ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS,
III SEMESTER.

		MARKS
P301.	SOLID STATE PHYSICS (85+15)	100
P302.	LASERS AND FIBER OPTICS (85+15)	100
P303.	DIGITAL ELECTRONICS & MICROPROCESSORS (85+15)	100

Special paper

P304	RADAR SYSTEMS AND SATELLITE COMMUNICATION (85+15)	100
P305	DIGITAL ELECTRONICS LAB practical-75 +record-25	100
P306	SOLID STATE PHYSICS LAB practical-75+record-25	100

Total Marks 600

Choice Based Paper for other Departments in University Campus Only

	ANALYTICAL TECHNIQUES

SCHEME OF EXAMINATION

Theory pass minimum 40%
Practical pass minimum 50%
Aggregate 50%

SCHEME OF INSTRUCTION :

Teaching Hours 4 Periods per week
Tutorial 1 Period per week

Practical 6 Periods per week

DEPARTMENT OF PHYSICS
ANDHRA UNIVERSITY
M.Sc. Physics
III Semester
(w.e.f 2009-10 batch)
P301: SOLID SATE PHYSICS.

UNIT-I: CRYSTAL STRUCTURE: 14 Hrs

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: 14 Hrs

Bragg's law, Experimental diffraction methods-- Laue method and powder method, Derivation of scattered wave amplitude, indexing pattern of cubic crystals and non-cubic crystals (analytical methods). Geometrical StructureFactor, 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: 6 Hrs

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: 6 Hrs

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.

UNIT-IV: THE BAND THEORY OF SOLIDS: 10 Hrs

. Nearly free electron model, Origin of the energy gap, The Block Theorem, Kronig-Penny Model, wave equation of electron in a periodic potential, Crystal momentum of an electron-Approximate solution near a zone boundary, Number of orbitals in a band--metals and isolators. The distinction between metals, insulators and semiconductors

TEXT BOOKS:

1.Introdcution to Solid State Physics, C.Kittel, 5^{th} edition,
2.Solid State Physics, A.J.DEKKER.

ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
III Semester
(w.e.f 2009-10 batch)

P302: Lasers and Fiber optics

UNIT-I

LASER SYSTEMS : Light Amplification and relation between Einstein A and B Coefficients. Rate equations for three level and four level systems. Laser systems: Ruby laser, Nd-YAG 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.

UNIT-IV

FIBER CHARACTERISTICS : Signal Degradation In Fibers - Attenuation, Absorption, Scattering and Bending losses in fibers, radiative losses, Core and Cladding losses. Signal distortion in optical wave guides: Group delay, material dispersion, waveguide dispersion and intermodal dispersion. Pulse broadening in optical fibers. Power launching in Optical fibers, Source-output pattern, Lensing schemes. Fiber-to-fiber joints: Mechanical misalignment, fiber related losses, Fiber and face preparation. fiber splicing techniques, fiber connectors.

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)

ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS, SPACE PHYSICS

III Semester

(w.e.f 2009-10 batch)

P303, SP303: Digital Electronics & Microprocessors
(Common for M.Sc.Space Physics and M.Sc.Physics)

UNIT - I

Digital Circuits (i) Number Systems and Codes: Binary, Octal, Hexadecimal number systems, Gray code, BCD code, ASCII code.(ii) Logic Gates and Boolean Algebra: OR, AND, NOT, NOR, NAND gates, Boolean theorems, DeMorgan laws.

II) Combinational Logic Circuits: (i) Simplification of Boolean Expressions: Algebraic method, Karnaugh Map method, EX-OR, EX-NOR gates, ENCODER, DECODER, Multiplexer, Demultiplexers.

(ii) Digital Arithmetic Operations and Circuits: Binary addition, Design of Adders and Subtractors, Parallel binary adder, 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 and Related Devices: NAND latch, NOR latch, Clocked flip-flops, Clocked S-C flip-flop, J-K flip-flop, D flip-flop, D latch, Asynchronous inputs, Timing problem in flip-flops.(ii) Counters: Asynchronous counters (Ripple), Counters with MOD number < 2^N, Asynchronous down counter, Synchronous counters, Up-down counter, Presettable counter.

(iii) Registers: Shift Register, Integrated Circuit registers, Parallel In Parallel Out (PIPO), SISO, SIPO, PISO

(iv) Applications of Counters: Frequency Counter and Digital clock.

