvii) Design a 1:4 demultiplexer using NAND gates.
(xviii) Use 741, S138 as a demultiplexer
(xix) Use 74151 and 74138 to design IDM scheme which multiplexer 8 input lines into a single transmission line and then to 8 output lines IS may be controlled parallel using divide by 8 counter.

Section- II

(x) Find the characteristics of an RS flip-flop.
(xi) To study the characteristics of a JK flip-flop.
(xii) To study the characteristics of a D flip-flop.
(xiii) Make a ripple binary counter using JK flip-flops.
(xiv) To construct and study a BCD decade counter using JK Flip-flop.
(xv) Design a controlled counter which counts as a modulo-8 counter when control C=1 and counts as modulo-5 counter. When C=0 using flip-flops.
(xvi) Design a modulo-8 up down counter using JK flip-flops.
(xvii) Design a 4-bit SISO shift register.