CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, ODISHA

SCHOOL OF BASIC SCIENCES

MASTER OF SCIENCE PROGRAMME
IN
APPLIED PHYSICS
2015-16 SYLLABUS

CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, PARALAKHEMUNDI

1^{st} YEAR SYLLABUS

SEMESTER-I				
Sl No	Subject Code	Subject	Contact Hours per week (L+T+P)	Credits
1	MSPH4701	Quantum Mechanics II	3+1+0	4
2	MSPH4702	Mathematical Physics II	3+1+0	4
3	MSPH4703	Electrodynamics II	3+1+0	4
4	MSPH4704	Classical Mechanics II	3+1+0	4
5	MSPH4705	Computational Physics II	3+1+0	4
6	As per course	FREE ELECTIVE-III	3+1+0	4
TOTAL CREDITS				24

SEMESTER-II				
Sl No	Subject Code	Subject	Contact Hours per week (L+T+P)	Credits
1	MSPH4801	Computational Physics III (all streams)	3+1+0	4
2	MSPH4802	Fluid Mechanics(common for strm 2 & 3)	3+1+0	4
3	MSPH4803	Physics of Materials I(for stream 2& 3)	3+1+0	4
4	MSPH4804	Physics of Atmosphere(for stream 2& 3)	3+1+0	4
5	MSPH4805	Analogue Communication Technique (strm 1)	3+1+0	4
6	MSPH4806	Digital Signal and system processing (strm 1)	3+1+0	4
	MSPH4807	Micro processor and interfacing devices (str 1)	0+0+3	3
	MSPL4803	Signal processing Lab	0+0+3	3
	MSPL4801	Physics of Materials Lab I	0+0+3	3
	MSPL4804	Micro processor and interfacing devices Lab (str 1)	0+0+3	3
	MSPL4802	Weather and Climate data analysis lab	0+0+3	3
TOTAL CREDITS FOR EACH STREAM				24

First Semester M.Sc. Applied Physics

MSPH4701 QUANTUM MECHANICS-II
(LTP: 3+1+0) (Credit: 4)

Module-I

Matter waves: De Broglie's hypothesis, Free Wave packets, The Heisenberg Uncertainty Relations, The probability Interpretation of the Wave Function, the Schrodinger Equation. Postulates of Quantum Mechanics.

The general structure of wave Mechanics: Vector spaces and operators,Dirac Notation, **O**perators and Observables,, Degeneracy and Simultaneous Observables, Observables as operators, Projection Operators, Harmonic Oscillator using creation-annihilation operators, The time dependence of Operators, Problems

Module-II

Angular Momentum: The angular Momentum Commutation Relations, Raising and Lowering Operators for Angular Momentum, Representation of |*l,m*> States in Spherical Coordinates, Matrix Representations of Angular Momentum Operators, problems
The Schrodinger Equation in Three Dimensions and the Hydrogen Atom:
The central Potential, The Hydrogen Atom and its Energy Spectrum, The Degeneracy of the Spectrum, problems.
Spin: Eigenstates of spin ½, The intrinsic Magnetic Moment of Spin ½ particles, Addition of Two Spins, The addition of spin ½ and orbital angular momentum, General Rules for addition of angular Momenta, Problems

Module-III

Perturbation Theory: Energy Shifts and Perturbed Eigen states, Degenerate Eigenstate and removal of degeneracy, The Stark Effect, Zeeman effect, Hyperfine structure, Fermi's Golden rule. Introduction to Time- Dependent Perturbation Theory.Schrodinger, Heisenberg and Interaction Picture.