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:

Architecture, Functional diagram, Pin description, Timing Diagram of Read Cycle, Timing diagram of write Cycle.

Programming the 8085 Microprocessor:

(i) Addressing Methods, Instruction set, Assembly language programming.

(ii) Examples of Assembly Language Programming: Simple Arithmetic - Addition/Subtraction of two 8-bit/16-bit numbers, Addition of two decimal numbers, Masking of digits, word disassembly.

(iii) Programming using Loops: Sum of series of 8-bit numbers, Largest element in the array, Multiple byte addition, Delay sub-routine.

UNIT - IV

Data Transfer Technique:

Serial transfer, Parallel transfer, Synchronous, Asynchronous, DMA transfer, Interrupt driven Data transfer.

8085 Interfacing:

I/O Interfacing: Programmable Peripheral Interfacing, 8255, Programmable Peripheral Interval Timer 8253, Programmable Communication Interface 8251, DAC 0800 and ADC 0800 interfacing.

TEXT & REFERENCE BOOKS:

1. "Digital Systems – Principles and applications" –Ronald.J.Tocci,
2. "Fundamentals of Microprocessors & Microcomputers" - B. RAM.
3. " Introduction to Microprocessors for Engineers and Scientists" - P.K.Ghosh and P.R.Sridhar
4. "Microprocessor Architecture, Programming and Applications with the 8085 /8080A" – Ramesh. S. Gaonkar.

ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS AND M.Sc. SPACE PHYSICS

III Semester

(w.e.f 2009-10 batch)

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

P304 , SP 304 - RADAR SYSTEMS & SATELLITE COMMUNICATION

UNIT - I

Radar Systems:

Fundamental – A simple RADAR – overview of frequencies – Antenna gain Radar Equation – Accuracy and Resolution – Integration time and the Doppler shift (Ch 1 of Text Book 1)

Designing a surveillance radar – Rader and surveillance – Antenna beam – width consideration – pulse repetition frequency – unambiguous range and velocity – pulse length and sampling – radar cross section – clutter noise (Ch 2 of Text Book 1)

Tracking Radar – Sequential lobbing – conial scanning – Monopoles Radar – Tracking accuracy and Process – Frequency Agility – Radar guidance (Ch3 of Text Book 1)

UNIT - II

Signal and Data Processing – Properties of clutter – Moving Target Indicator Processing Shareholding – Plot extraction – Tract Association, Initiation and Tracking (Ch 5 of Text Book 1)

Radar Antenna – Antenna parameters – Antenna Radiation Pattern and aperture distribution – Parabolic reflector – cosecant squared antenna pattern – effect of errors on radiation pattern – Stabilization of antennas (Ch7 of Text Book 2).

UNIT - III

Satellite Communication

Satellite System – Historical development of satellites – communication satellite systems – communication satellites – orbiting satellites – satellite frequency bands – satellite multiple access formats (Ch1 of Text Book 3).

Satellite orbits and inclination – Look angles, orbital perturbations, space craft and its subsystems – attitude and orbit control system – Telemetry, Tracking and Command – Power system – Transponder – Reliability and space qualification – launch vehicles

(Ch2 & 3 of Text Book 4)

UNIT - IV

Multiple Access Techniques – Time division multiple access – Frequency division multiple access – Code division multiple access – Space domain multiple access

(Ch 7 of Text Book 4).

Earth Station technology – Subsystem of an earth station – Transmitter – Receiver Tracking and pointing – Small earth station – different types of earth stations – Frequency coordination – Basic principles of special communication satellites – INMARSAT VSAT, GPS, RADARSAT, INTELST

(Ch 10 & 11 of Text Book 4).

