Department Of Physics

Palamuru University

Scheme of Instructions, Examination and Syllabus

M.Sc. (Physics)

under CBCS scheme

(W.e.f. academic year 2021-2022 at University, PG Centers and Affiliated Colleges)

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY

SYLLABUS FOR M.Sc. (PHYSICS)
w.e.f. 2021 - 22
(Under CBCS Scheme)

General Information:

Palamuru University offers the following courses at campus, PG Centers and Affiliated colleges, under CBCS.

1. **M. Sc. Physics**

M. Sc. Physics: It is a two years course with Semester system having 4 semesters with the two specializations from III semester onwards. The specializations are:

1. Solid State Physics and
2. Electronics & Instrumentation.

CONTENTS

M. Sc. – Physics Semester I under CBCS
(w.e.f. 2021-2022)
Common to Solid State Physics and Electronics & Instrumentation
Paper No., Subject Code and Titles of the Papers

S. No.	Paper No. & Subject Code	Title of the Papers
1	Paper –I & P101T/CBCS	Mathematical Physics
2	Paper –II & P102T/CBCS	Classical Mechanics
3	Paper –III & P103T/CBCS	Quantum Mechanics - 1
4	Paper –IV & P104T/CBCS	C- Progamming and Numerical Methods
5	Paper –V & P105T/CBCS	Electronics – 1
Practicals		
6	Paper-VI & P101P/CBCS	C-Programming
7	Paper-VII & P102P/CBCS	Analog and Digital Electronics

M. Sc. – Physics Semester II under CBCS
(w.e.f. 2021-2022)
Common to Solid State Physics and Electronics & Instrumentation
Paper No., Subject Code and Titles of the Papers

S. No.	Paper No. & Subject Code	Title of the Papers
1	Paper –I & P201T/CBCS	Electromagnetic Theory
2	Paper –II & P202T/CBCS	Statistical Mechanics
3	Paper –III & P203T/CBCS	Quantum Mechanics - II
4	Paper –IV & P204T/CBCS	General Solid state Physics
5	Paper –V & P205T/CBCS	Electronics - II
Practicals		
6	Paper-VI & P201P/CBCS	Heat & Acoustics
7	Paper-VII & P202P/CBCS	Optics

M. Sc. – Physics Semester II under CBCS
(w.e.f. 2021-2022)
Scheme of Instruction and Examination

S. No.	Paper No. & Subject Code	Title of the Papers	Instruction hrs per week	credits	Duration of Exam (hrs)	Max. Marks
1	Paper –I & P201T/CBCS	Electromagnetic Theory	4	4	3	80+20*
2	Paper –II & P202T/CBCS	Statistical Mechanics	4	4	3	80+20*
3	Paper –III & P203T/CBCS	Quantum Mechanics - II	4	4	3	80+20*
4	Paper –IV & P204T/CBCS	General Solid state Physics	4	4	3	80+20*
5	Paper –V & P205T/CBCS	Electronics - II	4	4	3	80+20*
Practicals						
6	Paper-VI & P201P/CBCS	Heat & Acoustics	8	4	4	100
7	Paper-VII & P202P/CBCS	Optics	8	4	4	100
			36	28		700

***Out of 100 Marks for each theory paper 20 Marks are allotted for internals and 80 for University end exam. Common Syllabus to University, PG Centers and Affiliated Colleges. There shall be no internal assessment examinations for practicals. Practical Examinations will be conducted at the end of each semester.**

Pattern of Question Paper: The question paper consists of two parts, each covering all the **four units**.
Part – A consists of EIGHT short answer questions, carrying 4 marks each. The student has to answer all the questions.
Part – B consists of FOUR essay type questions with an internal choice. Each question carries 12 marks. The student has to answer all the questions.

M. Sc. – Physics Semester III under CBCS
(w.e.f. 2021-2022)
Paper No., Subject Code and Titles of the Papers

Sl. No.	Paper No. & Sub.Code	Title of the Paper	General/ Specialization Papers
1	Paper –I & P301T/CBCS	Modern Optics	General
2	Paper –II & P302T/CBCS	Advanced Solid State Physics	
3	Paper –III & PSSP 303T/CBCS	Crystal Physics & Physical Properties	Solid State Physics
	Paper –IV & PSSP 304T/CBCS	Physics of Phonons & Structural Phase Transitions	
	Paper –V & PSSP 305T/CBCS	Band Theory & Electrical Properties	
4	Paper –III & PEI 303T/CBCS	Digital Logic Circuits	Electronics & Instrumentation
	Paper –IV & PEI 304T/CBCS	Micro Processors, DSPs &Interfacing	
	Paper –V & PEI 305T/CBCS	Electronic Instrumentation	
5	Paper-VI & P301P/CBCS	Modern Physics	General
6	Paper-VII & PSSP 302P/CBCS	Solid State Physics -I	Solid State Physics
	Paper-VII & PEI 302P/CBCS	Analog, Digital & Simulation Practicals	Electronics & Instrumentation

M. Sc. – Physics Semester III under CBCS
(w.e.f. 2021-2022)
Scheme of Instruction and Examination

S. No.	Paper No. & Subject Code	Title of the Papers	Instruction hrs per week	credits	Duration of Exam (hrs)	Max. Marks
1	Paper –I & P301T/CBCS	Modern Optics	4	4	3	80+20*
2	Paper –II & P302T/CBCS	Advanced Solid State Physics	4	4	3	80+20*
Specialization Paper III						
3	PSSP 303T/CBCS	Crystal Physics & Physical Properties	4	4	3	80+20*
	P303TEI/CBCS	Digital Logic Circuits				
Specialization Paper IV						
4	PSSP 304T/CBCS	Physics of Phonons & Structural Phase Transitions	4	4	3	80+20*
	PEI 304T/CBCS	Micro Processors, DSPs &Interfacing				
Specialization Paper V						
5	PSSP 305T/CBCS	Band Theory & Electrical Properties	4	4	3	80+20*
	PEI 305T/CBCS	Electronic Instrumentation				
Practical's						
6	Paper-VI & P301P/CBCS	Modern Physics	8	4	4	100
7	Paper-VII & PSSP 302P/CBCS	Solid State Physics	8	4	4	100
	Paper-VII & PEI 302P/CBCS	Analog, Digital & Simulation Practicals				
8	Seminar		2	1	-	25
			38	29		725

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M. Sc. – Physics Semester IV under CBCS
(w.e.f. 2021-2022)
Paper No., Subject Code and Titles of the Papers

Sl. No.	Paper No. & Sub.Code	Title of the Paper	General/ Specialization Papers
1	Paper –I & P401T/CBCS	Nuclear Physics	General
2	Paper –II & P402T/CBCS	Spectroscopy	
3	Paper –III & PSSP 403T/CBCS	Optical Phenomena in Solids	Solid State Physics
	Paper –IV & PSSP 404T/CBCS	Resonance Phenomena in Solids	
	Paper –V & PSSP 405T/CBCS	Studies on Reduced Dimensionality in Solids	
4	Paper –III & PEI 403T/CBCS	Embedded Systems & Applications PC Architecture	Electronics & Instrumentation
	Paper –IV & PEI 404T/CBCS	Instrumentation For Measurement, Control,	
	Paper –V & PEI 405T/CBCS	Data Acquisition & Data Transmission	
5	Paper-VI & P401P/CBCS	Nuclear Physics	General
6	Paper-VII & PSSP 402PS/CBCS	Solid State Physics -II	Solid State Physics
	Paper-VII & PEI 402P/CBCS	Microprocessors & Microcontrollers Lab	Electronics & Instrumentation

M. Sc. – Physics Semester IV under CBCS
(w.e.f. 2021-2022)
Scheme of Instruction and Examination

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1	Paper –I & P401T/CBCS	Nuclear Physics	4	4	3	80+20*
2	Paper –II & P402T/CBCS	Spectroscopy	4	4	3	80+20*
Specialization Paper III						
3	PSSP 403T/CBCS	Optical Phenomena in Solids	4	4	3	80+20*
	PEI 403T/CBCS	Embedded Systems & Applications PC Architecture				
Specialization Paper IV						
4	PSSP 404T/CBCS	Resonance Phenomena in Solids	4	4	3	80+20*
	PEI404T/CBCS	Instrumentation For Measurement, Control,				
Specialization Paper V						
5	PSSP 405T/CBCS	Studies on Reduced Dimensionality in Solids	4	4	3	80+20*
	PEI 405TEI/CBCS	Data Acquisition & Data Transmission				
Practicals						
6	Paper-VI & P401P/CBCS	Nuclear Physics	8	4	4	100
7	Paper-VII & PSSP 402P/CBCS	Solid State Physics-II	8	4	4	100
	Paper-VII & PEI 402P/CBCS	Microprocessors & Microcontrollers Lab				
8	Seminar		2	1		25
			38	29		725

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I Semester Syllabus

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY

M.Sc (Physics)
I- Semester Syllabus (w.e.f.**2021-2022**) Under **CBCS**

P101 T/CBCS

Paper – I

Mathematical Physics

UNIT – I : (13 Hrs)

Legendre's Differential Equation: The Power series Solution –Legendre Functions of the first and second kind –Generating Function- Rodrigues' Formula –Orthogonal Properties –Recurrence Relations. Beta and Gamma function –Properties –Relations between them.

Bessel's Differential Equation: Power series Solution –Bessel Functions of First and Second kind- Generating Function –Orthogonal Properties –Recurrence Relations.

UNIT – II: (13 Hrs)

Hermite Differential Equation : Power series Solution –Hermite polynomials -Generating Function-orthogonality –Recurrence relations -Rodrigms formula –Hyper geometric equation-solution-Laplace equation-Solution Wave equation and its applications to rectangular membrane.

UNIT – III : (13 Hrs)

Fourier Transform : Infinite Fourier Sine and Cosine transforms –Properties of Fourier transforms-Derivative of Fourier transform –Fourier transform of a derivative-Fourier Sine and Cosine transform of derivatives-Finite Fourier transforms –Applications of Fourier Transforms.

