



THANTHAI HANS ROEVER COLLEGE, PERAMBALUR – 621220
(AUTONOMOUS)
M. Phil., PHYSICS – COURSE STRUCTURE UNDER CBCS
(For the candidates admitted from the academic year 2018-2019 onwards)



Course	Subject Code	Title of the paper	Marks			Credits
			IA*	UE*	Total	
Semester – I						
Course – I	18MPPH1CC1	Research methodology	40	60	100	4
Course – II	18MPPH1CC2	Advanced Physics	40	60	100	4
Course –III	18MPPH1CC3	Paper on topic of research <i>(Guide will prepare the syllabus and it will be sent to the COE)</i>	40	60	100	4
Course – V	18MPPH1CC4	Teaching and learning skills	40	60	100	4
Semester – II						
	18MPPH2DW	Dissertation and Viva-voce Viva voce 50 marks Dissertation 150 marks	--	--	200	8

IA* Marks – Internal Assessment Marks; UE* Marks – University Examination Marks

RESEARCH METHODOLOGY

Course: I
Course Code: 18MPPH1C1
Credit: 4

Semester: I
Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- ✓ To know about the different steps in doing a research problem
- ✓ To have a idea about data analysis through various test
- ✓ To understand the advanced analytical techniques

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 – Power point and poster – Writing of synopsis, 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, HR-XRD, FT-IR, Raman and UV-visible spectrometers – SEM, FESEM, EDAX, TEM, HR-TEM with SAED, XPS, AFM – Instrumentation – Sample preparation – Analysis of materials – Study of dislocation – Ion implantation uses.

References

1. J. Anderson, B.H. Durston and M. Poole, Thesis and Assignment writing, Wiley Eastern, New Delhi, 2nd Edition, 1994.
2. Rajammal Devadas, Hand Book of Methodology of Research, R.M.M. Vidyalaya Press, 1993.
3. C.R. Kothari, Research methodology: Methods and Techniques, New age International, New Delhi, 2nd Edition, 2008.
5. P. K. Chattopadhyay, Mathematical Physics, Tata McGraw Hill, New Delhi, 2007.
6. Yogandra Prasad Joshi, An Introduction to FORTRAN 90/95 syntax and Programming, Allied Publishers Private Limited, New Delhi, 2003.

7. V. Rajaraman and C. Siva Ram Murthy, Parallel computers – Architecture and Programming, Prentice Hall of India, New Delhi, 2006.
8. H. K. Dass, Mathematical Physics, S. Chand & Company, New Delhi, 7th Revised Edition, 2014.
9. C.R. Kothari, Research methodology: Methods and Techniques, New age International, New Delhi, 2013.
10. D. Mularidharao, A.V.N. Samy, D. Dharaneeswara Reddy, Instrumental Methods of Analysis, CBS Publishers, New Delhi, 2013.

ADVANCED PHYSICS

Course: II
Course Code: 18MPPH1C2
Credit: 4

Semester: I
Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- ✓ To understand the different methods of preparation of crystal growth, nanomaterials and thin films
- ✓ To know about the linear and nonlinear oscillations
- ✓ To have an idea of various energy sources.

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: Nanomaterials

Introduction to nano technology - Importance of nanomaterials – Types of nanostructures (1D, 2D, 0D) – Top down approach – Bottom up approach - Sol-Gel and Precipitation technologies - Ball milling - RF plasma - Laser synthesis - Gas phase condensation - Sonochemical – Applications of nanomaterials.

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.

References

1. V.K. Thankappan, Quantum Physics, New Age International (P) Ltd. Publishers, 2nd Edition, New Delhi, 2006.
2. J.C. Brice, Crystal Growth Processes, John Wiley and Sons, New York, 1986.
3. P. Santhana Raghavan and P. Ramasamy, Crystal Growth Processes and Methods, KRU Publications, Kumbakonam, 2007.
3. A. Goswami, Thin film Fundamental, New Age International (P) Ltd, New Delhi, 2006.

4. G. Cao, Nanostructures and Nanomaterials : Synthesis, Properties and Applications, World Scientific Publishing Co. Pvt. Ltd., Singapore, 2nd Edition, 2011.
5. M. Lakshmanan and S. Rajasekar, Nonlinear Dynamics, Narosa Publications, New Delhi, 2008.
6. D. Yogi Goswami, Principles of Solar Engineering, CRC Press, 3rd Edition, 2015.
7. G.D. Rai, Solar Energy Utilization, Khanna Publishers, 5th Edition, New Delhi, 2006.

TEACHING AND LEARNING SKILLS

Course: IV
Course Code: 18MP1C4
Credit: 4

Semester: I
Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- ✓ To know the different parts of computer system and their functions
- ✓ To understand the operations and use of computers and common Accessories
- ✓ To 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, Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi, 2007.
2. Don Skinner, Teacher Training, Edinburgh University Press Ltd., Edinburgh, 2005.
3. Jonathan Anderson and Tom Van Weart, Information and Communication Technology in Education: A

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