Text Books:

1. Understanding Radar Systems – Simon Kingsley and Shaun Quegan.
2. Introduction to Radar Systems – MI Skolnik
3. Satellite Communication – Robert M. Gagliardi
4. Satellite Communication – Manojit Mitra

ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS AND M.Sc. SPACE PHYSICS
III Semester
(w.e.f 2009-10 batch)
P 305 : DIGITAL ELECTONICS Lab

I Digital electronics

1. Verification of Gates: AND, OR, NOT, NAND, NOR, EX –OR, EX – NOR gates

2. Encoder and Decoder

3 Multiplexer and De multiplexer

4. Adders: Half adder, Full Adder, Paraller Adder

5. Flip Flops (7400,7402,7408,7446)

6 Decade Counter (IC 7490)

7. Seven segment Decoder/ Driver (7490,7447)

8 .UP/DOWN Counter IC 74193

9. Digital Comparator (7485)

10 Micrprocessor 8085

Addition/ subtraction of 8 bit numbers

Sum of series of 8 – bit numbers

ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
III Semester
(w.e.f 2009-10 batch)
P 306: PRACTICALS : Solid State Physics Lab

LIST OF EXPERIMENTS
(Any six of the following)

1. LATIC DYNAMICS – STUDY OF PHONON DISPERSION CHARACTERESTICS.
2. DETERMINATION OF DIELECTRIC CONSTANT-DETERMINATION OF GUIDE WAVELENGTH OF AN X-BAND TEST BENCH AND DETERMINATION OF DIELECTRIC CONSTANT OF BENZENE.
3. HALL EFFECT: DETERMINATION OF HALL COEFFICIENT AND ESTIMATION OF CARRIER CONCENTRATION
4. ESR STUDIES AND DPPH- DETERMINATION OF 'G' VALUE OF AN ELECTRON
5. COUPLED OSCILLATIONS AND STUDY OF THE STRENGTH OF THE COUPLING CONSTANT.
6. X-RAY DIFFRATION STUDIES
7. DETERMINATION OF ELASTIC CONSTANT.
8. THERMOLUMINISCENCE-DETERMINATION OF ACTIVATION ENERGY OF ELECTRONS.
9. DETERMINATION OF MAGNETIC RESISTANCE
10. STUDY OF MAGNETIC HYSTERESIS LOOPS OF FERROMAGNETIC MATERIALS (BH CURVE)

Department of Physics, A.U
ANALYTICAL TECHNIQUES

(Choice Based Paper to be offered in the Dept., of Physics during 3rd Semester for Other Dept., students in AU Campus only)
(W.e.f. 2009 – 2010 admitted batch)

Unit I

Concepts of interaction of electromagnetic radiation with matter, wave and particle properties of electromagnetic radiation, electromagnetic spectrum, absorption laws, electronic transitions, optical and molecular spectra, molecular energies, Raman spectra, photoelectric effect, photoelectric cells, Compton effect, radiation sources, detectors, lasers

References :

1)Instrumental methods of analysis, Willard, Merritt, Dean, Settle (CBS Pub.)
2)Instrumental methods of chemical analysis, H. Kaur (Pragati Prakasan Pub.)

Unit II : Ultrasonic techniques

Acoustic Plane waves-Elastic behavior of fluids, plane wave equation, velocity of sound in fluids, energy density acoustic intensity, specific acoustic impedance. Transmission phenomenon-transmission from one fluid medium to another reflection at the surface of a solid, transmission through three media normal incidence and oblique incidence. Resonators & filters- Helmholtz resonator, acoustic impedance, acoustic analogue. Ultrasonic & sonar transducers-piezoelectric effect equivalent electrical circuit, generalized theory, quality factor, piezoelectric relations. Architectural acoustics-classical Ray theory decay of sound in live room & dead rooms. Applications of Ultrasonics

References:

1)Fundamentals of Acoustics-Kinsler & Fray Wiley Eastern.Limited
2) Ultrasonics , Jack Blitz
3) Physical Ultrasonics-Beyer & Letcher Academic Press

Unit III : Magnetic Resonance Techniques

1)Electron Spin Resonance: Basic Concepts, g-factor and nuclear hyperfine interaction,, essential features of an ESR spectrometer, Applications of ESR: in Physical Sciences and biological systems.

2)Nuclear Magnetic Resonance: Basic principles, continuous wave and pulsed NMR, Fourier Transform NMR, measurement of spin -lattice and spin- spin relaxation times, proton and C-13 NMR, basic pulsed Fourier Transform NMR spectrometer, 2D NMR, applications of NMR in physical and biological sciences, basic features of MRI.