Laplace Transform: Properties of Laplace transforms –Derivative of Laplace transform – Laplace transform of a derivative –Laplace transform of periodic functions- Inverse Laplace transform and its properties –Inverse Laplace theorem –Convolution theorem-Evaluation of inverse Laplace Transforms by Convolution theorem.

Unit –IV : (13 Hrs)

Matrices–Addition, subtraction and multiplication of matrices –Invese of matrices- Characteristic equation of a matrix- eigen values- eigen vectors- Types of matrices- square, diagonal, unit symmetric and skew symmetricandHermition matrices.

Tensors –Order and rank of the tensors –transformation laws Covariant and constravariant tensors - Addition, subtraction and multiplication of tensors-outer and inner products of tensors and quotient law.

Recommended Books:

1. Applied Mathematics for Engineers and Physicists –Lious A Pipes and Lawrance R. Rarvill.
2. Mathematical Physics – AK Ghatak, IC Goyal and SL Chua-Macmillan India Ltd.
3. Vector and Tensor Analysis –Scham Series.
4. Mathematical Physics – SatyaPrakash

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY

M.Sc (Physics)

I- Semester Syllabus(w.e.f **2021-2022**) Under **CBCS**

P102 T/CBCS

Paper – II

CLASSICAL MECHANICS

UNIT – I : (13 Hrs)

Newtonian formalism

Inertial frames and Galilean transforms-Non-inertial frames-pseudo forces, rotational frames, rotational transforms and conservation theorems.Description of rotations in terms of Euler angles-Euler's equations of motion for a rigid body.

Minkowski space, space-time diagrams, world point and world line-relativistic motion and Lorentz transforms as rotations in four-space, four velocity, energy-momentum vectors with few examples.

UNIT – II : (13 Hrs)

Lagrangian formalism

Constraints, generalized coordinates. Principle of virtual work and D'Alembert's principle Lagrange's equations from D'Alembert's principle- Applications of Lagrange's equations (plane and spherical pendulums, L-C circuit), velocity dependent potential-Lagrangian for a charged particle in electromagnetic field. Hamilton's principle- Lagrange equation's from Hamilton's principle.

UNIT – III : (13 Hrs)

Hamiltonian formalism

Principle of Least Action and Hamilton's equations – Applications of Hamilton's equations (motion of a particle in a central force field, projectile motion of a body). Cyclic coordinates, Canonical coordinates and canonical transforms, Conditions for a transformation to be canonical, generating functions, Lagrange and Poisson brackets. Hamilton equations in Poisson bracket from, Hamilton-Jacobi theory.

UNIT – IV : (13 Hrs)

Mechanics of continuous systems

Analysis of the free vibrations of a linear triatomic molecule, Eigen value equation- Principal axis transformation-Frequencies and normal coordinates Lagrangian formulation for continuous systems, Hamiltonian formulation.

Reference Books :

1. Classical Mechanics : By Goldstein, Poole &Safko (Pearson 2002)
2. Classical Mechanics :By JC Upadhyaya (Himalaya Publishing House)
3. Introduction to Classical Mechanics : Takwale&Puranik (TMH)
4. Classical Mechanics :Rana&Joag (TMH)
5. Classical Mechanics of Particles and Rigid Bodies :Kiran C Gupta. (New Age International Publishers)
6. Lagrangian and Hamiltonian Mechanics: Calkin (Allied Publishers 2000)
7. Lagrangian Dynamics : Dave Wells (schaum series)

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY

M.Sc (Physics)
I- Semester Syllabus (w.e.f **2021-2022**) Under **CBCS**

P103 T/CBCS

Paper – III

Quantum Mechanics- I

UNIT – I (13 hrs): Basics of Quantum Mechanics

Linear Vector space, Dirac's Ket and Bra notation.Eigenvalue equation, Eigenkets and Eigenvalues – Degenerate and non-degenerate states - completeness relation, Wave functions in position and momentum space. Normalization and Orthogonality of wave functions, change of basis. Observables - Operators, Hermitian operators and their properties-Commuting and non-commuting operators, Physical significance. Matrix representations of vectors and operators – Observable and expectation value of an observable - Parity operator, Projection operator and significance. Basic commutation relations. Uncertainty principle between any two non-commuting Operators.

UNIT – II (13 hrs): Exactly Solvable problems

The Schrodinger, Heisenberg picture and interaction pictures.
Linear harmonic oscillator-Solution to Schrodinger equation, Eigen values and Eigen functions, properties of stationary states. Linear harmonic oscillator- Solution by operators method. Raising and Lowering operators, the number operator.

UNIT – III (13 hrs): Symmetries in Quantum Mechanics

Space and time displacements – unitary operators of space and time displacements and equations of motion.Generators of infinitesimal rotations.Space inversion and unitary inversion operator - intrinsic parity. Time reversal operator – anti-linear operator- time reversal operator for spin zero and non- zero spin particles.

UNIT – IV (13 hrs): Angular Momentum

Orbital Angular Momentum, Commutation Relations involving: L^2, L_x, L_y, L_z – Eigenvalues and Eigen functions of L^2 –Generalized angular momentum, J – commutation relations between J^2 and components of J. J_+ and J. - Eigen values of J^2 and J_z. Matrix representation for J^2 and J_z. Spin angular momentum-Pauli spin matrices and their properties. Addition of angular momenta - Clebsch-Gordon coefficients- Recursion relations- C-G coefficients for $J_1 = ½$, $J_2 = ½$, and $J_1 = ½$, $J_2 = 1$, as examples.

Reference Books:

1. Quantum Mechanics by LI Schiff
2. A Text book Quantum Mechanics : PM Mathews and K Venkateshan (TMH)
3. Quantum Mechanics by Ghatak and Lokanathan (Macmillian)
4. Quantum Mechanics by E Merzbacher (John Wiley)
5. Quantum Mechanics by Aruldhas (New Age International)
6. Modern Quantum Mechanics by Sakurai (Addison Wesley)

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY

M.Sc (Physics)

I- Semester Syllabus (w.e.f **2021-2022**) Under **CBCS**

P104 T/CBCS

Paper – IV

C- PROGRAMMING AND NUMERICAL METHODS

UNIT I: (13 Hrs)

Introduction to programming in C:
Then input and output operator, comments, Data types, Variables, objects and their declarations, keywords and identifiers chained assignments Integer types, simple arithmetic operators, operator precedence and associativity, the increment and decrement operators, compound assignment expressions,, simple programs.
The if statement, the if……. else statement, Relational operators, Compound Statements, The while statement, the do……...while statement, for statement break statement, continue statement, the go to statement., the Switch Statement, Enumeration types.

UNIT II: (13 Hrs)

Function, Arrays and pointers:
Function declaration & definitions, local variables & functions, void functions, passing by reference and passing by value, passing by constant reference, Array declaration and initializing, processing Arrays, passing an Array to a function, the Linear search and Bubble sort algorithm, binary search algorithm, using arrays with enumeration types, Multidimensional Arrays.

Pointers declaration, pointer operator, address operator, pointer arithmetic's References, Derived types, Arrays & pointers, the new operator, the delete operator, dynamic arrays, Arrays of pointers and pointers to Arrays, Pointers to Pointers. Pointers to functions call by value, call by References.

UNIT III :(13Hrs):

Solution of Algebraic Equations:
Back substitution Gauss Elimination method, Gauss-Jordan Elimination method, Pivoting, Jacobi methods & Gauss-Seidel iterative methods Comparison of direct and iterative methods. Root-finding Algorithms: Bisection method, successive bisection method, method of false position, Newton-Raphson method, Secant method, method of Successive approximations.

UNIT IV: (13 Hrs)

Interpolation and differential equations:
Lagrange's Newton interpolation method, Least square line fitting. Numerical differentiation, Numerical Integration (Gaussian Quadrature method, Newton-cotes Integration formula, Trapezoidal rule and Simpson's rule.) Numerical methods for ordinary differential equations: Euler's method &Runge-Kutta method (second & fourth order)

Text and Reference Books:

1. Sastry: Introductory Methods of Numerical Analysis.
2. VetterningTeukolsky, Press and Flannery: Numerical Recipes.
3. Numerical Recipes in C: by William H. Press, Saul A. Teukolskly, William T. Vertterling Brian P. Flannery
4. An Introduction to Numerical Analysis by Kendall E. Atkinson.
5. Programming with C by Balaguruswamy
6. Programming in C Kerningham and Ritchie
7. C programming Raja Raman

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY

M.Sc (Physics)

I- Semester Syllabus(w.e.f. 2021 – 2022) Under **CBCS**

P105 T/CBCS

Paper – V

Electronics – I

UNIT – I:

Semiconductor Devices :

Voltage-Current Characteristics of Tunnel Diode, JFET, MOSFET, SCR, DAIC and TRAIC.

Regulated Power Supply :

Concept of regulation, Principles of constant voltage and current regulators, Basic principles of Zener regulator and its working, Transistorized Series regulator, Switch Mode Power Supply (SMPS).

UNIT – II:

Amplifiers:

Classification of amplifiers, Operating point and its stability, Biasing of Transistor, Fixed bias, Collector to base bias, potential divider bias, h-parameter model of BJT, Single Stage and two stage RC coupled amplifiers and their frequency response, hybrid π- model, high frequency response using hybrid π-model.

Feedback Amplifiers:

Classifications of Amplifiers (Voltage amplifier, Current amplifier, Transconductance amplifier and Transresistance amplifier), concept of feedback, Positive and Negative feedbacks. Advantages of Negative feedback in amplifiers, Emitter follower and Darlington pair.

UNIT – III:

Sinusoidal Oscillators (Using BJT's) :

Barkhausen Criterion, Wein Bridge Oscillator, Hartley and Colpitts Oscillators, Crystal Oscillator.

Multivibrators:

Collector coupled Astable, Monostable, Bistablemultivibrator circuits.

UNIT – IV: Modulation and Detection:

Amplitude Modulation-Analysis of AM signal, Balanced Amplitude Modulator, Square law and Envelope detectors, Frequency Modulation-Analysis of an FM signal, Basic Reactance modulator, frequency discrimination method.

