DEPARTMENT OF PHYSICS

College of Science & Technology

ANDHRA UNIVERSITY

VISAKHAPATNAM – 530003

75% Syllabus

&

MODEL QUESTION PAPERS

(For the students of 3rd Semester End Examination for the academic year 2020-21 ONLY)

M.Sc. PHYSICS

M.Sc. SPACE PHYSICS

M.Sc. ELECTRONICS (INSTRUMENTATION)

NOVEMBER 2020

M.Sc. PHYSICS

&

M.Sc. SPACE PHYSICS

DEPARTMENT OF PHYSICS
ANDHRA UNIVERSITY

M.Sc. Physics
III SEMESTER
P 301: SOLID STATE PHYSICS

UNIT-I: CRYSTAL STRUCTURE:

Periodic array of atoms—Lattice translation vectors and lattices, symmetry operations, The Basis and the Crystal Structure, Primitive Lattice cell, Fundamental types of lattices—Two Dimensional lattice types, three Dimensional lattice types, Index system for crystal planes, simple crystal structures-- sodium chloride, cesium chloride and diamond structures.

UNIT-II: CRYSTAL DIFFRACTION AND RECIPROCAL LATTICE:

Bragg's law, Miller Indices indexing pattern of cubic crystals and non-cubic crystals (analytical methods). Geometrical Structure Factor, Determination of number of atoms in a cell and position of atoms. Reciprocal lattice, Brillouin Zone, Reciprocal lattice to bcc and fcc Lattices.

UNIT-III: PHONONS AND LATTICE VIBRATIONS:

Vibrations of monoatomic lattices, First Brillouin Zone, Group velocity, Long wave length, Lattice with two atoms per primitive cell, Quantization of Lattice Vibrations-Phonon momentum.

FREE ELECTRON FERMI GAS:

Energy levels and density of orbitals in one dimension, Free electron gas in 3 dimensions, Heat capacity of the electron gas, Experimental heat capacity of metals, Motion in Magnetic Fields-Hall effect, Ratio of thermal to electrical conductivity.

Text Books:

1. Introduction to Solid State Physics - C. Kittel, 5th edition,
2. Solid State Physics - A.J.DEKKER.

MODEL QUESTION PAPER

M.Sc DEGREE EXAMINATION
ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
III SEMESTER

M.Sc. PHYSICS
P301: SOLID STATE PHYSICS

Time: 3 Hrs. **Max.Marks:80**

Answer ALL Questions. **4 x 20 = 80**

1. a) What are the different fundamental types of 3 dimensional lattices?
   b) Write about the Translation lattice vectors and Reciprocal lattice vectors.

OR

   c) Exlain Bragg's law in finding the crystal structure.
   d) Explain the indexing pattern for cubic and non-cubic crystals.

2. a) Obtain the dispersion relation for a monoatomic lattice considering interactions among nearest neighbour planes.
   b) Explain the first Brillouin zone and group velocity for the elastic waves. What is the long wavelength limit in the continuum theory?

OR

   c) Derive an expression for electron gas in three dimensions.
   d) Deduce expressions for Fermi energy, density of orbitals and electron velocity at the Fermi surface.

3. a) State Bloch's theorem.
   b) Obtain the condition for energy states of electrons moving in a periodic Kronig – Penny potential.

OR

   c) What is Hall effect? Describe in detail the motion in magnetic fields.
   d) Describe the experimental heat capacity of metals.

4. Answer any four of the following: (Set TWO questions from each Unit)

   a) Describe the crystal structure of diamond and show the reciprocal lattice for B.C.C. is F.C.C. lattice.
   b) What are the additional features of vibrational spectrum of a diatomic lattice compared to a monoatomic lattice.
   c) What is geometrical structure factor?
   d) Obtain the effective number of free electrons in a partially filled band and hence classify solids.
   e) What is phonon momentum? Explain.
   f) Explain Brillouin zones.

DEPARTMENT OF PHYSICS
ANDHRA UNIVERSITY

M.Sc. Physics
III SEMESTER
P 302: LASERS AND FIBER OPTICS

UNIT-I

Laser systems: Characteristics of Laser, Laser construction, Pumping pathways. Rate equations for three level and four level systems. Laser systems: Nd-YAG laser, Titanium Sapphire laser, CO_2 Laser, Dye laser, Excimer laser, Semiconductor laser.