Text Books:

1. A text Book of Quantum Mechanics, PM Mathews and K Venkatesan, McGraw Hiil, 2010.
2. Quantum Physics by S. Gasiorowicz, John Wiley, 2013.
3. Introduction to Quantum Mechanics, D J Griffith, Pearson, 2014.
4. Modern Quantum Mechanics, J.J. Sakurai, Pearson, 2013.
5. Quantum Mechanics, Gupta & Kumar (Jai PrakashNath Publications)

First Semester M.Sc. Applied Physics

MSPH4702 MATHEMATICAL PHYSICS II
(LTP: 3+1+0) (Credit: 4)

Module-I

Vector Analysis: Vector calculus, Integral theorems, Curvilinear coordinates, Differential vector operators in curvilinear coordinates, Coordinate Transformations.
Complex variable Theory: Cauchy's Integral Theorem, Cauchy's Integral Formula, Laurent Expansion, Calculus of residues.
Matrices and Tensors: Tensor analysis, Pseudo-tensors, Dual tensors.

Module-II

Vector Spaces:
Defintion of vector spaces, Scalar product, Hilbert Space, Dirac- Delta Function, Gram-Schmidt Orthogonalization, Operators, Commutation relations, Identity, Inverse and Adjoint operators.
Sturm-Lioville Theory:
Hermitian Operator, ODE eigenvalue problems, Bessel Functions of the First kind, Spherical Bessel Functions, Orthogonality and completeness of the eigenfunctions.
Gamma function:
Definitions,Properties,The Beta Function

Module-III

Fourier Transforms:
Fourier Transforms, Properties of Fourier Transforms, Convolution Theorem.
Partial differential equations (PDEs):
Second order PDEs, Classification of PDEs, Laplace equation, Fourier's Heat flow equation, Wave equation.
Green's Functions: One-dimensional problems, Qualitative idea of Green's functions in 2- and 3-dimentions.

Text Book:

1. Mathematical Methods for Physicists by G B Arfken, H J Weber and F E Harris, Elsevier, 2012.

Reference Books:

2. Mathematical Physics by C. Harper, PHI, 2012.
3. Mathematical Physics: The Basics by J D Joglekar, Universities Press, 2005.
4. Mathematical Physics: Advanced Topics by J D Joglekar, Universities Press, 2006.
5. Advanced Mathematical Methods for Scientists and Engineers, C M Bender and S AOrszag, Springer International Edition, 2013.
6. Mathematical Physics by SatyaPrakash, Sultan Chand & Sons; Sixth edition (2014).

First Semester M.Sc. Applied Physics

MSPH4703 ELECTRODYNAMICS II
(LTP: 3+1+0)(Credit: 4)

Module I
Electricity in Matter:

The electrostatic field of conductors, energy of the electrostatic field of conductors, methods of solving problems in electrostatics, forces on the conductor, the electric field in dielectrics, dielectric permeability, thermodynamics of dielectrics, electric forces in a fluid dielectric, piezoelectrics, Ferroelectrics, Current density and conductivity, Hall effect.

Module II Magnetism
in Matter:

Matter in constant magnetic field, Force in magnetic field, Gyromagnetic phenomena, Dia-, Para-and Ferromagnetism, Ferromagnetics near the Curie point, Domain structure of ferromagnetics, Anti-ferromagnetism, Magnetic properties of superconductors, Superconductivity current, Critical field, Eddy currents, Skin effect.

Module III
Electromagnetic Waves in Matter:

Maxwell's equations, EM waves in vacuum, field equations in a dielectric in the absence of dispersion, frequency dependence of dielectric and magnetic permeability, Dispersion relations, EM waves in waveguides and resonators, EM waves in non-homogeneous and anisotropic media, Scattering and absorption of em waves by small particles, EM waves and matter interaction.

Text Book:

1. Electrodynamics of Continuous Media, by L D Landau E M Lifshitz and L P Pitaevskii, CBS Publishers and Distributers, 2007.

Reference Book:

2. Introduction to Electrodynamics, D J Griffiths, Prentice Hall of India, 2012.
3. Introduction to Solid State Physics, C Kittel, Wiley, 2012.
4. Callister's Materials Science and Engineering, R Balasubramaniam, Wiley, 2014.

