M.Phil. PHYSICS

SEM	COURSE CODE	COURSE	COURSE TITLE	NO. OF HOURS	CREDIT	CIA MARKS	SE MARKS	TOTAL MARKS
I	14MPPH1C1	CORE I	Research Methodology	4	4	40	60	100
	14MPPH1C2	CORE II	Advanced Studies in Physics	4	4	40	60	100
	14MPPH1C3	CORE III	Research Topics in Physics	4	4	40	60	100
	14MPPH1C4	CORE IV	Teaching and Learning Methodology	4	4	40	60	100
*** One hour Library for each course**								
TOTAL				**16**	**16**	**160**	**240**	**400**
II	14MPPH2PW	Project Work	Dissertation **	--	8	--	--	200
GRAND TOTAL				**--**	**24**	**--**	**--**	**600**

** (Evaluation of the Dissertation shall be made jointly by the Research Supervisor and the External Examiner)

Project (M.Phil)

Maximum Marks: 200

I review	20 Marks
II review	20 Marks
Evaluation of project	120 Marks
Viva voce	40 Marks

CORE COURSE – I
RESEARCH METHODOLOGY

Course Code : 14MPPH1C1 | **Max. Marks : 100**
Hours / Week : 4 | **Internal Marks : 40**
Credit : 4 | **External Marks : 60**

Objectives:

- To learn the identification, literature surveyof research problems. Usage of internet in accessing research informations and publishing the thesis write-ups. The presentation of research ideas in scientific seminars and to develop the art of writing the thesis.
- To study hyper geometric functions, statistical descriptions of data.
- To learn advanced computing and advanced analytical techniques.

UNIT – I WORKING ON A RESEARCH PROBLEM 12 hours

Identification of the Problem –Determining the Mode Of Attack – Literature Survey – Reference – Awareness of current status of the art –Abstraction of a Research Paper – possible way of getting oneself abreast of Current Literature –Internet – And Its applications-#Assessing the status of the problem# – Guidance from the supervisor – Actual investigation –Results and conclusions – Presenting a scientific seminar –Art of Writing the Thesis.

UNIT – II HYPERGEOMETRIC FUNCTIONS 12 hours

Series solution of Gauss Hypergeometric equation – elementary properties of Hypergeometric function – Symmetry property – Differentiation of Hypergeometric function – Integral representation – Linear transformation of Hypergeometric functions.

UNIT – III DATA ANALYSIS 12 hours

Introduction –Statistical description of data (mean, variance, skewness, median, mode)- Distributions (student's T-test, F-test, Chi-test), correlation (linear and nonparametric/ rank); Modeling data: Least squares, fitting data - Nonlinear models - Surrogate analysis.

UNIT – IV ADVANCED COMPUTATION 12 hours

Symbolic Manipulation using MAPLE: Introduction to Maple – symbolic computation – basic programming constructs: The assignment statement – conditional statement – recursive programming – basic data structures – expressions – procedures – computing with symbolic parameters – roots of polynomial and its plots – examples – programming with Maple graphics evaluation rules – nested procedures – debugging Maple programs – solving differential equation (symbolic manipulation by a single command)

MATLAB fundamentals and applications: MATLAB basic operations- Matrix operations - Array operations- The Colon symbol (:) - M-files- Plotting commands - Graph functions- X-Y Plots and Annotations - Logarithmic and Polar Plots - Control Statements - Loops - IF Statements - WHILE loop - INPUT/OUTPUT Commands - Applications of MATLAB - Transient analysis - RL, RC and LCR circuits - Frequency response of CE amplifier- Introduction to SIMULINK.

UNIT – V ADVANCED ANALYTICAL TECHNIQUES 12 hours

Single crystal and Powder diffraction- Diffractometers- FT-IR, Raman and UV- Visible spectrometers –Photo luminescence –**#**Light, Matter interaction**#** –Photo reflectance Electronic transitions –Analytical technique –principles of SEM, EDAX, EPMA Instrumentation –Sample preparation.