3)Nuclear quadrupole resonance: Basic principle and applications

References

1)Electron Paramagnetic Resonance : Elementary Theory and ractical Applications, J.A.Weil, J.R.Bolton and J.E.Wertz (Wiley) N.Y, 1994
2) Principles of Nuclear Magnetic Resonance in One and Two Dimensions, R.R.Ernst, G.Bodenhausen and A.Wokun,(Oxford)1987
(3)Basics of NMR, Joseph. P. Hornack, Free Online Text
(4)Nuclear Quadrupole Coupling Constants, E.A.C. Lucken (A.P) 1969

Unit IV : Structural characterization techniques

X-ray diffraction, indexing pattern of cubic crystals and non-cubic crystals (analytical methods), crystal structure identification and determination of lattice parameters.

Fundamentals of Transmission Electron Microscopy (TEM) and Scanning Electron Microscopy (SEM), major components in SEM and TEM, study of crystal structure using TEM, study of microstructure using SEM.

References :

1)Elements of X-ray Diffraction, B.D. Cullity, Addison-Wesley Publishing Co. Inc., USA (1977).
2)Physical Methods of Materials Characterization (Second Edition), PEJ Flewitt and RK Wild, Institute of Physics Publishing, Bristol, UK.

ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS,
IV SEMESTER.

		MARKS
P401.	**ADVANCED QUANTUM MECHANICS (85+15)**	**100**
P402.	PROPERTIES AND CHARACTERIZATION OF MATERIALS (85 +15)	**100**
P403.	**COMMUNICATION ELECTRONICS (85 +15)**	**100**

Special paper

P404	ANTENNA THEORY AND RADIOWAVE PROPAGATION (85 +15)	**100**
P405	MICROPROCESSOR LAB **Practical -75 and record -25**	**100**
P406	**COMMUNICATION LAB Practical -75 and record -25**	**100**

Total marks 600

SCHEME OF EXAMINATION

Theory pass minimum	**40%**
Practical pass minimum	**50%**
Aggregate	**50%**

SCHEME OF INSTRUCTION :

Teaching Hours	4 Periods per week
Tutorial	1 Period per week
Practical	6 Periods per week

ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS.
IV SEMESTER
(w.e.f 2009-2010 admitted batch)

P401: ADVANCED QUANTUM MECHANICS .

UNIT - I

Linear Vector Spaces in Quantum Mechanics:

Vectors and operators, change of basis, Dirac's bra and ket notations. Eigen value problem for operators. The continuous spectrum. Application to wave mechanics in one dimension.

(Merzbacher Sec. 14.1, 14.2, 14.3, 14.4, 14.5, 14.6, 14.7)

UNIT - II

Quantum Dynamics :

The equation of motion, Quantization postulates, canonical quantization, Constants of motion and invariance properties. Heisenberg picture. Harmonic Oscillator.

(Merzbacher . Sec. 15.1, 15.2, 15.3, 15.4, 15.6, 15.7)

UNIT - III

Development of time-dependent perturbation theory. The golden rule for constant transistion rates.

(Merzbacher. Chapter. 18 relevent parts)

Addition of two angular momenta. Tensor operators.

Wigner-Eckart theorem. Matrix elements of vector operators. Parity and time reversal symmetries.

(Merzbacher . Section. 16.6, 16.8, 16.10, 16.11)

UNIT - IV

Scattering:

Concept of differential cross-section. Scattering of a wave packet. Born approximation. Partial waves and phase shift analysis.

(Merzbacher. Section. 11.1, 11.2, 11.4, 11.5)

. Relativistic Quantum Mechanics

Klein – Gordon equation, Dirac equation for a free particle, Equation of continuity, Spin of a Dirac particle, Solutions of free particle Dirac equation, Negative energy states and hole theory

TEXT BOOKS:

1. " Quantum Mechanics" by R.D. Ratna Raju
2."Quantum Mechanics " by E. Merzbacher

Reference Books:

1." Quantum Mechanics" by Thankappan
2. "Quantum Mechanics" by Biswas

ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
IV SEMESTER
(w.e.f 2009-2010 batch)

P.402 : PROPERTIES AND CHARACTERIZATION OF MATERIALS

UNIT - I

THERMAL PROPERTIES:

Anharmonic crystal interactions-thermal expansion, thermal conductivity, lattice thermal resistivity, umklapp processes, and imperfections.

OPTICAL PROPERTIES :

Lattice Vacancies, Diffusion, Color Centers—F Centers, other centers in alkali halides, Alloys, Order-disorder transformations, Elementary theory of Order.