First Semester M.Sc. Applied Physics

MSPH4704 CLASSICAL MECHANICS-II (LTP:3+1+0)(Credit:4)

Module I:

Lagrangian Dynamics for holonomic systems and extensions, Hamiltonian dynamics, conservation laws, central force problem, variational principle.

Module II:

Canonical transformations, Poisson Bracket, Hamiltonian-Jacobi equation, Canonical perturbation theory, Time-dependent perturbation, Illustrations of time-dependent perturbation theory, Time-dependent perturbation theory in first order with one degree of freedom.

Small Oscillations: Coupled oscillators in Lagrangian formalism, Lagrangian formulation of continuous systems.

Anharmonic oscillations.Introduction to parametric resonance.

Module III:

Introduction to Nonlinear systems: Simple non-linear models: logistic map, system of differential equations, phase space trajectories, dynamical behavior: period doubling, limit cycles, chaos.

Text Book:

1. Classical Mechanics by J C Upadhyaya, Himalaya Publishing House, 2014.
2. Nonlinear Dynamics and Chaos, S H Strogatz, Persius Books, 2000.

Reference Books:

2.Classical Mechanics by H Goldstein, Pearson, 3rd Edition, 2011.

3. Classical Mechanics by Landau &Lifshitz, 7th Ed, CBS Publishers, New Delhi, 2010.
4. Differential Equations, Dynamical Systems and an Introduction to Chaos, MW Hirsch, S Smale, RL Devaney, Elsevier, 2012.

First Semester M.Sc. Applied Physics

MSPH 4705 COMPUTATIONAL PHYSICS-II
(LTP: 2-0-3) (Credit: 4)

Module I

Functions and roots: Bisection method, Newton-Raphson method.
Numerical differentiation, Partial differentiation in space and time domains. Interpolation: Lagrange interpolation formula.
Numerical integration (Trapezoidal, Simpson, Gaussian quadrature).
Computation of moment of inertia of various objects, Computation of electric and magnetic fields due to line.

Module II

Solution of systems of linear algebraic equations: Gauss elimination method, Gauss-Jordan Elimination method.
Solution of ordinary differential equations, the Initial Value problem, Euler method, Runge-Kuttamethod.The classical harmonic oscillator problem.

Module III

Solution of partial differential equations, Boundary Value problem, The vibrating string. Steady state Fourier's heat equation in one dimension.

Text Book:

1. Numerical Methods for Scientific and Engineering Computation, M K Jain, S R K Iyengar, R K Jain, New Age International Publishers, 2012.

Reference Books:

2. A First Course in Computational Physics, by J. Hasbun& P. Devries,Viva Books, 2011.
3. Computational Physics by R C Verma, P.K.Ahluwalia, K C Sharma,New Age Publishers, 2007.
4. Computational Physics by N.J.Giordano&H.Nakanishi,Pearson, 2012.

COMPUTATIONAL PHYSICS LAB-II

1. Basics of SCILAB
2. Working with matrices and plotting graphs

3. Computing Taylor Series of functions
4. Working with loops, branches and control flow
5. Plotting graphs using for loop
6. Problem solving using for loops
7. Numerical Intergration using Trapizoidal rule
8. Numerical Integration using simpson's rule
9. Implementation of Gauss Legendre Integration
10. Solution of a system of linear equations using Gauss Elimination and Gauss-Jordan Elimination methods
11. Solution of a 2^{nd} order Ordinary Differential equation using Euler method, Runge-Kutta method
12. Solution of a 1-dimensional Partial Differential equation: The vibrating string problem.

Second Semester M.Sc. Applied Physics

MSPH4801 COMPUTATIONAL PHYSICS-III

(LTP: 2+0+3) (Credits: 4)

(Common to All Three Streams)

Module I

Partial Differential Equations: Laplace equation, Poisson Equation, Navier-Stokes equation.

Simulation of Nonlinear systems: Predator-prey model: the Logistic map, Lorentz attractor.

Module II

Statistical analysis of data: Regression, Correlation, Probability distribution of data, Fourier Transforms and spectral analysis.

