GUJARAT VIDYAPITH: AHMEDABAD

Syllabus of M. Phil (Physics)

(In force from June 2013)

Department of Microbiology,

M. D. Gramseva Mahavidyalaya, Sadra

Dist: Gandhinagar 382 320

Gujarat Vidyapith: Ahmedabad
Structure of M. Phil. (Physics) Course
In force from June-2013

Semester-1				
Subject	**Hours**		**Credits**	**Marks**
	Theory	**Practical**		
PHY-101: Research Methodology	60	-	4	100
COMP-102: Computer Application in Research **(Compulsory for all subjects)**	15	30	2	50
PHY-103: Reviews of Literatures in Specific Research Area of Physics	**-**	60	2	50
PHY-104: Condensed Matter Physics	60	**-**	4	100
Dissertation [Selection of the research problem, preparation of research design and list out the lab requirements (chemicals, glass wares, miscellaneous items) for respective research work and primary practical work]	225		(**5 Credits** but it is included in semester-2)	-
Total	**450**		**12**	**300**
Semester-2				
Dissertation (Practical work, dissertation writing, dissertation submission)	450		10 (sem-2) + 5(sem-1)	Satisfactory report from referee
Total	**450**		**15**	**-**

Note:

- Available time for each semester=15 weeks (excluding examination, public holidays, other activities, vacation)
- 1 day=5 hours(excluding prayer and recess)
- 1 week=6days(excluding Sunday)

Therefore **1week=30 hours (It is available for direct teaching)**

Available time for each semester=15 weeks ×30hours=450 hours

→ **Relation between credit and hours:**

- For theory **1 credit=15 hours**
- For practical work **1credit=30 hours**
- For dissertation work **1credit=45 hours**

M.D.GRAMSEVA MAHAVIDYALAYA: SADRA
Syllabus of Course work for M. Phil. (Physics)
In force from June-2013
PHY-101: Research Methodology
(Total Teaching Hours=60, Credits=4, 100 Marks)

Unit I: Working on a Research Problem (12 hour, 20 Marks)

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: Scientific writing (12 hour, 20 Marks)

(A) Communicating information: General aspects of scientific writing, reporting practical and project work, writing literature surveys, research papers and reviews, organizing a poster display, giving an oral presentation

(B) Research Report: Format of research proposal, Format of the research report, style of writing the report, references and bibliography.

Unit III: Advanced Characterization techniques (18 hour, 30 Marks)

(A) Structural characterization: single crystal and powder X-ray diffraction

(B) Chemical analysis: Electron Probe Microanalysis-EDAX, Auger Electron Spectroscopy (AES), X-ray photoelectron spectroscopy (XPS)

(C) Electrical characterization: Two probe & Four probe method, Van der Pauw method of sheet resistivity, I-V characteristics, Hall effect by Van der Pauw method.

Unit IV: - High Performance computing (18 hour, 30 Marks)

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).

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. A Hand books of Methodology of Research by Rajammal P. Devdas and K. Kulandaivel, Sri Ramkrishnan Mission Vidyalaya Press, Coimbatore.
2. Thesis and assignment Writing by Janathan Andorson, et. al. Narosa Publication
3. Research- How to plan, Speak and Write about it by C.Hawkins and M.Sorgi, Narosa Publishing House
4. Web Site of Inflibnet, UGC, CSIR, INSA, DST.

Unit III

1. C.R. Kothari*, Research methodology: Methods and Techniques*, (New age International, New Delhi, 2006).
2. M. William and D. Steve, Instrumental Methods of Analysis (CBS Publishers, New Delhi, 1986).
3. Michael Sayer and A. Mansingh, Measurement, Instrumentation and Experiment Design in Physics and Engineering, Printice Hall of India, New Delhi.

Unit IV

1. Troy Baer, *An Introduction to FORTRAN 90,* Ohio Supercomputer Centre, Columbus, OH, USA
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).