UNIT - II

MICROSCOPIC EXAMINATION:

Fundamentals of Transmission electron microscopy and scanning electron microscopy, study of crystal structure using TEM, study of microstructure using SEM.

UNIT - III

RESONANCE METHODS:

Spin and an applied field—the nature of spinning particles, interaction between spin and a magnetic field, population of energy levels, the Larmor precession, relaxation times—spin- spin relation, spin-lattice relaxation,

Electron Spin Resonance: Introduction, g-factor, experimental methods.

Nuclear Magnetic Resonance—equations of motion, line width, motional narrowing, hyperfine splitting,

Nuclear Gamma Ray Resonance: Principles of Mossbauer Spectroscopy, Line Width, Resonance absorption, Mossbauer Spectrometer, Isomer Shift, Quadrupole Splitting, magnetic field effects, Applications.

UNIT - IV

5ELECTRICAL AND MAGENTIC CHARACTERIZATION TECHNIQUES:

DC & AC Conductivity, Curie temperature, Saturation Magnetization and Susceptibility

OPTICAL SPECTROSCOPY:

Fundamentals of Infra-red Spectroscopy and Applications.

TEXT BOOKS:

Solid State Physics, 5th edition, C.Kittel
Fundamentals of Molecular Spectroscopy CN Banwell
Mossbauer Effect and its Applications VG Bhide

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ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
M.Sc PHYSICS, and SPACE PHYSICS
IV SEMESTER
(w.e.f 2009-2010 batch)
P 403 , SP 403 COMMUNICATION ELECTRONICS
(Common for M.Sc. Space Physics and M.Sc Physics)

UNIT 1. CW Modulation:

Amplitude Modulation (AM): 8 periods

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): 4 periods

SSB principles, Balanced Modulator, SSB generation

Angle Modulation: 8 periods

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 2. **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 8 periods

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: 8 periods

ASK, PSK, FSK and DPSK

UNIT 3. **Special Communication Circuits** : 6 periods

Tuned amplifiers :Single tuned amplifier-Hybrid π – equivalent for the BJT, Short circuit current gain for the BJT in CE and CB amplifiers, CE and CB tuned amplifiers, Cascode amplifier.

Mixer Circuits : Diode mixer, IC balanced mixer.

Filters : Active filters, Ceramic, Mechanical and crystal filters.

Oscillators: Crystal oscillator, Voltage controlled oscillator, phase locked loop(PLL).

UNIT 4. **Noise in Communication Systems:** 8 periods

Thermal Noise, Shot Noise, Partition noise, Signal - to – Noise ratio, Noise factor, Amplifier input noise in terms of F, Noise factor of amplifiers in cascade (Friss formula), Noise temperature, Noise in AM, Noise in FM systems. Noise in pulse modulation systems: Intersymbol interference (ISI) , eye diagrams.

Text Books:

1. Electronic Communications D. Roody and John Coolin
2. Electronic Communications Systems G. Kennedy
3. Modern Analog & Digital Communications B.P. Lathi.

DEPARTMENT OF PHYSICS

M.Sc. PHYSICS and M.Sc. SPACE PHYSICS,

IV SEMESTER (w.e.f 2009-2010 batch)

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

P404 , SP404 : ANTENNA THEORY AND RADIOWAVE PROPAGATION

UNIT - I

Radiation

Potential functions of electro magnetic fields. Potential function for sinusoidal oscillations. Fields radiated by an alternating current element. Power radiated by a current element and radiation resistance. Radiation from a quarter wave monopole or a half wave dipole. EM field close to an antenna and far field approximation. *(Chapter 10 in Jordan and Balmain 6 Hrs.*

Antenna Fundamentals

Definition of an antenna. Antenna properties – radiation pattern, gain, directive gain and directivity. Effective area. Antenna beam width and band width. Directional properties of dipole antennas. *(Chapter 11 in Jordan and Balmain and Chapter 2 in Kraus) 6 Hrs.*

UNIT - II

Antenna Arrays

Two element array. Linear arrays. Multiplication of patterns and binomial array. Effect of Earth on vertical patterns. Mathematical theory of linear arrays. Antenna synthesis – Tchebycheff polynomial method. Wave polarization.