UNIT – II:

Laser cavity modes: Line shape function and Full Width at half maximum (FWHM) for Natural broadening, Collision broadening, Doppler broadening, Saturation behavior of broadened transitions, Longitudinal and Transverse modes. ABCD matrices and cavity Stability criteria for confocal resonators. Quality factor, Q-Switching, Mode Locking in lasers. Expression for Intensity for modes oscillating at random and modes locked in phase. Methods of Q-Switching and Mode locking.

UNIT-III

Optical fiber waveguides: Basic optical laws and self-focusing. Optical fiber modes and configurations Fiber types, Rays and Modes, Step-index fiber structure. Ray optics representation, wave representation. Mode theory of circular step-index wave guides. Wave equation for step-index fibers, modes in step-index fibers and power flow in step-index fibers. Graded – index fiber structure, Graded-index numerical aperture, modes in Graded-index fibers.

Text Books:

1. Lasers -Theory and Applications – K. Thyagarajan and A.K. Ghatak. (MacMillan)
2. Optical fiber Communications – Gerd Keiser (Mc Graw-Hill)

Reference Books:

1. Laser fundamentals – William T. Silfvast (Cambridge)
2. Introduction to fiber optics – Ajoy Ghatak and K. Thyagarajan (Cambridge)
3. Optical Electronics – Ajoy Ghatak and K.Thyagarajan (Cambridge)
4. Opto- electronics – J. Wilson and J.F.B. Hawkes (Printice Hall)

MODEL QUESTION PAPER

M.Sc DEGREE EXAMINATION
ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
III SEMESTER

M.Sc PHYSICS
P302: LASERS AND FIBER OPTICS

Time: 3 Hrs. **Max.Marks:80**

Answer All Questions **4 x 20 =80**

1. a) Explain in detail the two types of excitation pathways and Explain the working of carbon dioxide laser.

   OR

   b) By writing down rate equations, obtain the condition for steady state inversion in a four-level system.

2. a) Explain emission broadening and arrive at an expression for Full width at half Maximum due to radiative decay of atoms.

   OR

   b) Derive an expression for Intensity for modes locked in phase. Describe a method of mode locking.

3. a) Explain the various optical fiber modes and configurations. Evaluate an expression for the modes of polarization in case of a graded – index Fiber.

   OR

   b) What are the characteristics of a single mode fiber. Explain the mode theory of circular wave guides.

4. Answer any four of the following: (Set TWO questions from each Unit)
   a) Distinguish between monomode and multimode optical fibers
   b) Explain what is meant by Q-switching
   c) Explain characteristics and construction of laser
   d) Using paraxial approximation, arrive at matrices for translation and reflection through homogeneous medium
   e) Briefly explain about Excimer laser
   f) Explain what is meant by pulse broadening in Optical Fibers

DEPARTMENT OF PHYSICS
ANDHRA UNIVERSITY

(*Common for M.Sc. Space Physics and M.Sc. Physics*)

III SEMESTER

P 303 & SP 303: DIGITAL ELECTRONICS & MICROPROCESSORS

UNIT- I: **Combinational Logic Circuits**: **(i)** Simplification of Boolean Expressions: Algebraic method, Karnaugh Map method, , encoder ,decoder, Multiplexer, Demultiplexers. Design of Adders and Subtractors, IC parallel adder. **(iii)** Applications of Boolean Algebra: Magnitude Comparator, Parity generator, Checker, Code converter, Seven-segment decoder/ Driver display.

UNIT – II: Sequential Logic Circuits:(i) Flip-Flops: NAND latch, NOR latch, , Clocked S-C flip-flop, J-K flip-flop, D flip-flop, , Asynchronous inputs.**(ii)** Counters: Asynchronous counters (Ripple), Counters with MOD number $< 2^N$, Asynchronous down counter, Synchronous counters, Up-down counter,(iii) Registers: Shift Register, Integrated Circuit registers, Parallel In Parallel Out (PIPO), SISO, SIPO, PISO. **(iv)** Applications of Counters: Frequency Counter.
v) A/D and D/A Converter Circuits: D/A Converter, Linear weighted and ladder type, An integrated circuit DAC; Analog-to-Digital Conversion, Digital Ramp ADC, Successive Approximation Method, Sample and Hold Circuit, Digital Voltmeter.

UNIT – III: Intel 8085 Microprocessor (i) Architecture, Functional diagram, Pin description, Timing Diagram of Read Cycle, Timing diagram of write Cycle. **Programming the 8085 Microprocessor:** Addressing Methods, Instruction set, Assembly language programming.**(ii)** Examples of Assembly Language Programming: - Addition/Subtraction of two 8-bit/16-bit numbers, Addition of two decimal numbers, Sum of series of 8-bit numbers, Largest element in the array, Multiple byte addition, Delay sub-routine.