Time Series: Characteristics of time series, stationary and non stationary data, correlation, auto-correlation.

Random Numbers: Generation and use, Introduction to Monte-Carlo methods.

Module III

Optimization problems, Introduction to Neural Networks, Genetic Algorithm and Fuzzy Logic.

Books:

1. A First Course in Computational Physics, by J.Hasbun& P. Devries,Viva Books,2011.
2. Introduction to Time Series and Forecasting, by P.J. Brockwell&R.A.Davis, Springer-Verlag,1998.
3. Fundamental of Neutral Networks, by Laurene V Fausett, Pearson Education,2004.
4. Neural Network,fuzzylogic,Genetic Algorithm: Synthesis and Applications, by S.Rajasekaran&G.A.VijayalakshmiPai,PHI,2003.

The lab evaluation will be in project mode. The projects will be based on the topic mentioned above

Second Semester M.Sc. Applied Physics

<u>MSPH4802 FLUID MECHANICS</u>
(LTP: 3-1-0) (Credit-4)
(Common for Streams 2 &3: Materials Science, Atmospheric Science) Module-I

Kinematics of Fluids.Methods describing Fluid motion.General theory of stress and rate of strain.Lagrangian and EulerianMethods.Translation and Rate of Deformation. Streamlines, Pathlines an Streaklines,

Fundamental equations of the flow of viscous compressible fluids. 1-D inviscid incompressible flow, Equation of continuity, motion and energy in Cartesian coordinate system.

Module-II

2-D and 3-D inviscid incompressible flow.Basic equations and concepts of flow.Circulation theorems.Velocity Potential, Rotational and irrotationalflows.Integration of the equations of motion.Bernoulli's Equation.

The equation of state. Fundamental equations of continuity, motion and energy in Cylindrical & Spherical coordinate systems.

Module-III

Laminar flow of viscous incompressible fluids, the laminar boundary layer, introduction to turbulent flow, introduction to inviscid compressible flow, introduction to viscous compressible flow.

BOOKS:

1. Fundationsof Fluid Mechanics by S.W.Yuan. Publisher: Prentice-Hall of India.1967. Chapters: 3(3.1 to 3.4), 5(5.1 to 5.6), 7(7.1 to 7.5).
2. An Introduction to Fluid Dynamics by G.K.Batchelor,Cambridge University Press,2013.
3. A text book of Fluid Mechanics, by R.K.Bansal, Laxmi Publisher 2005.
4. Viscous Fluid Dynamics by J.L.Bansal, IBH Publication, Jaipur. 2003.

Second Semester M.Sc. Applied Physics

MSPH4803 PHYSICS OF MATERIALS-I

(LTP: 3+1+0) (Credit: 4)

(Common for Streams 2 &3: Materials Science, Atmospheric Science)

Module-I

Overview of Condensed matter physics: Water as an example, Energies and potentials.

Structure of materials through scattering: Elementary scattering theory- Bragg's law, The density operator and its correlation functions, Liquids and gases, Crystalline solids, The Kronig - Penney Model, Symmetry and crystal structure, Crystal defects, Liquid crystals, One and two-dimensional order in three dimensional materials.

Module-II

Thermal Properties: Phonon theory, Phonon scattering; Specific heat of solids, Properties of heat conductors and insulators; Thermodynamics and statistical mechanics of homogeneous fluids, The ideal gas, Spatial correlations, Symmetry in ordered systems, Mean field theories of first-order phase transitions: liquid-gas and solid-liquid transitions.

Module-III

Mechanical Properties: Elasticity of solids: the stess and strain tensors, Stress-Strain relations, Thermodynamics of deformations: The elastic free energy, Isotropic and cubic solids, Fluctuations, Vacancies and interstitials, The Lagrangian elasticity.

Books:

1. Principles of Condensed Matter Physics, by P M Chaikin and T C Lubensky, Cambridge University Press, (Indian Print) 2007.
2. Introduction to Solid State Physics , C. Kittel, Wiley, 2012.
3. Solid State Physics by M. A. Wahab, Narosa, 2005.
4. Elements of Materials Science and Engineering, L H Van Vlack, Prentice Hall; 1989.