Reference Books :

1. Integrated Electronics by Millman and Halkias, TMH 2007.
2. Pulse Digital & Switching Waveforms by Millman and Taub, TMH 2001.
3. Microelectronics by Millman& Grable, TMH 200.
4. Fundamentals of electronics by JD Ryder, Wiely
5. Electronics Communications systems By Kennedy, Macgrawill.

I – Semester Practicals

Electronics lab: List of Experiments

Analogue Experiments:

1. Wien's bridge Oscillator
2. RC coupled amplifier
3. Voltage controlled oscillator
4. Three pin regulator
5. Astable multivibrator
6. Colpits oscillator

Digital Experiments:

1. Logic gates
2. Adder and Subtractor
3. Flip Flops
4. Decade counter and Binary counter
5. Semiconductor devices

C - PROGAMMING & NUMARICAL METHODS LAB

II SEMESTER SYLLABUS

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY

M.Sc (Physics)

II- Semester Syllabus (w.e.f 2021 – 2022) Under**CBCS**

P201 T/CBCS

Paper – I

Electromagnetic Theory

UNIT – I : (13 Hrs)

Electro-Static Potentials and Maxwell's Field Equations :

Special techniques for calculating electrostatic potential : Poisson's and Laplace's equations-Solutions of Laplace's equations for electrostatic potential in Cartesian, spherical and cylindrical co-ordinates-Multipole expansion of the energy of a system of charges in an electrostatic field-The scalar and vector magnetic potentials.

Derivation of Maxwell's equations-General wave equation-Gauge transformations-Lorentz and Coulomb gauges-Momentum, angular momentum and free energies of electromagnetic field-Poynting Theorem (work energy theorem in electrodynamics).

UNIT – II: (13 Hrs)

Propagation of Plane Electromagnetic Waves:

Electromagnetic (EM) waves in unbounded media-EM wave equation for a homogeneous isotropic dielectric medium-Propagation of plan EM waves in free space-Propagation of EM waves in homogeneous isotropic dielectric medium.Propagation of EM wave in conducing medium- Attenuation and Skin effect-Energy transmitted –Polarization of EM wave.

UNIT – III: (13 Hrs)

Interaction of Electromagnetic Waves with Mater :

Propagation of EM waves in bounded media-Boundary conditions for EDB and H – Reflection and Refraction of plane EM waves at plane interface between two dielectrics- Laws of reflection and refraction-Fresnel's relations- Reflection (R) and Transmission(T) coefficients -Brewester's angle-Total internal reflection-Reflection and Refraction of plane EM waves at plane interface between non-conducing and conducting medium-Metallic reflection and its applications.Normal and anomalous dispersion.

UNIT – IV: (13 Hrs)

Electromagnetic Fields and Radiating Systems:

Electromagnetic radiation: Inhomogeneous wave equation for potentials-Retarded potentials-Multipole expansion of EM radiation for harmonically oscillating source -Oscillating electric dipole radiation-Oscillating magnetic dipole radiation-Radiation from centerfed linear antenna

Radiation from accelerated charges :

LienardWiechert potentials-Electromagnetic field of a charge in arbitrary motion.

Reference Books:

1. Classical Electrodynamics by SP Puri, Tata McGraw-Hill Publishing Co., Ltd (2000).
2. Introduction to Electrodynamics by DJ Griffiths, Prentice- Hall of India (1998).
3. Electrodynamics by Gupta, Kumar and Singh, PragathiPrakashan Publishing (2007).
4. Electricity and Magnetism by MH Nayfeh and MK Brussel, John Wiley and Sons (1985).
5. Classical Electrodynamics by JD Jackson, John Wiley and Sons (1999).
6. Foundations of Electromagnetic Theory by JR Rietz, FJ Milford and Christy, Narosa Publishing house (1986)
7. Engineering Electromagnetics by WH Hayt and JA Buck Tata Mc-Graw Hill (2001)
8. Electromagnetic waves and Radiating systems by EC Jordan and KG Balmain, Prentic Hall (1968

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY

M.Sc (Physics)

II- Semester Syllabus (w.e.f 2021 – 2022) Under **CBCS**

P202 T/CBCS

Paper – II

Statistical Mechanics

UNIT – I : (13 Hrs)

Relation between thermodynamics and statistical mechanics- Micro stages and macro states of a system – Phase space- Ensembles – Mean values and ensemble average –Density distribution in phase space- Liouville's theorem. Apriori probability postulate –Micro canonical, canonical and grand canonical ensembles –Quantization of phase space.

Entropy and Probability –Equilibrium conditions:

Thermal, mechanical and concentration equilibrium.Entropy of a perfect gas using micro canonical ensemble-Gibbs paradox-Sackur.-Tetrode equation.

UNIT – II : (13 Hrs)

Maxwell –Boltzmann statistics-Distribution law- Maxwell velocity distribution-Equipartition theorem.Canonical ensemble- Partition function-Ideal gas, Grand canonical ensemble-Partition function-Ideal gas.Quantum Statistical Mechanics-Postulates- Indistinguishability-Bose-Einstein and Fermi-Dirac statistics and distribution laws.

Partition function and thermodynamic quantities-Transational, rotational and vibrational partition functions - Specific heat of diatomic molecules.

UNIT – III : (13 Hrs)

Ideal Bose-Einstein gas-Energy and pressure of the gas.Bose-Einstein condensation-Liquid Helium-Two Fluid model-Phonons, rotons, super fluidity.

Ideal Fermi-Dirac gas Energy and pressure of the gas –Electronic specific heat, thermionic emission, white dwarfs.

UNIT – IV : (13 Hrs)

Fluctuation-mean square deviation-Fluctuations in energy, volume and concentration Brownian motion-Classification of phase transition-Phase transitions of first and second kind: Ising model, Bragg-Williams approximation-One dimensional Ising model a application to Ferro magnetic systems-Order-Disorder transition.

Reference Books. :

1. Statistical Mechanics by SatyaPrakash and JP Agarwal (Pragati Prakahan-2002)
2. Statistical Mechanics by Gupta and Kumar (PragathiPrakahan -2002)
3. Statistical Mechanics by BK Agarwal and M Eisner (New Age Internaional)
4. Statistical Mechanics by RK Srivatava and J Ashok (Prentice Hall, India)
5. Introduction to phase transitions and critical Phenomena HE Stanley (Clrendon Press, Oxford).
6. Heat and Thermodynamics by Zemansky (TMH).

P203 T/CBCS

Paper – III

Quantum Mechanics - II

UNIT – I (13 hrs) : Scattering Theory
Kinematics of Scattering Process: differential and total cross-section -Asymptotic from of scattering wave function. Scattering amplitude by Green's method. Born approximation method and screened potential and square well potential as examples - Partial wave analysis and phase shift-Optical Theorem- Relationship between phase shift and Potential.

UNIT – II (13 hrs) : Time Independent Perturbation Theory
Approximation Methods. Non-degenerate case, First-and Second- order cases - Examples of harmonic and an-harmonic Oscillators. Degenerate case- Stark effect for H-atom for n=2 level. Variation Method - Helium atom ground state. WKB approximation method - connection formulae - application to Alpha Decay.

UNIT – III (13 hrs) : Time Dependent Perturbation Theory
Time development of state, variation of constants (coefficients), Transition probability- Selection rules for transition.Constantperturbation.Transition probability to closely spaced leaves- Fermi's golden rule. Harmonic perturbation- Transition probability rate.Interaction of an atom with electromagnetic radiation.Electric dipole approximation.The Einstein Coefficients.

UNIT – IV (13 hrs) : Relativistic Quantum Mechanics
Klein –Gordon Equation, Plane wave solution and Equation of continuity, Probability density- Dirac Equation, alpha, beta- matrices, Plane wave solution, significance of negative energy states. Spin of Dirac particle Relativistic particle in central potential –Total Angular Moment, properties of gamma matrices- Dirac's equation in covariant form.

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2. A Text book Quantum Mechanics by PM Mathews and K Venkateshan (TMH)
3. Quantum Mechanics by Ghatak and Lokanathan (Macmillian)
4. Quantum Mechanics by E Merzbacher (John Wiley)
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DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY

M.Sc (Physics)
II- Semester Syllabus(w.e.f 2021 – 2022) Under **CBCS**

P204 T/CBCS

Paper – IV

General Solid State Physics

UNIT – I: (13 Hrs)

Crystalline State & Structural Studies :
Unit cell, Bravais lattices,, Symmetry operations, Point groups, Space groups and their notation. Atomic structure factor, Geometrical structure factor and Debye Wallar factor, Concept of reciprocal lattice, Concept of Brillouin zones, Experimental methods of X-ray diffraction of crystals–Powder methods, Determination of unit cell parameters of a cubic crystal, Elements of neutron and electron diffraction.

UNIT – II: (13 Hrs)

Lattice Vibrations and Thermal Properties:
Elastic waves in one dimensional array of identical atoms, Vibrational modes of a diatomic linear lattice and dispersion relations, Acoustic and Optical modes, Infrared absorption in ionic crystals, Phonons and verification of dispersion relation in crystal lattices.
Lattice heat capacity- Einstein and Debye theories, Lattice thermal conductivity –Phonon mean free path, Origin of thermal expansion.

UNIT – III: (13 Hrs)

Band Theory and Semiconductor Physics:
Failure of Free electron theory of metals, Bloch theorem, Behavior of electron in periodic potentials, Kronig- Penny model, E vs K relation, Density of states in a band, Effective mass of electron, Negative effective mass and concept of hole.
Intrinsic semiconductors, Fermi level, Expressions for electron and hole concentrations in intrinsic and extrinsic semiconductors, Hall effect in semiconductors.

UNIT – IV: (13 Hrs)

Crystal Growth and Imperfections:
Crystal growth from solution and melt, growth from vapour phase, Experimental techniques of growth from melt. Schottky and Frenkel defects, expression for their equilibrium concentrations in metals and ionic crystals, Colour centers and their models, Diffusion mechanisms, Fick's laws of diffusion, Kirkendal effect, Ionic conductivity, Dislocations-Edge and Screw dislocations, Grain boundaries.

