BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024

M.Phil. PHYSICS [FT / PT] Programme

(For the candidates to be admitted from the academic year 2009-2010 onwards)

Semester I	Title of the Course	Marks			Credits
		IA	UE	Total	
Course -I	Research Methodology	40	60	100	4
Course - II	Advanced Physics	40	60	100	4
Course- III	Paper on Topic of Research (Guide will prepare the syllabus and it will be sent to the COE)	40	60	100	4
Course – IV	Teaching and Learning skills (Common Paper)	40	60	100	4
Semester II					
	Dissertation and Viva-Voce Viva Voce 50 marks Dissertation 150 marks			200	8

For each Course other than the Dissertation

Continuous Internal Assessment – 40 Marks

End Semester Examination – 60 Marks

Total – 100 Marks

Question paper pattern for Course I - III

10 questions compulsory 10 x 01 = 10 Marks (2 from each unit)

5 questions 05 x 04 = 20 Marks (either or type, one from each unit)

3 questions from 5 03 x 10 = 30 Marks (one question from each unit)

Total 60 Marks

Question paper pattern for Course IV

5 Questions 05 x 12 = 60 Marks (either or type, one from each unit)

CIA components

Tests (2x10) - 20 Marks

Term Paper – 10 Marks

Seminar - 10 Marks

COURSE I : RESEARCH METHODLOGY

Unit – I: Working on a Research Problem

Scientific research – Aim and motivation – Principles and ethics – Identification of research problem: Determining the mode of attack – Current status – Literature survey – Abstraction of a research paper – Access using Internet web tools – e-mail – Impact and usefulness of the research problem – Role of research guide – Guidance and rapport – Preparation and presentation of Scientific reports; need and methods – Power point and poster – Writing of synopsis and dissertation and thesis.

Unit – II: Mathematical Methods

Hypergeometric function – Confluent Hypergeometric function – Series solution of Gauss Hypergeometric equations – Elementary properties - Symmetry property – Differential and Integral representations – Linear transformation of Hypergeometric function.

Elliptic functions and elliptic integrals - The Binomial, Poisson and Gaussian distributions – General properties and fitting experimental data.

Unit – III: Data Analysis

Introduction – Statistical description of data - Mean , variance, skewness, median, mode – Distributions – Student's t-test, F-test, Chi-square test – Linear and rank correlations – Modelling data: Least-squares, Fitting data.

Unit – IV: High Performance Computing

High performance computing basics – Elements of Fortran 90/95 – Constants and variables – Arithmetic expressions – I/O statements – Logical expressions – Conditional and control statements - Arrays – Functions and subroutines – Format statements – Advanced features: Procedures, modules, recursive functions and generic procedures – Applications Software and Libraries: MATLAB, MATHEMATICA, GNUPLOT, LATEX, LAPACK, BLAS, and FFTW (basics only).

Unit – V: Advanced Analytical techniques

Analytical Technique – principles of single crystal and powder X-ray diffraction , FT-IR, Raman and UV-visible spectrometers – SEM, TEM, EDAX, AFM, EPMA – Instrumentation – Sample preparation – Analysis of materials – study of dislocation – ion implantation uses.

Books for Study and References

Unit I

1. J. Anderson, B.H. Durston and M. Poole, *Thesis and Assignment writing* (Wiley Eastern, New Delhi, 1977).
2. Rajammal Devadas, *Hand Book of Methodology of Research* (R.M.M. Vidyalaya Press, 1976).
3. *Internet: An Introduction*, CI Systems School of Computing, Jaipur (Tata McGraw Hill, New Delhi, 1999).
4. C.R. Kothari*, Research methodology: Methods and Techniques*, (New age International, New Delhi, 2006).

Unit II

1. P. K. Chattopadhyay, *Mathematical Physics*, (Tata McGraw Hill, New Delhi,2007).

Unit III & IV

1. Troy Baer, *An Introduction to FORTRAN 90,* Ohio Supercomputer Centre, Columbus, OH, USA
   Internet Tutorial URL: http://oscinfo.osc.edu/training/f90/html/bsld.002.html
2. V. Rajaraman and C. Siva Ram Murthy, *Parallel computers – Architecture and Programming*, Prentice Hall of India, New Delhi.
3. H. K. Dass, *Mathematical Physics,* S. Chand & Company, New Delhi (2003).
4. C.R. Kothari*, Research methodology: Methods and Techniques*, (New age International, New Delhi, 2006).

Unit – V

1. M. William and D. Steve, Instrumental Methods of Analysis (CBS Publishers, New Delhi, 1986).

COURSE II : ADVANCED PHYSICS

Unit – I: Quantum Field Theory

Lagrangian field theory – Canonical quantization – Classical field equations – Hamiltonian formulation quantization of field – Non-relativistic field – System of Bosons – System of Fermions – Relativistic fields – Klein Gordon fields – Dirac fields.

Unit – II: Crystal Growth and Thin Film Physics

Nucleation – Spherical and cylindrical nucleation – Solution growth methods : Slow cooling , slow evaporation and temperature gradient methods - Melt growth : Bridgman method – Czochralski method – Thin film preparation : Physical methods - thermal evaporation - electron beam evaporation - sputtering method - Chemical methods : chemical bath deposition - spray pyrolysis.