Second Semester M.Sc. Applied Physics

MSPH4804 PHYSICS OF THE ATMOSPHERE

(LTP:3+1+0) (Credit:4)

(Common for Streams 2 &3: Materials Science, Atmospheric Science)

MODULE-I

Fundamentals on Earth and Atmosphere: Structure and composition of the atmosphere.Equation of State and gas laws.Ideal Atmosphere.Hydrostatic equilibrium.Atmosphere of the other planets.

MODULE-II

Thermodynamics of the Atmosphere.Thermodynamic variables.The laws of conservation of energy. Thermodynamics of dry air, Potential temperature, Adiabatic process, Entropy. Thermodynamics of moist air.Virtual Temperature and Potential temperature.Thermodynamic diagrams, Phase change and Clausius-Clapeyron equation.

MODULE-III

Clouds, Precipitation and Radiation.Hydrostatic stability and Convection.Principle of cloud nuclei formation.Types of clouds and cloud microphysics. The fundamental physics of radiation: solar and terrestrial radiation, radiation laws. Absorption, emission and scattering in the atmosphere. Schwarzchild'sequation.Greenhouse effect.

Books:

(1) Meteorology Today by Ahrens C D, 11th editions, Cengage, 2015.

(2) Atmospherics Science – An Introductory Survey, Wallace, J. M. and P. V. Hobbs, Academic Press, 2006.

(3) Meteorology for Scientists and Engineers, Stull, R.B., Brooks/Cole, 2000.

(4) General Meteorology, Buyers, H.R., McGraw Hill Book Company, 1977.

(5) Introduction to Theoretical Meteorology by S. L. Hess, Kreiger Publishing Company, 2002.

Second Semester M.Sc. Applied Physics

MSPH 4805 ANALOGUE COMMUNICATION TECHNIQUES

(LTP:3+1+0) (Credit: 4)

(for Stream-1: Electronics and Communication Sciences)

Module – I (15 hours)

Spectral Analysis : Fourier Series, The Sampling Function.The Response of a linear System. Normalized Power in a Fourier expansion.Impulse Response. Power Spectral Density. Effect of Transfer Function on Power Spectral Density. The Fourier Transform. Physical Appreciation of the Fourier Transform. Transform of some useful functions. Scaling, Time-shifting and Frequency shifting properties.Convolution, Parseval's Theorem. Correlation between waveforms; Auto-and cross correlation. Expansion in Orthogonal Functions.Correspondence between Signals and Vectors. Distinguish ability of Signals.

Module -II (14 hours)

Amplitude Modulation Systems : A Method of Frequency translation, Recovery of baseband Signal,AmplitudeModulation,Spectrum of AM Signal. The Balanced Modulator . The Square law Demodular. DSB–SC, SSB-SC and VSB-SC - Their Methods of Generation and Demodulation. Carrier Acquisition . Phase-locked Loop (PLL). Frequency Division Multiplexing.

Frequency Modulation Systems : Concept of Instantaneous Frequency. Generalized concept of Angle Modulation.Frequency modulation, Frequency Deviation, Spectrum of FM Signal with Sinusoidal Modulation.Bandwith of FM Signal Narrowband and wideband FM. Bandwith required for a Gaussion Modulated WBFM Signal. Generation of FM Signal . FM Demodulator . PLL, Preemphasis and Deemphasis Filters.

Module - III (16 hours) Mathematical Representation of Noise : Sources and Types of Noise. Frequency Domain Representation of Noise. Power Spectral Density. Spectral Components of Noise.Response of a Narrow band filter to noise.Effect of a Filter on the Power spectral density of noise. Superposition of Noises, Mixing involving noise .Linear Filtering.Noise Bandwidth.