Text Books:

1. "Digital Systems – Principles and applications" –Ronald.J.Tocci,
2. "Fundamentals of Microprocessors & Microcomputers" - B. RAM.

Reference Books:

1. Introduction to Microprocessors for Engineers and Scientists" - P.K.Ghosh and P.R.Sridhar
2. Microprocessor Architecture, Programming and Applications with the 8085 /8080A" Ramesh. S. Gaonkar.

MODEL QUESTION PAPER

M.Sc DEGREE EXAMINATION
ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
III SEMESTER

(*Common for M.Sc Space Physics and M.Sc Physics*)

P 303 & SP 303: DIGITAL ELECTRONICS & MICROPROCESSORS

Time: 3 Hrs. **Max.Marks:80**

Answer all Questions **4 X 20 = 80**

1 (a) Draw the circuit symbol and truth tables of 3 line-8 line decoder and explain
(b) Write a note on half adder and full adder

OR

(c) Write a note on K – Map method of simplification of Boolean function with a variable Map
(d) Write a note on parity generator and checker circuits

2 (a) With a neat block diagram explain the working of JK flip-flop
(b) Write a note on shift registers

OR

(c) With a neat block diagram explain the working of 3 bit Up/Down counter
(d) Distinguish between ripple counters and parallel counters

3 (a) Draw the functional diagram of 8085 and explain the register section of 8085.
(b) Write a note on addressing methods of 8085 with examples

OR

(c) Write an ALP to find the sum of series of 8 bit numbers
(d) Write a note on Delay sub routine

4 Answer any four of the following: (Set TWO questions from each Unit)

(a) Write a note on multiplexer
(b) Write a note on code converter
(c) Write a note on D – Flip flop
(d) Write a note on successive approximation method of A/D converter
(e) Write a note on sample and hold circuit
(f) Write a note on multiple byte addition

DEPARTMENT OF PHYSICS
ANDHRA UNIVERSITY

(Common for M.Sc. Space Physics and M.Sc Physics)

III SEMESTER

P 304 & SP 304: COMMUNICATION ELECTRONICS

Unit I:

Wave spectra: Sinusoidal Wave forms, General petripodic wave forms, Trigonometric Fourier series for periodic wave, Fourier coefficients, Some general properties of periodic wave forms, Exponential Fourier series, Energy signals and Fourier Transforms, properties of Fourier Transforms, Fast Fourier transforms, Power signals

Unit II:

CW Modulation: Amplitude Modulation (AM): Introduction, Amplitude modulation, modulation index, Frequency spectrum, Average power for sinusoidal AM, Amplitude modulator and demodulator circuits, double side band suppressed carrier (DSBSC) Modulation, Super heterodyne receiver. Single Side Band Modulation (SSB): SSB principles, Balanced Modulator, SSB generation. **Angle Modulation**: Frequency modulation (FM), sinusoidal FM, Frequency spectrum for sinusoidal FM, frequency deviation, modulation index, Average power in sinusoidal FM, FM generation. Phase Modulation: Equivalence between PM and FM, FM detectors: Slope detector, Balanced slope detector, Foster – Seley discriminator, Ratio detector, Amplitude limiter, FM receiver.

UNIT III:

Pulse Modulation: Digital Line Codes: Symbols, Functional notation for pulses, Line codes and wave forms: RZ, NRZ, Polar, Unipolar, AMI, HDBn and Manchester codes, M-ary encoding, Differential Encoding, Sampling theorem, Principles of pulse Amplitude Modulation (PAM) and Pulse Time Modulation(PTM), Pulse code modulation (PCM), quantization, Nonlinear quantization, companding, differential pulse code modulation (DPCM), Delta Modulation(DM) .

Digital Carrier Systems: ASK, PSK, FSK and DPSK

Text Books:

1. Electronic Communications - D. Roody and John Coolin
2. Communication Systems Analog and Digital - RP Singh & SD Sapre

Reference Books:

1. Electronic Communications Systems - G. Kennedy
2. Modern Analog & Digital Communications - B.P. Lathi.

MODEL QUESTION PAPER

M.Sc DEGREE EXAMINATION
ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
III SEMESTER

(*Common for M.Sc Space Physics and M.Sc Physics*)
P 304 & SP 304: COMMUNICATION ELECTRONICS

Time: 3 Hrs. **Max.Marks:80**

Answer all Questions **4 X 20 = 80**

1. (a) Write a note on classification of signals
   (b) List any five properties of Fourier Tansforms

OR

(c) Write about exponential Fourier series
(d) Represent saw tooth wave form in terms of trignometric Fourier series

1. (a) What is amplitude modulation? Obtain expression for average power for sinusoidal AM.
   (b) What is meant by demodulation? Explain.