#.....# Self study portion

Text books:

T.B 1 Rajamal.P.ADevadas, A. Hand book of methodology of research, R.M.M vidyalaya Press, First edition, 1989.

T.B 2 B.D. Guptha, Mathematical Physics, Vikas publication, third edition,2005.

T.B 3 S.L. Guptha, V.K. Kapoor, Fundamentalsof mathematical statistics, S.Chand publications, 11th edition,2013.

T.B 4 Andrew Knight, Basics of MATLAB and Beyond, CRC press, 2000.

T.B 5 H. Kaur, Spectroscopy,PragathiPrakashan,9th edition, 2014.

.

Unit – I	**Chapter 1& 2**	**Sections 1.2 – 1.8 & 2.42 -2.86**	**T.B 1**
Unit – II	**Chapter 8**	**Sections: 8.3 - 8.76**	**T.B 2**
Unit – III	**Chapter 2**	**Sections: 2.13 - 2.16**	**T.B 3**
Unit – IV	**Chapter 1- 5**	**Sections: 1.1 - 5.4**	**T.B 4**
Unit – V	**Chapter 6 -8, 20 &24**		**T.B 5**

Books for reference:

1. J.Anderson ,B.H.Durston&M.Poole,Thesis and assignment writing ,Wiley Eastern, 4th edition 1997.
2. J.Mathews and R.L Walker, Mathematical methods of Physics W.A. Benjamin INC, 2nd edition, 1973.
3. L.A.Pipes and L.R.Harwil, Applied Mathematics for Engineers and Physicists, Tata McGraw Hill, 5th edition,1997.
4. Thomas C Bartee, Digital Computer Fundamentals, Tata McGraw Hill, New Delhi, 6th edition, 1992.
5. Internet: An Introduction, Cistern school of Computing Jaipur, Tata McGraw Hill, New Delhi 1999.
6. Maple – Learning guide, Waterloo Maple Inc, Canada.2001
7. M.S. Mogan et.al., Maple – Programming guide,Waterloo Maple Inc 2001
8. R.H.Enns and G.McGuireBirkauser, Maple for scientists and engineers, 1st edition,1997
9. Timothy A. Davis & Kermit Sigmon, MATLAB Primer, CRC press, 7thedition,2005.
10. Brian D. Hahn & Daniel T. Valentine,Essential MATLAB for Engineers and Scientists - Elsevier Publications, 2007

CORE COURSE – II
ADVANCED STUDIES IN PHYSICS

Course Code : 14MPPH1C2 | **Max. Marks : 100**
Hours / Week : 4 | **Internal Marks : 40**
Credit : 4 | **External Marks : 60**

Objectives:

- To have a knowledge in advanced concepts of classical and quantum statistics
- To study Relativistic the theories of Wave Equations and Elements of Field Quantization
- To learn the concepts of Quantum computing

UNIT – I Classical Statistics 12 hours

Statistical equilibrium – micro canonical ensemble –#Partition functions and their properties# – Calculation of thermodynamic quantities – validity of classical approximation - Equipartition theory and its applications – Phase transformation of a simple substance - Entropy and probability – statistical equilibrium of free electrons in semiconductors – phase transitions – theory of critical phenomena.

UNIT – II Quantum Statistics 12 hours

Ideal Bosons – Condensation of ideal Bose gas – #Thermodynamic properties of B-E gas# – twofluid model for He-II – Landau's spectrum of Phonons and Rotons – The field of sound waves - Fermions – thermodynamics of black body Radiation – electrons in metals – White dwarfs–nuclear matter – Ultracold atomic Fermi gases – Statistical mode of the atom.