Noise in AM Systems: The AM Receiver , Super heterodyne Principle, Calculation of Signal Power and Noise Power in SSB-SC, DSB-SC and DSB+C. Figure of Merit, Square law Demodulation. The Envelope Demodulation.Threshold.Mathematical Representation of the operation of the Limiter Discriminator; Calculation of output SNR.Comparision of FM and AM. SNR Improvement using preemphasis. Multiplexing.Threshold in frequency modulation.

Text Books :

1. Principles of Communication Systems by Taub&Schilling ,TataMcGraw Hill. Selected portion from Chapter 1, 3, 4, 7, 8, 9 and 10 .
2. Communication Systems bySimanHaykin,John Wiley & Sons, Inc.

Additional Reading :

1. Modern Digital and Analogue Communication Systems by B.P. Lathi,3rd Edition, Oxford University Press. Selected Portion from Ch. 2,3,4,5 and 12.
2. Digital andAnalog Communication Systems by Leon W.couch, II, 6th Edition Pearson Education Pvt. Ltd

Second Semester M.Sc. Applied Physics

MSPH4806 DIGITAL SYSTEMS & SIGNAL PROCESSING

(LTP:3+1+0) (Credit:4)

(for Stream-1: Electronics and Communication Sciences)

Module – I

Continuous and discrete time signals: Some Elementary Continuous-time and Discrete-Time signals. Classification of Signals – Periodic and a periodic even – odd – energy and power signals – Deterministic and random signals – Causal and non causal signals and anti causal signals -- complex exponential and sinusoidal signals ---Simple Manipulations of Continuous and discrete time signals.

Continuous-Time Systems: LTI Continuous-Time systems, Block diagram and signal flow graph representation, response of LTI Continuous-Time system in time domain, classification of Continuous-Time systems, convolution of Continuous-Time signals.

Discrete-Time Systems: Analysis of Discrete-Time LTI Systems: Techniques, Response of LTI Systems, Properties of Convolution, Causal LTI Systems, Stability of LTI Systems; Discrete-Time Systems Described by Difference Equations; Implementation of Discrete-Time Systems; Correlation of Discrete-Time Signals: Cross correlation and Autocorrelation Sequences, Properties.

Module-2

The Z-Transform: The Direct Z-Transform, The Inverse Z-Transform; Properties of the Z-Transform; Rational Z-Transforms: Poles and Zeros,

Inversion of the Z-Transforms: The Inversion of the Z-Transform by Power Series Expansion, The Inversion of the Z-Transform by Partial-Fraction Expansion;

Discrete Time Fourier Transform(DTFT) :The discrete time fourier transform of Aperiodic signal, Convergence of fouriertransform,thefourier transform of signal with poles on unit circle,frequency domain and time domain signal properties,prorerties of DTFT

DISCRETE FOURIER TRANSFORM:

The Discrete Fourier Transform, The DFT as a Linear Transformation, Relationship of the DFT to other Transforms; Properties of the DFT: Periodicity, Linearity, and Symmetry Properties, Multiplication of Two DFTs and Circular Convolution.

MODULE-3

Efficient Computation of the DFT: FFT Algorithms: Direct Computation of the DFT, Radix-2 FFT Algorithms: Decimation-In-Time (DIT), Decimation-In-Time (DIF);

Design of IIR Filters from Analog Filters: IIR Filter Design by Impulse Invariance, IIR Filter Design by the Bilinear Transformation.

Design of FIR Filters: Symmetric and Ant symmetric FIR Filters, Design of Linear-Phase FIR Filters by using Windows, Design of Linear-Phase FIR Filters by the Frequency-Sampling Method;

Books :

1. Digital Signal Processing – Principles, Algorithms and Applications by J. G. Proakis and D. G. Manolakis, 4th Edition, Pearson.
2. Digital Signal Processing: S.Salibhanaan, A. Vallavaraj, C.Gnanapriya, TMH.
3. Digital Signal Processing – Ramesh Babu, ScitechPublication.