Reference Books:

1. Crystallography and Solid State Physics – A.R. Verma and O.N. Srivastava
2. Solid State Physics – A.J. Deckker, Macmillian Indian Ltd, 2003.
3. Introduction to Solid State Physics – C. Kittel, Johan Wiley Sons Inc, New York
4. Solid State Physics- RL Singhal, KedarNath&Ramnath& Co, 2006
5. Elements of Solid State Physics – J.P. Srivastava, Prentice Hall India, 2006.
6. Elements of Solid State Physics -- Ali Omar, Pearson Education Inc, 2002.

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY.

M.Sc (Physics)

II- Semester Syllabus(w.e.f 2021- 2022) under CBCS

P205 T/CBCS

Paper – V

Electronics –II

UNIT – I : (13 Hrs)

Operational Amplifiers :

Characteristics of Ideal operational Amplifier, Block diagram of an IC operational Amplifier, Emitter coupled differential amplifier and its transfer characteristics. Analysis of inverting amplifier, Non-inverting amplifier, Integrator, Differentiator, summing amplifier, Difference amplifier, Comparator, Logarithmic amplifier and exponential amplifier, Analog computation, Square wave, Rectangular wave, Triangular wave and Sine wave generators.
Timer IC 555: Working of IC 555, Astable multivibrator circuits with IC 555.

UNIT – II : (13 Hrs)

Logic Circuits:

Boolean laws and theorems, Min terms and Max terms, Karnaugh Maps (upto 4 variables), Half adder and Full adder, Decoder/ Demultiplexer, Data selector/ Multiplexer, Encoder.
Flip –Flops: RS, D JK and M/S JK flip flops.
Shift Registers: Types of Registers, Serial in Serial out, Serial in Parallel out, Parallel in Serial out and Parallel in Parallel out Registers, IC 7496, Ring Counter.

UNIT – III: (13 Hrs)

Counters: Ripple (Asynchronous) Counters, Divide by N Counter, Synchronous Counters, Decade Counter using Flip-Flops and IC's 7490, 7493.
D/A Converters: Variable Resistor Network type, R-2R ladder type, 4 bit Binary Converter, D/A Accuracy and Resolution.
A/D Converters : Simultaneous Conversion, Counter method, Continuous A/D conversion, Successive approximation Conversion, Dual slope A/D conversion, A/ D Accuracy and Resolution.

UNIT – IV : (13 Hrs)

Microprocessor:

Introduction to Microprocessors –Architecture of 8085 microprocessor, Instruction set : Data transfer instructions, Arithmetic Logic and Branch operations, Simple Assembly language programming : 8-bit addition, 8-bit subtraction, 8-bit multiplication, Ascending and descending arrangement of given numbers.

Reference Books. :

1. Integrated Electronics –MilmanHalkies.
2. Microelectronics –Milliman&Grabel.
3. Digital principles and applications- Malvino and Leech
4. Operational amplifier –Gawkward
5. Principles of Digital Electronics –Gothman
6. Digital Principles and Applications Computer Electronics –Malvino.
7. Microprocessors Architecture, Programing and Application with the 8085 / 8080 – Goankar.

SEM - II

Heat and Acoustics lab: List of Experiments

1. Estimation of errors.
2. Young's modulus (Y) and rigidity modulus (η) of a spiral spring.
3. Coefficient of linear expansion of the given material with Fizeau method.
4. Study of verification of specific heat of graphite with temperature.
5. Determination of Stephan's constant (σ) with blackened silver disc.
6. Viscosity of water using oscillating disc.

SEM - II

Optics lab: List of Experiments

1. Determination of Cauchy's constants.
2. Verification of Malus law.
3. Determination of wavelength of a given sodium vapor lamp by using single and double slit.
4. Determination of Young's modulus of glass beam using Newton rings.
5. Study of Double refraction of Quartz crystal using spectrometer.
6. Semiconductor laser apparatus.
7. To determine the specific rotation of cane sugar solution by using Quartz Polarimeter.
8. To determine the wavelength of a monochromatic light by Newton's rings.

III Semester Syllabus

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY

M.Sc. (Physics) - III Semester Syllabus - General Paper

w.e.f. 2021- 2022 under CBCS

P 301 T/CBCS

Paper - I (Common for all Specializations)

MODERN OPTICS

Unit I

Fundamentals of Lasers

Two-energy level diagrams for absorption, spontaneous and stimulated emission of light, non-radiative decay, emission line broadenings. Laser principle. Rate equations: for two-level pumping scheme, three-level pumping scheme, and four-level pumping scheme. Longitudinal and transverse modes in a rectangular laser cavity. ABCD law of Gaussian beams. Properties of laser beams.

Unit II

Laser Systems

Classification of laser systems – Gas, Liquid and Solid Lasers-Gas lasers and: *Construction, working,* Energy level schemes, *and applications of:* He- Ne, Argon, CO_2 Gas lasers, Excimer lasers- Solid State lasers: Ruby, Neodymium, YAG lasers – Applications, GA-As lasers

Unit III

Holography and Fourier Optics

Basics of holographic recording and image reconstruction. Gabor holography and Fourier transform holography. Applications of holography.

Thin lens as a phase transformer, thickness function, and various types of lenses. Fresnels diffraction integral. Spatial frequency filtering. Fourier transforming properties of lenses for objects placed in front of the lens.

Unit IV

Non-linear Optics and Ultrafast Optics

Non-linear polarization. Electro-optical effects and self focusing. Optical mixing: sum frequency and difference frequency generations. Second harmonic generation and phase matching condition.

Mode-locking for ultra short pulses, auto-correlation, power spectrum, and frequency-resolved optical gating.

Recommended books and references:

1. Principles of Lasers-O. Svelto
2. Optical Electronics-Ghatak and Thyaga Rajan
3. Introduction to optical electronics-Amnov Yariv
4. Basics of Holography-P. Haricharan
5. Introduction to Fourier Optics- J. W. Goodman
6. The Principles of non-linear Optics- Shen
7. Ultrafast optics-Andrew M. Weiner

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY
M.Sc. (Physics) - III Semester Syllabus - General Paper
(w.e.f. 2021- 2022) under CBCS

P 302 T/CBCS

Paper – II (CB Paper I - Common for all Specializations)
ADVANCED SOLID STATE PHYSICS
[Thermal, Electrical and Magnetic Properties of Solids]

Unit I

Electronic Properties
Introduction to band theory of solids, Fermi surface and Brillouin zones, Construction of Fermi surfaces, Extended, periodic and reduced zone schemes. Fermi surfaces in simple cubic, bcc and fcc lattices. Effect of electric and magnetic fields on Fermi surfaces. Anomalous and skin effects.

Unit II

Dielectrics and Ferroelectrics
Macroscopic description of the static dielectric constant. The electronic, ionic and orientational polarizabilities. Measurement of dielectric constant of a solid. Clausius-Mosotti relation. Behavior of dielectrics in an alternating field, elementary ideas on dipole relaxation. Classification of ferroelectric crystals- Ba TiO_3 and KDP. Dipole theory of ferro-electricity. Spontaneous polarization and ferroelectric hysteresis.

Unit III

Magnetic Properties
Diamagnetism- Langevin's theory and quantum theory. Origin of permanent magnetic moment. Theories of paramagnetism. Spontaneous magnetization – Weiss theory of spontaneous magnetization. Nature and origin of Weiss molecular field, Heisenberg exchange interaction. Ferromagnetic domains and hysteresis. The Bloch wall, Neel's theory of anti ferromagnetism. Ferrimagnetism, ferrites and their applications (basic concepts only)

Unit IV

Superconductivity
Occurrence of superconductivity. Experimental observations – persistent currents, effect of magnetic field, Meissner effect, Type I and type II superconductors. Isotope effect, entropy, heat capacity and thermal conductivity. Energy gap. Theoretical explanations: London' equations-penetration depth. Coherence length. Cooper pairs and elements of BCS theory. Josephson effects (Basic ideas only).
Elements of high temperature superconductors (basic concepts). Applications of superconductors.

Books Recommended:

1. Solid State Physics -- A.J.Deckker
2. Introduction to Solid State Physics -- Kittel
3. Solid State Physics -- R.L.Singhal
4. Elements of Solid State Physics -- J.P.Srivastava
5. Solid State Physics -- M.A.Wahab

M.Sc.(Physics) under CBCS
III Semester

Specialization:
SOLID STATE PHYSICS

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY

M.Sc. (Physics) – III Semester Syllabus

w.e.f 2021- 2022 under CBCS

Solid State Physics - Specialization at University

SSP 303 T/CBCS

Paper III
CRYSTAL PHYSICS AND PHYSICAL PROPERTIES

Unit I

Elements of group theory

Introduction to crystallographic point groups, the five platonic solids, procedure for symmetry classification of molecules, class , matrix notation for geometrical transformations, matrix representation of point groups , reducible and irreducible representations, great orthogonality theorem and its consequences, Character tables for C_{2v} and C_{3v} point groups, Mullikan symbolism, Symmetry species.

Unit II

Elements of Ligand field theory and Electronic spectra

Concept of ligand field and crystal field. Free ion configurations- terms and states. Derivation of free ion terms for d^1 and d^2 configuration. Energy ordering of terms- Hund's rules. Strength of crystal fields, Crystal field potentials for O_h and T_d fields. Meaning of Dq. Construction of ligand field energy level diagrams- effect of weak crystal fields on terms. Splitting due to lower symmetries Electronic spectra of d^1 and d^9 systems.

Unit III

Crystal symmetry and physical properties

Development of theoretical formalism, tensors, Physical property and its tensorial representation . Quotient theorem, Symmetry in crystals - point groups and space groups, Crystal classes. Neumann's Principle.

Fumi's method determining symmetry of physical properties, Pyroelectricity and crystal Symmetry, Dielectric constant and Crystal symmetry –triclinic, monoclinic, orthorhombic and cubic systems; Piezoelectricity and crystal symmetry- triclinic, monoclinic and cubic systems, Piezoelectricity in quartz.