UNIT – III Relativistic Wave Equations 12 hours

Covariant notation – covariance of Dirac equation - Relativistic invariance of Dirac equation – Lorentz transformation operator – Demonstration of the relativistic invariance – The parity operation – Charge conjugation – time reversal operation - Feynman's theory of positrons.

UNIT – IV Elements of Field Quantization 12 hours

Concepts of classical mechanics – classical field equation – Lagrangian form – Hamiltonian form – Quantization of the field – Quantization of the Schrödinger equation – system of Bosons –Creation and Annihilation operators – system of Fermions – Relativistic fields – the Klein-Gordon field – The Dirac field

UNIT – V Quantum Computing 12 hours

Introduction to Quantum computing- Quantum bits (Qubits) – Multiple Qubits – Geometrical representation of a Qubit (Bloch sphere)- Quantum gates: Single Qubit gates – Multiple Qubit gates – Bell states- Quantum half adder and subtractor- Applications of quantum computing: Quantum teleportation – Quantum Parallelism – Superdense coding –Quantum communication – Shor's algorithm – Quantum Fourier Transform.

#.....# Self study portion

Text books:

T.B 1 B.K. Agarwal& Melvin Eisner, Statistical Mechanics, New age publishing, Fourth edition, 2007.

T.B 2 G. Aruldhas, Quantum Mechanics, PHI Learning Private Limited, Sixth edition, 2009

T.B 3 Vishal Sahni, Quantum Computing, Tata McGraw Hill, Third edition, 2007.

Unit – I	**Chapter 3,4& 8**	**Sections 3.1 - 3.4, 4.1 -4.7 & 8.1-8.4**	**T.B 1**
Unit – II	**Chapter 6& 7**	**Sections: 6.1 - 6.8, 7.1 -7.6**	**T.B 1**
Unit III&IV	**Chapter 3,5,15& 16**	**Sections: 3.4, 5.1 - 5.4, 15.1 -15.15, 16.1 -16.10**	**T.B 2**
Unit – V:	**Chapter 4**	**Sections: 4.1 -4.9**	**T.B 3**

Books for reference:

1. F.Reif, Fundamentals of Statistical and Thermal Physics, Levant Books, First edition, 2010.
2. R.K.Pathira& Paul D. Beale,Statistical Mechanics, ELSEEVIER, Academic Press, Reprint 2011.
3. S.L.Kakani,Quantum Mechanics theory and problems, H.M.Chandalia, Sultan Chand &Sons, Second edition, 2007.
4. N.Devanathan, Quantum Mechanics,Narosa Publishing House, Fifth edition, 2005.

CORE COURSE – III
RESEARCH TOPICS IN PHYSICS
EXPERIMENTAL TECHNIQUES IN NUCLEAR PHYSICS

Course Code : 14MPPH1C3 | **Max. Marks : 100**
Hours / Week : 4 | **Internal Marks : 40**
Credit : 4 | **External Marks : 60**

Objective:

- To enhance the experimental ideas in nuclear science and to study the theory of Nuclear Reactions

UNIT – I A B C's of Nuclear Science 12 hours

Nuclear Structure – Radio Activity – Alpha decay – Beta Decay – Gamma Decay – Half Life – Reactions – Fusion – Cosmic Rays – Antimatter.

UNIT – II Particle Accelerators 12 hours

Cockcroft – Walton generator – Van De Graaf generator – betatron – cyclotron – pelletron – colliders – large Hadron Collider(LHC) – Relativistic Heavy Ion Collider (RHIC) – Circular Particle Accelerator - (Tevatron).

UNIT – III Nuclear Detectors 12 hours

Ionisation counter – Geiger Muller tube – Spark Chamber – Proportional counter – Diamond counter – Germanium Counter – Scintillation counter – Time of flight detector – Si (Li), Ge(Li), HPGe detectors.

UNIT – IV Theory of Nuclear Reactions 12 hours

General descriptions of Nuclear reactions – Matrix theory of Nuclear reactions – Compound Nucleus reactions – Optical model and diffraction Phenomena – Direct Nuclear reactions – Multiple diffraction scattering.