Second Semester M.Sc. Applied Physics

MSPH4807 MICROPROCESSORS AND INTERFACING DEVICES

(LTP:3-1-0) (Credit: 4)

(for Stream-1: Electronics and Communication Sciences)

MODULE I:

Introduction to Microprocessor, Microprocessor systems with bus organization, Microprocessor Architecture & Operations, Memory, I/O Device, Memory and I/O Operations 8085 Microprocessor Architecture, Address, Data And Control Buses, Pin Functions, De-multiplexing Of Buses, Generation Of Control Signals, Instruction Cycle, Machine Cycles, T-States, Instruction set.

Assembly Language Programming Basics, Classification of Instructions, Addressing Modes, 8085 Instruction Set, Instruction And Data Formats, Writing, Assembling & Executing A Program.

MODULE II:

Introduction, Architecture, pin description, mode of operations,clockgeneratorIntel-8284A,bidirectionalbustrans- receiver8286/8287,buscontroller8288,buscyclememoryread/writefor minimum mode, 8086system ,memoryinterfacing,interruptprocessing;softwareinterrupts, singlestepinterrupt,non- maskableinterrupt,interruptpriority,DMA,HaltState, WaitforTeststate,comparison between 8086 an 8088.Instructionsetandprogramming8086.

MODULE III:

Interfacing Concepts, Ports, Interfacing Of I/O Devices, Interrupts, Interfacing of ADC and DAC Data Converters, 8255A PPI, 8253/8254 Timer, 8259A PIC, 8237 DMA Controller, Serial I/O Concepts, SID And SOD, 8251A USART, Memory Interfacing, Memory and I\O mapping, Interfacing of above chips With 8085 and 8086

8051 Microcontroller : overview and comparison with microprocessors.

Books:

1. Ramesh S. Gaonkar, ”Microprocessor Architecture , Programming and Applications with the 8085”, Penram International.
2. MicroprocessorsandInterfacing;byDouglasVHall;McGrawHill.
3. MicroprocessorsandMicrocontrollersArchitecture,programmingandsystemDesign 8085,8086,8051,8096:byKrishnaKant;PHI..
4. Fundamentals of Microprocessor and microcontroller by B. Ram.

References:

1. The 8088 and 8086 Microprocessors Programming, Interfacing, Software, Hardware and Application;byWalterA.Triebel&AvtarSingh;PearsonIndia.
2. The8086Microprocessor:Programming&InterfacingthePC- KennethJ.Ayala,Delmar CengageLearning,IndianEd.

Second Semester M.Sc. Applied Physics

MSPL4801 PHYSICS OF MATERIALS LAB-I

(LTP:0+0+3) (Credit:2)

1. Study of characteristic frequencies (normal modes) of a coupled pendulum.
2. Study of synchronisation of weakly coupled oscillators.
3. Temperature variation of Surface tension of water.
4. Temperature dependence of viscosity of glycerine using Ostwald Viscometer.
5. Measurement of velocity of sound.
6. Study of drag forces offered by different media (air,water,oil,glycerine).
7. Measurement of specific heat of solids.
8. Verification of Wiedemann-Franz law and determination of Lorentz number.
9. Measurement of thermal conductivity of metals.
10. Study of Zeeman effect using Fabry Perot etalon.
11. Determination of wavelength of monochromatic light using Michelson interfeter.

Second Semester M.Sc. Applied Physics

MSPL4802 WEATHER AND CLIMATE DATA ANALYSIS LAB

(LTP: 0-0-3) Credit: 2

1. Introduction to UNIX/LINUX. Basic commands and file management.

2. MATLAB I/O with common data formats. MATLAB using Math works resources.

3. MATLAB I/O with NetCDF, HDF and GRIB2.

4. Observational data visualization. Plotting 1, 2 and 3 dimensional weather/climate data and animations with MATLAB.

5. Univariate& bivariate statistics. Mean/median/mode.Variance/standard deviation.

6. Correlation, errors, regression. Probability and distributions.

7. Frame and test a hypothesis. Principles of statistical significance, Test hypotheses and estimate statistical significance using MATLAB functions.