OR

(c) What is frequency modulation? Obtain expression for average power in sinusoidal FM.

(d) What is amplitude limiter? Explain.

3. (a) State and explain sampling theorem.
   (b) Explain the Manchester codes.

OR

(c) Explain the principle of pulse code modulation.
(d) Compare FSK and DPSK.

4. Answer any four of the following: (Set TWO questions from each Unit)

(a) Explain the working of super heterodyne receiver
(b) What is slope detector? Explain.
(c) Explain M – ary encoding and differential encoding
(d) What is pulse time modulation? Explain
(e) Write a note on Convolution theorem
(f) Time domain and frequency domain representation of signals

DEPARTMENT OF PHYSICS
ANDHRA UNIVERSITY

M.Sc. Space Physics
III SEMESTER
SP 301: AERONOMY

UNIT – I : NEUTRAL ATMOSPHERE
Structure and Composition
(Chapters 1 in Rishbeth & Garriott and 4.1 in Hargreaves).
Nomenclature-Thermal structure of the atmosphere. Hydrostatic equation of the atmospheric structure. Scale height and geopotential height. Exosphere.
Atmospheric composition. Dissociation and diffusive separation and thermospheric composition. Heat balance and temperature profile of thermosphere.

UNIT – II: Chemical concepts in Atmosphere
(Chapters 2.1, 2.2, 2.3 and 3.4 in Brasseur & Solomon)
Thermodynamic considerations – Enthalpy. Elementary chemical kinetics- Reaction rate constants and chemical life time of species. Unimolecular, bimolecular and termolecular reactions.
Effect of dynamics on chemical species.

UNIT – III: Ionized Atmosphere
(*Chapters 3, 5 and 6 in Rishbeth & Garriott and 4.2, 4.3 and 10 in Hargreaves)*
Photochemical processes in the ionosphere
Introduction to ionosphere – discovery. Continuity equation and photochemical equilibrium.
Theory of photo-ionization and Chapman production function. Chemical recombination and electron density.
Solar radiation and production of ionospheric layers.
Loss reactions
Different types of recombination processes. Chemistry of E and F1 regions. D region balance equations. D region chemistry – formation of water cluster ions. Electron attachment and negative ions. Positive and negative ion schemes of D region.
Linear and square law loss formulae and splitting of F layer. Vertical transport, ambipolar diffusion and F2 peak. Diffusion between ionosphere and protonosphere.
Airglow.

Text Books:

1. "Introduction to Ionospheric Physics" - H. Rishbeth & O. K. Garriott

2. "Aeronomy of the Middle Atmosphere" - Guy Brasseur & S. Solomon.

3. "Upper Atmosphere and Solar Terrestrial Relations" - J. K. Hargreaves

MODEL QUESTION PAPER

M.Sc DEGREE EXAMINATION
ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
III SEMESTER

M.Sc. SPACE PHYSICS
SP 301: AERONOMY

Time: 3 Hrs. **Max.Marks:80.**

Answer ALL Questions **4 x 20 = 80**

1. a) Give an account of neutral atmospheric structure in terms of temperature and state of mixing

   OR

   b) What are the effects of earth's gravity and solar heating on the atmospheric constituents? Obtain the hydrostatic equation of atmospheric structure

2. a) Give a detailed account of interaction of solar radiation with atmosphere and discuss the formation of different ionospheric layers

   OR

   b) What do you understand by continuity equation for electron density? Describe various loss processes and their relative importance in different ionospheric regions.

3. a) In the context of ionospheric behavior, what do you understand by the term 'anomaly'? Discuss in detail F region anomalies.