UNIT – V Experimental Techniques in Nuclear Physics 12 hours

Radiation sources and interactions –counting statistics–general properties of radiation detectors –Gamma spectroscopy with scintillation and semiconductor detectors – Neutron detectors detection of Charged particles – Nuclear electronics, Instrumentation and Pulse processing.

Text book:

D. C. Tayal, Nuclear Physics, Himalaya publishing house, 2nd edition, 2011.

Unit – I:	**Chapter 2 - 7**	**Sections 2.1 –7.5**
Unit – II	**Chapter 11**	**Sections: 11.1 -11.8**
Unit – III	**Chapter 4**	**Sections: 4.2 – 4.11**
Unit – IV:	**Chapter 10**	**Sections: 10.15 -10.28**
Unit – V:	**Chapter 4**	**Sections: 4.3 - 4.7**

Books for reference:

1. M.L. Pandya, R.P.S. Yadav ,Elements of nuclear Physics, KedarNath Ram Nath, New Delhi, 4th edition, 2011.

2. SatyaPrakash, Nuclear & Particle Physics, Sultan Chand & Sons, New Delhi, 4th edition, 2010

CORE COURSE – III
RESEARCH TOPICS IN PHYSICS
GROWTH OF CRYSTALLINE MATERIALS

Course Code : 14MPPH1C3	**Max. Marks : 100**
Hours / Week : 4	**Internal Marks : 40**
Credit : 4	**External Marks : 60**

Objectives:

- To learn the crystal growth and characterization techniques
- To study about the formation of thin films.
- To study the importance and fabrications of nano materials

UNIT I: Introduction to crystal growth and nonlinear optics **12 hours**

Nucleation – Theories- Spherical and cylindrical nucleation - Nonlinear optics- basic concepts – First, second and third order harmonic generation- Nonlinear optical (NLO) materials- applications.

UNIT II: Solution growth **12 hours**

Solution and solubility - Measurement of supersaturation - Meir's solubility diagram - Slow cooling, slow evaporation and temperature gradient methods – Gel growth - Properties of gel - U–tube and straight tube methods- Flux growth – Phases of matter – Principles of flux growth – Choice of flux.

UNIT III: Melt growth **12 hours**

Different growth techniques**:**Bridgeman method – Czochralski method- Vapour growth**:** Physical vapour deposition-– Chemical vapour deposition.

UNIT IV: Thin films and deposition techniques **12 hours**

Definitions and concepts - Growth of thin films - Various deposition techniques: sol-gel, spin coating, electro-deposition - spray pyrolysis, sputtering- Measurement of film thickness, structure by XRD and optical band gap **-** Applications of thin films in various fields.

UNIT V: Nano materials and fabrication methods **12 hours**

Importance of nanomaterials - Novel techniques for synthesis of nanoparticles - Silicon Carbide, Alumina and various metal oxides - Methods of measuring properties: Scanning electron and Tunneling microscopes, Field Ion microscope, Infrared Surface Spectroscopy, Brillouin Spectroscopy and Luminescence.

Text books:

T.B 1 P**.** SanthanaRaghavanandP**.**Ramasamy**,** Crystal Growth ProcessesandMethods**,** KRU Publications Kumbakonam, Second edition,2000.

T.B 2 A. Goswamy, Thinfilms fundamentals, New age international,Fourth edition, 2008.

T.B 3 A.K. Bandyopadhyay, Nanomaterials, New Age International Publishers, Fifth edition, 2008.