(Chapter 11 and 12 in Jordan and Balmain and Chapter 4 in Kraus) 12 Hrs.

Impedance

Antenna terminal impedance. Mutual impedance between two antennas. Computation of mutual impedance. Radiation resistance by induced emf method. Reactance of an antenna. Biconcal antenna and its impedance.

(Chapter 14 in Jordan and Balmain and Chapters 8.1 –8.5 in Kraus) 6 Hrs.

UNIT - III

Frequency Independent (FI) Antennas

Frequency Independence concept. Equiangular spiral. Log Periodic (LP) antennas. Array theory of LP and FI structures.

(Chapter 15 in Jordan and Balmain and Chapter 15 in Kraus) 4 Hrs.

Methods of excitation and Practical Antennas

Methods of excitation and stub matching and baluns. Folded dipole, loop antennas. Parasitic elements and Yagi-Uda arrays and Helical antenna. Complementary screens and slot antennas. Radiation from a rectangular horn antenna.

(Chapter11.15 in Jordan and Balmain and Chapters 6.1 – 6.4 ,7.1 – 7.8 and 13 in Kraus) 10 Hrs.

UNIT - IV

Radio Wave Propagation

Elements of Ground wave and Space wave propagation. Tropospheric propagation and Troposcatter. Fundamentals of Ionosphere. Sky wave propagation – critical frequency, MUF and skip distance.

(Chapter 16 and 17 in Jordan and Balmain) 6 Hrs.

BOOKS

1."Electromagnetic waves and Radiating Systems" by E.C.Jordan and K.G.Balmain

2."Antennas" by J.D.Kraus. (Second Edition)

ANDHRA UNIVERSITY

DEPARTMENT OF PHYSICS

M.Sc PHYSICS,
IV SEMESTER
(w.e.f 2009-2010 batch)

P 405 : MICROPROCESSOR LAB

1.Decimal addition of 8 – bit numbers

2 Addition of two 16 – bit numbers

3 Multibyte addition

4.Sum of series of 16 – bit numbers

5.Word Disaasembly

6. Largest number in an array

7. Ascending order of array of 8 - bit number

8. Interfacing of 8255 PPI: generation of square wave and rectangular waves

9. Interfacing of 8253 programmble timer: Mode 1, Mode2, Mode3, Mode 4, Mode5

10 0800 DAC interfacing : generation of square, triangular and stair case wave forms

ANDHRA UNIVERSITY
DEPARTMENT OF PHYSICS
M.Sc. PHYSICS
IV SEMESTER
(w.e.f 2009-2010 batch)

P 406 : COMMUNICATION LAB
LIST OF EXPERIMENTS

1. **AMPLITUDE MODULATION**
2. **FREQUENCY MODULATION AND DETECTION**
3. **MIXER**
4. **BUTTERWORTH FIRST ORDER LOWPASS AND HIGHPASS FILTERS**
5. **CHEBYSHEV SECOND ORDER LOWPASS FILTER**
6. **PHASE LOCKED LOOP (PLL)**
7. **PULSE MODULATION-PAM-AND SAMPLING**
8. **STUDY OF PRE- EMPHASIS AND DE- EMPHASIS CIRCUITS**
9. **GENERATION OF PWAM, AND PPM USINGPLL AND 555 TIMER**
10. **STUDY OF FSK TRANSMISSION AND RECEPTION**
11. **OPTICAL FIBRE –BENDING LOSSES AND NUMERICAL APERTURE**
12. **MEASUREMENT OF BIT ERROR RATE (BER)**
13. **MEASUREMENT OF SPEED OF LIGHT IN OPTICAL FIBRE**
14. **DETERMINATION OF FREQUENCY AND WAVELENGTH IN A RECTANGULAR WAVEGUIDE IN $TE_{1,0}$**
15. **DETERMINMATION OF STANDING WAVE RATIO AT REFLECTION COEFFICIENT**
16. **STUDY OF ISOLATOR /CIRCULATOR**
17. **MEASUREMENT OF GAIN ,FRONT TO BACK RATIO,BEAM WIDTH OF RADIATION PATTERN IN HALF WAVE DIPOLE**
18. **FIVE ELEMENT YAGI UDA ANTENNA**
19. **HELICAL ANTENNA**
20. **CUT –PARABOIDAL REFLECTOR ANTENNA**