Elasticity and crystal symmetry – triclinic, monoclinic, orthorhombic and cubic systems .

Unit IV

Surface science

Introduction, Crystal shape and bond densities, Preparation clean surfaces, Low energy electron diffraction (LEED), Structure of surfaces, Examples of surface reconstruction, Interaction of gases with surfaces, Chemisorptions and co-adsorption, Photoelectron spectroscopy(PES), UPS, XPS, ESCA, Synchrotron radiation, Auger electron spectroscopy(AES), Electron Energy Loss spectroscopy (EELS), Extended X-ray absorption fine structure (EXAFS)

Recommended books

1. Chemical applications of group theory — F.A. Cotton
2. Spectroscopy of molecules — Veera Reddy
3. Ligand field theory — B.N. Figgs
4. Physical properties of crystals — J.F.Nye;
5. Physics of crystals — S.Bhagavantam and S.Radhakrishna,
6. Solid State Physics — G. Burn

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY

M.Sc. (Physics) – III Semester Syllabus

(w.e.f. 2021- 2022) under CBCS

Solid State Physics - Specialization

SSP 304 T/CBCS

Paper – IV

PHYSICS OF PHONONS AND STRUCTURAL PHASE TRANSITIONS

Unit I

Phonon Physics

Theoretical background of lattice vibrations – Phonons and their properties – Crystal momentum – Conservation – Neutron diffraction from phonons – Experimental verification of dispersion relations – Thermal conductivity – Role of phonons – Thermal conductivity – Normal and Umklapp processes – Photon –Phonon interaction – TO and LO phonons – Liddane – Sach – Teller's (LST) relation – Applications – Infrared measurements, Raman effect – Theory of polaritons – Experimental measurement.

Unit II

Diffusion in solids

Solid state diffusion, Diffusion mechanisms, Self-diffusion, Impurity diffusion coefficient, Fick's second law, Diffusion coefficient, Experimental determination of diffusion coefficient, Various methods, Random walk diffusion and correlated and uncorrelated motions, Diffusion in a simple cubic structure, Diffusion under external field, Nernst-Einstein relation, Correlation factor 'f', Kirkendall shift.;Ionic conductivity, Ionic conductivity of alkali halides and effect of divalent impurities on ionic conductivity.

Unit III

Ferroelectricity and structural phase transitions

Introduction to ferroelectricity and phase transitions, The free energy expression to summarize characteristics of ferroelectrics, Soft modes in ferroelectrics, Structural phase transitions, Comparison with experiments, Symmetry of low temperature phases, Microscopic model of soft modes, Renormalization group, Optical properties of ferroelectrics, other related properties including pyroelectricity, Piezoelectricity, Ferroelasticity and Antiferroelectricity.

Unit IV

Superconductivity

Instability of Fermi Sea and Cooper pairs, BCS ground state, manifestation of energy gap; consequence of BCS theory and comparison with experimental results, Quantization of magnetic flux, Giaver tunneling, Josephson effect – Phase coherence, D.C. and A.C. Josephson effects, Superconducting quantum interference devices (SQUIDS). Discovery of the phenomenon of High Temperature Superconductivity; Discovery of various types of HTSC materials, viz; - Y-, Bi-, Tl and Hg based materials. Preparation of HTSC materials by the solid state reaction method and their fundamental physical properties (Elementary treatment only).

Recommended Books

1. Solid state physics – G.Burns;
2. Intermediate theory of crystalline solids – Animalu
3. Solid state physics – H.Ibach and H.Luth,
4. Solid state physics – Christ,
5. Solid state physics – Kachchava
6. Solid State Physics - Dekker
7. Solid State Physics --Wahab

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY

M.Sc., (Physics) – III Semester Syllabus

w.e.f. 2021- 2022 under CBCS

Solid State Physics - Specialization

SSP 305 T/CBCS

Paper –V

BAND THEORY AND ELECTRICAL PROPERTIES

Unit I

Band Theory of Solids

Brillouin zones.- Brillouin zones in one, two and three dimensions., Density of states,Extended, reduced and periodic zone schemes; Nearly free electron model, Tight binding approximation and its application to simple cubic lattice, Calculation of energy bands- APW method, Pseudo potential method, OPW method.

Unit II

Fermi Surface

Introduction, Characteristics of Fermi Surface, Construction of Fermi surface, Fermi surface and Brillouin zones, Dynamics of an electron in electric field; Dynamics of an electron in magnetic field –Cyclotron frequency, Cyclotron mass, Onsager-Lifshitz quantization condition, Cyclotron resonance, Energy levels and density of states in magnetic field, de-Haas van Alphen effect.

Unit III

Transport Phenomenon In Metals

The Boltzmann transport equation, Electrical conductivity, Definition and experimental features – The Drude Lortentz theory, The Sommerfeld theory- Calculation of the relaxation time, The electrical conductivity at low temperatures, Matheissen's rule, Thermal conductivity, Widemann-Franz law, Hall-effect.

Unit IV

Electrical Transport Properties Of Insulators

Hopping conduction; Temperature variation of electrical conductivity; Seebeck coefficient; Polorons- small poloron band conduction; large poloron band conduction; small poloron hopping conduction; Mott transitions; Ionic Conductivity; Superionic Conductivity- structure, defects and conductivity.

Recommended books

1. Principles of theory Solids – Ziman
2. Solid state Physics -- Singhal
3. Solid state Physics -- H.C. Gupta
4. Elementary SolidState Physics – M.Ali Omar
5. SolidState Physics – M.A. Waheb
6. SolidState Physics – Kachchava,
7. Principles of the solid state – H.V. Keer

M.Sc.(Physics) under CBCS
III Semester

Specialization:

ELECTRONICS-INSTRUMENTATION

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY

M.Sc. (Physics) – III Semester Syllabus

w.e.f. 2021- 2022 under CBCS

Specialization: Electronics – Instrumentation

PEI 303 T/CBCS

Paper III
DIGITAL LOGIC CIRCUITS

Unit I

Combinational Logic Circuits

Simplifying Logic Circuits, Sum of products form - Algebraic simplification, designing combinational logic circuits, Karnaugh Map Method, looping - pairs, quads, octets, complete simplification process, Don't care conditions, examples.

Digital Arithmetic Operations and Circuits Binary addition, representing signed numbers, binary subtraction, BCD addition, Hex arithmetic, ALU, parallel binary adder, design of full adder, carry propagation's, IC parallel adder, 2's compliments system, IEEE/ANSI symbols.

Unit II

Flip-Flops

NAND and NOR gate latches, clock signals and clocked flip-flops, clocked R-S, J-K, and D-FFs, D latches, Asynchronous inputs, IEEE/ANSI symbols, Timing consideration, one shot.

Counters and Registers : Ripple counters, Counter with MOD numbers $< 2^n$. IC asynchronous counters, asynchronous down counters, propagation delay in ripple counter, Up/Down counters. Presettable counters, 74193 counter, Decoding a counter, Decoding glitches, synchronous counter design, Left & Right shift registers, shift register counters, IEEE/ANSI symbols.

Unit III

IC Logic Families

Digital IC terminology, TTL logic family, TTL series characteristics, improved TTL series, TTL loading and fan-out other TTL characteristics, connecting TTL outputs together, tristate TTL, ECL Family, MOS digital IC's and characteristics, CMOS logic and characteristics, bilateral switch, TTL driving CMOS and vice versa. Low voltage technology

MSI Logic Circuits: Decoders, BCD to 7 segment decoder/driver, liquid crystal display, Encoders, multiplexers and their applications, demultiplexers, magnitude comparators, code converters, data busing, data bus operations, IEEE./ANSI symbols,

Unit IV

Memory Devices

General Memory Operation, CPU-Memory connection, Read only memories, ROM architecture, ROM timing, and types of ROMs, Flash memory, and ROM applications. Semiconductor RAMs, RAM architectures, static RAM, Dynamic RAM (DRAM), DRAMS structure and its operation, DRAM Read/Write cycles, DRAM refreshing, Expansion of word sizes and capacity

programmable Logic Devices and Introduction to VHDL

Basic ideas, PLD architectures (PROM), PAL, PLAS, Application of programmable logic devices - GAL 16 V, 8A, programming a PLD, Introduction to VHDL- Description Languages verses Programming Languages, HDL Format and Syntax , Intermediate signals, representing data in VHDL, Truth tables using VHDL.

Text Books

. Digital Systems - Principles and Applications - Ronald J.Tocci, 6/e, PHI, New Delhi. 1999.

2. Modern digital electronics – R.P.Jain, Tata McGraw Hill 3rd Edition

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY

M.Sc., (Physics) – III Semester Syllabus

w.e.f. 2021- 2022 under CBCS and Non-CBCS

Specialization: Electronics – Instrumentation

PEI 304 T/CBCS

Paper IV
MICROPROCESSORS, DSPs & INTERFACING

Unit I

The 8086 Microprocessor - General Organization of a Microcomputer, Detailed Architecture of 8086, Addressing Modes, Instructions Set, Assembly Language Programming, Programming Examples. The 8086-Based **System Design** - Pins and Signals, System Components, Interfacing Memory, I/O Devices.

Unit II

Peripheral Interfaces and Interfacing with 8086 : Parallel I/O Methods, Programmable Peripheral Interface (8255 A), Key board /Display interface (8279),Programmable Priority Interrupt Controller (8259 A), DMA Controller (8237/8257), Programmable Interval Timer (8254), Programmable Communication interface (8251), UART.

Advanced Microprocessors- Protected Mode Operation, The 80286, 80386, 80486, Pentium, Pentium-Pro and Pentium I-IV Microprocessors.

Unit III

Digital Signal Processors (DSP) Architecture of TMS320C5X- Introduction-Bus structure-Central architecture logic unit (CALU)-Auxilary Register (AR)-Index register (INDX)-ARCR-Block move address register Block Repeat Register, Parallel Logic Unit (PLU), memory mapped registers-Program controller-Some flags in status registers. On chip memory – on chip peripherals.