Unit – I:	**Chapter 2**	**Sections 2.2- 2.26**	**T.B 1**
Unit – II:	**Chapter 4**	**Sections:4.11 -4.21**	**T.B 1**
Unit – III	**Chapter 5**	**Sections: 5.1 – 5.4.61**	**T.B 1**
Unit – IV:	**Chapter 9**	**Sections: 9.1 - 9.72**	**T.B 2**
Unit – V:	**Chapter 2 & 8**	**Sections: 2.1 - 2.6 & 8.2 - 8.2.18**	**T.B 3**

Books for reference:

1. J.W. Mullin,Crystallization, Butterworths, London, Second edition, 1972.
2. P.Hortman, Crystal growth an introduction, North Holland publishing Co.,Amsterdam, Second edition,1965.
3. H.K.Henish, Crystal growth from gel, The Pennsylvania state university, First edition, 1969.
4. P.Ramasamy, Recent trends in Crystal growth , ICSU- COSTED Publications, Madras, First edition,1988.
5. B.R.Pamplin, Crystal Growth,Pergamon press, London, Second edition,1980.

CORE COURSE – III
RESEARCH TOPICS IN PHYSICS
LASERS AND NANOMATERIALS IN MEDICINE

Course Code : 14MPPH1C3 | **Max. Marks : 100**
Hours / Week : 4 | **Internal Marks : 40**
Credit : 4 | **External Marks : 60**

Objectives:

- To learn the productions and action of Laser. To study the medical applications of Lasers.
- To understand the concepts of quantum dots and the role of nano materials in medicine.

UNIT – I LASER THEORY AND MEDICAL LASERS 12 hours

Fundamentals of Laser action - Einsteins relations - Conditions for large stimulated emission - Different types of pumping - Three level and four level pumping schemes; - Lasers Rate Equations: Three level and four level laser system; - Medical Lasers: Nd-YAG, Ar-Ion, and Excimer lasers.

UNIT – II LASER-TISSUE INTERACTION 12 hours

Laser tissue interaction: Photophysical and photobiological processes; - Analysis of different Interactions: Photothermal - Photochemical - Electromechanical - Photoablative processes. Tissue optics: Measurement of optical properties of tissues using integrating sphere methods.

UNIT – III LASERS IN MEDICINE 12 hours

Principle and theory of Fluorescence - Different techniques for cancer detection: Laser-induced fluorescence (LIF), Diffuse reflectance spectroscopy (DRS) and Raman spectroscopy. Cancer treatment: Photodynamic therapy (PDT) - Principle and mechanism of PDT.

UNIT – IV QUANTUM DOTS 12 hours

Quantum confinement: Quantum well, Quantum wire, Quantum dots - Need for Quantum confinements - Hetrostructures - Electrical and Optical properties - Applications: Low dimensional semiconductors - LED - Photovoltaic devices - Cellular imaging - Tumor targeting.

UNIT – V NANOMATERIALS IN MEDICINE 12 hours

Basic concepts of nanomaterials - Preparation and synthesize of nanomaterials: Co-precipitation, Sol-gel, and Sputtering; - Characterization of nanomaterials: XRD, FTIR, UV, PL and TEM; - Applications: Drug delivery - Cancer diagnosis and therapy - Antimicrobial activity.

Text books:

T.B 1 B.B. Laud, Lasers and Non-Linear Optics, New Age International Publishers, 2nd Edition, 2008.

T.B 2 S. Svanberg, Atomic and Molecular Spectroscopy (Basic aspects and practical applications), Springer-Verlag Berlin Heidelberg, 4th Edition 2007.

T.B 3 Dr .M. Arumugam, Biomedical Instrumentation ,Anuradha Publications,10thReprint Chennai.

T.B 4 T. Pradeep, NANO: The Essentials-Understanding Nanoscience and Nanotechnolgy McGraw-Hill education, NewDelhi, 2007.