   OR

   b) Enumerate important sources of ionization in the D – region of the ionosphere

4. Answer any four of the following: (Set TWO questions from each Unit)

   a) What are the main constituents of the exosphere and under what conditions particles escape?
   b) Explain the concept of scale height
   c) Enumerate sources and sinks of heat in thermosphere
   d) What is enthalpy of formation of a chemical species? How do you determine the spontaneity of a reaction in the atmosphere?
   e) What are the assumptions in the Chapman's theory of photo ionization? How is the generalized production function obtained?
   f) Write a short note on splitting of F- region

DEPARTMENT OF PHYSICS
ANDHRA UNIVERSITY

M.Sc. Space Physics
III SEMESTER
SP 302: PRINCIPLES OF PLASMA PHYSICS AND SPACE PLASMAS

UNIT – I: PRINCIPLES OF PLASMA PHYSICS

Plasma and its characteristics (*Chapter 1 in Boyd and Sanderson*)
Definition of a plasma. Plasma characteristics: Quasi neutrality, Plasma oscillations, Debye shielding, Debye length and Debye potential.
Particle orbit theory (*Chapters 2.1 to 2.8 in Boyd and Sanderson*)
Motion of charged particles in constant and uniform electric and magnetic fields. Particle motion in magnetic field with gradient and curvature: Particle motion in converging magnetic fields. Invariance of magnetic moment of a charged particle in slowly varying magnetic field. Magnetic mirror. Adiabatic mirror trap.

UNIT – II: Hydro magnetics (*Chapter 4 in Boyd and Sanderson*)

Frozen fields and Force free fields. Magneto-hydrostatics – magnetic stress tensor. Pinching in plasmas. Linear pinch – Bennett's relation, Theta pinch and Dynamic pinch. Hydro-magnetic stability. Kink and Sausage instabilities. R.T.instability. Alfven waves.
Cold plasmas (*Chapters 7.1 to 7.3 in Boyd and Sanderson*)
Definition of cold plasma. General wave concepts: wave polarization,group velocity. Waves in cold plasma: waves with **k** parallel to **B:** Shear Alfven waves and Ion Cyclotron waves; waves with **k** perpendicular to **B:** Compressional Alfven waves

UNIT – III: Space Plasmas

Geomagnetism (*Chapter 7 in Rishbeth and Garriott*)
Origins of geomagnetic field. Representation of Earth's magnetic field and magnetic field components. Geomagnetic field variations.
Solar Wind and Interplanetary Magnetic Field (IMF) (*Chapters 7.1, 7.2 and 7.3 in Hargreaves*)
Sun Spots and solar cycle. Solar flares. Theory of solar wind. Observed properties of the solar wind. IMF and sector structure

Text Books:

1. "Plasma Dynamics" - T. J. M. Boyd and J. J. Sanderson
2. "The Upper Atmosphere and Solar Terrestrial Relations" - J. K. Hargreaves

Reference Books:

1. "Introduction to Ionosphere and Magnetosphere" - J. A. Ratcliffe

MODEL QUESTION PAPER

M.Sc. DEGREE EXAMINATION
ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
III SEMESTER

M.Sc. SPACE PHYSICS
SP 302: PRINCIPLES OF PLASMA PHYSICS AND SPACE PLASMAS

Time: 3 Hrs. **Max.Marks:80**

Answer ALL Questions **4 x 20 = 80**

1 a) Describe the quasi-neutral nature of the plasma
b) Describe the motion of charged particle in uniform magnetic and electric fields

OR

c) Describe the phenomenon of Debye Shielding and give expressions for Debye length and Debye potential.
d) Describe the adiabatic mirror trap and show that the higher the mirror ratio, the lower is the probability of escape of the particles from the trap.

2. a) What are frozen fields?
b) Derive the magnetic stress tensor and describe the pinching effect in plasmas

OR

c) Define cold plasma
d) Derive the dispersion relation for waves propagating parallel to the magnetic field.

3. a) Describe the solar flares
b) Give the theory of solar wind.

OR

c) What are Radiation belts?
d) Describe the production and loss mechanisms of the Van Allen particles in the radiation belts.

4. Answer any four of the following: (Set TWO questions from each Unit)

a) Give an account of plasma oscillations.
b) Describe the kink and sausage instabilities
c) Describe the phenomenon of Alfven waves in the magneto hydrodynamic fluids and derive the expression for Alfven wave velocity
d) What are the cold plasma equations?
e) Describe the structure of Inter Planetary Magnetic Field
f) Give an account on solar flares

M.Sc. ELECTRONICS (INSTRUMENTATION)

M.Sc. Degree Examination
Electronics (Instrumentation)

Third Semester

SYLLABUS

EI 301 – Electronic Measurements and Instrumentation
(Effective from the admitted batch of 2017-2018-CBCS)

Unit-1: Measurement Error and Standards
Accuracy and precision – Significant figures – Types of error – Statistical analysis – Probability of errors – Limiting errors – Classification of standards – Standards for mass, length, and volume – Time and frequency standards – Electrical standards – Standards of temperature and luminous intensity – IEEE standards.