Unit IV

Digital Signal Processors (DSP) TMS320C5X Assembly Language Instruction – Assembly Language Syntax, Addressing Modes, Load and Store Instructions, Addition/ Subtraction Instructions, Move Instructions, Multiplication Instructions, The NORM Instruction, Programme Control Instruction, Peripheral Control.

Books:

1. Microprocessors, PC Hardware and Interfacing - By N. Mathivanan, PHI, 2003
2. The Intel Microprocessors 8086/8088, 80186/80188, 80286,80386,80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, Architecture, Programming, and Interfacing - By Barry B. Brey, 6th Ed., PHI / PEA, 17th Reprint, 2003
3. Digital Signal Processors- B.Venkata Ramani and M.Bhaskar (TMH).
4. The 8086 Microprocessor : Programming & Interfacing the PC - By Kenneth J. Ayala Penram International Publishing, 1995
5. Advanced Microprocessors and Peripherals - Architecture, Programming and Interfacing - By A K Ray and K M Bhurchandi, TMH, 2000
6. Advanced Microprocessors and Interfacing - By Badri Ram, TMH, 2nd Reprint 2002
7. Microprocessors and Interfacing, Programming and Hardware - By Douglas V. Hall, TMH, 2nd Ed., 18th Reprint, 2003
8. The 8088 and 8086 Microprocessors - Programming, Interfacing, Software, Hardware and
9. Microcomputer Systems : The 8086/8088 Family, Architecture , Programming, and Design By Yu-cheng Liu and Glenn A. Gibson, PHI, 2nd Ed., 1986.

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY

M.Sc. (Physics) – III Semester Syllabus

w.e.f. 2021- 2022 under CBCS

Specialization: Electronics – Instrumentation

PEI 305 T/CBCS

Paper - V
ELECTRONIC INSTRUMENTATION

Unit I

Measurement and Error

Definitions- Accuracy and Precision – Significant figures – Types of error – Statistical analysis- Probability of errors – Limiting errors.

Performance characteristics of an instrumentation system: Zero, First and Second Order systems – Response of first and second order systems to STEP, RAMP and IMPULSE inputs- Frequency response of first and second order systems. Specification and testing of dynamic response.

Unit II

Amplifiers and Signal Conditioning

Instrumentation amplifiers- Isolation amplifiers- Chopper amplifiers- Voltage to frequency and frequency to voltage converters-Frequency multipliers - Logarithmic amplifiers,- S/H Circuits- Attenuators. Second order active filters – Low pass , High pass, Band pass, and Band stop filters- Butterworth and Chebychev filters- Frequency transformation- All pass filters. Phase sensitive detectors (PSD) - Phase lock loop (PLL) – Lock-in-amplifier.

Unit III

Signal Generation

Frequency synthesized signal generator- Frequency divider generator- RF signal generator- Signal generator modulation- Sweep frequency generator- Function generator – Noise generator.

Signal Analysis: Wave Analyzer- Audio frequency Wave analyzer- Heterodyne wave analyzer- Harmonic distortion analyzer- Resonant harmonic distortion analyzer-Heterodyne harmonic distortion analyzer- Fundamental suppression harmonic distortion analyzer- Spectrum analyzer- Spectra of CW, AM, FM and PM waves.

Unit IV

Electronic Measuring Instruments

Q- meter- Vector impedance meter- Digital frequency meter – Digital voltmeter – Phase meter – RF power and voltage measurement – Power factor meter – Vector volt meter.

Display and Recording: X-t, X-Y Recorders – Magnetic tape Recorders- Laser printers – Ink jet printers. - Storage oscilloscope.

Characteristics of digital displays: LED- LCD – Dot matrix and seven segment display systems.

Recommended Books

1. Modern Electronic Instrumentation and Measurement Techniques – A.O. Helfrick and W.D.Cooper, Prentice Hall India Publications.
2. Instrumentation Devices and Systems – C.S Rangan, G.R. Sharma and VSV Mani, Tata Mc Graw Hill Publications.
3. Introduction to Instrumentation and Control – A.K Ghosh – Prentice Hall India Publications.
4. Electrical and Electronics Measurement and Instrumentation – A.K.Sawhney.

LIST OF EXPERIMENTS IN PHYSICS LAB III SEMESTER

Modern Physics Lab

1. Thermoelectric power
2. Plank's constant (h) using LED
3. Hall Effect
4. Magnetic susceptibility by Quinick method.
5. Study of Dielectric constant and Curie temperature using Ferroelectronic Ceramics.
6. Study the Photoelectric effect and determine the value of the plank constant (h).
7. Beers Law

Solid State Physics Lab-I

1. Magneto resistance
2. Energy band gap of a semiconductor Resistivity measurement of semiconductor using Four-probe method
3. Ionic conductivity
4. Thermister characteristics
5. Hysteresis loss measurement.

Analog, Digital & Simulation Lab (SEM – III)

(A1) Analog Experiments :

1. Power control by SCR using UJT.
2. PLL (IC 565) as FM Detector.
3. Active filters.
4. PLL (IC565) as frequency synthesizer.
5. Strain guage –Trainer kit.
6. LVDT -Trainer kit.
7. PLL (IC 565) as AM detector.

(A2) Analog Simulation Experiments

8. Active filters Using Op-Amps
9. Frequency Modulation and detection
10. Amplitude modulation and detection
11. Solution of differential equations using analog computation (Using TUTSIM)

(B) Digital experiments (Hardware and Simulation)

1. Construct a synchronous up/down counter using IC74192 and display count using 7-segment display.
2. Implement Boolean functions using a multiplexer.
3. Construct a shift register using IC 7495.
4. Construct an 8-bit full adder using two 4-bit adders.
5. Implement Boolean functions using Dec/D
6. Simulating a four variable Boolean function using a 1 of 16 data Sel/Mu
7. Given a four variable Boolean function design and simulate the circuit using gates.
8. Simulate a 4-bit Bin/BCD decade counter
9. Simulate a full adder circuit using a Dec/Dem
10. Simulate a 4-bit shift register.
11. Design a counter with skipped counts & simulate
12. Simulate a Johnson Counter

M.Sc. (Physics) under CBCS and IV Semester

GENERAL PAPERS
(Common for all Specializations)

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY

M.Sc. (Physics) - IV Semester Syllabus – General Paper

w.e.f. 2021- 2022 under CBCS

P 401 T/CBCS

Paper - I (Common for all Specializations)
NUCLEAR PHYSICS

Unit I

Nuclear Force And Nuclear Models

Systematics of nuclear force-strength, range, charge independence; Deuteron problem and its contribution to the definition of the Nuclear force. Exchange force theories- Majoranna, Bartlett, Heisenberg and Yukawa.

The liquid drop model-the semi empirical mass formula and its applications. The Shell model-states based on square well potential and harmonic oscillator potential. Predictions-spins and parities of nuclear ground states, magnetic moments ,electric quadrupole moments.

Unit II

Nuclear Decay Processes

α-decay, Gamow's theory, fine structure of α spectrum. alpha decay, systematics, neutrino hypothesis, Fermi's theory of β-decay, Fermi-Kurie plot, angular momentum, selection rules for β-decay, -decay, Multipole radiation, selection rules.

Unit III

Nuclear Radiation Detection

Interaction of charged particles with matter, Bohr's theory, Bethe's formula. Range-energy relation. Stopping power. Measurements of range and stopping power. Interaction of gamma rays with matter-Photoelectric effect, Compton effect and pair production. gamma ray detection using gas, scintillation and solid state detectors.

Unit IV

Nuclear Reactions

Classification of nuclear reactions, Kinematics and Q-value of reactions. Basic theory of Direct nuclear reactions-Born approximation, stripping and pick-up reactions, characteristics, cross-sections, examples and applications. Compound nucleus formation. Theory of Fission and fusion reactions. Nuclear structure information from nuclear reactions.

Particle Physics

Elementary Particles Classification and their Quantum Numbers (Charge, Spin, Isospin etc). Fundamental Forces, Conservation of Parity, Strangeness and Lepton and Baryon numbers, Quark model.

REFERENCES

1. Concepts of Nuclear Physics; B.L.Cohen (TMH)
2. Introductory Nuclear Physics: Kenneth S.Krane (Wiley)
3. Nuclear and Particle Physics:Blin-Stoyle (Chapman and Hall)
4. Nuclear Physics;I.Kaplan (Narosa 2002)
5. Introductory Nuclear Physics: W.Wong
6. Introductory Nuclear Physics: S.B.Patel
7. Nuclear Physics: Tayal

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY
M.Sc. (Physics) - IV Semester Syllabus - General Paper
w.e.f. 2021- 2022 Under CBCS

402 T/CBCS

Paper – II (Common for all Specializations)
SPECTROSCOPY

Unit I

Atomic Spectra
Different series in alkali spectra (main features), Ritz combination principle, Terms for equivalent & non-equivalent electron atom, Term values in alkali spectra and quantum defect, L-S and j-j coupling; Energy levels and spectra; Spectroscopic terms.
Spin-Orbit interaction, doublet structure in alkali spectra, selection rules, intensity rules, alkali-like spectra, Lamb shift, many electron atoms, isotope shift; hyperfine splitting of spectral lines, selection rules. Lande interval rule.

Unit II

Molecular Spectra
Types of Molecular spectra, Regions of the Spectrums, Salient features of rotational spectra, rotational spectra of diatomic molecule as a rigid rotator, Energy levels and spectra of a non-rigid diatomic molecule, effect of isotopic substitution on rotational spectra, salient features of Vibrational-Rotational spectra, vibrating diatomic molecule as a harmonic oscillator and as anharmonic oscillator. Diatomic molecule as rigid rotator and harmonic oscillator diatomic molecule as a non-rigid rotator and anharmonic oscillator.

Unit III

Raman and Infrared (IR) Spectra
Raman effect and its salient features, classical and quantum theory of Raman effect, normal vibrations of CO_2 and H_2O molecules, vibrational and rotational Raman spectra, Infrared spectroscopy; infrared spectroscopy – basic concept of IR spectroscopy – IR spectrophotometer – Principle and Instrumentation – FTIR principle and working – interpretation of data from Raman and IR spectroscopy.