8. Introduction to probability, distributions and statistical significance.

9. Visualization and analysis of spatial weather/climate data. Spatial data analysis.
10. Time-series analysis.
11. Regridding meteorological station data, interpolation, map overlays.

12. Interpolation and Estimate trend in weather/climate variables.

Text Books:

1. RudraPratap, Getting started with MATLAB, 1st Edition, Oxford, 2010.
2. Trauth, M., MATLAB Recipes for Earth Sciences, 3rd Edition, Springer 2010
3. Trauth, M. and E. Sillman, MATLAB and Design Recipes for Earth Sciences, 1st Edition, Springer, 2012
4. von Storch, H. and F.W. Zwiers, Statistical Analysis in Climate Research,1st Edition, Cambridge,2003
5. Wilks D.S., Statistical Methods in the Atmospheric Sciences. 3rd edition, Academic, 2010.

Second Semester M.Sc. Applied Physics

MSPH4803 SIGNAL PROCESSING LAB (LTP:0+0+3) (Credit:2)

1. Study and design of AM modulator and demodulator

2. Study of angle modulation and Demodulation Techniques. 3.Convolution

of sequences (Linear Convolution, Circular Convolution)

4. Correlation of two sequences (Auto correlation and Cross Correlation)

5. To design digital IIR filters (Low-Pass, High Pass, Band-Pass,

Band-Stop). 6.To design FIR filters using windows technique.

7. Design and simulation of DFT and IDFT .

8. Implementation of FFT algorithm by decimation in time and decimation in frequency.

9. Implementation of IIR (LowpassAndHighpass) Filters DSP kit.

10. Implementation of IIR (Band Pass and band stop) Filters DSP kit.

11. Implementation of FIR (LowpassAndHighpass) Filters using DSP kit.

12. Implementation of linear phase FIR (LowpassAndHighpass) Filters using DSP kit.

Second Semester M.Sc. Applied Physics

MSPL 4804 MICROPROCESSOR & INTERFACING DEVICES LAB

(LTP:0+0+3)(Credit:2)

Experiment List (Total10 (Ten)experiments have to becompleted .)

A) 8085

1. Addition, Subtraction, Multiplication, Divisionof two 8bit numbers resulting 8/16bit numbers.
2. Smallest/Largestnumberamong two numbers and n numberina given data array.
3. + Binaryto Gray Code / Hexadecimalto decimalconversion & segment display.

B) INTERFACING

COMPULSORY

3. Generatesquarewavesonalllinesof8255withdifferent frequencies(conceptof delay program)
4. Study of stepper Motor and its operations (Clockwise,anticlockwise, angularmovement, rotate in various speeds) 1 lecturer)

OPTIONAL (AnyTwo)

5. Study of TrafficLight controller
6. Study of Elevator Simulator
7. Generation ofSquare , triangular andsaw tooth wave using Digital to Analog Converter
8. Studyof 8253 and its operation (Mode 0,Mode 2, Mode 3)
9. Studyof Mode 0, Mode 1,BSRMode operation of 8255.

10.Studyof 8279(keyboard& Displayinterface) 11.Study of 8259 Programmable Interruptcontroller.

OPTIONAL(any one)

13.Addition, subtraction of 16 bitnumbers.

14.Multiplication, Divisionof 16 bit numbers

15.Transfer a blockof data to anothermemorylocationusing indexing. 16.Operation of 8255 using8051 microcontrolle

D) 8086

COMPULSORY

17.Addition, subtraction, Multiplication , Division of 16 bitnos + 2'scomplement of a 16 bit no.

OPTIONAL (AnyOne)

18.Findinga particulardata element in a givendata array.

19.Markingof specific bit ofanumber using look-up table.

20.Largest /Smallestnumberof a givendata array.

21.To separate the Odd andEvennumbers from a given dataarray.

22.Sorting an array of numbers in ascending/descendingorder\