Unit-2: Electromechanical Indicating Instruments and Instruments for Basic Parameters
Permanent-magnet moving-coil (PMMC) mechanism – DC ammeters – DC voltmeters – Ohmmeter – Electrodynamometer – Watt-hour meter – Power-factor meter – Instrument transformers.
Instruments for measuring basic parameters
FET input dc voltmeter – AC voltmeter – True RMS voltmeter – Digital multimeter –LCR meter – Vector impedance meter – Vector voltmeter – RF power measurement.

Unit-3: Oscilloscopes and Signal Generators
Principle of CRO – Cathode Ray Tube (CRT) – Vertical deflection system – Horizontal deflection system – CRO probes and transducers – Special purpose CROs.
Signal Generators
Sine wave generator – Frequency-synthesized signal generator – Sweep frequency generator – Pulse and square wave generator – Function generator.

Text Books

1. Electronic Instrumentation and Measurement Techniques – Helfrick and Cooper
2. Electronic Measurement and Instrumentation – Sawhney

Reference Books

1. Electronic Instrumentation – Oliver and Cage
2. Electronic Instrumentation – Kalsi

MODEL QUESTION PAPER

M.Sc.Degree Examination
Electronics (Instrumentation)
Third Semester

EI 301 – ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
(Effective from the admitted batch of 2017 – 2018 CBCS)

Time: 3 Hours Max.Marks: 80

PART – A
Answer ALL questions (4 x 20 = 80)

1. a) Define different types of errors.

   b) Explain the statistical analysis of measurements of data for an instrument.

   (OR)

   c) Explain briefly the classification of standards

   d) Discuss IEEE Standards.

2. a) Draw the diagram of DC ammeter for current measurement. Explain its operation.

   b) Explain the operation by series type and shunt type ohmmeter.

   (OR)

   c) Explain the working of LCR meter with a neat diagram.

   d) Explain the working of True RMS voltmeter with a neat block diagram.

3. a) Explain the working of CRT with a neat diagram.

   b) Explain the role of vertical deflection system.

   (OR)

   c) Discuss the working of function generator.

   d) Describe the mechanism of sine wave generator with a neat diagram.

4. **ANSWER** any **FOUR** of the following **(TWO Questions from Each Unit)**

   a) Explain the limiting error of an instrument with an example.

   b) Explain international, primary and secondary standards of measurement.

   c) Explain the working of power factor meter.

   d) Draw the diagram of watt-hour meter and explain its working.

   e) Write a brief note on digital millimeter.

   f) Discuss the working of digital storage oscilloscope.

M.Sc. Degree Examination
Electronics (Instrumentation)

Third Semester

SYLLABUS

EI 302 – Industrial and Process Instrumentation
(Effective from the admitted batch of 2017-2018-CBCS)

Unit-1: Pressure and Temperature Measurement
Manometers – Elastic types – Bourdon tubes – Diaphragm Elements – Bellows elements – Electrical types.
Temperature Measurement
Solid expansion type – Fluid expansion type – Electrical type – RTDs – Thermocouples – Thermistor – Radiation and optical pyrometers.

Unit-2: Flow and Level Measurement
Head types – Pilot tube – Area flow meters – Electrical type – Magnetic types – Ultrasonic or acoustic velocity flow meter – Hot wire anemometer.
Level measurement
Float type – Displacer type – Hydrostatic – Electrical methods.

Unit-3: Process Control
Process variable – Batch process and continuous process – Self regulation – Basic control actions – Characteristics of on off – Proportional – Single speed floating – Integral and derivative control modes – Composite control modes – P+I, P+D, P+I+D, response of controllers for different types of inputs – Tuning of controllers- ratio control – Cascade control.

Text Books

1. Principles of Industrial Instrumentation – Patranabis
2. Principles of Process Control – Patranabis

Reference Books

1. Principles of Industrial Instrumentation – Eckman
2. Automatic Process Control – Eckman

MODEL QUESTION PAPER

M.Sc. Degree Examination
Electronics (Instrumentation)
Third Semester

EI 302 – INDUSTRIAL AND PROCESS INSTRUMENTATION
(Effective from the admitted batch of 2017 – 2018 CBCS)

Time: 3 Hours Max.Marks: 80

PART - A
Answer **ALL** questions

(4 x 20 = 80)

1. a) What is the basic difference between optical pyrometer and the total radiation pyrometer. Describe the measurement of temperature using the optical pyrometer.