Unit – I	**Chapter 6 - 8**	**Sections 6.1 - 8.6**	**T.B 1**
Unit – II	**Chapter 4& 5**	**Sections 4.12 - 5.85**	**T.B 3**
Unit – III	**Chapter 10**	**Sections 10.5 - 10.64**	**T.B 2**
Unit – IV & V	**Chapter 1& 3**	**Sections 1.2 - 1.16, 3.1 -3.14**	**T.B 4**

Books for reference:

1. William T. Silvast, Laser Fundamentals , Cambridge University Press, New Delhi,2nd Edition, 2004.

2. K. Thyagarajan and A.K. Ghatak, Lasers Theory and Applications, Macmillan India Ltd., 2007.

3. Markolf H. Niemz, Laser-Tissue Interactions-Fundamentals and Applications, Springer Verlag Berlin Heidelberg, 1996.

4. B. Viswanathan, Nanomaterials,Narosa Publishing house, Chennai, 2010.

CORE COURSE – III
RESEARCH TOPICS IN PHYSICS
ELECTRONICS

Course Code : 14MPPH1C3 | **Max. Marks : 100**
Hours / Week : 4 | **Internal Marks : 40**
Credit : 4 | **External Marks : 60**

Objectives:

- To learn the principles of analog and digital electronic instruments.
- To understand the principles of transducers and their types
- To study the hardware components and software programming of Intel 8051 microcontroller.
- To learn the interfacing techniques of memory and I/O devices.
- To understand the concept of linear and non-linear electronics circuits.

UNIT – I Digital Instruments and signal generators 12 hours

Digital instruments – Digital multimeters – Digital panal meters – Digital phase meter – Digital capacitance meter – Microprocessor based instrumentation – the IEEE488 Bus oscilloscope – Digital storage oscilloscope – signal generator – function generator.

UNIT – II Transducers 12 hours

Transducers – Electrical transducers – Resistive transducers – capacitive transducers – load cell – Piezo electrical transducers – Inductive transducer – linear variable differential transducer (LVDT) – Thermistor – resistance thermometer – IC type sensor – semiconductor – diode temperature sensor.

UNIT- III Microcontroller Intel 8051 12 hours

Comparison of Microprocessors and Micro controllers – Architecture – Memory organization - Pin diagram – Addressing modes – instruction set – interrupts.
Assembly language programming – 8-bit addition, subtraction, multiplication and division – sum of the elements in an array – Ascending and descending order.

UNIT – IV Interfacing Memory and I/O Devices 12 hours

Memory mapped I/O – I/O mapped I/O - Data transfer schemes - Programmed and DMA data transfer schemes - Programmable Peripheral Interface (8255A) - 8253 Timer Interface - DMA controller - Programmable Interrupt Controller (8259) – Programmable Communication Interface (8251).

UNIT –V Linear and Nonlinear Circuits 12 hours

Linear and nonlinear electronic circuits – RLC circuit – Chua's diode – Bifurcation and chaos in Chua's Circuit – Analog simulation of Duffing oscillator – Chaotic signal masking – Transmission of analog signals – Chaotic digital signal transmission.

Text books:

T.B 1 Kalsi, Electronic Instrumentation, S. Chand & Sons, 2005

T.B 2 P.S.Manoharan, Microprocessors & Microcontrollers, Charulatha Publications, Fifth edition,2011.

Unit – I & II	**Chapter 4 - 6**	**Sections 4.1 - 6.28**	**T.B 1**
Unit – III & IV	**Chapter 5&7**	**Sections 5.1 - 5.9, 7.2 -7.8**	**T.B 2**
Unit – V	**Chapter 5**	**Sections 5.1 - 5.5**	**T.B 3**

Book for reference:

B.Ram, Fundamentals of Microprocessors and Microcomputers, DhanpatRaiPublication,Ltd, 7th Edition, 2011

CORE COURSE – III
RESEARCH TOPICS IN PHYSICS
NON LINEAR DYNAMICS: INTEGRABILITY, SOLITONS AND CHAOS

Course Code : 14MPPH1C3 | **Max. Marks : 100**
Hours / Week : 4 | **Internal Marks : 40**
Credit : 4 | **External Marks : 60**

Objective:

- To understand the concepts of nonlinear dynamics and to practice the problems of integrability, solitons and chaos.