COMP-102: સંશોધનમાં કમ્પ્યૂટરનું ઉપયોજન ગુણ - ૫૦

સૈદ્ધાંતિક કાર્ય

એકમ-૧ સંશોધનમાં શબ્દ પ્રક્રિયન(Word Processing)નો ઉપયોગ ગુણ - ૧૦

૧.૧ ડોક્યુમેન્ટ ક્રિએટીંગ એન્ડ ફોર્મેટીંગ : પેરેગ્રાફ, ફોન્ટ, એલાઈન્મેન્ટ, લાઇન સ્પેસિંગ, પેજ સેટઅપ,

૧.૨ એડિટીંગ : કટ, કોપી, પેસ્ટ, ફાઇન્ડ, રીપ્લેસ

૧.૩ ઇન્સર્ટ ઓબ્જેકટ

એકમ-૨ સંશોધનમાં અંક પ્રક્રિયન(Numeric Processing)નો ઉપયોગ ગુણ - ૧૦

૨.૧ ક્રિએટ વર્કશીટ

૨.૨ માહિતી વિશ્લેષણ : ડેટા એનાલિસીસ પાર્ક (વર્ણનાત્મક અંકશાસ્ત્રીય ગણતરીઓ, આવૃત્તિ વિતરણ અને કોષ્ટકીકરણ (Tabulation) T - ગુણોત્તર અને એકમાર્ગી વિચરણ વિશ્લેષણ (One Way ANOVA)

૨.૩ આલેખાત્મક રજૂઆત : લાઇન, કોલમબાર, પાઈ આલેખની રચના રીતિ

એકમ-૩ સંશોધનમાં ઇન્ટરનેટનો ઉપયોગ ગુણ - ૦૫

૩.૧ ઓનલાઇન અને ઓફલાઇન માહિતી શોધની રીતો

૩.૨ ઈ-જર્નલ્સ અને ઈ-બુકનો ઉપયોગ

૩.૩ કમ્પ્યૂટર આધારિત પ્રત્યાયનનો સંશોધનમાં ઉપયોગ (ઈ-મેઈલ)

પ્રાયોગિક કાર્ય ગુણ - ૨૫

૧. એક પેજ ડોક્યુમેન્ટ (One Page Document) તૈયાર કરી સૂચવેલા પેજ સેટ અપ કરે.

૨. એક પેજ ડોક્યુમેન્ટ(One Page Document)માં સૂચના મુજબ પેરેગ્રાફ, ટાઈટલ, ફોન્ટ અને લાઈન સ્પેસિંગ ફોર્મેટ કરે.

૩. એક પેજ ડોક્યુમેન્ટ(One Page Document)માં સૂચના મુજબ કટ, કોપી, પેસ્ટ અને સ્પેલ ચેક કરે.

૪. વર્ક શીટ તૈયાર કરી વર્ણનાત્મક અંકશાસ્ત્રીય ગણતરીઓ કરે. (મધ્યક, મધ્યસ્થ, પ્રમાણવિચલન, વિરૂપતા, કક્ષદતા)

૫. વર્ક શીટમાં ડેટા ફીડ કરી તેના આધારે આલેખ રચના કરે.

૬. આલેખ રચનામાં આલેખનો પ્રકાર, આલેખ અને ધરીના શીર્ષક, રંગમાં પરિવર્તન કરે.

૭. Excelની સામગ્રી(વર્કશીટ, આલેખ)ને Word Documentમાં ઈન્સર્ટ કરે.

૮. પાવર પોઈન્ટનો ઉપયોગ કરી ૧૦ સ્લાઈડવાળું પ્રેઝન્ટેશન તૈયાર કરે.

૯. પોતાની સંશોધન સમસ્યા આધારિત સંબંધિત સાહિત્યની શોધ કરે.

૧૦. E-mail ડ્રાફ્ટ કરે.

નોંધ : ઉપરોક્ત પ્રાયોગિક કાર્યોમાંથી કોઈપણ બે પ્રાયોગિક કાર્યો કરવાના રહેશે.