Unit IV

Basics of NMR & ESR
Nuclear spin and magnetic moment, origin of NMR spectra, Theory of NMR sp, relaxation process, ESR spect, (origin)- resonance condition , quantum theory ,Franck-condon principle,Born-Oppenheimer approximation.

Books Recommended
1. Elements of Spectroscopy - Gupta, Kumar, Sharma
2. Atomic Spectra & Atomic Structure - Gerhard Hertzberg
3. Introduction to Molecular Spectroscopy - G.M.Barrow
4. Molecular Spectroscopy - J.D.Graybeal
5. Atomic and Molecular Spectroscopy - Raj Kumar
6. Molecular Structure & Spectroscopy - G.Aruldhas

Reference Books
1. Introduction to Atomic Spectra - H.E.white
2. Fundamentals of Molecular Spectroscopy - C.N. Banwell and EM Mc Cash
3. Spectra of Diatomic Molecules - Herzberg
4. Spectroscopy Vol. I, II, III - Walker and Straughen
5. Principles of Magnetic Resonance - C.P.Slitcher
6. Electron Spin Resonance: Their Applications - Wertz and Bolton

Special Subject:
SOLID STATE PHYSICS

Specialization: Solid State Physics

PSSP 403 T/CBCS

Paper-III
OPTICAL PHENOMENA IN SOLIDS

Unit I

Optical Properties of Solids
Introduction, Relation between the dielectric and optical properties (macroscopic theory), Kramers-Kronig relations, Absorption of electromagnetic radiation, Interband transitions, Direct and indirect absorption coefficients.

Unit II

Optical Band Transitions
Frenkel and Wannier excitons and their absorption, Imperfections - exciton absorption below the bandgap, Plasma absorption, Intraband transitions - Absorption and reflection in metals, Hagen-Rubens relation, reflectance in UV transparency region, Einstein coefficients, Raman and Brillouin scattering, Magneto-optic effects: the Faraday effect.

Unit III

Luminescence
General considerations of luminescence, exciton, absorption and emission processes of luminescence, Configuration coordinate diagram, Energy level diagram, radiative and non-radiative processes, Decay mechanisms, Effect of doping and efficiency, Energy transfer and charge transfer, Different kinds of luminescence, Electro luminescence, Photoluminescence and Thermoluminescence, Defects and color centers, Different kinds of color centers in the context of luminescence in alkali halides.

Unit IV

Photovoltaics and Photodetectors
Photovoltaic effect, Types of interfaces, homojunction, heterojunction and Schottky barrier-Choice of semiconductor materials for fabrication of homojunction solat cells, equivalent circuit of a solar cell, Solar cell output parameters – Fill factor, conversion efficiency, quantum efficiency, effect of series and shunt resistance on the efficiency of solar cells, Variation of open-circuit voltage and short circuit current with intensity of incident light, effect of temperature on I-V characteristics.
Photo detectors - Photoconductors, d.c. and a.c. photoconductors, gain and bandwidth, PIN photodiodes.

References:

1. Solar cells – Charles E. Backus, IEEE Press.
2. Fundamentals of Solar cells, Farenbruch and Bube.
3. Principles of theory of solids – Ziman, Vikas Publishing House, New Delhi.
4. Solid State Physics – G. Burns
5. Luminescence and Luminescent Materials – Blasse
6. Solid State Physics – Dekker.
7. Optoelectronic devices _ P. Bhattacharjee
8. Physics of semiconductor devices – S. M. Sze.

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w.e.f. 2021- 2022 under CBCS

Specialization: Solid State Physics

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Paper-IV
RESONANCE PHENOMENON IN SOLIDS

Unit I

Magnetism In Solids
Ferromagnetism - Ferromagnetic coupling, Theory of spin waves, magnons in ferromagnets; Anti-ferromagnetism – Molecular field theory, susceptibility and Neel temperature; Ferrimagnetism – susceptibility variation with temperature, Neel's theory, Bloch $T^{3/2}$ law; Ferrites - Structure, properties and applications; Novel magnetic materials – GMR/ CMR materials.

Unit II

Nuclear Magnetic Resonance
Nuclear magnetic resonance (NMR), Basic principles of NMR, Resonance condition, Spin-lattice and Spin-spin relaxation mechanisms, Bloch's equations and complex susceptibility, Chemical shift, Bloch diagram of NMR spectrometer, Analysis of the spectra, Applications of NMR.

Unit III

Electron Spin Resonance
Principle of Electron spin resonance , Nuclear hyperfine interaction, crystal field theory, splitting of energy levels for octahedral and tertrahedral fields in transition metals; rare earth and actinide ions, Experimental details of Electron spin resonance spectrometer; Analysis of ESR spectra.
Elements of Nuclear Qudrapole Resonance (NQR) and construction and working of NQR spectrometer.

Unit IV

Mossbauer Effect
Resonance fluorescence/Natural and Doppler broadening of lines, Qualitative theory of recoil less gamma ray emission, Mossbauer effect, Temperature dependence of recoilless process, Debye-Waller factor, Experimental study, Mossbauer spectroscopy, Quantum mechanical theory of Mossbauer effect, Isomer shift, Magnetic hyperfine interactions, Electric quadrupole interactions, Applications of Mossbauer effect.

Recommended books

1. Elementary theory of solid state Physics - J.P. Srivastava.
2. Mossbauer effect- Principles and applications – G.K.Wertheim,
3. Mossbauer spectroscopy – N.N.Greenwood and T.C.Gibb,
4. Solid State Physics – Singhal;
5. Horizons of Physics, Vol. I, --Wiley Eastern Publishers

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SSP 405 T/CBCS

Paper-V

STUDIES ON REDUCED DIMENSIONALITY IN SOLIDS

Unit I

Two Dimensional Solids - Quantum-Well Device Structures

A review of quantum mechanics w.r.t . infinite deep rectangular potential well, Basic concepts of artificial structures; Introduction to Semiconductor hetero-junction superlattices, Properties of semiconductor superlattices - Optical absorption, Resonance tunneling, Negative differential conductivity, Modulation doped hetero-junction superlattices,n-i-p-i structures, Inversion layers in MOSFETS and MODFETS, Metallic superlattices and their preparation, characterization and properties.

Unit II

One And Zero Dimensional Solids

Definitions, Zero-dimensional systems, Fullerenes, Quantum dots and their optical and electronic properties; One-dimensional systems: one-dimensional metals, Peirls distortion, conjugated polymers, Nano-tubules, Quantum wires (elementary treatment only)

Unit III

Preparation Of Thin Films

Vacuum evaporation: Types of evaporation sources – Resistive heating, electron beam evaporation, Two source evaporation – Flash evaporation – Laser ablation.

Epitaxial deposition: Vapor-phase epitaxy, Liquid-phase epitaxy, molecular bean epitaxy-Thickness distribution of evaporated films (Point and Ring sources).

Sputtering : Glow discharge, dc and RF sputtering, Reactive sputtering, magnetron sputtering, Ion beam deposition.

Chemical methods: Chemical Vapor deposition (CVD), Plasma chemical vapor deposition(PCVD), Metal organic chemical vapor deposition (MOCVD).

Unit IV

Insulator Thin Films

Metal insulator contact-Mott-Gurney contact- Schottky contact- Conduction in insulator films-Schottky emission-Poole-Frenkel emission-Thermally activated hopping-Direct tunneling-Space charge limited current-Photo conduction-Photovoltaic effect-Voltage controlled negative resistance-Experimental techniques for photo conduction.

Recommended Books:

1. Fundamentals of thin films - Goswamy
2. Thin films - K.L.Chopra
3. Semiconductor Devices - Physics and Technology - S.M.Sze
4. Hand book of nanostructred materials and nanotechnology (Vol. 1-4) Ed. By Hari Singh Nalwa
5. Nano crystalline materials – H. Gleiter
6. Nanophase materials - R.W. Seigel

SpecialIZATION:

ELECTRONICS-INSTRUMENTATION

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY **M.Sc. (Physics) – IV Semester Syllabus**
w.e.f. 2021- 2022 under CBCS

Specialization: Electronics – Instrumentation

PI 403 T/CBCS

Paper – III
EMBEDDED SYSTEMS AND ITS APPLICATIONS

Unit I

The 8051 Microcontroller
Introduction to Microcontrollers : History of Microcontrollers and Microprocessors, Embedded Versus External Memory Devices, CISC and RISC Processors, Harvard and Von Neumann
Architectures, Block diagram of the 8051; **Inside the 8051**, Assembling and Running an 8051 Program, The Program Counter and ROM space, Date Types and Directives, Flag Bits and PSW Register, Register Banks and Stack; **Pin Description**, I/O Programming, Bit Manipulation; **Addressing Modes-** Immediate and Register Addressing Modes, Accessing Memory using Various Addressing Modes

Unit II

Programming the 8051
Instruction Set- Arithmetic instruction Programs- Add, Subtract, Multiplication and Division of Signed and Unsigned and Unsigned Numbers; **Logical** Instruction and Programs- Logic, Compare, Rotate, Swap, BCD and ASCII Application Programs; **Single Bit** Instructions and Programming – Single Bit Instructions with CY; **Jump, Loop** and call Instructions, Time Delay Generation and Calculation; Timer/Counter Programming, Serial Communication an interrupts Programming.

Unit III

PIC Microcontrollers
Overview and Features, **PIC 16C6X/7X** Architecture (PIC 16C61/C71), Registers, Pin diagram, Reset action Memory Organization, **Instructions**, Addressing Modes, I/O Ports, Interrupts, Timers, Analog-to- Digital Converter (ADC).
Pin Diagram of PIC **16F8XX Flash Microcontrollers**, Registers, Memory organization, Interrupts, I/O Ports and Timers.