UNIT – I Linear and Nonlinear Oscillators 12 hours

Damped and driven linear and nonlinear oscillators –Autonomous and nonautonomous systems –Classification of equilibrium points:- Two-dimensional case – Chaos in dissipative nonlinear **Oscillator:-Example:**-Duffing and van der Pol oscillators – Chaotic dynamics of the electronic analog simulation of the Duffing oscillator – Lyapunov exponents.

UNIT – II Painlevé analysis and the Integrability 12 hours

The notion of integrability – How to detect integrability – Painlevé analysis – Classification of singular points – Historical development of the Painlevé analysis – The Painlevé analysis for partial differential equations – Detecting the integrable properties of the nonlinear Schrödinger(NLS) equation by using the Painlevé analysis.

UNIT – III Linear and Nonlinear waves 12 hours

Linear dispersive wave propagation:- Fourier Transform analysis – Nonlinear waves – Cnoidal and Solitary wave solutions of the Korteweg – de Vries(K-dV) Equation – FPU numerical experiments – Recurrence Phenomenon – The Numerical experiments of Zabusky and Kruscal – the birth of Soliton – Solitons in Optics.

UNIT – IV Hirota's Method and Scalar Optical Solitons 12 hours

Hirota's direct bilinearisation method – Nonlinear pulse propagation in SiO_2 and NLS equation – Optical soliton solution of the NLS equation with the positive and Negative Nonlinearity – soliton interaction in the negative Kerr media – Application of solitons in the fiber communication.

UNIT – V Vector Optical Soliton 12 hours

Inadequacy of NLS equation – Vector optical Soliton – Manakov model – Bright vector optical solitons and their collision dynamics – Asymptotic analysis – application of Bright vector optical soliton in the optical computation.

Text book:

M. Lakshmanan and S. Rajasekar, Nonlinear dynamics, Integrability, chaos and patterns, Springer, 2003

Unit – I - V Chapter 2- 4,11,12 & 16 Sections 2.1 -16.6

Book for reference:

Govind P. Agrawal, Applications of Nonlinear fiber optics, Academic Press, New York, 1989.

CORE COURSE – III
RESEARCH TOPICS IN PHYSICS
ULTRASOUND AND ITS APPLICATIONS

Course Code : 14MPPH1C3 | **Max. Marks : 100**
Hours / Week : 4 | **Internal Marks : 40**
Credit : 4 | **External Marks : 60**

Objectives:

- To learn the measurement techniques of ultrasound velocity
- To understand the ultrasound study of liquid mixtures and Solutions
- To study the concepts of acoustical and thermo dynamical parameters
- To know the applications of Ultrasoundin medicine and Non–Destructive Testing on liquid samples.

UNIT – I Measurement techniques of ultrasound velocity 12 hours

Wave parameters and characteristics – classification of sound waves – Ultrasonic waves – pulse superposition method – pulse echo overlap method – cross correlation method – continuous wave method – Resonance ultrasound spectroscopy –Laser interferometry– comparison method –apparent method – Rayleigh surface wave method.

UNIT – II Ultrasound study of Liquid Mixtures and Solutions 12 hours

Ultrasonic study of molecular Interactions – preparation of multi component liquid mixtures – interferometer – continuous wave method – pulse echo overlap method – density – viscosity – free length theory – collision factor theory – Nomoto's relation – thermodynamic theories – scaled particle theory – Khasare's formulation.