અનુપારંગત અભ્યાસક્રમ

COMP-102: સંશોધનમાં કમ્પ્યૂટરનું ઉપયોજન ગુણ - ૫૦

સમય : ૧ કલાક **સૈદ્ધાંતિક કાર્ય** **ગુણ - ૨૫**

પ્રશ્ન ૧	બહુવિકલ્પ પ્રકારના પ્રશ્નો	ગુણ ૧૦
પ્રશ્ન ૨	ટૂંક જવાબી પ્રશ્નો (સાતમાંથી પાંચ)	ગુણ ૧૦
પ્રશ્ન ૩	નિબંધલક્ષી પ્રશ્નો (બેમાંથી એક)	ગુણ ૫

સમય : ૨ કલાક **પ્રાયોગિક કાર્ય** **ગુણ - ૨૫**

પ્રાયોગિક કાર્ય - ૧	ગુણ - ૧૫
પ્રાયોગિક કાર્ય - ૨	
મૌખિક	ગુણ - ૧૦

M.D.GRAMSEVA MAHAVIDYALAYA: SADRA
Syllabus of Course work for M. Phil. (Physics)
In force from June-2013
PHY-103: Reviews of Literatures in Specific Research Area of Physics
(Total Teaching Hours=60, Credits=2, 50 Marks)

Students must deeply review the literature in specific research area of Physics and submit the summary of the same to the department through proper channel for evaluation.

M.D.GRAMSEVA MAHAVIDYALAYA: SADRA
Syllabus of Course work for M. Phil. (Physics)
In force from June-2013
PHY-104: Condensed Matter Physics
(Total Teaching Hours=60, Credits=4, 100 Marks)

Unit I: Nanoscience (15 hour, 25 Marks)

Importance of Nanoscience, Size effects: Structural, Mechanical, Optical, Chemical, Magnetic and Electrical properties of nanomaterials

Tools for nanotechnology: Scanning Tunneling Microscopy (STM), Atomic Force Microscopy (AFM), Transmission Electron Microscopy (TEM), Applications of nanomaterials in Industry, Medicine, Textile

Unit II: Crystal Growth Techniques (15 hour, 25 Marks)

Bridgman and related methods-basic processes, high temperature solution growth: flux growth, high pressure methods, hydrothermal growth, chemical vapour transport technique: introduction, some theoretical aspects- concepts of epitaxy, reaction, transport processes, stability condition, closed systems, open systems for bulk crystals, open systems for thin layers.

Defects in crystalline materials – an introduction, concept of slip, dislocations and slip, cross slip, velocity of dislocations, climb, and experimental observations of climb.

Unit III: Experimental Techniques (15 hour, 25 Marks)

Vacuum Techniques: Creation of Vacuum with different Vacuum Pumps: Rotary, Diffusion, Turbomolecular and Cryo pump, Measurement of Vacuum with different Gauges: Pirani, Penning, Mcleod.

Transducers: Desired characteristics of transducer, Different transducers: Temperature, Capacitive, Magnetic field, LVDT, Piezoelectric, Photomultiplier tube.

UNIT IV: High pressure physics (15 hour, 25 Marks)

Production and measurement of high pressure: Introduction, properties of materials for high pressure systems, The transmission of pressure, basic

considerations in pressure measurement, Practical methods of pressure generation: Gravitational methods, Thermodynamic methods, shock – wave methods, Piston methods- Single and multi stage, Pressure measurements and pressure scale: Primary pressure measurement, secondary measuring instruments-Phase change methods, Bourdon gauge, resistance gauge, pressure calibration points. Bridgman Anvil Cell and Diamond Anvil Cell

Reference Books

Unit I

(1) G. Cao, Nanostructures and Nanomaterials, Imperial College Press (2004)

(2) Robert Kelsall, Ian Hamley, M. Geoghegan, Nanoscale Science & Technology John Wiley (International) Publications

(3) K.K. Chattopadhyaya & A.N. Banerjee, Introduction to Nanoscience & Nanotechnology by, PHI Learning, New Delhi

(4) Introduction to Nanotechnology by Charles P. Poole, Jr., Frank J. Owens

Unit II

1. Crystal growth processes by J.C. Brice (Blackie and sons Ltd.)
2. Crystal growth by Santaraghvan and P. Ramasamy (Kru Publishers)
3. Introduction to dislocation by D. Hull

Unit III

1. K. M.Varier, A. Jodrph, Advanced Experimental Techniques in Modern Physics, Pragati Prakashan
2. J. P. Holman, Experimental Methods for Engineers, Tata McGraw Hill
3. Hand book of Thin film Technology by Leon I. Maissel, Reinhard Glang
4. Vacuum Science and Technology by V. V. Rao and T. B. Ghosh

Unit IV

1. High Pressure Physics and Chemistry Volume-1 Editor: R.S.Bradley Academic Press- London and New York-1963