Unit – III: Nano-materials

Introduction to nano technology - Importance of nanomaterials – Types of nanostructures (1D, 2D, 0D) - Self-assembled monolayers (SAM) – Vapour Liquid Solid (VLS) – Chemical Vapour Deposition(CVD) – Carbon nanotubes (CNT) – Metals (Ag, Au) – metal oxides (TiO_2, ZnO) - Semi-conductors (CdS, ZnSe).

Unit – IV: Nonlinear Dynamics

Regular and Chaotic motions – Linear and nonlinear oscillators – Phase trajectories – Fixed points and limit cycles – Period doubling phenomenon and onset of chaos in Logistic map.

Linear and nonlinear waves – Solitary waves – Numerical experiments of Kruskal and Zabusky – Solitons – KdV equation (no derivation) – one soliton solution by Hirota's direct method.

Unit – V: Energy Sources

Nuclear Reactor principle – Nuclear fuel source – Enrichment – Energy production – Power and Breeder Reactors - Waste disposal –safety measures- prospects of renewable energy sources – Solar Cells : Solar cell parameter – characteristics – Efficiency – Single crystal silicon solar cells – Polycrystalline silicon solar cells – Applications of solar energy: water heating – photo voltaics -Wind energy: Wind power – Principle – Generation – Distribution – Efficiency.

Books for study and references

Unit I

1. V.K. Thankappan, *Quantum Physics,* (New Age International (P) Limited Publishers, 2nd Edition New Delhi, 2006)

Unit II

1.J.C. Brice, Crystal Growth Processes, John Wiley and Sons, New York (1986).
2. P. Santhana Raghavan and P.Ramasamy, 'Crystal Growth Processes and Methods', KRU Publications Kumbakonam (2000).
3. A. Goswami, Thin film Fundamental, New Age International (P) Ltd, New Delhi (2006).

Unit III

1. G. Cao, Nanostructures and Nanomaterials : Synthesis, properties and applications, Imperical College Press, 2004**.**

Unit – IV

1. M. Lakshmanan and S. Rajasekar, *Nonlinear Dynamics* (Narosa Publications, New Delhi, 2003).

Unit – V

1. Kreith and kreider, Principles of Solar Engineering, Tata McGraw Hill Publication.
2. M.P.Agarwal, Solar Energy, S.Chand & Co.
3. S.P. Sukhatme Solar Energy
4. G. D. Rai Non-conventional energy sources, Khauna Publications Delhi
5. G.D. Rai, *Solar Energy Utilization* , (Khanna Publishers, 5th Edition New Delhi, 1997).
6. http://www.euronuclear.org/info/energy-uses.htm
7. www.theiet.org/factfiles/energy/nuclear-principles.cfm?type=pdf
8.http://paksnuclearpowerplant.com/download/1216/Fast%20breeder%20reactors.pdf
9. http://en.wikipedia.org/wiki/Nuclear_fuel

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COURSE –IV – TEACHING AND LEARNING SKILLS

Objectives:

- acquaint different parts of computer system and their functions
- understand the operations and use of computers and common

Accessories

- develop skills of ICT and apply them in teaching learning context and Research
- appreciate the role of ICT in teaching, learning and Research
- acquire the knowledge of communication skill with special reference to its elements, types, development and styles
- understand the terms communication Technology and Computer mediated teaching and develop multimedia / e-content in their respective subject
- understand the communication process through the web
- acquire the knowledge of Instructional Technology and its Applications
- develop different teaching skills for putting the content across to targeted audience

Unit I – Computer Application Skills

Computer system: Characteristics, Parts and their functions – Different generations of Computer – Operation of Computer: switching on / off / restart, Mouse control, Use of key board and some functions of key – Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations

Unit II – Communication Skills

Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and written; Non-verbal communication – Intrapersonal, Interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and writing – Methods of developing fluency in oral and written communication – style, Diction and Vocabulary – Classroom communication and dynamics

Unit III – Communication Technology

Communication Technology: Bases, Trends and Developments – Skills of using Communication Technology – Computer Mediated Teaching: Multimedia, E-content – Satellite-based communication: EDUSAT and ETV channels, Communication through web: Audio and Video applications on the Internet, interpersonal communication through the web.

Unit IV – Pedagogy

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation – Versatility of lecture technique – Demonstration, Characteristics, Principles, Planning Implementation and Evaluation – Teaching – Learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion – Models of teaching: CAI, CMI and WBI

Unit V – Teaching Skills

Teaching skill: Definition, Meaning and Nature – Types of Teaching skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing

Questions, Skill of Black Board writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills

References:

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi
2. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh
3. Information and Communication Technology in Education: A Curriculum for Schools and programme of Teacher development, Jonathan Anderson and Tom Van Weart, UNESCO, 2002
4. Kumar K.I (2008) Educational Technology, New Age International Publishers, New Delhi
5. Mangal, S.K. (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana
6. Michael D. and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New York
7. Pandey S.K. (2005) Teaching Communication, Commonwealth Publishers, New Delhi
8. Ram Babu A. and Dandapani S (2006) Microteaching (Vol.1&2) Neelakamal Publications, Hyderabad
9. Singh V.K. and Sudarshan K.N. (1996) Computer Education, Discovery Publishing Company, New York
10. Sharma R. A. (2006) Fundamentals of Educational Technology, Surya Publications, Meerut
11. Vanaja. M. and Rajasekar S. (2006) Computer Education, Neelkamal Publications, Hyderabad.

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