UNIT – III Acoustical and Thermo dynamical parameters 12 hours

Acoustic impedance – relaxation time – adiabatic compressibility – Molar volume – Wada's constant – Rao's Constant – Free length – Free Volume – Internal pressure – Absorption coefficient - Molar cohesive energy - Lenard-Jones potential – Vander wall's constants – Enthalpy – Gibb's free energy – apparent molar compressibility – Apparent molar volume

UNIT – IV Ultrasound Non – Destructive Testing 12 hours

Classification of ultrasonic testing – flaw detector – different types of scans - calibration of the testing system – commonly used calibration blocks – ultrasonic inspection of welds – ultrasonic inspection of forgings – ultrasonic inspection of castings – Ultrasonic testing – advantages and disadvantages.

UNIT – V Ultrasound in Medicine 12 hours

Piezo-electric ultrasonic transducers – Magnetostrictive ultrasonic transducers – Interaction of Ultrasound with tissues – ultrasonic diathermy – ultrasonic continuous wave Doppler blood flowmeter – recording fetal heart moment using Doppler ultrasonic method – ultrasonic A-mode, B-mode and C-mode display.

Text book:

Baldev Raj, V.Rajendran, P.Palanichamy, Science and technology of Ultrasonics, Narosa Publishing House, 2009

Unit – I - V Chapter 2,6,7&9 Sections 2.1 - 2.5.3, 6.1 -7.9.6,9.1 -9.6

Books for reference:

1. Baldev Raj, T.Jayakumar, M.Thavasimuthu, Practical Non-Destructive Testing, Narosa Publishing House, 2006
2. Rowlison J.S. and Switon F.L, Liquids and Liquid mixtures, 3rd Edition, Butterworth Scientific, London, 1982.
3. Dr .M. Arumugam, Biomedical Instrumentation , Anuradha Publications, Reprint,2010.

CORE COURSE – IV
TEACHING AND LEARNING METHODOLOGY

Course Code : 14MPPH1C4 | **Max. Marks : 100**
Hours / Week : 4 | **Internal Marks : 40**
Credit : 4 | **External Marks : 60**

Objectives:

- To know the use of the communication technology in teaching and learning methods
- To have a knowledge in usage of electronic media for teaching physics principles
- To learn the utilization of the online teaching in higher education
- To have a knowledge in Virtual Learning and Computer Networking Skills.

UNIT – I: Communication Technology **12 hours**

Convergence of information technology – communication policies and development – #uses of communication technology# – barriers of communication technology – contribution of communication technology to education and limitations.

UNIT – II: Media in Physics **12 hours**

Electronic media: Factors influencing media selection – audio and video medium: Strengths and limitations – Educational Television: Types of formats – Kinds – Merits and limitations – Digital library services: Meaning – Features – Objectives – Advantages and problems.

UNIT – III: Online Teaching in Higher Education **12 hours**

Online learning – online delivery system – multimedia in teaching-learning – computer media in education – satellite and education: communication satellite – EDUSAT – teleconferencing: organization – #advantages and limitations#.

UNIT – IV: Virtual Learning **12 hours**

Meaning – Significance – virtual learning environment – elements – education through e-learning: importance – mobile learning – information and communication technology in education (ICT): Factors responsible for the growth of ICT – designing, development, production and application of ICT in education.

UNIT – V: Computer Networking Skills 12 hours

Meaning – significance – Internet: Keywords –Developing internet skills– internet in education –internet services – Telnet, File Transfer Protocol (FTP) – E-mail – internet chating – Cu-SeeMe –**World Wide Web:** Developing web-based courses – **#**connecting to the internet**#**.

#.....# Self Study portion

Text book:

E.C Eyre, Effective Communication, William Heinemann Ltd, 1979.

Unit – I - V Chapter 1,4 – 6, 8 & 9 Sections 1.1 -4.3, 6.1 - 6.9, 8.4 -9.6

Books for Reference:

1. Hawkridge D, New Information Technology in Education, Croom Helm, London, 1983.
2. Rogers Everett M, Communication Technology, The New Media in Society, The Free Press, New York, 1986.
3. Schramm W, Men, Message and Media: A Look at Human Communication, Harper and Row Publ, New York, 1986.