[OR]

b) Describe the measurement of temperature using Thermistor. What are the advantages and disadvantages of Thermistor sensor?

2. a) Describe the mass flow meter for the measurement of mass flow rate.

[OR]

b) What are the different types of ultra-sonic flow meters? Describe one of them.

3. a) What are the various types of hydrostatic level sensors? Discuss the diaphragm box type level gauging.

[OR]

b) Distinguish between the float type and displacer type liquid level gauges.

c) Discuss the measurement of level using displacer type level indicator.

4. ANSWER any **FOUR** of the following **(TWO questions from Each Unit)**

a) How strain gauges are used in diaphragms for measuring differential pressure?

b) What are the advantages of using double slide wire bridge circuit arrangement in measuring the temperature?

c) Explain the measurement of flow of a gas using Hot wire Animometer.

d) Discuss the working of rotameter for flow measurement.

e) Describe the Scheme of a weighted float level control.

f) Explain how control value sizing techniques allow selection of the proper size of control value.

M.Sc. Degree Examination
Electronics (Instrumentation)

Third Semester

SYLLABUS

EI 303 – Analytical Instrumentation
(Effective from the admitted batch of 2017-2018-CBCS)

Unit-1:
Classification of the methods of analysis – Classical / instrumental methods.
UV-VIS spectrophotometer – IR spectrometer – NMRspectrophotometer – X-ray methods

Unit-2:
Flame photometry – AAS,ICP-AES, ICP-MS spectrometers.
pH – Photentiometry – Conductivity – Polarography.

Unit-3:
Thermogravimetry – Differential thermal analysis – Differential scanning calorimetry.
Gas chromatography – GC-MS – High performance liquid chromatography (HPLC) – LC-MS.

Text Books

1. Instrumental Methods of Analysis – Willard
2. Handbook of Analytical Instruments – Khandpur

Reference Books

1. Instrumental Methods of Chemical Analysis – Sharma

MODEL QUESTION PAPER

M.Sc. Degree Examination
Electronics (Instrumentation)
Third Semester

EI 303 – ANALYTICAL INSTRUMENTATION
(Effective from the admitted batch of 2017 – 2018 CBCS)

Time: 3 Hours Max.Marks: 80

PART - A
Answer **ALL** questions

(4 x 20 = 80)

1. a) Explain the radiation sources and detectors used in IR spectroscopy.

[OR]

b) Give an account of experimentation for X – ray spectrometry? Discuss their applications.

2. a) Explain the principle and working of a basic polarographic instrument and mention their applications

[OR]

b) Discuss the principle of Flame photometry. Explain the working of a flame photometer with neat sketch.

3. a) With neat sketch explain the magnetic deflection type mass spectrometer. List the application of mass spectrometers.

[OR]

b) Describe the working of DTA. Mention the applications of DTA.

4. ANSWER any **FOUR** of the following **(TWO questions from Each Unit)**

a) Give an account of Filters used in UV spectroscopy.

b) Write a brief note on FT – IR.

c) What is ICP? What is its use in AAS?

d) Write in brief differential scanning calorimetry (DSC).

e) Discuss about High performance liquid chromatography (HPLC)

f) Explain the working of TCD used in GC.

M.Sc. Degree Examination
Electronics (Instrumentation)

SYLLABUS

Third Semester

ELECTIVE PAPER

1. Telecommunication Switching Systems and Networks

(Effective from the admitted batch of 2017-2018-CBCS)

UNIT – I:

Evolution of telecommunication systems, Network structures, Types of Networks, guided transmission media, wireless transmission media, structure of public switched telephone network, trunks and multiplexing, switching, generations of mobile systems

UNIT – II:

Protocol hierarchies, Design issues of layers, connection oriented and connectionless services, relationship of services and protocols, OSI and TCP/IP reference models, comparison of TCP/IP and OSI, Error detection and Error correction, HDLC, Frame relay and ATM Networks

UNIT – III:

Wireless spectrum, wireless channel capacity, frequency hopping spread spectrum, direct sequence spread spectrum, multiple access techniques, diversity

Text Books

1. Wireless communications & Networks – William Stallings
2. Computer Networks – Andrew S. Tanenbaum

Reference Books

1. Wireless Communications – Andrea Goldsmith
2. Telecommunications switching, Traffic and Networks – J.E.Flood
3. WCDMA and cdma 2000 for 3G Mobile Networks – M.R. Karim, Mohsen Sarraf

MODEL QUESTION PAPER

M.Sc. Degree Examination
Electronics (Instrumentation)
Third Semester

ELECTIVE 1 -TELECOMMUNICATION SWITCHING SYSTEMS AND NETWORKS
(Effective from the admitted batch of 2017 – 2018 CBCS)

Time: 3 Hours Max.Marks: 80

PART - A
Answer **ALL** questions

(4 x 20 = 80)

1. a) Give a detail note on Telecommunication network structures and explain types of networks.