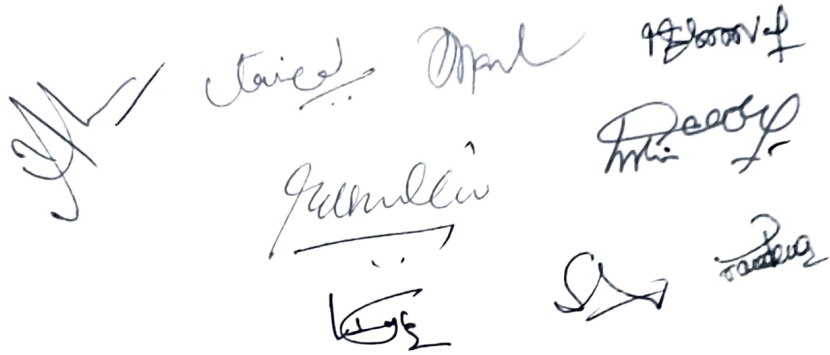
Unit – IV

Industrial Applications of Microcontrollers
Connecting of - Light Emitting Diodes (LEDs), Push Buttons, Relays and Latches. **Interfacing** of - Keyboard, 7-Segment Displays, LCD Interfacing, ADC and DAC with 89C51 Microcontrollers.
Measurement Applications of – Robot Arm, LVDT, RPM Meter, Digital Thermo Meter and Strain Gauges.
Automation and Control Applications of – PID Controllers, D C Motors and Stepper Motors.

Recommended Books:
1. Microcontrollers – Theory and Applications – By Ajay V Deshmukh, TMH, 2005

Reference Books:

1. Programming and Customizing the 8051 Microcontroller – By Myke Predko, TMH,2003
2. Embedded Microcontrollers Handbook, Intel Applications
3. Design with Microcontrollers By - J B Peatman, MH.
4. The 8051 Microcontroller - programming, interfacing and applications – By Howard Boyet and Ron Katz, (MII) Microprocessors Training Inc.
5. The concepts & features of Microcontrollers by Rajkamal, Wheeler Pub.
6. The Microcontroller Idea Book Circuits, Programs, & Applications featuring the 8052-BASIC Microcontroller By Jan Axelson, Penram International.



DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY **M.Sc.**
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w.e.f. 2021- 2022 under CBCS

(For the batch admitted from 2012-2013 onwards)
Specialization: Electronics – Instrumentation

PEI 404 T/CBCS

Paper – IV
PC ARCHITECTURE

Unit I

Basic Computer organization: Instruction codes, computer instructions , timing and control, memory referred instructions , I/O and interrupts , complete computer description and design [Chap.5].

Unit II

Programming the computer: Assembly language, assembler, program loops, arithmetic and logical operations, subroutines and I/O programming. **Microprogrammed control :** Control memory, address sequencing and microprogram examples [Chap's.6 &7].

Unit III

Central Processing Unit: Introduction to CPU, general register organization, stack organization, Instruction formats, Addressing modes, Data transfer and manipulation, Program control and RISC,. [Chap. 8].
Computer Arithmetic – I : Addition and subtraction Multiplication algorithms, Division algorithms [Chap.10].

Unit IV

Computer Arithmetic – II : Floating point Arithmetic Operations, Decimal arithmetic Unit, and Decimal Arithmetic Operations. [Chap. 10]
Input –Output organization: Peripheral Devices, Input –Output Interface, Asynchronous Data transfer, Modes of transfer, Priority Interrupt, Direct Memory Access (DMA), Inapt-Output processor (IOP), Serial Communication [Chap.11].

Recommended Text books :

1. Computer System architecture -- Moris mano , PHI (2000).

Reference books :

1.An introduction to digital computer design -- V.Rajaraman and T.Radhakrishna .
2.Computer Architecture and parallel processing -- k.Hang and F.A bigg , Mcgraw –Hill
3.Computer Architecture and logic design -- Thomas C.Bartee , Mcgraw –Hill
4.Computer Fundamentals ,Architecture and Organization -- B.Ram 3rd Edn. New Age International.

DEPARTMENT OF PHYSICS, PALAMURU UNIVERSITY **M.Sc. (Physics) – IV Semester Syllabus w.e.f. 2021- 2022 under CBCS**

Specialization: Electronics – Instrumentation

PEI 405 T/CBCS

Paper-V

INTRUMENTATION FOR MEASUREMENT, CONTROL, DATA ACQUISITION, AND DATA TRANSMISSION

Unit I

Transducers: Classification of transducers – Active and Passive transducers- Electrical transducers- Displacement transducers -Digital transducers -Basic requirement of a transducer .
Displacement Measurement: Variable resistance devices– Variable inductance devices - Variable capacitance devices.
Strain Measurement: Theory of operation of strain gauge – Types of strain gauges – Strain gauge circuits _ Quarter bridge- Half bridge and Full bridge – Temperature compensation – Calibration of strains gauges – Strain gauge load cell.

Unit II

Pressure Measurement: Bourdan Tube- Bellows - Diaphrams – Transduction methods- Potentiometer device- Straingauge transducer – LVDT type transducer –Variable capacitance device – Force- balance transducer – Piezoelectric transducer- Digital Pressure Transducer- Pressure calibration.
Temperature Measurement: Classification of temperature measuring devices-Resistance type temperature sensors (platinum resistance thermometer, thermistrors) –Resistance thermometer circuts- Thermocouples – Types of thermocouples -Cold junction compensation – Solid State Sensors – Temperature measurement by radiation methods – Calibration of thermometers.

Flow Measurement : Classification of flow meters – Head type flow meters-Orifice meter- Venturi Tube- Pitot tube – Rotameter- Anemometer – Electromagnetic flow meter - Ultrasonic flow meter.

Unit III

Process Control : Open loop control – Closed loop control – Examples- Block diagram algebra -Block diagram of Closed loop system - Closed loop transfer function –DC AND AC Servomotors-Stepper motor-Temperature Control-Liquid level control.
Analog and Digital Data Acquisition Systems: Interfacing transducers to electronic control and measuring systems – Digital to analog multiplexer - Analog to Digital multiplexer - IEEE 488 Bus.

Unit IV

Data Transmission and Telemetry : Methods of data transmission–General telemetry system- Functional blocks of telemetry system – Types of telemetry systems– Land line telemetering system-Voltage telemetering systems–Current telemetering system-Position telemetering system– Land line telemetry feedback system-Radio frequency telemetry - PAM, PCM Telemetering–Multiplexing in telemetering system- Transmission channels- Digital data transmission.

Recommended Books:

1. Modern Electronic Instrumentation and Measurement Techniques – A.O.Helfrick and W.D.Cooper, Prentice Hall India Publications.
2. Instrumentation Devices and Systems- C.S.Rangan, G.R. Sharma and VSV Mani, Tata Mc.Graw Hill Publications.
3. Introduction to instrumentation and Control- A.K.Ghosh – Prentice Hall India Publications.
4. Electrical and Electronics Measurement and Instrumentation – A.K.Sawhney.
5. Transducers and Instrumentation – DVS Murthy, PHI Publications.

LIST OF EXPERIMENTS IN PHYSICS LAB - IV SEMESTER

NUCLEAR PHYSICS LABORATORY

1. To draw the characteristic curve of the given G.M. Detector and determine its plateau length and working potential.
2. To determine the dead time of a given G.M. tube using double source.
3. To determine the half life of a long lived radio active substance .
4. To determine the linear and mass absorption coefficients of β-particles in a given material, i.e. Al.
5. To determine the absorption coefficient of gamma rays in different absorbing materials, i.e., Al and Pb.
6. To determine the half life of irradiated Indium foil.
7. To determine the half life of short lived and long lived irradiated silver (Ag) foil.
8. To verify inverse square law using beta or gamma source.

SOLID STATE PHYSICS LABORATORY-IV SEMESTER

List of Experiments

1. characteristics of a solar cell and determination of power gradient and efficiency
2. Determination of Lande factor – ESR Spectrometer
3. Magnetic Susceptibility of a paramagnetic salt-Guoy's balance method
4. Variation of manetoresistance with magnetic field and temperature by four probe method
5. Determination of lattice parameter of a fcc crystal usind XRD pattern
6. Determination of ferroelectric transition of a PZT material.
7. Dielectric constant for ferroelectric ceramics.
8. Verification of curie-weiss law for the electrical susceptibility of a ferroelectric material.

ELECTRONICS INSTRUMENTATION- PRACTICALS

IV Semester
Microprocessors & Microcontrollers Lab

Programming and Interfacing using Microprocessor (8086)

1. Addition of fifty 16-bit numbers stored in consecutive memory location
2. Divide a 28 bit unsigned number by 8 .
3. Convert a 2-digit unsigned BCD number to binary.
4. To add two words ,each word containing four packed BCD digits.
5. Write a subroutine ,to multiply a signed 16-bit number and a signed 8-bit number, that can be called by a main program in a different code segment and stores the result in consecutive memory locations.
6. Simple programs on PC using Macro Assembler MASM 86
7. To interface the analog-to-digital converter (ADC) kit with PC and to develop suitable programs to convert the analog signal into digital value.
8. To interface the digital-to analog converter (DAC) kit with PC and to develop suitable programs to generate various waveforms to display it on CRO.
9. To interface the given stepper motor and to develop suitable program to rotate it at various stepping angles

Experiments using Microcontroller (8051)

1. To test the 8051 system and its ports.
2. To interface an ADC to the 8051.
3. To program the 8051 timer. To generate a square wave using the 8051 timer.
4. To interface a DAC to the 8051. To generate a sine wave on the scope using the DAC.
5. To interface a DAC to the 8051. To generate a sine wave on the scope using the DAC.
6. To interface a stepper motor to the 8051.To write a program to control the angle and direction of stepper motor rotation by the user
7. To examine and use an 8051 Assembler. To examine and use an 8051 simulator
8. To code a program to add hex numbers. To code a program to add BCD numbers. To code a program to add two multi-byte BCD numbers.
9. To practice converting data from decimal to binary and hexadecimal systems.
10. To write a program to convert data from hex to ASCII. To write a program to find the average of a set of hex data. To examine the 8051 division and multiplication instructions.