[OR]

b) Explain in briefly about structure of public switched telephone network and generation of mobile systems.

2. a) Explain protocol hierarchies and design issue of layers.

[OR]

b) Explain HDLC, Frame relay and ATM networks.

3. a) Explain wireless spectrum and its channel capacity.

[OR]

b) Explain in detail about frequency hopping spread spectrum and diversity.

4. ANSWER any **FOUR** of the following **(TWO questions from Each Unit)**

a) Give a detailed note on Guided transmission media.

b) Discuss trunks and multiplexing switching.

c) Explain comparison between TCP/IP and OSI models.

d) Give a detailed note on error detection and correction.

e) Give a note on Direct Sequence spread spectrum.

f) Give a note on multiple access techniques.

M.Sc. Degree Examination
Electronics (Instrumentation)

SYLLABUS

Third Semester

ELECTIVE PAPER

2. PLC & SCADA
(Effective from the admitted batch of 2017-2018-CBCS)

Unit 1: Overview of PLCs. PLC Hardware Components, Number Systems and Codes.

Brief history of PLCs, what makes PLCs work, PLCs configurations, System Block diagrams, basic components and symbols, PLCs system, PLCs controllers, Internal Architecture, Hardware, PLCs number and codes.

Unit 2: Logic Fundamentals, Basic PLC Programming.
Physical components Vs Programme components, Lighting control, Internal relays,Disagreement circuits, oscillators, holding, always ON & always OFF contacts, Input Devices, output devices, I/P and O/P units, Signal conditioning, remote connections, Networks, commercial system example, processing inputs, I/O addresses, Discrete Output models, TTL o/p modules, analog o/p modules.

Unit 3: PLC Wiring Diagrams & Ladder Logic Programs, Timers & Counters.
Fundamentals of ladder diagram, conventional ladders Vs PLCs ladder logic, overview of logic and logic functions, lader functions, latching, multiple outputs, Entering outputs, function blocks, Series logics (AND, 3 I/P AND), Parallel logics (OR, NOT,) Analysis of Rung #1, Analysis of Rung #2, Ex-OR, Ex-OR logic, combinational logic, Types of Timers, ON delay, OFF delay, Pulse and Retentive Timers, Form of counters, up and down counting, Timers with Counters, sequences.

Text Books:

1. Programmable logic controllers- W.Bolton.
2. Introduction to Programmable logic Controllers,(Delmar Publisher)- Gary Dunning

Reference Books

1. Programmable logic controllers Hardware, software and Applications- George.L..
2. Programmable logic Controllers, (Prentice Hall of India)- Webb & Reis.
3. Programmable Logic Controller – Principles and Applications- J. W. Webb.
4. Programmable Logic Controller – Programming methods and Applications- Hackworth John R. and Hackworth Frederick D. Jr.
5. Programmable Controllers, Theory and Implementations—L.A Bryan, E.A Bryan.

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MODEL QUESTION PAPER

M.Sc. Degree Examination
Electronics (Instrumentation)
Third Semester

ELECTIVE 2 – PLC & SCADA
(Effective from the admitted batch of 2017 – 2018 CBCS)

Time: 3 Hours Max.Marks: 80

PART - A
Answer **ALL** questions (4 x 20 = 80)

1. a) Explain in detail about the internal architecture of the (PLC) programmable logic controllers.

[OR]

b) Discuss about the programmable logic controllers and configurations.

c) What are programmable logic controller numbers and codes?

2. a) Discuss about the internal relays in programmable logic controllers

b) Discuss the discrete output models in programmable logic controllers

[OR]

c) Write a note on input devices and output devices of programmable logic controllers.

3. a) Write a note on conventional ladders versus programmable logic controllers' ladder logic.

[OR]

b) Write a note on series logics and parallel logics.

c) Briefly discuss about timers.

4**. ANSWER** any **FOUR** of the following

a) Write a note on programmable logic controllers.

b) Write a note on remote connections of programmable logic controllers.

c) Discuss about on delay and off delay.

d) Explain in detail about programmable logic controller counters.

e) Explain special function instructions in programmable logic controllers.

f) Explain the analysis for RUNG#1 for OR Logic.